

High Prevalence of Malnutrition and Household Food Insecurity in the Rural Subsistence Paddy Farming Sector

R.L.D.K. Malkanthi, K.D.R.R. Silva¹, G.A.P. Chandrasekera¹ and J.M.U.K. Jayasinghe²

Postgraduate Institute of Agriculture
University of Peradeniya
Peradeniya, Sri Lanka

ABSTRACT. *Nutritional status among household members, caloric and protein adequacy, perception of food consumption and dietary diversity within household are key variables in measuring Household Food Security (HFS). The present study was carried out to assess the household food and nutrition security of rural subsistence paddy farming communities using the above key variables. Eighty subsistence paddy farming households from 20 Divisional Secretariats across 10 districts were studied. Prevalence of protein energy malnutrition (stunting, wasting and underweight) and anaemia were determined among children. Under-nutrition among adolescents and adults were determined using Body Mass Index. A 24-hrs dietary recall was performed from all household members to estimate household energy and nutrient intake. A questionnaire including United States Department of Agriculture Core Food Security Module was used to determine the HFS level. The prevalence of stunting, underweight and wasting in children were 19%, 28% and 17%, respectively. Forty five percent of children less than five years were anaemic. Prevalence of food secure, food insecure without hunger, food insecure with moderate hunger and food insecure with severe hunger in households were 25%, 55%, 17.5% and 2.5%, respectively. Less dietary diversity with low consumption of animal protein sources was observed in households. Percentage of households which did not achieve energy and protein adequacy was 75% and 56%, respectively. High prevalence of chronic malnutrition among children, underweight females reflected long term food deprivation. Limited diversity of the food intake and low income are associated with high prevalence of malnutrition and food insecurity in the rural subsistence paddy farming sector.*

INTRODUCTION

Food security at national and household level is the most important element to ensure the nutritional well-being of people. Food security is defined as "a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life for all household members" (FAO, 1997). With the very satisfactory level of domestic production, particularly of rice and the capacity to import food that is in short

¹ Department of Applied Nutrition, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (60170), Sri Lanka.

² Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila (60170), Sri Lanka.

supply, Sri Lanka is in a fairly satisfactory position with regard to national food security (Ministry of Health, Nutrition and Welfare, 2004). Overall food availability in terms of per capita energy availability is about 2078 kcal per person which is only marginally below the average requirement of 2200 kcal per day recommended by the Medical Research Institute (MRI, 1998). However, it has been emphasized that global or national food security does not necessarily ensure household or individual food security, and that 20% - 30% of the population of countries where the per capita supply of food is at or above 100% of dietary energy needs may persistently have experience inadequate diets and be unable to meet their requirements for normal physiological functioning (FAO, 1992). Therefore, Household Food Security (HFS), the ability of the household to secure enough food to provide for all the nutrient requirements of all members of the household, is considered as a key factor that determines the individual dietary intake, nutritional and physical well-being of the household members.

Under-nutrition caused by protein energy malnutrition and micronutrient (iron, iodine and vitamin A) deficiencies among children, have been identified as major nutritional problems in Sri Lanka (Wikramanayake, 1996). Anthropometric indices represent the cumulative effect of access to food, health, education and environmental health conditions. Therefore, the nutritional status is a powerful indicator of nutrition security and well being of an individual and reflects the nutritional and poverty situation of a household. Especially the nutritional status of pre-school children is a sensitive indicator, because children are most vulnerable to nutritional imbalances. About 88% of the total poor in Sri Lanka reside in the rural areas, compared with 8% in urban areas and 4% in estate areas (Department of Census and Statistics, 2000). The percentage of poor households in urban, rural and estate sectors was 7.6, 26.4 and 23.2%, respectively. In-fact, almost 43% of principle income earners in the poor households are employed in agriculture. The districts that are predominantly agricultural and produce the bulk of food requirements of the country are the poorest districts in the country. Farmers cultivating low-value crops, especially paddy, on very smallholdings, is believed to be among the bulk of poor. About one half of the country's households are rural and derive incomes directly or indirectly from agricultural activity.

