

Validity of Household Food Insecurity Access Scale in Drylands of Bundelkhand Region: Observations from Banda District, India

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Abstract

The main aim of the present study is to analyse the condition of food insecurity in Bundelkhand's Banda district through Household Food Insecurity Access Scale (HFIAS). Simultaneously, study also assess the structural validity and internal consistency of HFIAS. Study uses primary data collected through field investigation during December 2014 through structured questionnaire and focus group discussions (FGDs). Multistage stratified random sampling has been used for selecting the villages and households for the survey. A total of 240 households have been surveyed for data collection. For measuring household's food insecurity HFIAS 9-item questionnaire has been opted. Study shows that household's food insecurity is positively linked to household's inability towards food access because of low income and poverty. On the basis of the score obtained from HFIAS the households were categorised into severely, moderately, mildly food insecure and food secure in order to find out the extent of food insecurity. The result reveals that, 24.58% of the sampled households were severely food insecure followed by 30.0% and 24.17% as moderately and mildly food insecure and remaining 21.25% were food secure. Cronbach's alpha coefficient is used to assess the internal consistency of the tool and rotated principal component factor analysis is used to analyse the structural validity of HFIAS. On the basis of the value of Cronbach's alpha (0.86) the tool displayed a good internal consistency. Factor analysis highlighted two key factors accountable for food insecurity in the study area i.e., insufficient food quality and insufficient food quantity eaten by the members of the households.

Keywords – Food insecurity, Food Quantity, Food Quality, Bundelkhand Region, HFIAS, Validation.

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I. INTRODUCTION

The concept of food security for a developing nation like India is essential because on one side India is the largest producer of foodgrains and on the other there are still some pockets characterized by hunger, malnutrition and food insecurity depriving people from their right to food (Shakeel, 2017). One such region is Bundelkhand region of India which is going through severe climatic and environmental changes in contemporary times (Shakeel, 2018). Bundelkhand region is facing drought, flood and hailstorm intermittently, affecting agriculture and availability of food at household level. More than 1.8 million people have migrated from this region over the years due to climate change (Dogra, 2016). Approximately, 60.0% of the population is working among which 60% is working as cultivators and agricultural labourers. About 79.0% population in Bundelkhand region lives in rural areas from among which one-third households are below poverty line. More than 75.0% of the population is dependent on agriculture and 96.0 per cent of the total income is raised from agriculture and livestock together. In a survey during 2016 it was found that 86 per cent of the household had cut down their pulse intake which is the most important source of protein for vegetarian population. Almost 79.0% eat chapati with salt or sauce and 80.0% household cut down on milk for their children (Shakeel, 2021). About 27.0% has to mortgage or sell their land (The Hindu, 2016). Additionally, about 40.0% of the people go through distress sale of cattle. (Dogra, 2007). At least 3000 farmers have committed suicide in Bundelkhand region during 2011 to 2015 (Tripathy, 2015; Shakeel, et. al., 2017). On the other hand, India is the world's second largest foodgrains producer where the production has increased from 50.0 to 284.83 million tonnes (MT) during 1950-51 to 2017-18. The Government norms says that a buffer stock of 25 MT is enough for providing food at the time of emergency but, India has more than 80 MT of foodgrains in 2012 which has declined to 65.3 MT in 2014 (Patel, 2017). Moreover, India has world's largest act on food security i.e., India's National Food Security Act (NFSA) followed by world's largest food distribution system namely; Public Distribution System

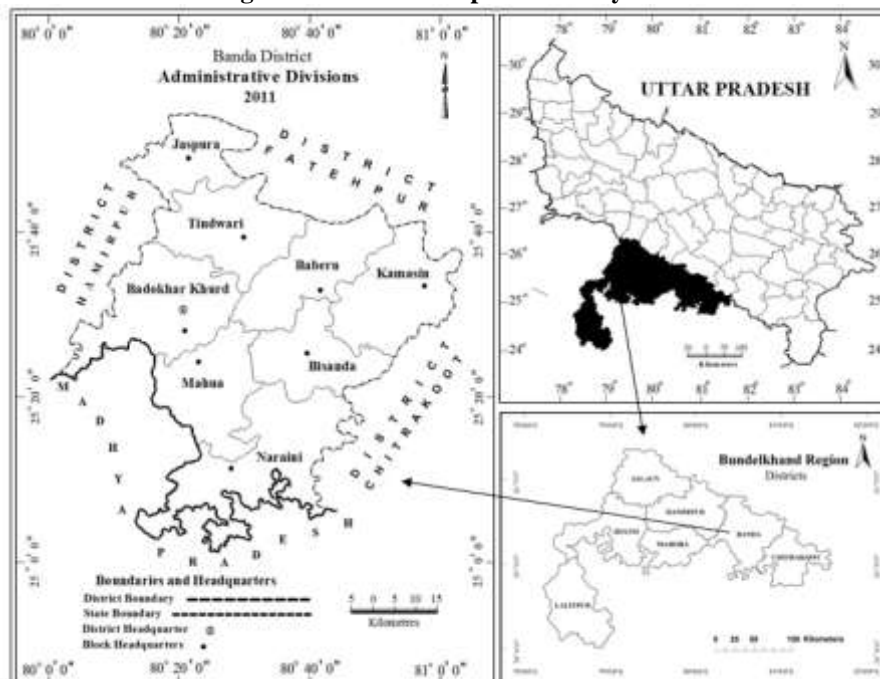
(PDS) in order to provide food to the people at a highly subsidized rate (Shakeel, 2019). But inspite of all, people in this region do not have access to basic food and are suffering from hunger and malnutrition. This shows that the problem of food insecurity in this region is not because of lack of food availability at national level but it is largely due to people's inaccessibility towards food at regional level (Shakeel, 2018a).

