NEED OF MICRO STUDY IN HOUSEHOLD FOOD SECURITY
A CASE FROM NORTH EASTERN INDIA

Dr. Rofique Ahmed
Associate Professor
Department of Economics
Bahona College, Jorhat, Assam, India

ABSTRACT

Household food security is a social issue intertwined with a large number of explanatory variables having implications of locality differentials. Researchers trying to dig out the major variables of household food security commonly use logistic probability model taking household food security itself as a dummy dependent variable. Application of logistic probability model in four case studies in the countryside of Jorhat district of Assam, a state in North Eastern India shows that determinants of household food security vary not only with locality, but also with food security thresholds. Food security here has been estimated as per FAO (1996) definition using two scales – one being calorie cut off used by Planning Commission of India and other being required dietary allowance for average Indian given by Indian Council of Medical Science Research. Identifying significant variables of household food security and mapping them as per their occurrence score, this paper concludes that, household food security monitoring and intervention need to be based on the selection of a proper threshold and area specific studies.

Key words : expenditure threshold, income threshold, balanced diet, significant variables, occurrence score.

A Monthly Double-Blind Peer Reviewed Refereed Open Access International e-Journal
Website: www.aarf.asia. Email: editoraarf@gmail.com , editor@aarf.asia

Page 20

1.   **Introduction**

Using a common statistical tool to explore cause and effect relationship in the context of a social issue in an area stratified with some geo-administrative definition, when the strata-specific outcomes lack homogeneity is reflective of characteristic difference of those strata and its components, though not to be noticed at first sight. Household food security (HFS) is such a social issue intertwined with a large number of explanatory variables both of its demand and supply sides having implications of locality differentials. Researchers often try to dig out the major variables having significant implications on HFS, so that proper policy thrust can be assigned. One of the commonly used statistical tools here is logistic probability model (Strauss, 1983; Barnum & Squire, 1979; Yotopoulos, 1983, quoted in Kidane et al. 2005; Amaza et al. 2006; Basir et al. 2012). Considering HFS as dummy dependent variable, the application of logistic probability model in four development blocks of Jorhat district of Assam under a common eco-climatic zone, shows that, the explanatory variables having significant implications on HFS vary not only with locality, but also with the difference in food security thresholds. In India, there is no official food security scale. The poverty scale as food security scale is still debatable. The poverty scale used by Planning Commission of India is just a hunger scale for an average Indian. It does not fully cover the cost of quality living in locality context, so far FAO (1996) food security scale is concerned. Indian Medical Science Research publishes sex and age specific required daily diet as per balanced diet norms. An attempt has been made in this paper to measure HFS by formulating two food security thresholds – one on the basis of calorie cut off scale used by Planning Commission of India (hereafter PCI scale) and other on the basis of balanced diet norms defined by Indian Council of Medical Science Research (hereafter ICMR scale). With an objective to identify demand and supply side lapses of HFS separately both scales were bifurcated at income and food expenditure threshold. Scaling them in four rural localities under four development blocks of Jorhat district, in the state of Assam, the gateway to North-Eastern India, the significant variables behind HFS have been traced and mapping them as per occurrence score this paper concludes that, if HFS monitoring and intervention is to perform on the part of any government and non-government agencies needs to be based on the selection of a proper threshold and area

A Monthly Double-Blind Peer Reviewed Refereed Open Access International e-Journal
Website: www.aarf.asia. Email: editoraarf@gmail.com , editor@aarf.asia

Page 21

specific studies. HFS monitoring is still an awaiting agenda in India. With recent performance, emerging in the developing world, India deserves HFS monitoring to understand both the poverty and achievement in socio-economic front, may be a substitute of/complimentary to official poverty scale. This paper is a justification to that need.

2.   HFS - Concepts

The concept of food security seems to have an evolutionary change during the last 50 years (Swaminathan, 2001). Its definition and concepts have undergone several rounds after having special emphasis in World Food Summit 1974. At that time food security emphasis centered round the supply and storage provisions at national and sub-national level, but in 80s its focus shifted to the issues of improved access to food at local, household and even individual level. In the 1990s, improved access was redefined by taking into account livelihood and subjective considerations. Another round of evolution took place particularly after the World Food Summit in 1996, when food security at individual, household, national, regional and global levels was said to be achieved only if all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, 1996). Currently, a synthesis of these definitions, with the main emphasis on availability, access, and utilization, serves as working definition. With slight modification Swaminathan (2008) defined it as - sustainable food security is physical, economic and social access to the balanced diet and clean drinking water to every child, woman and man in the country.