In order to achieve food security, it is essential to develop appropriate policies that are directed specifically to the people who are undernourished or at risk and implement through proper development planning. However, limited accurate information, on household food security, is a major drawback to formulate such policies in Sri Lanka.

There were no comprehensive studies which investigated household food security, especially in rural subsistence agriculture sector in Sri Lanka. Therefore, a large-scale survey was started by Wayamba University of Sri Lanka in May 2005 to assess HFS in rural subsistence agriculture sector. The present paper examined the prevalence of household food insecurity, determined by a modified version of the U.S. Household Food Security Survey Module (Bickel *et al.*, 2000), nutritional status of the nutritionally vulnerable groups, food intake and food diversity in households of rural subsistence agricultural sector.

SUBJECTS AND METHODS

Sampling and subjects

A multi-stage sampling method was used to select the households. A sample of 80 households (HHs) primarily involved with paddy farming and having at least one child aged < 5 yrs was selected for the study. HHs were chosen from purposely selected 20 Divisional Secretariats (DS) across 10 districts (Anuradhapura, Polonnaruwa, Kurunegala, Kegalle, Ratnapura, Badulla, Moneragala, Hambanthota, Galle and Matara) in five provinces. All eligible households in the selected DS divisions were identified and selected farming families were contacted through Agriculture Research and Production Assistants attached to the Agrarian Services Centers of the respective DS divisions. The survey was carried out by house visits during the period of December 2006 to February 2007.

Data collection

A comprehensive structured questionnaire, which included both quantitative and qualitative questions to capture the major three dimensions (accessibility, availability and utilization) of multi-faceted phenomenon of food security, was used as the major study instrument. The questionnaire was constructed after conducting 30 case studies by in-depth qualitative interviews done in households with a similar background to the study sample and pre-tested. Socio-economic information was gathered at the household level (only data related to nutritional status and overall food security is presented in this paper). All information was collected with reference to last two cropping seasons both *Yala* and *Maha*.

Assessment of food security level

Household food security level was measured using United States Department of Agriculture (USDA) Core Food Security Module (Bickel *et al.*, 2000) modified for the study population. This 18-question scale that is used to assess U.S. household-level food insecurity assesses uncertainty and worry, inadequate quality, insufficient quantity, and social unacceptability of food access.

Dietary assessment

A 24-hr dietary recall was performed from all household members to assess daily energy and macronutrient intakes.

Nutritional status assessment

Weight and height were measured from all household members using standard equipment and followed standard guidelines. Body weight was measured using a calibrated electronic floor scale (Seca, UK); accurate to the nearest 0.1 kg. Height was measured to the nearest 0.1 cm using an upright plastic portable stadiometer (Invicta, England).

Haemoglobin levels

Haemoglobin level of groups vulnerable to anaemia (children, pregnant mothers and adolescents) was determined by finger prick blood sample using HaemoCue® AB Hb

201⁺ portable blood haemoglobin meter (Angelholm, Sweden). The verbal consent was taken from the parent/guardian prior to the blood sample taken from children.

Data and statistical analysis

Households were categorized into four types of food security levels, (1) food secure (2) food insecure without hunger (3) food insecure with moderate hunger (4) food insecure with severe hunger according to the scores of USDA Core Food Security Module (Bickel *et al.*, 2000). Daily energy, carbohydrate, protein and fat intakes were calculated for all household members using “Foodbase 2000” database which consists of nutritional composition of Sri Lankan foods. Household energy and protein adequacy was determined comparing with total requirements for all members in the household based on their age, sex, physiological status, and activity level (WHO, 1985). Z-scores of Height-for-age (HAZ), weight-for-height (WHZ) and weight-for-age (WAZ) were calculated for the children less than 5 yrs using software *Anthro 2005*. Two standard deviations below the median (-2SD) of National Centre for Health Statistics (NCHS) reference population was used as the cut-off values to determine the prevalence of stunting, wasting and underweight (WHO, 1983). Body Mass Index (Weight/height²) was calculated in 5 - 10 yrs old children, adolescents and adults. Thinness was determined using BMI-for-age <-2SD in 5 - 10 yrs old children and adolescents. The adults who were below the 18.5 of BMI were considered as underweight and those who were above the 22.9 and 24.9 of BMI were considered as overweight and obese, respectively. Prevalence of anaemia was computed using standard WHO cut-off given based on the gender, age and physiological status (<11.5 g/dL).