Thus, a need arises to examine the problem of food insecurity with special focus on food accessibility. Moreover, there are various methods that measures food insecurity which are broadly categorised as objective and subjective. Objective measures such as food balance sheet, household consumption and expenditure surveys, food intake surveys, anthropometry etc. provide information related to consequences of food insecurity rather than directly measuring it and are extensive, long and costly (Castell et al. 2015). Followers of the subjective measures contend that objective measure do not emphasize upon important impalpable aspects of food insecurity such as persistent worries about the chances of food shortage or inadequate dietary variation (Shakeel, 2018b). One such measure which captures the subjective and access dimension of food security is the Household Food Insecurity Access Scale (HFIAS). HFIAS was developed at Tufts University by a group of researchers which were working under Food and Nutrition Technical Assistance (FANTA) project sponsored by United States Agency for International Development (Swindale and Bilinsky, 2009; De Cock *et al.*, 2013). HFIAS is much responsive to variations in household's food insecurity (Kirkland *et al.*, 2011). This scale being subjective is based on the perception and psychology of the respondents (Coates *et al.*, 2007). Moreover, a measurement process cannot be applied thoroughly until it is validated throughout the globe. Thus, many studies have been carried out in developing countries to judge the validity and applicability of this tool (Swindale and Bilinsky 2006; Knueppel *et al.*, 2009; Desiere, 2015; Gebreyesus *et al.*, 2015). This measure is a standardized tool and based on universal behaviour thus, it can be compared easily across different countries.

Area of Study

Bundelkhand region is one of the most important drought prone area in India and Banda is one of the districts of Bundelkhand region (Fig. 1). Banda district [24° 53' and 25° 55' N latitude and 79° 59' and 81° 34' E longitude] is an important agriculture-based area of Bundelkhand region of Uttar Pradesh. The area of the district is 4460 Km². Currently the agrarian condition of Banda is very poor due to climatic change it is experiencing. This region experienced drought at every sixteen years during 18th and 19th century but incidence of drought amplified threefold during 1968 to 1992. After the year 2002 the droughts were almost consecutive and up to 2015 the district faced more than ten agricultural droughts in addition to occasional floods and hailstorms. Agriculture is facing severe shortage of water for irrigation and till date and no productive action has been taken yet to tackle the problem. Banda district is now characterised as a semi-arid region which is heading towards desertification due to scanty and erratic rainfall (Shakeel, 2013). Climatic variation is a significant common risk that threatens the livelihood of the people especially of rural community which accounts for more than 85.0 per cent of the total population. Banda district have 8 development blocks and 682 inhabited villages.

Figure 1: Location map of the study area



Objectives of the Study

The main objective of the study is to analyse the condition of food insecurity by applying HFIAS. To analyse the correlation between household's food insecurity and other socio-economic and demographic variables in order to evaluate the convergent validity of HFIAS. Simultaneously, study also tests the construct validity and internal consistency of the scale.

II. DATA AND METHODOLOGY

The household survey was conducted only in Banda, a district in Bundelkhand Region. Survey was carried out by the researcher and two other experts from the study area in order to assist the survey. The questionnaire was drafted in English thus local experts helped the researcher to translate the questions in local Hindi language. The survey period was from mid December 2014 to end of January 2015. The survey period coincided with the harvesting season in India (Rabi) in order to check the effect of drought on the agricultural production and food consumption of the household which will be reflected while giving the answers of the nine questions of the HFIAS. HFIAS delineate food secure households from food insecure households on the basis of a set of nine queries that analyse the level of worry and the lack of access to, variety and/or quantity of food. The question retrospectively refers to a period of 30 days. The questions in the scale follow a sequence where the intensity and severity of food insecurity increases as one moves from question one to question nine. The first question reflects food anxiety and ambiguity about household food supply. Question 2nd to 4th reflects decline in the quality of food (insufficient quality) followed by question 5th to 7th showing decline in quantity (insufficient quantity) and lastly going to bed without food and going all day and night without food. Every question in the scale (HFIAS) carries two options i.e., 'yes' or 'no'. In case, if the respondent's reply to a question is 'no' then the weight assigned to it is 0. But in case, if the respondent's reply to a question is 'yes' then it is followed by frequency of incidence question with three options namely; 'often', 'Sometimes' and 'rarely' with weights assigned as 3, 2, and 1 respectively. Later, the scores of all 9 questions of the scale is summed up to obtain the scale value. The value which is obtained will range from 'zero' representing food secure to '27' representing households with severe food insecurity (Swindale and Bilinsky, 2006).

