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The role of shocks and risks for the livelihoods of small scale fishing communities of Hadejia-Nguru Wetlands in Nigeria*

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Abstract

This paper assesses the impact of risks and shocks on household welfare in the Hadejia-Nguru Wetlands in Nigeria. We use estimated income loss in consumption equations to assess the impact. Our findings identify death of an adult member, drought, and social conflict as important shocks in the area. These shocks are more significant in reducing household food consumption than non-food consumption. Additionally, we find that farming dependent households suffer more from social conflicts; fishing households suffer more from drought; while the impact of death of an adult member does not depend on household livelihood strategies. Since the shocks that significantly reduce household consumption are not specific to such communities, we conclude that fishing communities do not need special social protection policies but these should not be left out in these programs. Further research should consider understanding the roles of off farm activities as *ex-ante* risk mitigation strategies or *ex-post* coping strategies.

1 Introduction

The attainment of the first Millennium Development Goal of eradicating extreme poverty and hunger by half between 1990 and 2015 in Africa partially requires a set of policy strategies that are cognizant of the environment in which the rural poor operate. Rural agrarian households produce under very high levels of uncertainty induced by natural hazards (weather, pests, diseases, natural disasters); market fluctuations; and social uncertainty (insecurity associated with control over resources such as land tenure and state interventions, and war) (Ellis, 1992; Mendola, 2007). Risk affects both productive decisions (Lipton, 1968) and livelihood outcomes such as income, health, education attainment, and food security (see World Bank, 2000; Ligon and Schechter, 2003; Alwang et al., 2001). This makes risk management an important aspect of development strategies in rural agrarian societies. In Africa, in particular, recurrent droughts, health risks, pests, commodity price shocks, political strife, conflict and many other sources of risk require households and policy makers to make managing and responding to risks and shock of concern (Dercon, 2005) and this has been supported by both theoretical analyses and empirical evidence (Dercon and Khrishnan, 2000a; Dercon and Khrishnan, 2000b Chaudhuri, 2003). The emergence of the term 'vulnerability' which refers to the relationship between poverty, risk, and efforts to manage risk (Alwang et al, 2001) in development economics literature has helped to elaborate the importance of risk in rural livelihood. Household vulnerability depends on the nature of shocks the household faces; the availability of additional sources of income; the functioning of labour, credit and insurance markets; and the extent of public assistance (Hoddinott and Quisumbing, 2003). Unfortunately, in many rural communities labour, credit and insurance markets are either absent or imperfect and there are few reliable sources of income.

An important sub-sector of the rural agrarian economy in Africa where the effects of risk may be perverse but where effective risk management strategies hardly exist, are the small scale fishing communities. These areas are mostly isolated geographically, socio economically and politically (Pauly, 1997). As the result, poverty levels in small scale fishing communities have remained very high for a long time (see Béné, et al., 2003). Although it is not well documented, it can be assumed that most of these areas are more vulnerable to climatic extremes such of floods and drought than the non fishing agrarian

areas because of their topography. The objective of this paper is to identify important risks and shocks in small scale fishing areas and also assess their impact on household livelihood outcomes. This information is important since no similar study has been conducted in small scale fishing communities (see Macfadyen and Corcoran, 2002; and FAO, 2005). Unlike previous studies that assessed the impact of shocks that used either dummy variables (Dercon et al., 2005) or changes in household income (Tesliuc and Lindert, 2002; Dercon and Khrishnan 2000) this paper uses estimates of income shocks caused by different undesirable events in expenditure functions to assess the impact of these undesirable shocks. The paper therefore advances methodological innovations and present new empirical findings which may be useful for both researchers and policy makers. The paper is based on a case study from the Hadejia-Nguru wetlands in Nigeria.

The rest of the paper progresses as follows. Section 2 reviews the linkages between small scale fishing and rural development in Africa. The conceptual framework within which the analysis was conducted is presented in section 3. Section 4 is the econometric strategy while section 5 presents the data collection methodology. Section 6 is the presentation of empirical results and the paper is concluded in section 7.

2 Small scale fishing and rural development in Africa

This section provides a review of the importance of small scale fishing and how other rural development projects affect this sector. The purpose is to highlight the relations between other development interventions and small scale fisheries. This is also to make readers from the non-fishing fields to understand the position of small scale fishing in the rural development debate in Africa.

Small-scale fisheries can be broadly characterised as a dynamic and evolving sub-sector of the fisheries employing labour-intensive harvesting, processing and distribution technologies to exploit marine and inland water fishery resources. The activities of this sub-sector, conducted full-time or part-time or just seasonally, are often targeted on supplying fish and fishery products to local and domestic markets, and for subsistence consumption. Other ancillary activities such as net making, boat making, engine repair, and maintenance also provide fishery related employment and income opportunities in marine and inland fishing communities (Staples, et al., 2004). Small-scale fishers usually

operate in-shore, target multiple species, and use a large range of different fishing gear and techniques (FAO, 2005). This description of small-scale fisheries means that that the sub-sector is complex characterised by multiple activities, in different intensities for multiple objectives, which imply different roles of the sub-sector in poverty alleviation and food security. This heterogeneity in the sector also calls for careful considerations when drawing rural development policies that target small scale fishing communities since different policies would yield different outcomes to different households that are involved in different aspects of small scale fishing.

