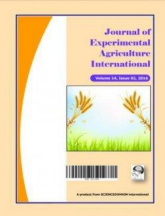

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Do Flood Hazards Affect Risk Attitudes? An Experimental Analysis in Agriculture-Dependent Communities in Cameroon

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Problem: That flood hazards affect agriculture is common knowledge. However, how flood hazards affect risk attitudes is not fully known. This work models the influence of flood hazards on risk attitudes in agriculture-dependent communities.
Study Design: We elicit risk attitudes among victims and non-victims from three agriculture-dependent flood hazard communities in Cameroon.
Methodology: Data collection took place in December 2016, using a combination of structured questionnaires and field experiments. Collected data was entered and analyzed using SPSS version 20.0.
Results: Hypothetical results from questionnaires showed similarity in risk aversion between victims and non-victims prior to flood hazards (78.4% and 69.3% respectively, p=.40). Similar attitudes were practically reported immediately after the flood hazards. However, higher but insignificantly different risk taking attitudes were observed for both victims (54.2%) and non-victims (68%) after the first experimental game (p=.30). Overall, risk taking increased in game 2. Both victims and non-victims demonstrated higher risk taking attitudes in the second iteration (≈72% and 90% respectively), with more non-victims (22%) becoming risk takers than victims (18%). Wins in the first iteration could have largely influenced the increasing risk taking attitudes observed in game 2.

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Conclusion: We contend that flood hazards can directly enhance risk taking attitudes among flood victims in agriculture-dependent communities, based on the desire to overcome negative impacts and restore livelihoods. Non-victims rather take risks to improve their capacity to buffer future flood hazards and avoid similar suffering of victims. Further research is however needed to ground these contentions.

Keywords: Risk attitudes; experimental analysis; flood hazards; Cameroon.

1. INTRODUCTION

Virtually every situation in life is characterized by a certain degree of risk and uncertainty. The desire to understand how decisions are made under such conditions, and how subjects' choices influence economic and social outcomes has created a springboard for a growing body of experiment-oriented studies [1-6]. Behavioral scientists have demonstrated up-surging interest in modeling the relationships between actual and perceived behavior and idiosyncratic or correlated (objective or subjective) risks faced by subjects under different settings [1,3,7,8]. As would be expected, assessment outcomes are mixed. For instance [3] reported that elicited risk taking attitude was strongly correlated with the willingness of the player to gamble in real life. In an earlier study, [1] observed amongst financially tagged subjects that individual risk taking behavior was associated with the willingness of the individual to engage in actual risky financial transactions. Such differences seem to support the contentions of [9] that a full understanding of individual or collective decision making under risky conditions warrants a check across many, and not necessarily a single domain.

Agriculture is exposed to a multitude of risks which farmers have to regularly identify and manage. Some of these risks include price fluctuation of agricultural products, pest and disease occurrence and unanticipated changes in climate-related factors such as rainfall and sunshine [5]. In deciding how much to invest in risk prevention, mitigation or coping endeavors, farmers often weigh costs, benefits and preferences from a multitude of perspectives, which they consider primordial. Very often, they do not make choices in isolation. In fact, agricultural risk choices are often influenced by social, context-specific factors [10]. This has been demonstrated in numerous studies [e.g. 5,6-14]. Successful application of risk experiments can facilitate informed policy decision making in the agricultural sector. In this sense, the relevance of the methodology question, and how it might influence experimental (and subsequently, policy) outcomes can therefore not be overemphasized. Like in other sectors, the key question for risk experiments in agriculture remains whether to rely on risk preference inferred from incentivized behavioral measures such as lottery choice tasks with actual pay offs [1,12]; non-incentivized approaches which are mostly questionnaire based, or a combination of both [6,15]. Empirical evidence suggests that experiments are more plausible, when a combination of both methods are used, and when at least similar trends can be established irrespective of method [11,16].

In recent years, increasing climate variability in Cameroon has exposed farmers to many risks such as increasing pest and disease incidence, and crop damages mainly from unanticipated floods and droughts [17]. These increasingly acknowledged risks have only been accompanied by timid efforts to understand how farmers make risk-related decisions. Applications in the context of natural hazards still lag behind, in spite of the growing recognition of the relevance of such events [7]. When efforts have been made, they have mainly focused on isolated case studies. This paper intends to contribute to this sluggishly growing literature, by (1) eliciting risk behavior of victims across multiple floods; and (2) comparing and validating outcomes captured through questionnaires on the one hand lottery games on the other hand, in agriculture-dependent communities in Cameroon. The added value of the paper lies in its contribution of new knowledge on the relationship between flood hazards and risk behavior among victims in agriculture-based communities. Such knowledge can be useful in shaping policies for re-establishing agriculture-dependent livelihoods after flood hazards, which are on the rise in developing countries such as Cameroon.