Present study is based on household level data because in the opinion of Corbett (1988) most of the decisions related to food production, consumption and investment are taken at household's level. Villages were selected through multistage-stratified sampling and within villages the households were randomly selected. The villages and households both were selected at 3% level. There were 682 inhabited villages in the district, out of which 16 villages were selected from 8 development blocks i.e., 2 villages from each block (Fig. 1). There were 9959 households in the district and 3% of the total households is 299 households randomly selected. But only 240 households were incorporated in the study because 41 questionnaires were incomplete after the survey was over thus, not included in the study. From 258 complete questionnaires, 15 questionnaires were picked from every village for analysing food insecurity. The questions were asked from the household's head which in case of India were largely males. In Indian villages males have the responsibility for earning livelihood and they better understand the economic condition and food accessibility of the household. In case where male household head was not present in such case the female household head was interviewed.

Further on the basis of the affirmative responses of the household's head the households were categorised into four types namely; severely food insecure, moderately food insecure, mildly food insecure and food secure households. The operational definitions and method for categorising the region into different categories adopted from Coates *et. al.* 2007. Karl Pearson's correlation technique and Student 't' test have been used to assess the convergent validity of the scale. Coping strategy index and dietary diversity index were also correlated with the scores of HFIAS. For determining the structural validity, the study used principal component factor analysis with varimax rotation. Internal validity was analysed by evaluating internal consistency of the questionnaire. Cronbach's alpha used in the study measures the extent to which the responses to each item in the HFIAS correlates.

III. RESULTS AND DISCUSSIONS

Prevalence of Food Insecurity

Present study aggregately shows (Table 1) that from among the total sampled households 24.17% 'rarely', 30.42% 'sometimes' and 37.50% 'always' were not able to eat the kind of food preferred. Also, 22.50% of households 'rarely', 29.58% of households 'sometimes' and 36.67% of households 'always' had to eat limited variety of foods. This shows that, first the decline in the quality of food was experienced when the inaccessibility of the households towards food was at decline. As the condition of food insecurity further intensifies it builds up mental pressure so high that 35.42% of household 'sometimes' and 30.42% of household 'always' worried that their household would not have enough food. Falling food quality and rising mental stress over food inaccessibility was followed by the dropping food quantity. Study shows that 37.08% of households 'sometimes' and 21.67% of household 'always' had to eat a reduced meal than they think was not adequate for

them to eat in terms of quantity. Also, 32.50% of household ‘sometimes’ and 20.83% ‘always’ had to eat lesser meals in a day due to food deficiency. This shows that when a house becomes food insecure the first thing experienced by it was the decline in the quality of meals followed by decline in the quantity of meals. The study also observes that decline in the size of the meals comes before followed by decline in the number of meals. In the later stage the households were characterised by continuous inadequate food consumption due to inaccessibility which transform transitory food insecurity into chronic food insecurity.

Table 1: Prevalence of Food Insecurity based on Household Food Insecurity Access Scale among Households

S. No.	Questions (9 Items)	Rarely	Sometimes	Always
1	In the past 30 days, did you worry that your household would not have enough food?	25.00*	35.42**	30.42**
2	In the past 30 days, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	24.17**	30.42**	37.50**
3	In the past 30 days, did you or any household member have to eat a limited variety of foods due to a lack of resources?	22.50**	29.58*	36.67*
4	In the past 30 days, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	29.58**	33.33*	26.67*
5	In the past 30 days, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	30.42*	37.08*	21.67**
6	In the past 30 days, did you or any household member have to eat fewer meals in a day because there was not enough food?	35.00*	32.50*	20.83**
7	In the past 30 days, was there ever no food to eat of any kind in your household because of lack of resources to get food?	42.08**	27.50**	12.92**
8	In the past 30 days, did you or any household member go to sleep at night hungry because there was not enough food?	28.33**	16.25**	2.50**
9	In the past 30 days, did you or any household member go a whole day and night without eating anything because there was not enough food?	13.75**	4.17**	0.00**

Source: Generated from primary survey. *Food-secure, **Mildly food-insecure, #Moderately food-insecure, ##Severely food-insecure. Based on Coates, et al., (2007).

Socio-economic and Demographic Determinants of Food Insecurity

The sample characteristics of the study population are shows that approximately, 93% of the sampled household were Hindus and 7% were Muslims. Regarding caste, 30.4% belongs to general category, 45.8% belongs to other backward classes (OBC) and 23.8% belongs to scheduled castes (SC). Out of total household surveyed in general, OBC and SC categories, about 64.38, 77.27 and 84.21% were food insecure, respectively. About, 95% household were males and rest were females. The educational characteristics of the household head reveal that 57.1% has taken education up to primary level or not educated at all followed by middle school (17.5%) high school (7.9%) senior secondary and only a meagre proportion (3.8%) were found to be higher education.