There is some recognition of the potential of small-scale fisheries in alleviating poverty and reducing food insecurity in rural areas (see Béné, 2006, Béné et al., 2003 and Smith et al, 2005). The contribution of small-scale fishing in poverty alleviation and food security has been acknowledged in many developing countries. For example, inland fisheries in Malawi were reported to provide about 70-75 percent of the total animal protein consumption of both urban and rural low-income families (Revenga et al, 2000). In North-eastern Nigeria, fisheries provide employment, income, trading opportunities and valuable protein for human consumption (Neiland and Sarch, 1994). It is also reported that fishing contributes about 30 percent of household income in the Brazilian Amazon floodplain (Almeida et al., 2002). In terms of employment contribution, FAO (2004) reports that about 90 percent of the 38 million people globally recorded as fishers and fish-farmers are classified as small-scale. Additionally more than 100 million people are estimated to be employed in other fisheries associated livelihood activities, particularly in processing and trading, bringing the total estimated to be directly or indirectly employed in small-scale fisheries and aquaculture to about 135 million in 2002 (FAO, 2005). Small-scale fisheries therefore underpin the livelihood of millions of people in Africa and most parts of the developing world. People who live in flood plains and river basins derive a lot of benefits from the fisheries.

However, the contribution of small scale fishing to macroeconomic aggregates seems to be blurred (see Béné, 2006 for a comprehensive review of empirical papers) may be because the contribution is really small or because some of its benefits are hardly valued. As stated by Ratner et al., (2004) official government data on natural resources sectors are typically biased towards direct uses that are transacted in formal markets and

contribute significantly to the national economy. The uses of small scale fisheries that are not directly marketed include the risk spreading role (Turpie, 2003), animal protein benefits (Ratner et al, 2004), and the employment contribution of small-scale fisheries (Neiland and Béné, 2003). Because of the perceived minimal contribution of small scale fisheries to the macro economy, small-scale fisheries have at times been overlooked and marginalized over the years (Staples et al, 2004). Most development projects in small scale fishing areas aim at promoting other productive activities such as farming and hydroelectric power generation and many of them have negative impacts on small scale fishing. Agricultural development projects in the form of irrigation investments or hydroelectric power generation through dam construction are mostly linked with negative impact to small-scale fisheries in most African river systems. It is generally agreed that there are losses in downstream fisheries as the result of dam construction and it is reported that irrigated agriculture accounts for a large share of freshwater use by humans and is also widely regarded as a major cause of degradation of freshwater ecosystems and fisheries (Smith, et al., 2005). Reduction in fish catches, as a result of disruptions of the flow regimes that supported them, has been reported by many in Africa. Although he did not explicitly talk about the fisheries, Goes (2002) reported that in Northern Nigeria, there was an increase in the dry season flow of water after the construction of the two dams along the Hadejia river and this created a conducive environment for *macrophyte* (aquatic weeds) development. This weed reduces the area for the fishing ground and eventually reduces fishing activities. In the Caborra Bassa Dam on the river Zambezi, Turpie (2003) reports that the dam affected the flow of the river Zambezi and that this has resulted in the loss of prawn fisheries estimated at $10-20 million per annum.

3 Conceptual Framework

Figure 1 below presents the conceptual framework that relates the negative shocks households face and household livelihood outcomes. The framework is not specific to fishing communities. The framework borrows from a number of frameworks that have been used in analysing risk, vulnerability and poverty (see Smith et al., 2005; Hoddinott and Quisumbing, 2003; and Bebbington, 1999). We employ a livelihood approach to poverty is taken to escape the temptation of narrowing household well-being to income

and/or consumption while ignoring other equally important aspects of livelihood such as food security, health, nutrition and others. Following Bebbington (1999), the framework has been designed to address the diverse assets that rural people draw on in building livelihoods; the way in which people are able to access, defend and sustain these assets; and the abilities of people to transform those assets into consumption levels that improve their well being. Capital assets include physical (agricultural tools, livestock), natural (land, water, forest, fish), human (knowledge, skills and health), financial (cash-in-hand, bank accounts, net loans outstanding), and social (networks, norms and social trust that facilitates coordination and cooperation). These assets are not simply resources that people use in building livelihoods but they are also assets that give them capabilities (Bebbington, 1999). For example, possession of human capital not only means people produce more and more efficiently, it also gives them the capability to engage more fruitfully and meaningfully with the world (Sen, 1997). The environment defines the opportunities and threats people face within the community when making livelihood decisions. These are mostly external to people's decision realms. These may include amount of rainfall received, quality of land, access rights to resources, physical infrastructure, existence of social norms and behaviours, existence of social cohesion and strife, processes for setting general rules of the game and policies that affect level, returns, and variability of returns to assets (Hoddinott and Quisumbing, 2003). The environment in which the household is operating defines how exposed a household is to risks and negative shocks. Any change in the environment that will negatively affect the household can be considered as a shock. A simultaneous consideration of the assets possessed and the environment assists households to decide on livelihood strategies to engage in. Smith et al. (2005) supports this notion by saying that in the rural communities, the capacity to resist poverty and improve livelihoods often depends on the opportunities offered by natural resource based production systems as conditioned by wider economic, institutional and political environment. Shocks are exogenous and they pass their effects to the households through the environment and these are then transmitted to asset stocks and livelihood strategies. As noted by Hoddinott and Quisumbing, (2003) shocks affect the stock of the asset endowment and/or the returns to these endowments. A set of negative effects will thus be felt such as reduced production,

poor health (such as injury), insecurity, loss of capitals, and post harvest losses. Depending on the assets the people have access to which defines livelihood activity opportunities, a household will then choose a set of coping strategies. Variations in household access to assets determine different capabilities to cope with crises (Smith et al., 2005). The net of the gain from coping strategies and the loss due to the negative shock then determines the final impact of the shock on household livelihood outcomes.

