Full Length Research Paper

Food Insecurity in Northern Ghana: Strategies Employed by Rural Families to Navigate Seasonal Shortage

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A household survey was conducted in four villages in the Bolgatanga District of northern Ghana with the objective of identifying causes and effects of seasonal food shortages and coping strategies adopted by households to increase food availability. Data was collected using structured questionnaires from 200 households selected by the simple random technique and was analyzed using descriptive statistics, chi-square test and probit model estimation. Findings of the study showed that effects of food shortages on households included difficulties in maintaining wards in schools and inability to register under the National Health Insurance Scheme as indicated by about 80.0% of the respondents. The chi-square analysis showed that household size and farm size were related to farm per capita output at 5 and 10% significant levels respectively. The probit analysis showed that education, farm size, income from off-farm activities, income from rearing and sale of livestock/poultry and receipt of remittances were the significant variables that determined household food availability at 5% significant level. The study recommends that efforts at reducing food insecurity among rural households should focus on increasing rural household income by engaging in off-farm income generating activities, literacy promotion, food supply and credit provision.

Key words: Bolgatanga municipality, coping strategies, food shortages, rural households.

INTRODUCTION

Food security is defined as access at all times to enough food for an active, healthy life. This includes having foods available that are nutritionally adequate, safe, acceptable, and obtained without resorting to emergency food supplies, scavenging, stealing, or similar coping strategies (Anderson, 1990). Food insecurity is no longer seen as a failure of food production at the national level but a livelihood failure (Devereux and Maxwell, 2001). The incidence of food insecurity and poverty are particularly devastating in the developing countries as a lot of resources are being channeled towards program-mes aimed at eradicating food insecurity and poverty by various international organizations and government of developing nations (Babatunde et al., 2007). According to Kyaw (2009), analyzing the recent trends and challenges

in food availability covering food production, consumption, consumption pattern, rising food prices and self-sufficiency at the country level is essential in order to provide information to recommend appropriate actions for attaining food security. As the issues of food security also relate with nutrition security, the nutritional status and health related environment of food insecure people must be considered in mobilizing resources for promoting the livelihoods of those people. Moreover, Smith and Subandoro (2007), agree that the pursuit of the Millennium Development Goal (MDG) to cut hunger requires a sound understanding of food security issues.

In 2001 to 2003, there were still 854 million under-nourished people worldwide: 820 million in developing countries, 25 million in the transition countries and 9 million in the industrialized countries (FAO, 2006). In the twenty-first century, however, the percentage of the world's population facing acute and chronic hunger is decreasing on every continent except Africa (Brown, 2001). Sub-Saharan Africa is the only region of the world

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Table 1. Crops cultivated/yields obtained in 2008 season by respondents.

Crop	Number of households that Cultivated the various crops	Area (Ha)	Average area (Ha)/HH*	Total output (Tons)	Yield (Tons)/Ha
Millet	200	101.38	0.51	38.08	0.37
Sorghum	200	94.52	0.47	37.14	0.39
Rice	111	31.80	0.29	17.45	0.55
Maize	7	2.58	0.37	1.47	0.57
Total	-	230.28	-	94.14	-

Source: Field survey (2010).*Household.

in which chronic food insecurity and threats of famine remain endemic for most of the population and the number of malnourished people is steadily increasing (Devereux and Maxwell, 2001; Rukuni, 2002). The people of the Upper East Region of Ghana are predo-minantly farmers and about 87% of the population lives in rural areas producing primary food crops including millet, maize, sorghum, rice, groundnuts, cowpea and soya bean. The cereals (millet, sorghum, maize and rice) are the main staple crops of the region, accounting for a sizeable portion of the diet of the people. The Upper East Region is one of the most disadvantaged regions of Ghana, with conditions similar to the northern parts of Niger, Mali and Burkina Faso (MoFA, 2008). These parts of West Africa experience a unimodal rainfall pattern capped with a long dry season. In addition, unexpected changes in rainfall sometimes result in drought during the early parts of the cropping season or floods which culminate in low crop production with its attendant consequence of high food unavailability for the rural poor.

Over the years, annual food balance sheets for the region have indicated deficits, especially for the main staples such as millet, maize and sometimes, rice. Households in the Upper East region usually consume harvested grains from harvest time, marking the start of diminishing household food reserves. As food stocks begin to decrease, households take measures to reduce food consumption, which come along with the risk of increased malnutrition (WFP/MOFA, 2009). The trend continues through the planting season till the start of the harvest of the early millet in July/August. The shortages are likely to cause serious starvation for people of the region especially, households that usually do not have enough income to buy extra grains from local markets.