Sources of Livelihood

The households’ sources of livelihood also clarify the causes behind food insecurity in Banda. The finding indicates that largest proportion of households was obtaining their livelihood working as casual labour (42.5%) because they were landless. Second largest category of the sampled population was of farmers (37.9%) and most of them were small and marginal (having less than two hectares of land). During FGDs it was informed by the peasantry community that being small and marginal their agriculture is subsistence in nature but enough to get two meals a day but during this season drought led to serious shortage of food at household level. Only a handful section of population was engaged in commercial and service sector. Due to dry condition of the region the farmers were quitting agriculture and were forced to migrate to near by and distant places to work as casual labour. This is the reason why majority of bread earners in sampled households were found to be working as causal labour.

Farmer’s Income and Household’s Poverty

Low income of the households leads to poverty. The study area was facing severe climatic consequence in the form of droughts, floods and hailstorm. Drought was the main cause of crop failure during kharif season of 2014 and during the same year major proportion of the standing rabi crop was destroyed due to hailstorm. This led to severe shortage of food at the household level and no produce was left for sale at market for generating income. The data shows that at the time of survey the income of the farmers and casual labours (which together accounted for 80.4% of the population) declined drastically. Approximately 42.0% of the households were having monthly income below 3500 rupees. The analysis further reveals that 34.58% of the sampled households earn between 3500 to 4500 rupees monthly. Only 13.3% of the households were earning more than 5000 rupees per month. Moreover, 65.8% of the sampled households of the district were living their life below poverty line. Crop failure acts as a two-edged sword for the peasantry community because on one

hand the crop is lost thus the farmers were unable to sell their produce at the market generating no income for further food access and on the other hand, crop failure leads to shortage of food at the household level. Thus, households were bound to live in extreme poverty and food insecurity.

Public Distribution System (PDS)

PDS is a system under National Food Security Act (NFSA) 2013 through which government distribute foodgrains to the poverty stricken and food insecure households at a highly subsidised rate. Government has divided the population into three categories namely APL (households that are above poverty line), BPL (households that are below poverty line) and Antyodaya (poorest of the poor household). It further allotted each category a fixed colour card for easy recognition of the beneficiaries and easy distribution of food. But, PDS is characterised by mismanagement and high internal corruption thus, unable to serve the aim it was meant for. The data shows that, out of total sampled households, almost 40.0% of the households were not having any type of ration card and were incapable of utilising the PDS facility. Maximum number of card holders (37.50%) belongs to APL category (having yellow card). Further, 19.17% of the households belong to BPL category (having white card) followed by 5.4% Antyodaya households i.e., poorest of the poor (having red/pink card). The irony here is that, the total number of BPL households is 65.8% but only 24.59% of the household (19.17% for white card and 5.42% for the pink card) were benefitted from the PBL schemes for assessing the basic food stuffs. It shows high level of corruption while allotting the cards to the families on the basis of their caste, creed and economic condition.

Calorie Consumption and Dietary Status

About 38.75% and 34.17% of the households were hungry and moderately food insecure, consuming calories below recommended daily allowance (RDA) of 1890 and between 1890 to 2400 calories/head, respectively as per Indian Council of Medical Research. Only 27.08% of the households are food secure. The dietary condition shows that 63.8% and 43.3% of the households were consuming pulses and cereals below the RDA, respectively. About 11.7% of the households were not consuming pulses at all. Low milk consumption was seriously affecting the health specifically of children and this was reflected in their low body mass index leading to wasting. Only 4.6% of the households were eating meat above RDA and remaining were not consuming meat at all because of their monetary inaccessibility. Due to low income and poverty the dietary diversity has drastically reduced leading to monotonous food diet. Low calorie consumption leads to food insecurity and undernutrition and low dietary diversity leads to nutritional insecurity and malnutrition. This is easily reflected in the body mass index of the population.

Availability of Livestock

The study reveals that the average value of livestock per household in the study area and average value of population dependent on livestock was 1.40 and 3.96, respectively. The agrarian distress has shattered the hopes of small and marginal farmers, due to crop failure and many were engaged in distress sale of cattle and livestock. The depletion of grazing grounds accompanied with drying up of water bodies has aggravated the situation. People were selling their livestock because of two reasons, first; when they run short of food, they sell their livestock to purchase food and other daily basic things from the market. The sale of livestock was being used by them as a short-term coping strategy for making themselves safe against the menace of food insecurity. Secondly; due to drought the households were running short of fodder and due to lack of money they were unable to purchase fodder from the market thus they were left with no other option than selling up their livestock. Sometimes the condition becomes so severe that to find customers for the sale of livestock becomes tough and the people were left with no other option to lose the livestock so that they could feed on their own. People responded 'we do not have fodder to feed our livestock due to droughts, we do not have money to purchase food even for ourselves so we cannot buy fodder, thus we set our livestock free in the beginning of summers till the arrival of monsoon. If monsoon arrive the livestock returns back and if not, the livestock die and it is good us because we cannot see our livestock dying in front of us. This tradition of making livestock free is called as '*anna pratha*'.