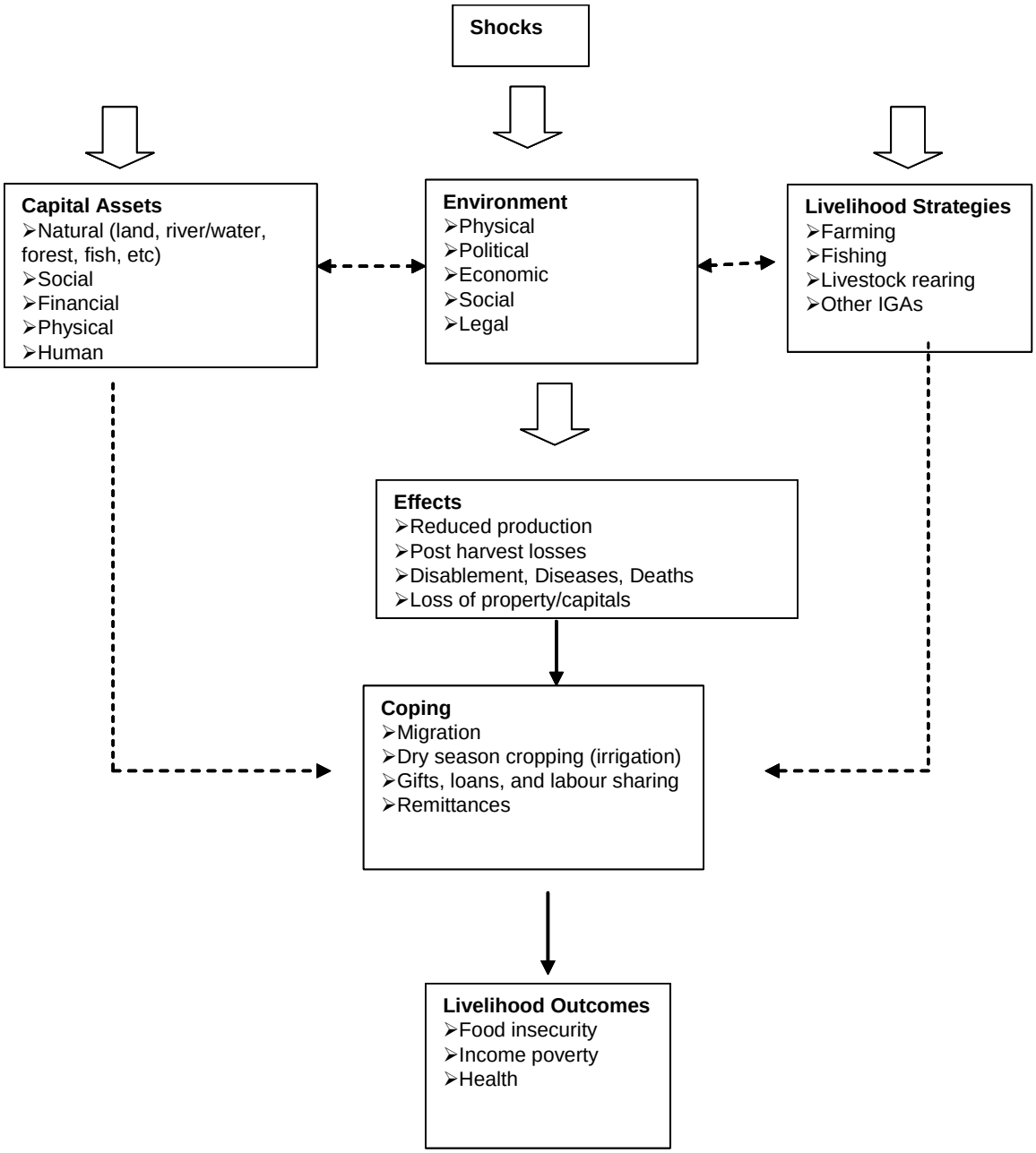

Figure 1: A conceptual framework for analysing risk, vulnerability and poverty

Source: Authors' illustration

4 Econometric procedure

Two major econometric strategies for assessing the impact of negative shocks on household livelihood are found in the literature. Both strategies estimate an expenditure function but they differ in the way they introduce the negative shocks in the expenditure function. One of the strategies uses a set of binary variables of the negative shocks the household has suffered as explanatory variables (see Dercon, et al., 2005; Makoka, 2008). The impact of the shock in this case is captured by the parameter estimates on the binary variables for the occurrence of the shock in the household. This method has an advantage of identifying the important shocks that are affecting household welfare. The shocks in this case are also exogenous thereby posing no or less estimation problems such as endogeneity. A disadvantage of this approach is that it does not capture the magnitude of the shock. The method assumes uniform effects of the shocks across heterogeneous households. The other approach uses the change in household and/or community income as a way of introducing a negative shock in the expenditure function (see Ravallion and Chaudhuri, 1997; Jacoby and Skoufias, 1998; Dercon and Khrishnan, 2000; and Tesliuc and Lindert, 2002). This approach assesses the impact of negative shocks and the effectiveness of informal risk sharing arrangements in handling negative shocks. The parameter estimate on the change in household income is used to assess the impact of idiosyncratic shocks while the parameter estimate on the change in average community level income is used to test the impact of covariate shocks. The focus on changes in income assumes that all shocks experienced by a household affect the growth rate of household consumption through their impact on the contemporaneous growth rate on household income. Skoufias and Quisumbing (2002) argued that as long as there is information available on shocks that might have impacted on the household, it can be used as an instrument for the change in household income so as to account for the role of measurement error in income. Additionally, household income would also capture the effects of unobserved shocks. However, this approach does not help to identify the specific income shocks that are affecting the household's welfare. Knowing the different effects of different shocks on household welfare may be more important to policy makers than just knowing that households are vulnerable to negative income shocks. Additionally, this approach assumes that all income changes are due to negative shocks