1.1 The Problem Context and Background

That up-surging natural disasters inflict negative impacts on victims globally is a terrifying reality.

The impacts on agriculture in particular and poverty in general are very heavy in sub-Saharan Africa where Africa's poor is concentrated [16-19].

Floods are the most frequent natural disasters in sub-Saharan Africa (SSA). Increasing flood frequency in SSA is the outcome of uncontrolled processes such as climate variability, deforestation and rapid urbanization [20].

Cameroon is one of sub-Saharan African countries which is severed by floods [21-22]. Frequent floods in the country seriously affect assets and entitlements, and therefore livelihood security of the predominantly agriculture-based population [23-24]. Flood effects especially in agriculture-dependent communities usually range from the destruction of crops, livestock and agricultural lands, through the pulling down of houses, to increased disease prevalence, internal displacements, resettlements, and loss of [25-28]. Before, during and after floods, victims often implement several strategies, which adequately or inadequately circumvent the overall flood effects, and therefore affect the eventual livelihood outcomes after flood events. The effectiveness of implemented strategies depends on factors such as household socio-economic status [28], risk perceptions [29], institutional failure, the level of community organization/support [22-23] as well as the ability and willingness to take risks [11,30]. The risk attitude adopted by farmers, that is, risk taking, risk neutrality or risk adversity, inherently influences the strategies adopted and their ability to prevent, mitigate or cope with flood hazard effects on agriculture. Risk taking farmers may resort to different flood-related insurance (or micro-lending) schemes according to their risk attitudes; which will resolve in different capacities to buffer the effects of flood hazards [31-34]. At the same time, flood hazards might influence risk attitudes, for instance by inflicting fear, or the desire to get over the shock effects [35-36]. Understanding the relationship between flood hazards and risk attitudes therefore becomes very important in the Cameroonian context, in which agriculture—an important livelihood strategy for over half of the population, is increasingly affected by a rising frequency of flood hazards.

Contemporary research on flood hazards in agriculture-dependent communities in Cameroon has been biased towards assessing their causes, impacts and the role of community based management institutions [21,22,37]. Minimal efforts on eliciting the effects of hazards on risk attitudes have been directed to other forms of hazards, such as natural gas explosions [7]. Given that floods are the most frequent forms of natural hazards in the country [21], it therefore becomes imperative to extend this approach to flood hazards where outcomes can have maximum policy effects. This paper contributes knowledge on the relationship between flood hazards and risk attitudes.

2. METHODOLOGY

Behavioral economists and psychologists have developed and tested numerous approaches to elicit and assess individual risk attitudes [6-9]. Choosing which to utilize, however, is largely contingent on the sample characteristics as well as on the research objectives. In this study, primary data was mainly collected using structured questionnaires and risk experiments for two reasons. First, we wanted to assess the difference between hypothetical modeling using structured questionnaires and experiments, which continue to be a bone of contention in the discipline [11,38]. Secondly, during questionnaire administration, players were timidly introduced to the eventual risk experiments which were to be implemented shortly after the questionnaire administration. This approach aroused interest to participate in the field experiments. Key informant interviews were also used to clarify certain issues of interest to the research team.

In the first step, structured questions were used to elicit risk preferences that rely on the individual's self-reported propensity for risk taking. This method has been used before by many behavioral scientists [se for instance 6- 10, 37,39]. In the second step, the risk experiments designed and adopted following [7,8,10,12,13], [33], and [39-42] were implemented. Experimental data were collected from 130 respondents (70 victims and 60 non-victims) from three agriculture-dependent, flood-affected areas in the South West Region of Cameroon, namely *Bekora* community (hereinafter referred to as flood 1); *Clerks quarter* community (hereinafter referred to as flood 2) and *Motowoh* community (hereinafter referred to as flood 3).

The flood-affected communities were purposively selected using two criteria. Firstly, these are largely agriculture-dependent communities. Secondly, the communities have been affected by flood hazards not older than 5 years at the

time of the research, with recorded damages on agricultural production. The 5-year window period was deemed sufficient to reduce any form of bias that could have accompanied the data collected through the questionnaires, if the recall period was longer. Only this approach was feasible, given that there were no baseline data for the sample population before the respective floods.