Mean individual nutrient intakes of study population were compared with Recommended Daily Allowances (RDAs) by one sample student *t*-test. The association of household food security with nutritional status and income was determined by Chi-square test and Fisher’s exact test using SPSS.

RESULTS

Characteristics of the sample

Table 1 shows the major characteristics of the study sample. The total sample obtained consisted of 171 males and 192 females which included 83 children aged < 5 yrs and 198 adults (Mean age, 39 ± 15 yrs). Only 39% of farmers had own lands for their paddy cultivation. Average family size per household was 4.5. Mean area cultivated per season was 1.02 ha. Greater proportion of fathers and mothers had not achieved Ordinary Level (O/L) or better educational qualifications.

Dietary intake

The intake of macronutrients of the adults and children <5 yrs is presented in Table 3 and 4, respectively. Mean daily energy intake of the adult males and females were 2410 kcal and 1703 kcal, respectively. Both values were less than the RDA while female adults had significantly ($P<0.05$) lower energy intake than RDA. In this study sample about 68% of adult males and females did not meet the RDA for energy and about 57% of adult males and

70% of adult females did not meet the RDA for protein. Carbohydrate was the highest contributor to energy (74%) whereas fat contributed only about 18%.

Table 1. Characteristics of the sample.

Characteristics	Categories	Number (N)	Frequency (%)
Gender	Males	171	47
	Females	192	53
Age	<5 yrs	83	23
	5 -10 yrs	47	13
	11 -18 yrs	35	10
	18 -60 yrs	174	48
	>60 yrs	24	6
Land ownership	Own	31	39
	Tenure	20	25
	Lease	9	11
	Own + Tenure	11	14
	Own + Lease	9	11
Average area cultivated (ha)	-	1.02	-
Average family size (per HH)	-	4.5	
Mothers' education	Grade 10 and below	58	73
	Ordinary Level and above	22	27
	Grade 10 and below	66	82
Fathers' education	Ordinary Level and above	14	18

Note: HHs: Households

Table 2. Mean (SD) household income and expenditure per month

	Types	Mean	SD
Income	Gross income	14 956.00	12 192.00
	Agriculture expenditure	7 316.00	90 720.00
	Net income	7 640.00	7 384.00
	National average household income per month *	25 414.00	-
Household expenditure	Family expenditure	7 894.00	4 364.00
	National mean household expenditure per month*	22 671.00	-
	Expenditure on food	3 379.00	1 776.00
	National expenditure on food*	8 105.00	-

Note: * Source: Income and expenditure survey 2006, Department of Census and Statistics. values were given in Sri Lankan Rupees (SLR)

Table 3. Mean (SD) daily energy and nutrient intake of adults (>18 yrs) per day.

Nutrient	Males (n=93)			Females (n=104)			< RDA % (n)	
	Mean	SD	RDA [†]	Mean	SD	RDA [†]	Male	Female
Energy (kcal)	2410	1359	2500	1703*	962	1900	68 (63)	68 (71)
Protein (g)	57	34	55.5	41	23	45	57 (53)	70 (72)
Fats (% E)	18*	8	30.0	19*	9	30	89 (83)	88 (92)
CHO (% E)	74*	14	60.0	74*	13	60	11 (10)	10 (10)

Note: CHO, carbohydrates; E, energy; [†]RDA, Recommended Daily Allowance (WHO, 1985), *Significantly different from RDA ($P<0.05$).

Table 4. Mean (SD) daily energy and nutrient intake of children <5 years.