As a result of the low crop yields, many household, particularly rural households, face what is referred to as "hunger season" or "lean season" yearly, when stora ge barns become completely empty of grains. In view of the aforementioned mentioned issues, this study broadly examined food security in the study area in terms of availability of the main staple grains from rain fed farm production to the households, with little emphasis on supplementation from local market places. Specifically, the studied sought to find answers to the following questions: What factors contribute to seasonal food

shortages in the study area? What are the effects of coping strategies adopted by households to ensure availability of food? Is there any relationship between food security and socio-economic characteristics of respondents? What are the most motivating/preferred livelihood options adopted by households in the area?

RESEARCH METHODOLOGY

The study areas, Sherigu, Katanga, Yorogo and Sumbrungu, were selected using the simple random technique from ten enumeration areas where the Bolgatanga Municipal Agricultural Development Unit (BMADU) collects information yearly from farmers for crop yield and production estimates. The population was 17,760 (14,235 male-headed and 3,525 female-headed) households in the Bolgatanga Municipality of the Upper East region. Using proportionate sampling, 146 male and 54 female headed households totalling 200 households were sampled for the study. The respondents were household heads. This study focused on households as households are the social institution through which most individuals gain access to food, and food distributions are normally targeted at households (Johnson-Welch, 2009). This study examined household food availability in the area rather than the broad term, 'food security'. Primary data was sourcedthrough the use of structured questionnaires. The statistical package for the social sciences (SPSS), descriptive statistics, chi-square test of independence and probit model estimation were employed to analyze the data collected.

RESULTS AND DISCUSSION

Acreage farmed and yields obtained

Table 1 shows the average land acreage cultivated and the corresponding outputs obtained. The 200 households interviewed in the survey area cultivated a total of 230.28 ha during the 2008 cropping season. Male headed households cultivated an average of 1.24 ha while female headed households averagely cultivated 0.91 ha. The lower average holding identified in the study for female headed households could be linked to the system of inheritance adopted by rural Northern Ghana families where mostly males inherit property. Although Brown (1999), indicated that females can also inherit property but are mostly disadvantaged. The highest area of land (101.38 ha) was used for millet whiles maize area was the

lowest (2.58 ha) although the crop is known to yield higher relative to the other crops. The low patronage of maize cultivation in the study area is due to the fact farmers feared theft of maize crops after they have matured, a situation common in the area and also because maize cultivation in the area is quite capital intensive. The yield figures obtained in this study are below those established by Tweneboah (2000), for millet (0.5 to 1.0), sorghum (0.4 to 1.2), rice (4.5) and maize (3.5 to 5) in the Guinea Savanna zone of Ghana.

The results in Table 1 also show low patronage of maize cultivation in the study area. Only 3.5% of the 200 household heads interviewed cultivated maize even though the crop is known to yield higher relative to the other crops.

Main causes of low crop yields and farmers' suggestions to minimize effects

The ranking results showed that 88% of households use improved planting materials, compost preparation and use, cultivation of high protein maize and improved cultural practices such as use and timely application of inorganic fertilizer, timely weed control and spacing. According to Mwaniki (2006), a major challenge to food security in Sub-Saharan Africa is the overall decline in external input-investment including fertilizer, seeds and technology adoption by farmers. Frequent occurrence of drought during planting/crop season was ranked second (61.5%) whiles lack of adequate credit (22%) was rated the third most important factor to finance some farm activities.

In a bid to minimize the effects of the low yields, the farmers put forward a range of propositions. These propositions can be found in Table 2. These included improvement in extension farmer contact to enhance the understanding and adoption of improved technologies (87.5%), taking advantage of early rain to plant crops (76%), construction of dams to expand irrigation facilities (12.5%) and the formation of farmer associations to facilitate their qualification for credit support (34%).

Effects of food shortages on households

The study also determined effects of household per capita farm output, apart from the well known general effects of malnutrition and diseases on households. Approximately 161 (80.2%) households had difficulties in maintaining wards in schools, especially purchasing school uniforms, food for lunch, and payment of end of term examination typing fees. Around 49 (24.6%) house-holds also indicated their inability to register household members under the National Health Insurance Scheme whiles its associated difficulty, paying hospital bills was mentioned by 78 (39%) of the respondents.