Initially, the intention was to interview all the affected farmers in the three communities who would be willing to participate in the risk experiments. In this way, it will be possible to reliably compare the hypothetical data elicited through the questionnaires with that from the experiments. Only 70 out of a total of 92 victims in all three communities accepted to fill the questionnaires. 14 were not in the communities at the time of data collection, while 8 declined to participate. Only those who participated in filling the questionnaires were admitted into the risk experiments, in order to insure consistency of data and comparative analysis. 60 non-victims (i.e. 20 each from the 3 test communities) were randomly selected to constitute the control sample. One questionnaire was administered for each participant.

Given the research background and in resonance with previous research, this work intended to test the following hypotheses:

1. Risk taking attitudes are significantly stronger among victims than non-victims.

   This is based on the fact that the need to bounce back from the farm losses incurred as a result of the floods is likely to motivate victims to engage in risky activities (such as loan acquisition, adoption of agricultural technologies resilient to flood hazards, etc) in order to re-engage in agriculture, or to develop preventive measures against future floods (such as raised embankments).
2. Prior risk experiences are likely to influence current risk behavior.

2.1 Experimental Design

The key experiment consisted of the players making an independent choice between two lottery games (1 and 2). Game 1, the risky game, was designed to have 50% chance of winning any amount, up to a maximum of about three times the local daily wage. Game 2, the risk-averse counterpart, presented players with a sure but smaller win. Involving victims and non-victims in the games allowed us the possibility to assess if exposure to floods might have influenced risk attitudes. No-real-pay-off experimental games were implemented in order not to introduce any form of distortion in natural risk behavior. As such, expressed risk attitudes are likely to be contingent on flood experience, current exposure and discounted future risks. In addition, real pay-off would demand time-variant components which would have complicating the experiments with no major impacts on the research objectives [15].

Before the commencement of the game, visualization techniques were used to present the game to participants. Players were asked to choose between two games: the risk taking game (1) with a 50-50 chance of winning or losing, but with the possibility in case of luck to win up to 5,000 FCFA (≈10 US$), which amounts to about three times the local daily wage; and the risk-aversion game (2) with a sure but smaller win. Participants were encouraged to be as serious in the games as they would be in real life. Two players were randomly selected to do a pretest of the game in the watchful eyes of all participants. Any doubts were clarified before the players engaged in the actual games. Five iterations were carried out. At the start of each game session, players made a clear choice on whether to play risky game 1 or risk-averse game 2. Wins for game 1 players were known after a random draw from a bundle of possible lots carefully prepared before the games by the principal researcher, allowing a 50% chance to win or loss. Following [7], the minimum win was set at the hypothetical cost of a game ticket, while a loss was zero. Only players who opted for risk-taking game made draws from the lot. Only one draw per iteration was allowed. At the end of each game session, all wins or losses were completely recorded for all participants before commencing the next session. Facilitators supported illiterate players in recording. Players were allowed to announce their wins or losses after each game, if they wanted to. The payoff of the sure-win game 2 was set at three times the cost of the hypothetical ticket for the first game. This was increased to four times in the second iteration, six times in the third iteration, eight times in the fourth iteration, and nine times in the fifth and last iteration. It should be recalled that losses are not possible with game 2. However, those who demonstrate stronger risk taking attitudes by playing risky game 1 can even win more than a risk-averse player in all five game

iterations if they get lucky once [7]. A separate pre-prepared recording sheet was allocated to each player to carefully document game outcomes of in all five iterations.

It was assumed that as constant payments for game 2 increase, game 1 will become less attractive to a more risk-averse player who is likely to switch from Game 1 to 2; especially if such persons are not lucky enough to win substantial amounts in the gamble. A player's certainty equivalent to the gamble represented by game 1 is indicated by the payoff point of game 2 at which a player decides to switch [7,43]. At the same time, as people win in the risky game 1, more players with endogenous risk taking attitudes may switch to game 1, in order to try their luck. Equally, risk takers with hidden, cognitive risk aversion attitudes are likely to switch to the risk-averse game 2, after losing in risky game 1. This makes an analysis of the switching dynamics particularly interesting, especially after the first iteration. In addition to a common lunch, all players were compensated by with 4 cubes of soap for non-victims, and 6 cubes for victims. The results of the hypothetical responses (captured through structured questionnaires) and the risk experiments are analyzed, presented and discussed in section 3.

3. RESULTS AND DISCUSSION

3.1 Socio-economic Description of Experimental Population

The first part of the analysis presents the demographic characteristics of our sample. As can be observed in Fig. 1 below, the experimental population was constituted of both male and female players, both victims and non-victims drawn from across all three case study communities which have been affected by flood hazards. In the flood 1 area for instance, the majority of the sampled victims were male while the non-victims were female (53.3% and 60% respectively). A similar percentage of male and female victims participated from flood 2 community. However, the ratio of female to male amongst non-victims was 1 to 3. This is an indication that the gender effects of floods may vary from one case to another.