Nutrient	Males 1-3 years (n=19)			Females 1-3 years (n=7)			Males 4-5 years (n=19)			Females 4-5 years (n=24)		
	Mean	SD	RDA [†]	Mean	SD	RDA [†]	Mean	SD	RDA [†]	Mean	SD	RDA [†]
Energy [‡] (kcal)	630*	386	1230	470*	150	1165	1192*	625	1715	1284	962	1545
Protein (g)	18	16	14.5	13.7	5.3	14.5	31	16	19.7	35.8	32.7	19.7
Fats (%E)	28	12	30	23	4	30	25	7	30	22	11	30
CHO (%E)	64	15	60	62	17	60	65	8	60	66	18	60
Fe (mg)	4.8	4.4	5.0	3.3	2.5	5.0	10.3	11.7	5.5	9.8	9.2	5.5

Note: [†]RDA: Recommended Daily Allowance, WHO, 1985; [‡] Excluding energy from breast milk
*Significantly different from RDA ($P<0.05$).

Mean daily energy intake (excluding energy from breast milk) of both male and female children less than 5 yrs had significantly ($P<0.01$) lower energy intake than RDA except in children 4 - 5 yrs. There was no significant difference in protein, carbohydrates and iron intakes of children <5 yrs compared with RDAs. Seventy five percent (n=60) of the households did not meet the energy requirement whereas, 56% (n = 45) did not achieve protein requirement.

Dietary diversity

Table 5 shows dietary diversity of the households in the previous day of the survey. All households had consumed cereals in the previous day. Among the other food groups, legumes/pulses, vegetables and milk and milk products were consumed by more than 50% of households. Less than 50% of households had consumed fruits, green leafy vegetables, meat, fish and eggs. Fish consumption was greater (31%) compared with other animal food sources.

Table 5. Consumption of foods from different food groups in the households during the previous day of the survey.

Food group	Number of HHs	Frequency (%)
Cereals	80	100
Roots/tubers	38	48
Legumes/pulses	54	68
Vegetables	69	86
Green leafy vegetables	38	48
Fruits	34	43
Fish	25	31
Meat	3	4
Eggs	6	8
Milk and Milk products	56	70

Note: HHs: Households

Perception of food consumption

Table 6 shows the self reported perception of the housewife of the family on food consumption by the family. More than 50% of households said that their food consumption was adequate with respect to quantity, whereas most of the households said that they had not eaten a varied diet or balanced diet or preferred foods. However, a majority of the households admitted that they faced problems of eating a variety of foods due to lack of resources (Question 3; Table 6).

Household food security level

Household food security level which was determined using modified USDA Core Food Security Module is presented in Table 7. Prevalence of food secure, food insecure without hunger, food insecure with moderate hunger and food insecure with severe hunger in households were 25%, 55%, 17.5% and 2.5% respectively. Collectively 25% of households were considered as food secure and 75% of households were identified as food insecure.

Table 6. Perception on food consumption by the households.

Questions on perception of food consumption during last 30 days	Response (%)			
	Never	Rarely (Once/ twice)	Some times (3-10 times)	Often (> 10 times)
1. Did you worry that your household would not have enough food?	69	9	14	9
2. Were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	39	21	28	13
3. Did you or any household member eat a limited variety of foods due to lack of resources?	20	11	36	33
4. Did you or any household member eat food that you preferred not to eat because a lack of resources to obtain other types of food?	76	8	14	3
5. Did you or any household member eat a smaller meal than you felt you needs because there was not enough food?	86	6	5	3
6. Did you or any other household member eat fewer meals in a day because there was not enough food?	90	1	8	1
7. Was there ever no food at all in your household because there were not resources to get more?	96	1	3	0
8. Did you or any household member go to sleep at night hungry because there was not enough food?	98	1	1	0
9. Did you or any household member go a whole day without eating anything because there was not enough food?	99	0	1	0

Table 7. Food security level of the households based on USDA Core Food Security Module.

Level of HH food security	No of HHs	Frequency (%)
Food secure	20	25.0
Food insecure without hunger	44	55.0
Food insecure with moderate hunger	14	17.5
Food insecure with severe hunger	2	2.5

Note: HH: Household

Coping strategies

Table 8 shows the different coping strategies used by the households to upkeep their food security when there was a food shortage in the household. About 20% of households used coping strategies such as borrowing food and changing eating habits to upkeep the food security of the household.

Table 8. Coping strategies used by the study households to upkeep their household Food Security.