thereby overstating the impact of the shocks. Some of the changes in household incomes may just be due to changes in productive systems. To take care of the weaknesses and strengths of each of the two approaches, we used estimates of income shocks in the consumption expenditure function to assess the impact of shocks on household livelihood. The estimate of the income shock is defined by the predicted decrease in household income that is caused by a given shock. Using the estimate of the income shock helped to capture the magnitude of the shocks. This approach also helped to reduce the problem of endogeneity that is experienced when growth rate in income is used because the estimated income shock can be considered as more exogenous than the total income. Additionally, the predicted income shock also assisted in taking care of measurement errors in household income. The amount of income shock caused by shock *j* to a household *i*, S_{ij} is formally defined as:

$$\hat{S}_{ij} = \ln \hat{Y}_i - \ln \hat{Y}_{ij} \quad (1)$$

where $\ln \hat{Y}_i$ is the predicted natural logarithm of total household income in the absence of the negative shock while $\ln \hat{Y}_{ij}$ is the predicted natural logarithm of total household income when the household is negatively affected by shock *j*. $\ln \hat{Y}_i$ and $\ln \hat{Y}_{ij}$ are predicted from the following regression equations:

$$\ln Y_{ij} = \alpha + \beta X_i + \varepsilon_i \quad (2)$$

$$\ln Y_{ij} = \alpha + \beta X_i + \delta D_{ij} + \varepsilon_i \quad (3)$$

where X_i is a vector of household characteristics and productive inputs which includes household size, education of the household head, land holding size, farming assets, fishing assets, value of livestock, and proportion of household income from off farm activities. D_{ij} is a binary variable taking the value one for households that reported the

shock and zero otherwise. Equations 2 and 3 therefore present a form of an aggregated household level production function that controls for other household specific characteristics. Equation 3 implies that the estimates of income shocks, $S_{ij} = \delta D_{ij}$. The impact of the income shocks were then assessed by estimating the expenditure function presented below:

$$\ln c_i = \alpha + \beta X_i + \gamma S_{ij} + \varepsilon_i \qquad (4)$$

where $\ln c_i$ denotes the natural logarithm of per capita consumption expenditure for household i, X_i denotes the demographic and socioeconomic characteristics of household i, and S_{ij} is defined above. α, β, γ are vectors of parameters that were estimated while ε_i is the error term. To control for unobserved village characteristics that may be related to household income and consumption, we used village fixed effects models to obtain the estimates.

5 Data

The study was conducted within the framework of a larger research project titled 'Food security and poverty alleviation through improved valuation and governance of river fisheries in Africa' funded by the German Federal Ministry for Economic Cooperation and Development (BMZ). The project was implemented in the Lake Chad Basin in West Africa and the Zambezi basin in South Africa. In the Lake Chad basin, Chad, Cameroon, Nigeria, and Niger Republic are the countries that were involved.

The present paper uses data that was collected from the Hadejia-Nguru Wetlands which is located in semi-arid northeastern Nigeria. This is one of the most important wetlands in West Africa and has attracted a lot of policy and development interventions from state, national, and international agencies. A multi stage sampling strategy was employed to identify sample households. In the first stage, a total of 11 villages were randomly selected from a frame of 121 villages. The second stage involved selecting 282 households randomly from the sampled villages. We used the population proportion to size (PPS) technique to determine the number of households to be sampled from each of

the villages. Data was collected through focus group discussions (FGDs) and household interviews. Focus group discussions were conducted in each of the 11 sampled villages and groups of men in the range of 10 to 18 were involved in these discussions. Attempts to have gender balanced groups for the discussions were not successful because of religious and cultural constraints. The discussions collected qualitative information on overview of the villages (ethnic groups, religions, and major livelihood activities); access to natural resources; shocks, risks, and risk sharing arrangements; participatory poverty assessment; and fishing and fishing related activities. Household interviews used a household questionnaire to collect quantitative information on household demographic structure, education and occupations of household members, health information, risks and shocks in the past ten years, farming activities, livestock rearing activities, fishing activities, incomes from other sources, household assets, access to natural resources, access to infrastructure and services, food situation and food purchases and non food purchases.

6 Results and discussion

Based on the conceptual framework presented above, the empirical analysis aimed at identifying the capitals these rural communities possess, identifying the common shocks, and assessing the impact of the shocks on household livelihood outcomes.

6.1 Risks, shocks and coping strategies

In assessing the exposure to negative shocks by the households in the area, respondents were asked if they were negatively affected by any negative shock from 1997 to present (i.e. past ten years). A list of shocks was presented to the respondents to help them remember the shocks. Respondents were then asked to identify the worst three severe shocks among the reported shocks that have affected them. Further questions were asked about these three worst shocks. Health shock was captured by death of an adult member and also by the incidence of an illness to the household head that led to loss of working days in the previous 3 months. This was measured by number of days the household head did not work due to an illness. The analyses in this paper only considered these three worst shocks. Leaving out the other shocks does not mean that the other shocks do not

impact on household livelihoods but this is to make the analysis focussed and meaningful since many shocks were reported by the households. Table 2 below is a presentation of the frequency distribution of worst three shocks in the past ten years.