Table 1 below depicts that the majority of game participants had only primary education. Only flood 3 community had University graduates. The generally low educational levels in the sample were a justification for the experiments to be kept quite simple.

The majority of participants in all three communities were married (Fig. 2). For example all the non-victims of flood 1 were married. This result mirrors previous studies [23] which identified marriage as a key institution in Cameroonian societies.

An analysis of the major occupation of participants showed mixed trends across the communities. For instance, an equal percentage of victims and non-victims in the flood 1 community relied on farm and non-farm enterprises. More non-victims from the same community depended on the latter (P=.02).

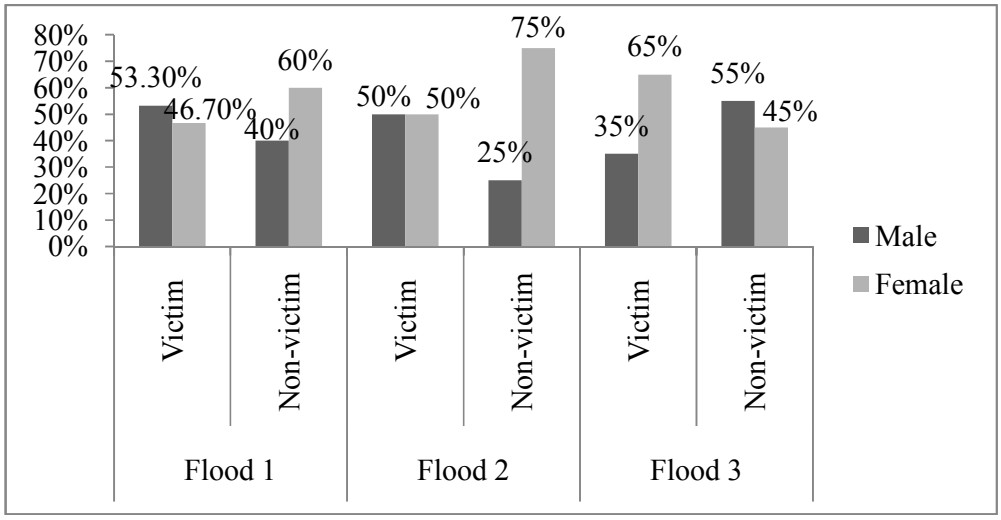

Fig. 1. Sex of participants

Table 1. Highest educational achievement among the experimental population

Flood area	State of respondent	No school	Primary education	Secondary education	Post secondary	University education	p-value
Flood 1	Victim	6.5%	60%	20%	13.5%	0%	.06
	Non-victim	0%	40%	50%	10%	0%	
Flood 2	Victim	0%	55%	10%	35%	0%	.00
	Non-victim	0%	30%	60%	10%	0%	
Flood 3	Victim	4.8%	19%	38.2%	0%	38%	.00
	Non-victim	0%	78.9%	21.1%	0%	0%	

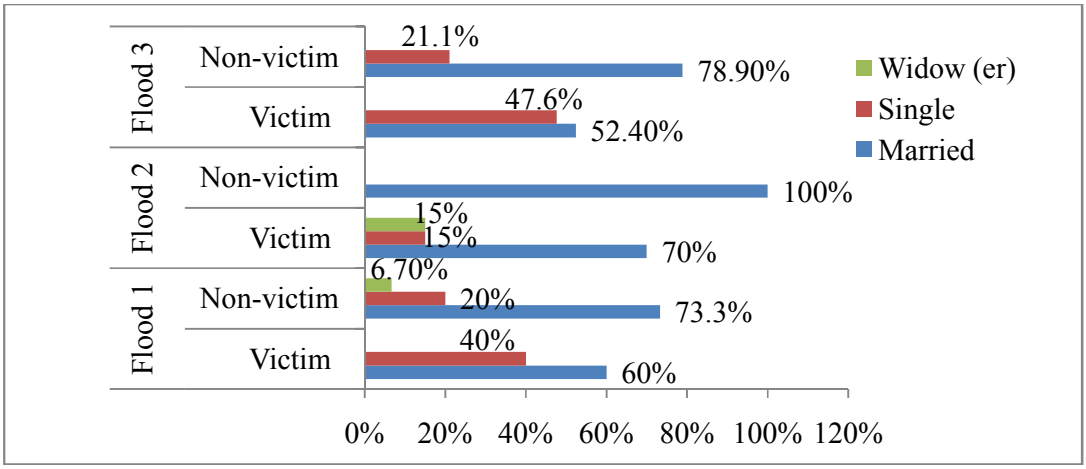

Fig. 2. Marital status of participants

Non-farm enterprise activities dominated players in flood 2 community, irrespective of player type (mean=95%; P=.04). A trend almost similar to flood 2 community was observed in the flood 3 community. Overall, a significantly higher proportion of the players depended on non-farm enterprise activities (70.8%, P<.05). Nevertheless, key informant interviews informed the research team that all players were involved subsistence agricultural activities through which food crops were produced for home consumption.