Coping strategy	No. of HHs	Frequency (%)
Borrow money for food	50	17
Borrow food	61	20
Change eating habits	64	21
Consume assets	44	15
Sell assets	50	17
Mortgage assets	13	4
Defer monthly installments on loans and deplete savings	19	6

Note: HH: Household

Nutritional status of children less than five years

The prevalence of stunting, wasting and underweight of the children under 5 yrs was 18.8%, 17.4% and 28.4% respectively (Table 9). The overall prevalence of stunting and wasting in the study sample was higher than that of prevalence in national level. However, underweight in the study sample was lower than the prevalence at the national level.

Nutritional status of primary school children, adolescents and adults

The nutritional status of the children between 5-10 yrs, adolescents, adult males and females is given in Table 10. The overall prevalence of underweight among fathers and mothers were 29% and 24% respectively.

Table 9. Prevalence of under-nutrition of the children under 5 years.

Age group (months)	n	% Stunting	Mean HAZ (SD)	% Under-weight	Mean WAZ (SD)	% Wasting	Mean WHZ (SD)
0-5	3	-	-	33.3	-1.97 (0.27)	-	-
6-11	8	-	-	25.0	-1.18 (1.07)	-	-
12-23	14	42.9	-1.45 (1.08)	42.9	-1.35 (1.31)	28.6	-0.90 (1.32)
24-35	18	11.1	-1.15 (0.71)	22.2	-1.56 (0.61)	11.1	-1.37 (0.63)
36-47	20	15.8	-1.07 (0.69)	15.0	-1.43 (0.80)	10.5	-1.08 (0.77)
48-60	18	11.1	-1.20 (0.97)	38.9	-1.71 (0.92)	22.2	-1.51 (0.79)
Total	81	18.8	-1.20 (0.85)	28.4	-1.5 (0.91)	17.4	-1.23 (0.89)
National*		13.5		29.4		14.0	

Note: Source: Department of Census and Statistics, 2000.

n: number of children, HAZ: Height-for-age, WHZ: weight-for-height, WAZ: weight-for-age.

Table 10. Nutritional status of the 5 - 10 years children, adolescents and adults.

Nutritional indices	Children 5-10 yrs (n=44) % (n)	Adolescents (n=35) % (n)	Household head (n=80) % (n)	Housewife (n=80) % (n)
Stunting (Height-for-age)	27 (12)	37 (13)	-	-
Underweight (Weight-for-age)	61 (27)	54 (19)	-	-
Thinness (BMI-for-age)	59 (26)	49 (17)	-	-
Normal	-	-	57 (46)	40 (33)
Underweight	-	-	29 (23)	24 (19)
Overweight	-	-	5 (4)	18 (14)
Obese	-	-	9 (7)	18 (14)

Note: n: number of individuals, BMI: Body Mass Index.

Anaemia status of children under 5 years

The prevalence of iron deficiency anaemia among children < 5 y was 45% (Table 11) and it was higher than the national prevalence of 30% (Medical Research Institute, 2001).

Table 11. Prevalence of anaemia and mean haemoglobin concentration of children under 5 years by gender.

Gender	Anaemia % (n)	Mean Hb (g/dL)	SD	Median Hb (g/dL)
Males	44.2 (19)	11.2	1.42	11.2
Females	45.7 (16)	11.2	1.42	11.5
Total	44.9 (35)	-	-	-

Note: n: number of individuals, Hb: Haemoglobin.

The association of income and nutritional status with food security is given in Table 12. There was a significant association between food security status and median mean income, nutritional status of mothers and adolescents. Significantly higher percentage of households with low disposable income had food insecurity. There was a significantly higher prevalence of adolescent thinness and mothers' underweight in food insecure households compared with food secure households. However, child malnutrition was not significantly associated with food security status.

Table 12. Relationship of income and nutritional status with household food security.