Nutritional security is defined as adequate nutritional status in terms of protein, energy, vitamins and minerals for all household members at all times (Quisumbing, et al., 1995). Ensuring varied food intakes, containing all essential macro and micronutrients in sufficient quantities, through a balanced and diversified diet is also essential to support an active and healthy life. Nutritional security involves the consumption and physiological use of adequate quantities of safe and nutritious food by every member of the household. Nutritional security envisages nutritional well-being for all people, whereby sufficient

quantities of safe and nutritious food are equitably distributed within households and among all communities and nations (Nandi 1999). Availability-accessibility is only primary condition whereas nutritional adequacy is the sufficient condition of food security. Here proper knowledge on healthy diet as well as healthy living also matters.

3.   Objectives

The objectives of this study are –

1. To estimate locality difference of HFS by thresholds.

2. To identify major variables of HFS.

3. To examine the need of area-specific study of HFS.

4.   Study Design

Two cut offs – one is calorie cut off of average Indian villager (2400 calorie) given by Planning Commission of India (PCI), and the other is required dietary allowance (weighted for both sexes and all age groups) given by Indian Council of Medical Science Research (ICMR). Both were transformed to cost cut offs at local price and food habits and it stands for expenditure threshold of HFS. Following the rule international agencies, it was developed to income threshold of HFS by adding 33 percent of expenditure threshold as a cost of non-food basic expenditure at local standard. Income threshold is supply implicated whereas expenditure threshold is demand implicated. Thus, in this study four HFS cut off were used. They are -

1.   Calorie based food expenditure threshold (CBFET).

2.   Calorie based income threshold (CBIT).

3.   RDA based food expenditure threshold (RBFET)

4.   RDA based income threshold (RBIT)

A household lying below the cut off was considered as food insecure and lying above as food secure. This constituted the dummy dependent variable of the HFS equation given in (1) below - assigning 0 for food insecure household and 1 for food secure household. Different explanatory variables of HFS have been identified by different scholars. Of

these, variables found common in the study area, unit of their measurement and type as explanatory variable are shown in table 1.

Table 1: Variables having implications on HFS in the study area – type and unit of measurement

Variables	Type	Unit of measurement
Household income (HI)	Continuous	Monthly per capita hh income (Rs.)
Literacy status of household head (LSHH)	Dummy	Literacy status of hh head : 1 = for having formal edn; 0 = for not having formal edn
Family pattern (FP)	Dummy	1 = for joint family, 0 = for single family
Religion (Rn)	Dummy	1 = for non-Muslim, 0 = for Muslim
Caste (Ce)	Dummy	1 = for non-SC/ST, 0 = for SC/ST
Food collected in wild (FCW)	Continuous	Monthly hh per capita natural support (Rs.)
Access to PDS* (APDS)	Dummy	1 = PDS access, 0 = No PDS access
Quality of farming land (QFL)	Continuous	Per bigha annual productivity (Rs.)
Loss in Disaster (LD)	Continuous	Per capita annual loss in disaster (Rs.)
Care on healthy diet (CHD)	Continuous	Score out of 8
Main occupation type (MOT)	Dummy	1 = for farming, 0 = for non-farming
Dependency ratio (DR)	Continuous	Ratio of worker to non-worker
Size of household disposable asset (SHDA)	Continuous	HH per capita durable assets (Rs.)
Sex of household head (SHH)	Dummy	1 = for male, 0 = for female
Age of household head	Continuous	Years

(AHH)		
Govt. support (GS)	Continuous	Monthly per capita (Rs.)
Aspired income (AI)	Continuous	Income expected to be sufficient to fill FS (Rs.)
Out migration (OM)	Continuous	HH member living outside the locality
Size of household land (SHL)	Continuous	Per capita land holding in *Bigha*

* *PDS = Public Distribution System*

For the dummy variables reference categories are -

Variables	Reference category	Observed category
LSHH :	Household head without having formal qualification	Household head having formal qualification
FP	Joint family	Single family
Religion	Non-Muslim	Muslim
Caste	Non-SC/ST	SC/ST
APDS	Non access to PDS	Access to PDS
OT	Non-farming	Farming
SHH	Female	Male

Care on healthy diet was estimated by recording score against 8 questions on general knowledge regarding healthy diet and healthy living – maximum score 8 and minimum 0 – divided in to two groups – 0 to 3 and 4 to 8. The first group has been taken as reference.