Dependency Ratio and Size of the Households

It is normally believed that with increase in the size of household the dependency burden also increases in case working member within the household remains constant. Present study show that large size of the family is not responsible for food insecurity because 41.67% and 53.75% of the households were small (1 to 4 household members) and medium (5 to 8 household members) but it was due to unfavourable and hostile natural climatic condition which gave a major setback to the livelihood of the people. The dependency ratio in the study area is not very high because the total dependency ratio was 92.09 followed by juvenile dependency of 80.37 and senile dependency of 11.72. Thing which requires attention is that majority of household in the area belongs

to small and medium category of family size and average size of the family in the study area is 5.50 which too belongs to the medium category of family size. Thus, in spite of having average family size of 5.50 persons per household and majority of family falling to small and medium category the condition of food security is very much deprived. About one-third of the household in the study area have monthly income up to 4000 Rs and the average size of the family is 5.5. Thus per capita income of this one-third proportion of population having income below 4000 Rs is 727 Rs per month. This calculated value (727 Rs) is below the value (768 Rs) as prescribed by the Planning Commission of India and shows that these individuals are living their life below poverty line. This shows that the accessibility of people towards food is so poor that in spite of having small to medium size of family the condition of food security is very pathetic.

Body Mass Index (BMI)

The study shows that 37.9% of the household heads (male and female combined) were suffering from chronic energy deficiency (CED). The proportion of adult male and female suffering from CED was 29.9% and 43.1%, respectively. The BMI of children show that 64.4% of the total children were suffering from wasting and at disaggregate level the proportion of male wasted children (65.9%) was higher than those of female children (62.6%). The BMI of adult male was far better than the BMI of children (male and female combined) and the adult female because of the practice of '*maternal buffering*'. It a practice in which the males of the household eat food first, secondly it is eaten by children of the household and women eat the food last and least. This was a common practice found largely in Indian villages.

Coping Strategy

The present study shows that households adopted various strategies to minimize the shock of food insecurity. The most frequent coping strategies opted by the households were shifting their consumption to those foods that were cheaper and less favored (leading to decline in quality of food eaten) followed by drop-off in the size and frequency of meals (leading to decline in food quantity). The study finds that, as the intensity and severity of food in security increases the households adopt more severe coping strategies such as purchasing food on credit, take-up food form friends and relatives, passing full day without food. Some of the households were in so difficulty that they were forced to sell their assets such as agricultural equipment, livestock and sometime even their land. The finding of coping strategies and HFIAS are more or less similar and experienced almost similar events (Shakeel and Shazli, 2020).

Household Dietary Diversity (HDD)

Loss of crop due to drought in particular and climate change in general leads to fall in income. Low income leads to poverty and poverty leads to food insecurity and low dietary diversity (DD). For analysing dietary diversity, present study incorporated 13 food groups. For better and easy understanding, the households were divided into three categories of low, medium and high DD. Household consuming less than 5 food groups were considered as low, those consuming between 6 to 7 food groups were considered as moderate and those consuming above 8 were taken as high dietary diversity households. The study shows that 40.83% of the households had low dietary diversity followed by 39.17% households having moderate and rest 20% were having high dietary diversity. The group of food which was frequently eaten was cereals including rice and wheat both. Pulses were also included in this group but the study shows that the consumption of pulses was very low due to its high price at the market. Being a drought resistant crop the production of pulses during both kharif and rabi season was low because of drought and hailstorm, respectively. The next commonly eaten food group was of vegetables but all types of vegetables were not eaten by the households. the most eaten vegetable was spinach because it requires less water and area for their growth. Moreover, vegetables that comes under the group of roots and tubers such as potato, carrot, radish etc., were not consumed due to low production and high market prices. The study observed that as one moves from food secure households to mildly, moderately and severely food insecure households the incidence of eating different food groups decreases accordingly.

Household food insecurity and Convergent Validity

In the absence of solid standard as reference method, present study for analyzing the convergent validity of HFIAS have used correlation between food insecurity (as determined by this HFIAS) and household's socio-economic and demographic characteristics. The HFIAS ranges from 0 to 27 and greater food insecurity is represented by higher score. On the basis of the categorical measure, the households are categorised into four categories in which, 24.58% of the sampled households were severely insecure followed by 30.0%, 24.17% and 21.25% as moderate insecure, mildly insecure and food secure, respectively. In simple words it could be inferred that 78.75% of the sampled households (severely + moderate + mild food insecure household) were food insecure in one way or the other. The correlation matrix presented in Table 2 shows that variable y_1 (HFIAS) is positively associated with variable X_1 and X_2 . It shows that household's food inaccessibility is

largely because of low income and poverty. Majority of the households were engaged in agricultural and allied activities and the area was experiencing drought leading to crop failure and low income. Variable y_1 is strongly associated with x_3 which proves that households not availing PDS facility are the larger sufferer of food inaccessibility. PDS provides foodgrains at a highly subsidized rate thus making it available and easily accessible.