Relationship of socio-demographic characteristics and household food availability

The independence of amount of food from a household's own farm in the 2008 cropping season from its socio-demographic characteristics was determined. The characteristics considered were age, sex, education of head of household, household size and farm size.

Chi-square (χ^2) test of independence

The results in Table 3 show that household food availability from own farm is dependent on size of household and farm size. Only these two variables had χ^2_{cal}(21.195 and 28.002) greater than χ^2_{crit}(11.345 and 18.475) at 5%, for household size and farm size, respectively. Hence, we reject the null hypotheses and conclude that household food availability is dependent on the two variables, household size and farm size.

Coping strategies on food availability

The respondents were grouped into households that were food secure from own farm output, households that gained food adequacy after adopting the necessary coping mechanisms and those that could not gained food adequacy even after adopting the necessary mechanisms. The results show that only 12% were foods secure from their own farm produce, 17% became food secure after using various coping mechanisms and 71% could not satisfy their food demand despite applying coping strategies (Table 4). This implies that about 82% of the respondents produce not enough food to meet their household food demand.

Household sizes, average farm sizes and average per capita farm outputs vary sequentially with the classes of food security status. Table 4 shows that households that did not become food secure despite adopting coping strategies have the largest average household size, smallest farm size and smallest per capita farm output. Computing average grain yield per hectare from the figures in Table 4 for the three (3) categories of households gives 0.45 ton/ha for households that were food secure from their own farm produce, 0.33 ton/ha for those households that became food secure after using coping strategies and 0.31 ton/ha for the third category.

Respondents were asked to indicate the hunger period (that is, months) they experienced food inadequacy up to the beginning of 2009 crop harvest. The 177 farmer households who were deficit in cereal grain balance from the 2008 harvest experienced different food inadequacy situations within the food insecure period. As many as 81% of the households experienced the effects of hunger variously between 3 and 5 months, while 19% experienced it between 3 and 6 months, both cases starting from

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Table 2. Farmer suggestions to address factors causing low crop yields.

Factor	No. of respondents	Suggested solutions	Respondents
Non/Low use of production technologies	176	i. There should be improvement in extension-farmer contact to help improve understanding and adoption.	87.5% (154)
		ii. Government must continue its fertilizer subsidy programme to farmers.	12.5% (22)
Frequent drought during planting/crop growth stage	121	i. Farmers should take advantage of early rains to plant their crops.	76.0% (92)
		ii. Government should dig more dams to expand irrigated agriculture.	19.0% (23)
		iii. Ministry of Food and Agriculture should continue to facilitate farmers to improve on livestock/poultry rearing.	12.5% (20)
Lack of credit	43	i. Government/banks should support farmers with credit.	100.0% (43)
		ii Farmers should form groups so as to qualify for loans.	34.9% (15)

NB: Frequencies in parenthesis. Source: Field survey (2010).

February to July. Months of inadequate household food provisioning has been defined as the time between stock depletion and the next harvest. This information usually provides a guide for food insecurity measurement in areas where production is primarily for home consumption and households do not make significant sales or purchases in the market.

Only 26 households (22 male and 4 female house-holds) of the 200 households interviewed, would be food sufficient on their per capita farm output in 2010.

Coping strategies adopted by food insecure households

Households use coping strategies are employed to mitigate the effects of not having enough food to meet the household's needs (Table 5). The survey results indicated strategies households used to cope with low levels of food availability during the lean season of 2009. About 50% of the households interviewed relied on incomes generated from non-farm activities, while 58.0% sold livestock/poultry to buy grains to feed the members. Approximately, 9.0% households engaged in dry season crop production and 25.5% received remittance from relatives. About 27.5% households were supported by other members of the household, 42.5% adopted limited portion, and 47.5% used reduction in number of meals

taken by adults per day while 21.0% had to rely on consumption of less expensive/preferred foods as short-term coping mechanism to survive the period.

Households used different strategy combinations to address the food shortage problem. This implies that more than half of the respondents depended on incomes accruing from livelihood activities to survive. Adegbenga, (2009), also reported that the most frequently used short-term coping strategy by households was reduction in number of meals per day by adults (98.9% of households). The type of income generating activity used by most households (58%) to ensure food availability was rearing and sale of livestock/poultry. Sen (1981), Swift (1989), and Drinkwater and McEwen (1992) indicated that livelihood systems in households are maintained by

a range of on-farm and off-farm activities, which together provide a variety of procurement strategies for food and cash. They identified off-farm employment when available, savings and family networks for sharing as coping strategies used by households.