Table 2: Frequency distribution of reported shocks

Shock Type	Number of households that reported the shock	Percent
Drought	183	64.9
Field crop pests and diseases	158	56.0
Flooding	137	48.6
Social conflict	102	36.2
Destruction of housing	50	17.7
Typha grass	43	15.2
Death of adult members	39	13.8
Theft	30	10.6
Decrease in output prices	24	8.5
Storage crop pests	12	4.3
Livestock pests and diseases	12	4.3
Fire outbreak	10	3.5
Disablement of adult members	8	2.8
Lack of capital	7	2.5
Disablement of other members	4	1.4
Forced migration	2	0.7
Increase in input prices	2	0.7

The results show that households are affected by a wide array of negative shocks that include household specific (idiosyncratic) shocks and community wide (covariate) shocks. Although households came from same villages which imply being affected by similar community wide shocks, different households reported that they were severely affected by different shocks. This may be due to differences in household capital assets and livelihood activities. For example, a flood may be considered as a worst shock by a farmer because it washes away both the farmer's properties and crops while the same may not be worse for a fisher because it will wash away the fisher's property but it will

also bring more fishing opportunities. Up to 65 percent of households reported drought as one of the shocks that severely impacted on their livelihoods. Other shocks that have high prevalence in the area are field crop pests and diseases, flooding, conflict with Fulani, destruction of housing, and *Typha* grass, and death of adult member of the household. Weather related shocks (drought and flooding) seem to be more prominent in the area. Ecological related shocks (crop pests and diseases, *Typha* grass, destruction of housing, and livestock pests and diseases) are also very important in the area. The study also finds that security related shocks (conflict with the nomadic Fulani, theft of livestock, theft of equipment, theft of cash and forced migration) have high prevalence rates. Decrease in output prices is the most important economic shock while death of an adult member is the most important health shock. Although, we did not include it in Table 2 above, we found that 52% of the household heads left their normal activities due to an illness in the previous 3 months. This agrees with what Heltberg and Lund (2008) found in Pakistan that health shocks are more frequent type of shocks.

Households employed different coping strategies and these are summarised in Figure 3 below:

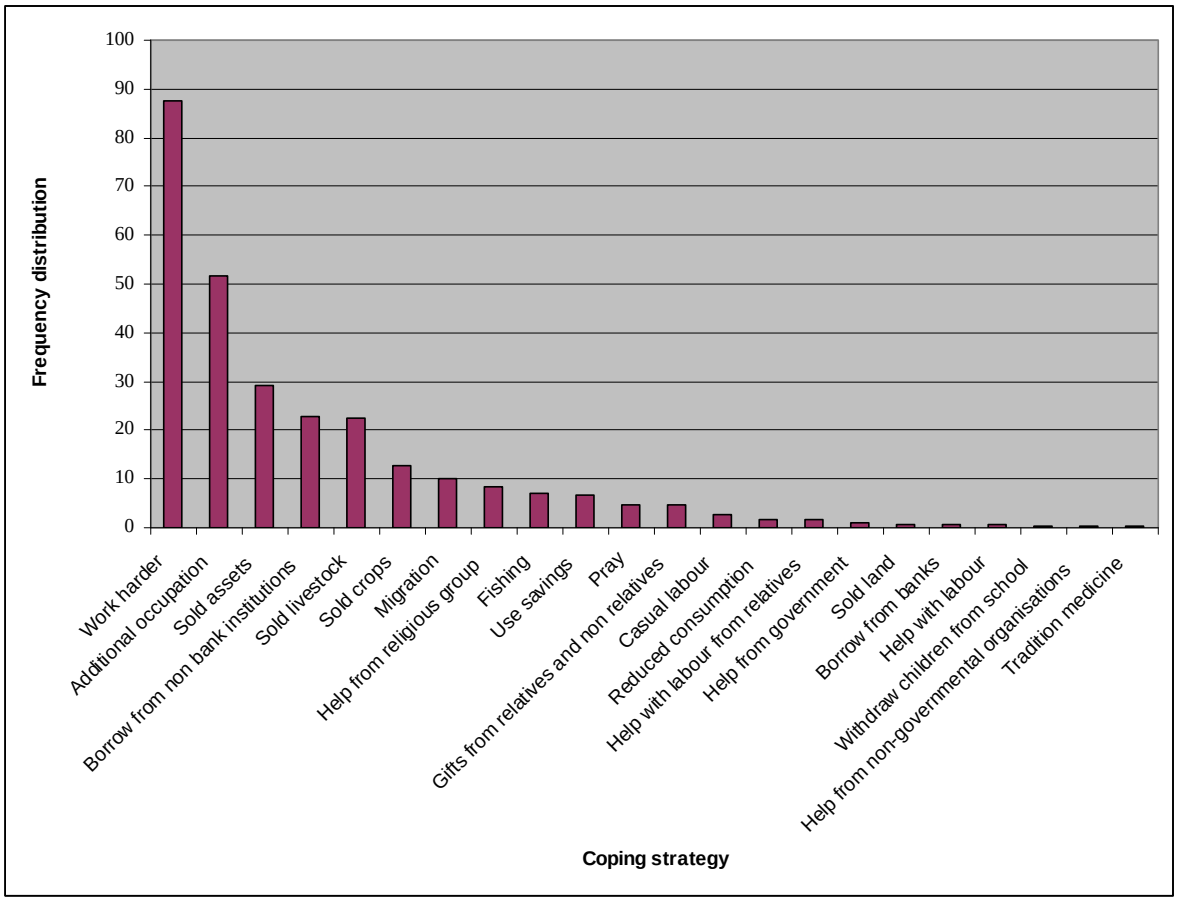

Figure 3: Frequency distribution of coping strategies

The results show that about 88 percent of the respondents indicated that their households had to work harder to cope with the effects of negative shocks that affected them. Related to this response is the second most frequent response where households took up additional occupations. Households were also found to sell assets, livestock, and crops to cope with the effects of negative shocks. Additionally borrowing from non bank institutions which include relatives, friends, and other individuals in the community is another important coping strategy. In general, households are using their labour, savings (financial and non-financial), assets, and social networks to cope with the effects of shocks. This implies that the capacity of a household to cope with the effects of a negative shock depends on the household's productive capacity (which include assets and labour) and the social networks. Unfortunately, poor households have less of these attributes making the negative shocks to trap them in poverty. Conspicuously absent

among the coping strategies is the external assistance from both governmental and non-governmental agencies.