Table 2: Pearson’s correlation between HFIAS and other socio-economic and demographic characteristics.

Variables	y_1	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}	x_{11}
y_1	1	.559*	.630**	.836**	.516*	.620*	0.265	.680**	0.43	.505*	.763**	-.735**
x_1		1	.623**	.590*	.618*	0.48	0.428	.581*	0.437	.638**	0.285	-0.484
x_2			1	.650**	0.43	0.442	0.137	.512*	0.293	.631**	0.397	-0.471
x_3				1	.661**	0.49	0.062	.707**	.566*	.522*	.540*	-0.381
x_4					1	0.273	-0.084	.804**	0.227	0.243	0.209	-0.113
x_5						1	.677**	.608*	.535*	.552*	.538*	-.649**
x_6							1	0.365	.543*	.529*	0.378	-.688**
x_7								1	.561*	0.493	0.465	-0.485
x_8									1	0.442	0.422	-0.435
x_9										1	0.361	-.631**
x_{10}											1	-.754**
x_{11}												1
x_{12}												

Note: **Correlation is significant at the 1% level, *Correlation is significant at the 5% level. y_1 – HFIAS is dependent variable, x_1 to x_{12} are independent variables.

y_1 - Household Food Insecurity Access Scale, x_1 - Percentage of Households having income below 3500 INR, x_2 – Percentage of population below poverty line, x_3 – Percentage of Households with no PDS facility, x_4, x_5, x_6 – percentage of households consuming cereals, pulses and milk below RDA, respectively. x_7 . Percentage of hungry households to total households (below 1890 cal/cu/day), x_8 – Percentage of adult as CED to total population, x_9 – Percentage of children as CED to total population, x_{10} – Coping strategy index, x_{11} – Household dietary diversity index.

Study reveals that, y_1 (HFIAS) is having strong positive association with x_4 and x_5 that indicates decline in consumption of basic foods such as cereals and pulses below RDA. HFIAS further shows positive association with x_7 suggesting that as people’s inability towards food access increases the percentage of hungry households also increases. Moreover, HFIAS and proportion of children suffering from CED is strongly linked with each other because children require more calories in the early stage of their growth. But in the study area the household’s ability to acquire food is very low, bringing chronic energy deficiency among the children. Moreover, variable y_1 is positively associated with coping strategy index (x_{11}) showing, that as the condition of a household towards food inaccessibility rises it simultaneously leads to rise in the frequency, severity and intensity of coping strategy chosen by a household. Moreover, study finds that HFIAS is having a negative relationship with household dietary diversity score (x_{12}) this reveals, that as the capability of a household to acquire the food resources decreases their dietary pattern shift from more diverse diet to monotonous diet. The HFIAS seems to be suitable for monitoring household food insecurity because it is having significant relationship with key economic, social and demographic determinants of household food security.

Household Responses to Food Insecurity Access Scale (HFIAS)

The response received from most of the respondents was positive and representing severe to moderate food insecurity. The most commonly observed food insecurity practice was the households’ inability to acquire the kind of food they favoured (92.08%). Data reveals that, 90.83% of the households were worried that they would not have enough food. It shows anxiety among the people towards shortage of food in future (Table 3). The third common experience was household ate the foods that they really do not wanted to eat due to lack of resource to acquire other types of food (89.58%). The item receiving the least amount of affirmative responses was item nine (17.92%) i.e., during the past 30 days the household head or any other member of the household remained hungry for a full day and night? The items indicating severe food insecurity was observed less frequently than those showing moderate food insecurity on HFIAS (Table 3). The severity with respect to the items in HFIAS increases from 1 to 9 and therefore item 1 should be on top with respect to affirmative response. But item 1 actually got 6th place in factor loadings for rotated component matrix. It was paradoxical that households were documenting the decline in quality followed by quantity of food as their primary experience rather feeling anxiety and uncertainty about shortage of food. Similar condition was also observed in the works of Knuppel et al. (2009) and Gebreyesus et al. (2015) where the respondents affirmatively responded to the items depicting the decline in the quantity and quality of food first rather than item one. In some areas of the world where food insecurity is an everyday phenomenon, the decline in the quality and quantity of food has been experienced to come about much frequently than expressing fear and anxiety to food shortage. For

instance, in a trial size of 600 households in Limpopo province of South Africa, high affirmative response was observed for items 2, 3 and 4 showing consumption of low quality of food than worrying about their food source (Sakyi, 2012). In a sample of 400 households in Varamin city of Tehran more households affirmed items 2 to 4 showing consumption of low quality of food more frequently than worrying their food supply (Salarkia et al., 2014). Similar findings were also found in the studies under taken in Rural Bangladesh (Frongillo et al., 2003) and in the Vaal Triangle in South Africa (Oldewage-Theron et al., 2006).