Effects of coping strategies on household food availability

In estimating the effect of socio-economic factors and coping strategies on household food availability, seven significant variables that were significant were household

Table 3. Results of chi-square analysis.

Socio-economic characteristics	Household food HHs secure (23)	Accuracy HHs insecure (177)	Relationship of variable to food adequacy
Sex			
Male	20	126	
Female	3	51	
Chi-square calculated	2.568		Not Dependent
Chi-square critical (5%)	6.635		
Age			
19≤	0	1	
20-29	1	8	
30-39	6	27	
40-49	4	39	
50-59	4	43	
≤60	8	59	
Chi-square calculated	2.208		Not Dependent
Chi-square critical (5%)	15.080		
Household size			
1-4	14	32	
5-8	7	105	
9-12	1	26	
>12	1	14	
Chi-square calculated	21.195		Dependent
Chi-square critical (5%)	11.345		
Education			
None	17	136	
Primary	2	17	
Middle/JSS	3	13	
Secondary	0	9	
Post-secondary	1	2	
Chi-square calculated	5.079		Not Dependent
Chi-square critical (5%)	15.086		
Farm size(acres)			
1<	0	11	
1-1.9	3	48	
2-2.9	8	48	
3-3.9	0	27	
4-4.9	3	26	
5-5.9	1	7	
6-6.9	4	7	
≤7	4	3	
Chi-square calculated	28.002		Dependent
Chi-square critical (5%)	18.475		

Source: Author's calculation (2010).

size, education, farm size, total per capita household farm output, grains from non-farm occupations, grains from sale of livestock/poultry and grains received as remittance (Table 6).

With regards to the predictive efficacy of the model, the R^2 estimate of 56% (0.5599) in Table 6 indicates that about 56% of the variability in household food availability was as a result of interaction between the dependent

Table 4. Food availability status before and after using coping strategies in relation to household size, farm size and yields obtained in 2008.

Food security status	Households			Average house size	Average farm size (Ha)	Average household per capita farm output 2008 (kg)
	Male headed	Female headed	Total			
Food secure from household farm produce	20	3	11.5% (23)	4.87	2.26	1,024.78
Food secure after adopting coping strategies	24	9	16.5% (33)	6.06	1.28	423.88
Food insecure, despite adopting coping strategies	102	42	72.0% (144)	7.08	1.03	320.66

Source: Field survey (2010).

Table 5. Coping strategies employed to increase household food availability.

Strategies	Frequencies	Percentage (%)
Engagement in non-farm activities	99	49.5
Sale of livestock/poultry	116	58.0
Engaged in dry season crop production	17	8.5
Received remittance from relatives	51	25.5
Contributions by other household members	55	27.5
Limited the portion size	85	42.5
Reduced number of meals for adults/day	95	47.5
Consumption of less expensive/preferred foods	42	21.0

Source: Field survey (2010).

variable (household food availability) and independent variables considered.

Parameter estimates of determinants of food security

The marginal effects of a unit change in the continuous and discrete variables, computed at sample means, on the probability of food availability were estimated (Table 7).

Household size

From Table 7, household size has a negative and significant relationship with the probability of household food availability. Calculated at average family size of sampled households, it decreases with an increase in family size. Similarly, Haile et al. (2005), found that household size negatively affected food availability.

Education

Education was found to have a significant and positive

relationship with household food security. Haile et al. (2005) in a similar study found that education had significant and positive relationship with household food security. This indicates that households with relatively better educated household heads are more likely to be food secure than those headed by uneducated household heads. An improvement in education level defined by the shift in educational level from illiterate to literate will therefore increase the probability of a household being food secure.

Farm land size

Keeping the other variables in the model constant, farm size is positively and significantly (1%) related to household food security. From Table 7, the marginal effect of a unit change in farm size, computed at sample mean of holding size, on the probability of food security is 0.118. This means that the probability of food security increases by 0.118 (about 12%) for a one hectare increase in farm size. As noted by Najafi (2003), food production can be increased extensively through expans-ion of area under cultivation. Paddy (2003) and Haile et al.

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Table 6. Parameter estimates of the Probit regression.