6.2 Econometric results

The descriptive statistics of the variables that were used in the econometric estimations are presented in Table 3 below.

Table 3: Variable definition and descriptive statistics

Variable	Mean	Std. Dev.
HH size	7.31	3.49
Dependency	0.50	0.20
Age HH head (years)	42.26	14.67
HH head education (1= formal education)	0.27	0.44
Associations	0.67	0.78
Ethnicity (1=Hausa; 0= otherwise)	0.67	0.47
Farm assets (naira)	15818.73	17428.97
Fish assets (Naira)	3246.22	7377.99
Farm size (ha)	6.72	6.69
Livestock value (Naira)	80526.16	135695.00
Off farm income (%)	0.32	0.24
Per capita annual income (Naira)	72400.48	73853.69
Per capita consumption expenditure (Naira)	43072.77	29174.37
Per capita food expenditure (Naira)	25700.15	15946.60
Per capita non-food consumption expenditure (Naira)	17498.46	20981.01
Food share of total consumption expenditure (Naira)	0.61	0.15

Official exchange rate at time of survey: US$1=126.1 Naira

The results show that household sizes in the area are generally large with the average size of 7.31 individuals per household. The dependency ratio of about 50 percent shows that each of the active members of the household supports at least one additional individual. The results also show very low levels of education attainment for the household heads. Only 27% percent of the household heads had some formal education and many of them were just educated up to junior primary school. The average land holding size is 6.72

hectares per household. This is relatively an abundant resource considering the land holding sizes in other African countries. The descriptive statistics also show that households own different productive assets which lead to different household income portfolios. On average, 32% of total household income comes from off farm activities which include fishing, livestock, and petty trading. This shows the dominance of farming in the household income portfolio. The results also show that about 61% of household consumption expenditure is allocated to food consumption which implies high poverty levels as also reflected by the annual mean per capita consumption expenditure of 43072.77 Nigerian Naira which translates to 118 Nigerian Naira per person per day.

The first stage of the econometric estimation involved the prediction of household expected income in the absence of shocks. These predictions were obtained by estimating equation 2. The regression results of this equation are presented in Table 4 below:

Table 4: Results of the household income regression without shocks dummies

Variable name	Coefficient	Absolute t-values
Age head	0.0003	0.10
Education head	0.1365	1.33
Household size	-0.1485	3.62***
Household size sqd	0.0065	3.07***
Log (land size)	0.3937	6.63***
Log (livestock value)	-0.0194	1.67
Log (farm assets)	0.0350	3.92***
Log (fishing assets)	0.0371	3.00***
Percent off-farm income	0.2466	1.24
Constant	11.3030	53.88***
Village fixed effects	2.23**	
Adjusted R	0.35	
F statistics	16.12***	
N	278	

Note: *** denotes parameter statistically significant at 1%; **denotes parameter statistically significant at 5%; and * denotes parameter statistically significant at 10%. t-statistics are in absolute values

The F-test for the fixed village effects is statistically significant which imply that there exists unobserved village heterogeneity in household income level. Other model statistics suggest that the regression results have a good fit and all the explanatory variables have expected signs although some are not statistically significant. The predicted values of per capita income from this regression define the expected per capita income in the absence of shocks. In the second stage, the same equation was estimated but each of the dummy variables for the reported shocks was introduced one after another into the equation to estimate the expected per capita income with the given shock (equation 3). Predicted income loss due to a given shock was then computed by subtracting the predicted per capita income when the household experiences the shock from the expected per capita income in the absence of a shock.

In Figure 4 below, we present the box plots of the predicted income losses. This helps us to see the distribution of the predicted losses.

Figure 4: Predicted income losses due to negative shocks

The plots show that the predicted log of the per capita income losses are not very high as they are mostly around zero. Greatest losses are expected when a household suffers from a conflict with the Nomadic livestock herders. Although these predicted losses are not very high, their impact on household consumption is significant as shown in coming sections.

In order to assess the performance of different approaches of assessing the impact of shocks, we used four specifications of shocks in consumption expenditure regressions in Table 5 below. Model 1 uses dummy variables of reported shocks except for illness of household head which is captured by number of days lost due to illness. Model 2 uses household per capita income in which cross sectional variations is incomes are assumed to occur due to shocks and is estimated by OLS. Model 3 also uses household per capita income as an indicator of shocks but this instrumented by the share of income from fishing which meets exclusion criterion (that is, correlated to household income and uncorrelated to consumption expenditure). Finally, model 4 uses the estimated income losses to capture shocks.