Variable	Food Secure HHs	Food Insecure HHs	P value
	% (n)	% (n)	
Disposable income			
< median SL value*	18 (14)	70 (56)	0.013 ^a
> median SL value*	8(6)	5(4)	
Mothers			
Underweight	5 (1)	30 (18)	0.031 ^b
Not underweight	95(19)	70 (42)	
Adolescents			
BMI-for-age(Thinness)			
< 5 th percentile	0 (0)	57(17)	0.045 ^b
> 5 th percentile	100(5)	43(13)	
5-10 yrs old children			
BMI-for-age(Thinness)			
< 5 th percentile	46 (5)	64 (21)	0.314 ^b
> 5 th percentile	54 (6)	36 (12)	
< 5 yrs old children			
Height-for-age			
Stunted	32 (6)	14 (7)	0.164 ^b
Non-stunted	68 (13)	86 (43)	
Weight-for-age			
Wasted	26 (5)	14 (7)	0.289 ^b
Non-wasted	74 (14)	86 (43)	
Weight-for-age			
Underweight	32 (7)	27 (15)	0.677 ^a
Non-underweight	68 (16)	73 (43)	

Note: ^aFisher's Extract test, ^bPearson Chi square, *Median household income per month for Sri Lanka in year 2006 is SLR: 16,494.00.

DISCUSSIONS

The main objective of this pilot study was to find out the multi-faceted phenomenon of food security using different variables in paddy farming sector. The data presented in this paper provide useful information about the food security status of the households using several aspects of food security, food and nutrient utilization (by assessing the nutritional status and water and sanitation status), food availability (using 24-hr recall of dietary intake, dietary diversity, and energy and protein adequacy within HH), food

accessibility (assessing monthly income), perceptions regarding food habits, and coping strategies.

This study was setup in 10 districts where a larger proportion of people depend on subsistence agriculture. The results of the study showed that the prevalence of malnutrition i.e. stunting, wasting, underweight and anaemia is high among children under 5 yrs in paddy farming sector. The prevalence of stunting and wasting was higher than that of national prevalence in Sri Lanka (Department of Census and statistics, 2000 and MRI, 2001). Stunting which indicates chronic malnutrition was highest among the 12 - 23 month age group. Stunting is an indication of inadequacy of nutrient supply during foetal development and thereafter due to provision of low quality complementary foods. Therefore, high prevalence of stunting provided evidence that farming families suffer inadequate food availability, access or utilization persistently over the past years. Wasting indicates a recent and severe process that has produced a weight loss usually as a consequence of reduced food intake and disease or chronic inadequate food intake (ACC/SCN, 2000). Underweight (weight-for-age) is an indicator of either current or past nutrition. High prevalence of wasting and underweight among children in farming households shows deficiency of food and nutrition. Therefore, poor nutritional status of under 5 yrs old children overall gives clear indication of current and past incidence of food insecurity in households.

Overall food insecurity is considerably high (75%) in subsistence paddy farming households according to USDA module scoring. Although the reliability of using USDA Core Food Security Module scoring criteria in developing countries has some doubts, this instrument has been successfully used in national surveys and the reliability and validity for use with low income families in developing countries were well established (Joda *et al.*, 2002). Food Security Scale shows significant relationships between food insecurity and consumption in the countries included in the study (Anne and Punam, 2004). High food insecurity together with high prevalence of malnutrition reported in the present study indicate suitability of USDA Core Food Security Module to determine food security status in subsistence farming sector in Sri Lanka.

Dietary intake data of the study population also indicate deficiencies in nutrition adequacy. The higher percentage of energy from carbohydrates in this study is due to the consumption of rice-based diet for three meals by the households. Mean protein intake per day for both males and females was of a satisfactory level and it could be contributed by the major staple food rice which contains about 7% of protein. However, animal protein consumption seemed to be very low. This is supported by low consumption of meat, eggs and fish. Limited consumption of animal food sources could lead to protein, vitamin and mineral deficiencies. The consumption of meat and fish which contributes much absorbable haem iron among this study population was much lower and it could be the reason for the higher prevalence (45%) of anaemia among children in this study population. Frequent illnesses and unsatisfactory sanitary conditions may be other factors contributing to high prevalence of anaemia. Only 59% (n = 47) of households had access protected wells as their main source of drinking water (data not shown).