Variable	Coefficient	Std. Error	Z-value	Probability
Cons	-0.714	0.733	-0.97	0.330
HHS	-0.719***	0.118	-6.06	0.000
EDU	0.546***	0.341	1.60	0.010
FZ	0.586***	0.106	5.50	0.000
ICPT	0.604	0.572	1.06	0.291
TGF	0.003*	0.002	4.73	0.100
TGNFA	0.005***	0.001	5.54	0.000
TGSLP	0.007***	0.002	4.73	0.000
TGR	0.005***	0.002	2.75	0.006
Number of observation			200	
Log-Likelihood			-52.041823	
LR chi-2 (8)			132.44	
Pro > chi-2			0.000	
Pseudo R^2			0.5599	

***Significant at 1%; **Significant at 5%; *Significant at 10%. Source: Author's computation (2010).

Table 7. Partial Effects for both Continuous and Discrete Determinants.

Determinant	Partial effects
Household size	-0.145
Farm size	0.118
Per capita household produce	0.000
Education	0.129
Income from non-farm/off-farm activities	0.001
Livestock/poultry rearing	0.001
Remittances	0.001
Use of improved technologies	0.088

Source: Author's calculation (2010).

et al. (2005) reported that household food availability is negatively related to household size while farm size has a positive relationship.

Improved technology application

Use of improved crop production technologies particularly fertilizer and seed, in the study area is another factor which was expected to have a significant impact on household food security. A positive, but insignificant relationship was found between improved technologies usage and household food security. This means non-users of improved technologies are likely to be food insecure.

Per capita production

Per capita aggregate production has a significant (10%) and positive influence on food security. A unit change in per capita aggregate production, calculated at sample means, results in a 0.1% increase in the probability of food security.

Involvement in other employment and/or rearing of livestock/poultry

Results in Table 5 show a positive and significant (1%) relationship between engagement in the two extra income activities and household food security. As noticed, any level of involvement in these extra income generating activities will result in increases in household food security.

Remittance

In Africa, extended kin relations are networks for ex-change, mutual assistance and social contact, especially during times of difficulty. Remittances to households was

Table 8. Most preferred long-term and short-term coping strategies.

Length of coping strategy	Main strategy	Households				
		M	F	Total	Percent of total households	Rank
Long-term	Rearing of livestock and poultry	104	28	132	61.0	1
	Weaving of baskets/hats and petty trading	31	34	65	32.5	2
Short-term	Limiting the quantity of food prepared for a meal	66	31	97	48.5	2
	Reducing number of meals taken per day	81	35	116	58.0	1

Source: Field Survey (2010).

significant (1%) and positively influenced food availability among households.

Preferences among coping strategies

Respondents ranked the coping strategies outlined in Table 5. FROM TABLE 8, rearing of livestock and poultry emerged the most preferred long-term coping strategy. About 61.0% of households adopted this coping strategy. Craft weaving and petty trading was second with (32.5%). For short-term strategies, the most immediately adapted in times of critical shortages was reduction in number of meals per day by adults which was ranked 1st (58.0%), followed by limiting quantity of food prepared for a meal (48.5%). Wilna et al. (2006), also found 81.0% of households adopted skipping of meals and 84.7% limited their portion size as short–term coping strategies. However, the results of this study indicate the reverse.

CONCLUSIONS AND RECOMMENDATIONS

Majority (73%) of the households were male-headed. Mean age of household head was about 52 years while average household size was 7. Majority (76.5%) of household heads have not had formal education. Average farm size was 1.24 ha for male and 0.91 ha for female headed households. Seasonal food shortages were caused mainly by non/low use of improved crop production technologies (88%) and frequent drought during planting/crop growth stage (60.5%). Main effects of food shortages were; difficulties in maintaining wards in school (80.4%) and also paying for hospital bills (39%). Household per capita farm output was associated with household size and farm size (at 5%). Household size was significant at 1% and negatively influenced household food availability while farm size, engagement of household head in off/non-farm employment, livestock

rearing and sales and receipt of remittances influenced food availability positively at 1% significance level.

Rearing of livestock/poultry and engagement in off-farm income generation activities especially basket/hat weaving and petty trading were the most preferred permanent long-term strategies. Skipping meals and reducing quantity of food served to children in the household were the most preferred short-term strategies.

Formulation of policies to support or increase funding for the functional literacy programmes for rural farmers. Institutions which foster agricultural research and extension (Ministry of Food and Agriculture) should intensify technology research and delivery, especially on efficient use of farm land, use of quality planting materials and other crop production practices. Talk shows or programmes on radios using local languages should be organized to increase farmer awareness of new agricultural information as well as promote early and uniform farm operations. This will enhance farmer efficiency in utilizing limited production resources. There should be provision of supervised credit by credit institutions as well as NGOs in the area.

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