Complicacy arises regarding the selection of FS determinants, because temporal and spatial factors play major role in this situation. Keeping this point in mind the following multiple logistic regression model has been applied to trace the major factors which may have impact on food security status:

$$\ln \frac{p_i}{1-p_i} = \beta_0 + \Sigma \beta_j X_{ji} + u_{ji} \qquad \qquad \text{........ (1)}$$

Where,

X_{ji} =   Proposed independent variables of HFS as mentioned above

u_{ji} = Stochastic variables

P_i = Probability of ith hh being food secured

Significant HFS variables have been identified by using SPSS-17.0, particularly the backward elimination option of the software. The leading significant variables have been trace by mapping their locality occurrence score across scales.

In this work, the state Assam, gateway to North-Eastern India (consisting of 7 states linking the mainland of India only through a narrow corridor of 24 km width) is taken as the universe, of which the district Jorhat is a representation of the state's socio-economic, ethnic and natural hazards compositions. It has neighborhoods of both the mighty Brahmaputra and the Naga Hills, a branch Himalayan range and its interior rural locality is affected regularly both by flood and haunt of wild elephants –common issues of rural living in Assam; first one is perennial and the later is recently emerging. Out of eight development blocks of this district, with the consideration of better representation of locality differentials throughout the state, four (Majuli, Dhekorgara, Kaliapani and Baghsung) were purposively selected to collect primary information from 600 households randomly selected – 150 in each development block.

Table 2 : Estimated monthly calorie based food expenditure threshold (CBFET) and calorie based income threshold (CBIT)

Thresholds		Development blocks			
		Majuli	Dhekorgara	Kaliapani	Baghsung
PCI	CBFET	907.20	896.70	904.20	892.20
	33% of CBFET	344.74	412.48	352.64	347.96
	CBIT	1251.94	1309.18	1256.84	1240.16

Table 3 : Estimated monthly RDA based food expenditure threshold (RBFET) and RDA based income threshold (RBIT)

Thresholds		Development blocks			
		Majuli	Dhekorgara	Kaliapani	Baghsung
ICMR	RBFET	830.91	821.29	828.16	817.17
	33% of RBFET	315.75	377.79	322.98	318.70
	RBIT	1146.66	1199.08	1151.14	1135.86

5.   HFS Estimates

Using PCI and ICMR norms regarding food energy intake per person food security threshold was estimated at local price (2012) and food habit context, as shown in table 4.

Table 4 : Estimated food security thresholds across the localities

Thresholds		Development blocks (Rs.)			
		Majuli	Dhekorgara	Kaliapani	Baghsung
ICMR	RBFET	830.91	821.29	828.16	817.17
	NFBE	315.75	377.79	322.98	318.70
	RBIT	1146.66	1199.08	1151.14	1135.86
PCI	CBFET	907.20	896.70	904.20	892.20
	NFBE	344.74	412.48	352.64	347.96
	CBIT	1251.94	1309.18	1256.84	1240.16

Table 5 shows that percentage of food secure household is higher as per ICMR scale than PCI scale. HFS as per balanced diet norms, given by ICMR is better than as per calorie in-take cut off used by PCI. But the percentage of food secure household in the study area is significantly lower. It even goes down to 20 percent in Kaliapani as per both PCI expenditure and income threshold. Official source shows that, in 2010, the percentage of

household above poverty line in Jorhat district is 88. That is, a large number of households above poverty line in the study area are food insecure irrespective of the scale.

Of course, percentage of food secure household as per income threshold, in some localities, being less than that of food expenditure threshold interestingly reflects the presence redundancy in the measurement of HFS. Logically percentage of food secure household as per expenditure threshold should be higher than that of income threshold as because income threshold, by definition, is 33 percent higher than expenditure threshold. In most of the localities result being contrary to this implies that some of the households being sufficient in income do not spend in food items as much as required to meet the norms. Expenditure stands for demand whereas income for supply side of HFS. HFS as per income threshold being less than that of expenditure threshold ensures that there is demand side lapse in HFS in some of the localities under study. This lapse is highest in Dhekorgara as per PCI scale and in Majuli as per ICMR scale. In case of such households demand side factors of HFS are not so strong to urge the supply side factors to match them.

Percentage of household as difference between income threshold and expenditure threshold being negative implies that some households in the study area attains food security in terms of food expenditure, though income is not sufficient to that. To maintain food expenditure they forgo some other non-food basic needs. Such households are present in Baghsung as per PCI scale and in Dhekorgara as per ICMR scale. In case of these households demand side factors of HFS are stronger than that of supply side factors.