Table 5: Impact of shocks on household per capita consumption

Variable	Model 1 (Dummy variables		Model 2 (OLS)		Model 3 (IV)		Model 4 (Predicted losses)	
	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
Household size	-0.0829	2.39**	-0.0600	1.87*	-0.0829	2.29**	-0.0918	2.74**
Household size sqd	0.0027	1.63	0.0018	1.18	0.0025	1.48	0.0032	2.00**
Education head	0.2049	2.88***	0.1952	2.90***	0.2024	2.97***	0.2138	3.01***
Associations	0.0302	0.76	0.0119	0.32	0.0249	0.66	0.0239	0.60
Dependency ratio	-0.5055	2.68**	-0.5149	2.91***	-0.4894	2.67**	-0.5018	2.66**
Ethnicity	0.0518	0.71	0.0923	1.34	0.1035	1.68	0.0491	0.66
Age head	-0.0051	2.15**	-0.0043	1.94*	-0.0050	2.14**	-0.0045	1.90*
Log (land)	0.1754	4.26***	0.1002	2.46**	0.1711	2.81**	0.1685	4.23***
Log (Farm assets)	0.0197	3.12***	0.0162	2.79**	0.0200	3.20***	0.0214	3.57***
Log (income)			0.1836	4.66***	0.0015	0.01		
Drought	-0.0941	0.86					-0.1694	0.87
Social conflict	0.0230	0.27					-0.0603	0.23
Flooding	0.0158	0.13					2.4076	0.11
Pests	0.0111	0.17					0.0710	0.09
Typha	-0.1120	0.70					0.5253	0.74
Death	-0.2669	1.48					0.1622	0.54
Theft	0.1451	0.58					-1.5982	1.48
Housing destruction	0.0238	0.20					0.0861	0.18
Illness	0.0000	0.48					0.2502	0.47
Constant	11.2280	71.27***	9.0885	18.84***	11.1791	7.56***	11.2270	73.32***
Village fixed effects		1.10	0.9460	0.50				1.01
Wu-Hausman						2.82*		
Durbin-Wu-Hausman						2.92*		
Adjusted R-sqd		0.34		0.40		0.34		0.34
F-statistic		8.45***		18.40***		15.54***		8.34***
N		279		279		279		275

Note: *** denotes parameter statistically significant at 1%; **denotes parameter statistically significant at 5%; and * denotes parameter statistically significant at 10%. t-statistics are in absolute values

Model 1 shows that none of the shocks significantly reduce household consumption but death of an adult member in the household has the highest t-value though insignificant. Using cross sectional variation in household income to proxy shocks, model 2 shows that household consumption significantly follows household income variation which implies that households fail to smooth consumption in the presence of negative income shocks. However, model 3 which corrects for endogeneity of household income shows that household income and consumption are not significantly related. The Wu-Hausman and Durbin-Wu-Hausman tests confirm the presence of endogeneity and therefore support the instrumental variables technique. This shows the challenges of using household income to reflect the shocks since this is likely to be endogenous and fixing of this problems depends on availability of good instruments. Failure to identify good instruments may result in inconsistent estimates and therefore wrong conclusions. As it was with model 1, model 4 which used the predicted income losses does not identify any important shock that is significantly affecting household consumption except for death of an adult member that has similar t-value with model 1. In general the results in model 1, model 3 and model 4 suggest that shocks do not have significant effects on household consumption and identifies death of an adult member of the household as the most important negative shock.

Although, the model statistics for models 1 and 4 are similar, the results show that the point estimates of the parameters are underestimated by model 1 although their interpretations are different. Further explorations of the results are therefore done with the specification in model 4.

Considering the fact that shocks may affect food and non food consumption expenditure differently we assessed impact of shocks on food and non-food consumption expenditures. Table 6 below presents the results of these estimations.

Table 6: Impact of shocks on food and non-food consumption expenditure

	Food consumption		Non food consumption	
Variables	Coef.	t-statistic	Coef.	t-statistic
Household size	-0.0978	2.73**	-0.0891	1.91*
Household size sqd	0.0032	1.86*	0.0036	1.61
Education HH head	0.1896	2.50**	0.2354	2.37**
Associations	0.0377	0.89	-0.0004	0.01
Dependency ratio	-0.5575	2.76**	-0.4351	1.65
Ethnicity	0.0792	1.00	0.0062	0.06
Head age	-0.0022	0.86	-0.0086	2.60**
Log (land)	0.2074	4.86***	0.0992	1.79*
Log (Farm assets)	0.0192	3.00***	0.0312	3.73***
Drought	-0.3255	1.56	0.0360	0.13
Social conflict	-0.3551	1.26	0.2056	0.56
Flooding	-0.7035	0.03	13.1417	0.43
Pests	-0.9867	1.17	1.4417	1.31
Typha	0.3138	0.41	0.3254	0.34
Death	-2.6424	2.29**	0.3625	0.24
Theft	0.2062	0.64	0.0628	0.15
Housing destruction	-0.2106	0.41	0.6262	0.93
Illness	0.2194	0.39	0.3666	0.49
Constant	10.6635	65.15***	10.2669	48.14
Village Fixed Effects		2.87***		0.56
Adjusted R^2		0.39		0.16
F-statistic		8.88***		4.15
N		275		277

Note: *** denotes parameter statistically significant at 1%; **denotes parameter statistically significant at 5%; and * denotes parameter statistically significant at 10%. t-statistics are in absolute values

The results in Table 6 above show that the impact of negative shocks is felt more on food consumption than non-food consumption in our study area. Although the parameter estimate on death of an adult member is the only significant parameter by conventional cut-off points, the t-value of the parameter estimate on drought still shows that this shock is significant in our study area considering the small sample. It is strange to find that household consumption of non food commodities is insensitive to shock experiences. We expected households to protect food consumption more than non-food consumption. The reduction in food consumption here may be both a coping strategy and a direct effect. As a coping strategy, households may have reduced food consumption to maintain food stocks for a long time while a direct effect implies that the household is consuming less food because it does not have the ability to consume enough today.