Table 3: Frequency of the subjects' responses to the questions of the HFIAS questionnaire.

Questionnaire Items	NO		Yes							
	n	%	Rarely		Sometimes		Often		Total Yes	
			n	%	n	%	n	%	n	%
Item no. 1	22	9.2	60	27.5	85	39.0	73	33.5	218	90.83
Item no. 2	19	7.9	58	26.2	73	33.0	90	40.7	221	92.08
Item no. 3	27	11.3	54	25.4	71	33.3	88	41.3	213	88.75
Item no. 4	25	10.4	71	33.0	80	37.2	64	29.8	215	89.58
Item no. 5	26	10.8	73	34.1	89	41.6	52	24.3	214	89.17
Item no. 6	28	11.7	84	39.6	78	36.8	50	23.6	212	88.33
Item no. 7	42	17.5	101	51.0	66	33.3	31	15.7	198	82.50
Item no. 8	127	52.9	68	60.2	39	34.5	6	5.3	113	47.08
Item no. 9	197	82.1	33	76.7	10	23.3	0	0.0	43	17.92

Source: Generated through Primary Survey (December, 2014). HFIAS

The current study also found to be similar to the studies undertaken by Lorenzana and Sanjur in Venezuela (1999) using four point 12-item scale a self perceived household food security scale followed by Shoaie et al., (2007) at Tehran in Iran using Radimer/Cornell 16-item questionnaire and lastly, Regassa and Stoecker (2011) in southern Ethiopia using HHS (household hunger scale) 3-item scale (household hunger scale) by reducing the 9-item scale of HFIAS questionnaire. Above mentioned studies concluded that the questionnaire used were effective, reliable and valid in examining the condition of food insecurity and these tools had an advantage of being easy and fast to manage (Salarkia et al. 2014).

Factor Analysis and Structural Validity of HFIAS

Principal component factor analysis technique has been used under present study for polarising the nine questions of HFIAS into two main factors. The construct validity of HFIAS was evaluated by means of rotated principal component analysis with varimax rotation. Factor having Eigen value of around one or more were taken. Based on rotated principal component factor, two factors were extracted. Loading of the two factors is shown in Table 4 after employing varimax rotation method.

Factor 1 which came out (represents moderate to severe food insecurity) highlighted six question of the HFIAS. It also brings out the characteristic features of food insecurity in the study area, showing the food consumed by the people was of inadequate quality and they were found eating those food that was normally not preferred by them. This decline in quality and food preference is further followed by food anxiety and uncertainty. These six variables indicate that the range of household food insecurity is mild to moderate. The HFIAS captures three different dimensions of food insecurity i.e. uncertainty and anxiety about food, then inadequate quality and quantity and lastly inadequate food intake and its physical consequences. But in present study the food anxiety did not came out as a separate sphere in the factor investigation but rather it has loaded in combination with the sphere of inadequate food quality and quantity. The cluster of the nine-question obtained in the analysis have resemblance as contoured by Coates et. al., 2007. Item 1 of the scale which deals with the fear and concern of the households for not having adequate food was observed to have weak loadings on both factors. This shows that item 1 did not came out as an isolated concept. The reason for not locating food anxiety as a separate domain is because of the prevalence of high food insecurity in the population over a longer period of time. There are studies which while assessing the construct validity of HFIAS reported that item-1 is showing food anxiety is loaded in combination with the items depicting food quality and quantity and failed to appear as a separate identity (Mohammadi et. al., 2012; Lenya et. al., 2008).

Table 4: Factor loadings for rotated component matrix for households' responses to nine questions

HFIAS Question	Factor 1* (E=5.00) Moderate food-insecurity	Factor 1+ (E=1.74) Severe food-insecurity
Q4. Have to eat non-preferred foods	.894	.203
Q2. Not able to preferred food due to lack of resources	.848	.072
Q6. Reduced number of meals	.843	.094
Q5. Reduced size of meals (quantity)	.839	.238
Q3. Have to eat limited variety of foods	.744	.467
Q1. Worried that that household would not have enough food	.701	.226
Q8. Went to sleep hungry	.282	.899
Q9. Did not eat for a whole day and night	.013	.882
Q7. No food of any kind at all in the household	.303	.800

E- Eigen value. Extraction method: principal component analysis, rotation method: varimax with Kaiser Normalization.

- Mild to moderate food insecurity factor explained 56.61% of the total variance.

- + Severe food insecurity factor explained 18.46% of the total variance.

Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy = 0.77.

Bartlett's test of sphericity is found Significant (p value <0.05).