The distribution of HFS as per both thresholds and scales across localities is not homogenous. The locality variance is higher in case of income threshold than that of expenditure threshold and in case of PCI scale than ICMR scale. It indicates the set of

factors behind the HFS is not homogenous for all localities. It causes the need of identification of the locality specific variables having significant implications on HFS.

Table 5 : Percentage of food secure household across localities

Localities	Food secure household as per food expenditure threshold		Food secure household as per income threshold		Household in threshold gap (% HFS IT - % HFS ET)*	
	PCI	ICMR	PCI	ICMR	PCI	ICMR
Pooled data	25.00	47.60	32.40	56.00	7.4	8.4
Majuli	28.85	48.08	30.77	67.31	1.92	19.23
Dhekorgara	24.68	55.84	48.05	53.25	23.37	-2.59
Kaliapani	20.00	35.00	20.00	50.00	0	15
Baghsung	27.87	49.18	26.23	55.74	-1.64	6.56

IT = Income threshold, ET = Expenditure threshold

6.   Identifying Major Variables

Using the logistic probability model stated in section 4 and having solution through SPSS version 17.0 opting for its backward elimination process, the significant variables identified in different localities as per different scales are shown in table 6. Of the HFS variables given in table 1, care on healthy diet, dependency ratio and aspired income are mainly implicated with demand side elements whereas income, food collected in wild, government support, quality of farming land, access to PDS, size of household land, disaster loss, out migration are mainly implicated with of supply side. Literacy status and age of household heads, caste, religion, size of household disposable asset, family pattern are factors admixed with demand and supply side elements. The variables such as the

caste, sex of household age, age of household head, aspired income and out migration were not found significant in determining household food security in the study area.

Table 6 : Mapping of significant variables having implications on HFS

Scales	Majuli	Dhekorgara	Kaliapani	Baghsung
CBFET	QFL	CHD	CHD	CHD
	GS	HI	HI	HI
	MOT	FP	SHDA	GS
	SHDA		Rn	DR
CBIT	LSHH	CHD	HI	CHD
	HI	APDS	GS	HI
	FCW	HI	SHDA	FP
	GS	FCW		LSHH
		DL		
		SHDA		
RBFET	CHD	CHD	CHD	CHD
	HI	FP	DR	HI
	FCW	MOT	HI	FP
	SHDA	Rn	FCW	LSHH
	FP	GS	QFL	GS
	LSHH		FP	
			LSHH	
			GS	
			SHDA	
RBIT	HI	HI	HI	CHD
	FCW	FCW	Rn	SHL
	LSHH	QFL	GS	HI
	GS	GS	SHDA	Rn
		DL		

6.1   Mapping the variables as per occurrence score

The significant variables of household food security can be mapped as per its locality occurrence in the list given in table 6. The maximum locality occurrence score is 4 as there are four localities under study and minimum is zero implying that in a locality the variable has not been identified as significant. Table 7 records the locality occurrence score of the variables as per scales. The more is the column variance the less is the unique in the occurrence of the variables across localities. No scale shows unique pattern of occurrence implying that they are not equally important in food security determination in all localities. The more is the total occurrence score maximum being 16, the more is equality in the significance of variable in determining HFS and vice versa. Not a single determinant shows universal occurrence in the localities irrespective of scales. With this consideration the most equally important significant variable is household income, the second most ones are govt. support and care on healthy diet. First two are supply side and the last one is demand side significant determinant of HFS.

Table 7 : Occurrence scores of variables across localities recognized as significant

| Variables | Thresholds | | | | Total score |
| | Expenditure | | Income | | |
	CBFET	RBFET	CBIT	RBIT	
Household income (HI)	3	3	4	4	14
Literacy status of household head (LSHH)	0	3	2	1	6
Family pattern (FP)	1	4	1	0	9
Religion (Rn)	1	1	0	2	4
Food collected in wild (FCW)	0	2	2	2	6
Access to PDS (APDS)	0	0	1	0	1
Quality of farming land (QFL)	1	1	0	1	3

Disaster Loss (DL)	0	0	1	1	2
Care on healthy diet (CHD)	3	4	2	1	10
Main occupation type (MOT)	1	1	0	0	2
Dependency ratio (DR)	1	1	0	0	2
Size of household disposable asset (SHDA)	2	2	2	1	7
Govt. support (GS)	2	3	2	3	10
Size of household land (SHL)	0	0	0	1	1