We also assessed the effects of shocks on households with different livelihood strategies. Household livelihood choices were defined with respect to income contribution of an activity. We first defined households as farming if they obtained more than 30% of their income from farming and non-farming if otherwise. We chose a threshold of 30% so that we should end up with roughly two equal sub-samples since almost all households are involved in farming. This threshold was also closer to the mean proportion of off-farm income to total household income. Households were defined as fishing if they obtained any amount of income from fishing. Because non-food consumption continued to have insignificant relationships with shocks, we conducted this assessment on food consumption only. These results are presented in Table 7 below:

Table 7: Impact of shocks on household food consumption on households with different livelihood strategies

	Non-farming dependent		Farming dependent		Fishing		Non-fishing	
Variables	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic	Coef.	t-statistic
Household size	-0.0667	0.57	-0.1399	2.45**	-0.0644	0.85	-0.1316	2.10**
Household size sqd	0.0017	0.34	0.0049	1.68	0.0013	0.29	0.0046	1.71*
Education HH head	0.1983	0.43	0.1968	1.92*	0.0854	0.88	0.2444	1.31
Associations	0.0909	1.31	-0.0290	0.51	0.0787	1.42	-0.0188	0.23
Dependency ratio	-0.3853	1.28	-0.6676	2.30**	-0.4077	1.46	-0.6318	1.82*
Ethnicity	0.0432	0.31	0.1226	1.21	0.1286	1.12	0.0365	0.28
Head age	-0.0060	0.64	-0.0008	0.25	-0.0020	0.51	-0.0013	0.29
Log (land)	0.2089	2.30**	0.1778	3.17***	0.1991	3.39***	0.2119	2.77**
Log (Farm assets)	0.0208	0.87	0.0205	2.51**	0.0212	2.50**	0.0132	1.00
Drought	-0.6494	1.74*	-0.3535	1.37	-0.5911	1.95*	-0.2052	0.61
Social conflict	0.0262	0.06	-0.7297	1.93*	0.2082	0.52	-0.5831	1.17
Flooding	-28.3012	0.89	39.6753	1.07	-10.7553	0.39	46.5749	0.80
Pests	-1.5415	1.09	-1.2125	1.06	-1.2654	1.10	-0.6656	0.46
Typha	-0.4216	0.29	0.2998	0.34	0.7664	0.73	-0.1411	0.11
Theft	0.7044	1.11	-0.0591	0.14	0.0916	0.15	0.3186	0.70
Death	-3.6815	1.57	-1.4023	1.08	-2.4140	1.35	-2.2375	1.31
Housing destruction	-0.7875	1.07	0.8831	1.10	0.3907	0.50	-1.0554	1.35
Illness	-1.8966	0.05	0.0804	0.15	0.2190	0.37	3.1697	0.31
Constant	10.5228	38.34***	10.8894	48.62***	10.3897	39.70***	10.9068	41.62***
Village fixed effect		2.33**		2.17**		1.43		2.246
Adjusted R		0.34		0.46		0.29		0.44
F-statistic		3.21***		7.17***		3.62		5.45
N		133		142		164		111

Note: *** denotes parameter statistically significant at 1%; **denotes parameter statistically significant at 5%; and * denotes parameter statistically significant at 10%. t-statistics are in absolute values

Comparing farming and non-farming households, the results show that drought reduces food consumption more in non farming households than in farming households. The level of significance is also higher in non-farming households. This result could be due to the fact that definitions of the household livelihood strategies are based on outcome variables (household income). This result shows that households that obtained less income from farming probably due to drought had low food consumption levels. In that case, the impact of drought can be said to pass through low income from farming and then low food consumption. On the other hand, households that obtained most of their incomes from farming were significantly affected by social conflict. Since most of the conflict emerges as the result of competition over the use of natural resources, farming households may be suffering more due to their dependency on land. At times, livestock herders could graze their animals on somebody's farm which means that if the household does not have other sources of incomes, this may leave them without enough output and food.

The results also show that food consumption significantly declines when fishing households are affected by drought. This result shows the importance of water availability to fishing households. Drought chocks fishers' livelihoods but non-fishing households can still survive in the presence of a drought assuming that they do not depend more on farming. Death of an adult member is also negatively related to household food consumption irrespective of the household's livelihood strategy.

7 Conclusions

The main aim of this paper was to assess the impact of risks and shocks on the livelihood outcomes of households in rural small scale fishing communities of the Hadejia-Nguru Wetlands in Nigeria. The study identifies illness of household head, drought, pests, floods, social conflict, destruction of housing, death of adult member of the household and theft of production assets, livestock and cash as most frequent shocks. The estimated income losses due to shocks are generally low but significantly reduce household welfare. In most cases, shocks have negative effects on household food and non-food consumption but few of them are statistically significant as Dercon et al (2005) found. Important negative shocks in the area include death of an adult member, drought, and

social conflict. Our findings also show that shocks are more significant in reducing household food consumption than non-food consumption. Additionally, farming dependent households are found to suffer more from social conflicts while fishing households are found to suffer more from drought.

We therefore conclude that although many shocks occur in fishing communities, few of them have significant negative effects on household food and non-food consumption probably due to availability of other natural resource based income sources. However, the shocks that are negatively affecting household food and non-food consumption in our study area can occur in any rural community and not specific to fishing communities. These results mean that fishing communities are not necessarily more vulnerable than non-fishing communities. The results also means that what is normally recommended by fisheries experts that small scale fisheries are overlooked and marginalised (e.g. Staples et al., 2004), which imply that small scale fisheries require special rural development policies may not be very true as regards to social protection policies. Our results suggest that fishing communities do not need special attention in the design and implementation of social protection policies but they need not to be left out from these programs. Further research should consider understanding the roles of off farm activities as *ex-ante* risk mitigation strategies or *ex-post* coping strategies. Application of the proposed method on longitudinal data where the shocks will be associated with an income change would be more attractive.

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