Though study on the basis of factorial analysis show that factor-1 is showing mild to moderate food security with 56.61% of the total variance does not conclude that the condition of food insecurity in the district was not severe. This is because the affirmative response in the present study for the items 1 to 6 is more than 85% moreover, similar respondents are suffering from food insecurity though the range might had been different from 'rarely' to 'always'. If present study is compared with other studies then it can be concluded that in other studies the affirmative responses for all items are lower. In the study by Farhadian *et. al.* (2015) the affirmative response for item 1 to 3 and item 4 to 8 was below 55% and 40% respectively. Similarly, in the study by Salarkia *et. al.* (2014) the affirmative response for item 1 to 4 and item 5 to 9 was below 70% and 40% respectively. Thus, in spite of having mild to moderate food insecurity the condition is severe. Factor 2 captures three variables for inadequate food intake i.e., the respondent or any other member of the household went to bed (sleep) hungry, went hungry for a full day and night and there were no consumable items of any kind available in the household. The results show that (Table 3) 82.50% of the households had no food at all in the house though majority of the household responded rarely (51.0%) about food availability. Factor-2 is showing moderate to severe food insecurity with 18.46% of the total variance and both the factors in combination explained 75.06% of the variance together.

Internal Consistency of HFIAS

Application of factorial analysis brings out two factors showing good internal consistency with the HFIAS. The Cronbach's alpha (α) value for whole FIAS was 0.86. The Cronbach's alpha (α) for the first cluster (6-items) obtained through factor analysis was 0.91 and for the second factor (3-items) it was 0.84. As opined by Frongillo (1999) internal consistency is a measure to assess the internal validity of the tool (HFIAS). It is measured by Cronbach's Alpha and the alpha must be 0.85 or higher to indicate adequate internal validity of the tool. The internal validity of HFIAS for Banda with respect to Cronbach's Alpha fulfils the above criteria. The results support the idea that the questionnaire applied for the study shows high internal consistency indicating that the device has a suitable validity and produce analogous results if used in similar condition. Similar studies are also undertaken that showed that the tool has appropriate validity. Salarkia *et al.*, 2014 and Naja *et al.*, 2014 using factor analysis extracted two factors of inadequate diet quality and inadequate diet quantity, both explaining 77.5% and 70.3% variance with a Cronbach's alpha value 0.95 and 0.91 respectively. Mohammadi *et al.*, 2011 extracted two factors with Cronbach's alpha value of 0.86. Knueppel *et al.*, 2009 mined two factors of inadequate quality of food and inadequate food intake; and both factors combinedly explained 69.0% of the variance with Cronbach's alpha value of 0.83 to 0.90. Leyna *et al.* (2007) while checking the validity of Radimer-Cornell questionnaire found Cronbach's alpha which was 0.85. Lorenzana and Sanjur (1998) found the

self-perceived household food security scale as a valid and reliable method for identification and monitoring of food security with a Cronbach alpha value of 0.92.

IV. CONCLUSIONS AND POLICY IMPLICATIONS

Based on the analysis certain complications and strategy formulations regarding various issues prevailing in district Banda are being pointed out. In general, the study area has been affected by the hazard of droughts since over a decade and the floods and hailstorms added extra grief to the peasantry community. Study concludes that on one extreme though the affirmative response received from the respondents for item 7, 8 and 9 was low but the percentage of affirmative response for items 1 to 6 is high. This shows that there is a high incidence of household food insecurity in Banda district. The finding of the present study shows a clear increasing trend of food insecurity because the affirmative response experienced was highest for decline in food quality followed by then moderate response experienced for decline in food quantity and finally lowest response was experienced for inadequate food intake (food consumed). The study favours that HFIAS is an effective, simple and valid device for measuring the access dimension of food insecurity and it can easily be correlated with other determinants of food insecurity. Moreover, the tools showed satisfactory results regarding internal consistency and trustability in evaluating household food insecurity. The findings of the study may help in developing better food security policies at regional level. A similar study could be done covering a wider geographical region. The environmental and ecological factors alone were not responsible for the crisis. There are other reasons such as failure of government programmes which have been implemented for mitigating natural disasters and other programmes related to food insecurity and nutrition. The NFSA which was implemented for eradication of food insecurity by the help of PDS was unable to benefit the population due to corruption involved in the selection of beneficiaries. Moreover, other subsidiary programmes of NFSA such as Mid-Day Meal Scheme (MMS) and Integrated Child Development Service Scheme (ICDS) was also not implemented well in the study area leading to high chronic energy deficiency among children. India at national level and state of Uttar Pradesh is self-sufficient in food but district Banda being a part of it facing severe food insecurity. This shows that the problem is of accessibility rather availability. Thus, government should check corruption and monitor PDS at very grass root level. Thus, urgent action should be taken for proper implementation and monitoring of NFSA and its subsidiary programmes. Selection of beneficiaries on the basis of their income is a tough task because the population is huge and corruption is high thus, rather selecting the beneficiaries under PDS it would be better to universalise the PDS. Majority of the population in the area is rural and engaged in peasantry activities in one way or the other, thus there must be some substitute industry apart from agriculture to provide employment to the people at the time of drought and other disaster. The development of irrigation is one of the most needed requirements for the farming community and focus must be on the development of dry-land agriculture and farming of drought resistant crops. Government at central level has come up with many programmes providing credit facilities to the farmers but majority of the farmers either do not know about these schemes or do not benefit from these schemes because of inappropriate execution.

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