8.   **Conclusion**

Household food insecurity is the reverse of household food security. In jorhat district, as revealed by the four case studies, household food insecurity, as per FAO guideline, is alarmingly high. But it is still a neglected area of study so far the food security literature at local context is concerned. No household food security monitoring as per its recent definition and concept is inherent in government functionary of India. Indian official poverty scale is a case of debatable for several decades. It is blamed being a hunger scale than a poverty scale. In a country like India growing per year more than 8 percent on average, and more than 30 percent household accessing to middle class life style, the poverty scale in its present formulation demands its sustenance only on political ground, but to recognize India as a prime world power, this scale needs modification at least updated as per recent formulation of household food security (such as using FAO scale) to make it more reflective of societal growth on the ground of justice. Present case study reveals that, though Jorhat is one of the economically advanced districts of the state of Assam, of its rural localities, 75 percent households are food insecure as per PCI and 67.60 percent as per ICMR food expenditure cut off. Locality variance in household food insecurity is in between 71.15 percent and 80 percent as per PCI and in between 51.95 percent and 80 percent as per ICMR food expenditure cut off. This situation improves to some extent when income cut off is considered. It is 52.40 percent varying in between 43.16 percent and 65 percent as per PCI scale whereas 44 percent varying in between 32.69 and 50 percent as per ICMR scale. Official data of 2010 shows that only 22 percent

households are below poverty line, they are actually below hunger line as the critics like to say, reflecting household food security neither from demand side nor from supply side.

The percentage of food insecure household as per expenditure threshold being higher than that of income threshold interestingly reflects that a good number of households being sound in income do not make food expenditure as per balanced diet norms. This is demand side lapse of household food security. Present study traces household income, government support and care on healthy diet as three leading significant determinants of household food security. It shows that households' own effort to earn and government support to this effort matter in household food security. Both are supply side determinants. Care on healthy diet being demand side determinant though matters here but unnoticed and uncared. The Public Distribution Mechanism now prevalent in India, even enriched with recent food security bill cares basically the supply side of household food security. In the study area household food insecurity is as high as 80 percent as per expenditure cut off. It ensures the presence of food insecurity in middle class families too not because dearth of income but because lack of proper knowledge on healthy diet and healthy living. In this situation, the urge for non-food basic expenditures just like costly mobile hand set, net pack there in just to check social account is expected to erode the food expenditure below its cut off mark. Separate study is deserved.

Occurrence of significant variable is affected both by locality difference and difference in the base of the cut off scales. Its locality variation justifies the need of micro or area specific study of household food security whereas variation in base specific occurrence justifies consideration of demand and supply side determinants of household food security separately. It is to note that expenditure thresholds are oriented to demand side whereas income threshold are to supply side forces of household food security.

REFERENCES

1. Amaza, P.S., Umeh J.C., Helsen, J., & Adjobi, A.O. (2006). *Determinants and Measurement of Food Security in Nigeria : Some Empirical Policy Guide,* IAAE Annual Meeting, August 12-18, Queensland, Australia.

2. Barnum, H. & Squire, L. (1979). *A Model of an Agricultural Household*, Occasional Paper – 27, World Bank, Washington D. C.

3. Basir, M.K., Steven Schilizzi & Ram Pandit (2012). *Food Security and Its Determinants at the Crossroads in Punjab, Pakistan,* Working Paper 1206. School of Agricultural and Resource Economics, http://www.are.uwa.edu.au

4. FAO (1996). *World Food Summit Plan of Action,* FAO, Rome
5. Kidane, H., Alemu, Z.G. & Kundhlande, G. (2005). Causes of Household Food Insecurity in Koredegaga Peasant Association, Oromiya Zone, Ethiopi*a, Agrecon*, Vol 44, No 4.
6. Nandi, B.K. (1999). *Nutritional Security: Asian Perspective Beyond 2000,* RAP WP - 1/1.
7. Quisumbing, A.L., Haddad, L. & Pena, C. (1995*). Gender And Poverty: New Evidence From 10 Developing Countries*, FCND DP – 9, IFPRI, Washington D.C.
8. Strauss, J. (1983). Socioeconomic Determinants of Food Consumption and Production in Rural Sierra Leone: Application of an Agricultural Household Model with Several commodities, MSU International Development Papers, No. 5. Department of Agricultural Economics, East Lansing, Michigan 48824-1039.
9. Swaminathan, M.S. (2001). Food Security and Sustainable Development, *Current Science*, 81(8): 948-954.
10. Swaminathan, M.S. (2008). Food for Thought*, Yojana*, Vol 52, June, pp 27.