The number of different food groups consumed by household members in the home, or prepared in the home over a given reference period can be used as a proxy measure of the nutritional quality of the household diet. Eating a variety of diet is very important to fulfill the daily nutrient requirements especially to obtain protein, vitamins and minerals

within the household. The findings of the present study indicated that farming households had low levels of dietary diversity which lead to low levels of energy availability. It is clear that most of the households did not consume a nutritionally balanced diet. They mainly considered the quantity not the quality of the diet. Although mean protein intake was adequate in different age groups, considerable proportion of households did not achieve daily protein requirement.

One of the methods used to assess the household food security level was assessing the different coping strategies used by the households to upkeep their food security level. Most of the households used at least one kind of coping strategy when there was a food shortage in household. This revealed that most of the households experienced food shortages and an unsatisfactory HFS level. Further, a majority of the households considered that their food consumption was adequate with respect to quantity but they emphasized that they were not consuming a balanced diet and preferred foods. As expected low income was one of the main reasons for food insecurity. The prevalence of maternal and adolescent malnutrition was significantly higher in food insecure households than food secure households. However, child malnutrition was seen among both food secure and food insecure households. Further in-depth analysis of several variables affecting household food security is necessary to find out factors associated with food insecurity.

CONCLUSIONS

A majority (75%) of households were food insecure. Prevalence of stunting, wasting, underweight and anaemia among children under 5 years were high in the study population. Limited diversity of the food intake and low income are associated with high prevalence of malnutrition and food insecurity in the rural subsistence paddy farming sector in Sri Lanka.

ACKNOWLEDGMENTS

This survey was funded by the Council for Agricultural Research Policy (CARP) Grant No: CARP 12/633/475. Authors acknowledge the assistance given by Research Assistants Mr. Lalith Rathnayake, Miss. Eranga Thilakaratne, Miss. Shanika Ariyasena and Miss. Dayani Gunathilaka in data collection and analysis, participants and the Agriculture Research and Production Assistants attached to the Agrarian Services Centers for their valuable support and assistance.

REFERENCE

- ACC-SNU (2000). Fourth Report on the World Nutrition Situation, Administrative Committee on Coordination-Subcommittee on Nutrition, United Nations, Geneva.
- Anne, S. and Punam, O.V. (2004). Measuring Household Food Consumption: A Technical Guide. Food and Nutrition Assistance Project (FANTA). Academy for Education Development, Washington.

- Bickel, G.W., Cook, J., Hamilton, W., Mark, N. and Price, C. (2000). Measuring Food Security in the United States. Guide to Measuring Household Food Security. Food and Nutrition Service, USDA, USA.
- Department of Census and Statistics (2000). Sri Lanka Demographic and Health Survey 2000. Colombo.
- Department of Census and Statistics (2002). Sri Lanka Household Income and Expenditure Survey-Final Report. Colombo.
- FOA (1992). Food and nutrition: creating a well-fed world. Food and Agriculture Organization, Rome.
- FOA (1997). Guide for the Conduct of the Constraints Analysis Component. Special Programme for Food Security, Hand Book Series, SPES/DOC/18, Food and Agriculture Organization, Rome.
- Joda, P. D., Anne, G.F. and Jennifer, E.L.A. (2000). The Core Food Security Module Scale is Valid and Reliable when used with Asians and Pacific Islanders. USA: Department of Occupational Therapy and Food Science and Human Nutrition, Colorado State University.
- MRI (1998). Recommended Dietary Allowances for Sri Lankans. Department of Nutrition, Medical Research Institute, Colombo.
- MRI (2001). Assessment of Anaemia Status in Sri Lankans. Department of Nutrition, Medical Research Institute, Colombo.
- Ministry of Health, Nutrition and Welfare (2004). Food and Nutrition Policy of Sri Lanka, 2004 - 2010. Ministry of Health, Nutrition and Welfare, Colombo.
- WHO (1983). Measuring change in Nutritional Status. Guidelines for Assessing the Nutritional Impact of Supplementary Feeding Programmes for Vulnerable Groups, World Health Organization, Geneva.
- WHO (1985). Energy and Protein Requirements. Technical Report Series No.724, World Health Organization, Geneva.
- Wikramanayake, T.W. (1996). Food and Nutrition, 3rd ed., Colombo: Hector Kobbekaduwa Agrarian Research and Training Institute.