Further descriptive statistics of our experimental population are presented in Table 2. One observes that while the mean age of flood 1 victims was significantly higher than that for the non-victims (43 and 30 years respectively, P=0.001), that for floods 2 and 3 victims are less than that for their respective non-victims (38 and 45 years, P=.03 for flood 2 and 37 and 39 years, P=.26 for flood 3 respectively).

In addition, the household sizes for the flood 1 and 2 victims was higher than that for their respective non-victims (6 and 4 persons, P=.00 and 8 and 7 persons P=.26 respectively). On the contrary, the household size of flood 3 victims is smaller than that for the non-victims (6 and 7 persons, P=.21). Only the monthly income of the game players from flood 1 was found to significantly differ between victims and non-victims (≈US$ 197 and ≈US$ 80 respectively, P=.02).

3.2 Gambling Experience and Risk Behavior Based on Survey Questionnaire

The gambling experiences of participants were captured using structured questionnaires. Previous experimental research in agriculture suggests that gambling experiences positively correlate with risk taking decisions such as new technology adoption, credit acquisition, contract farming and pesticide application [11,14,44-45]. The gambling experience and risk taking attitudes of the experimental population is presented in the next six tables. As observed in Table 3 below, most of the players irrespective of type demonstrated high risk aversion attitudes, through their timid prior involvement in gambling activities. Overall, victims demonstrated a near 10 percentage point risk aversion margin compared to non-victims. However, ≈40% of both

victims and non-victims from flood 3 community had high gambling experiences prior to the floods. Given that gambling entails risk taking, one will expect a higher risk taking attitudes amongst flood 3 members compared to the other communities. Also, higher levels of education in flood 3 community suggest a positive relationship between educational level and risk taking.

To further explore current risk attitudes and if they have been affected by flood experiences, we examined the contemporary willingness to pay for lottery tickets. The results are presented in Tables 4 and 5 below. In a first step, only a small fraction (<10%) of all the players demonstrated preference for investments in which high possible benefits were associated with high risk taking. In fact, most of the game players rather preferred to engage in high possible benefit games, with low to medium risks. In general, these were mostly flood victims irrespective of flood community, even if such tendencies were also observed amongst non-victims. Given that hypothetical risk taking dropped even among non-victims of flood 3, the current higher risk aversion attitudes are arguably attributable to flood effects. If this contention is true, then it will contradict the findings of [46] in Thailand and Vietnam where risk aversion amongst players was attributed to lowered incomes. But floods are likely to affect incomes [23]. Such a contention therefore needs to be further investigated. In our case study communities, non-victims have lower incomes on average as compared to victims (see Table 2). Key informant interviews suggested that this could be a consequence of external support that was biased towards flood victims. If the income differential would be an important explanatory variable for changing risk attitudes, then theoretically, more victims will be interested in paying for high-risk-high-benefits lottery tickets. Using the standard questionnaire, we then try to investigate the relation between incomes and willingness to pay for lottery tickets. The results are presented in Table 5.

The hypothetical willingness to pay for lottery tickets generally increases with the possible amounts to be won. However, the mean amounts flood victims are willing to pay for lottery tickets were lower for all options in floods 1 and 2 communities as compared to those of non-victims, irrespective of higher incomes for victims. The theoretically advocated positive correlation between income and willingness to pay was only observed in flood 3 community. A straight forward positive correlation between income and risk taking could therefore not be established in all case studies. Given that victims had higher incomes, the weak risk taking abilities demonstrated through lowered willingness to pay for lottery tickets compared to non-victims with smaller incomes can be attributed to the flood experiences of the former.

Table 2. Selected socio-economic characteristics by flood and household type

	Variable	State of respondent	Mean	Std. deviation	Std. error mean	p-value
Flood 1	Age	Non victim	30.30	11.31	2.53	
		Victim	43.07	13.64	2.49	.00
	Household	Non victim	3.60	1.67	.37	
	size	Victim	6.21	3.26	.62	.00
	Monthly	Non victim	53,125	61260	15315	
	income	Victim	72,540	54245	10640	.15
Flood 2	Age	Non victim	45.05	8.85	1.98	
		Victim	38.00	10.61	2.500	.03
	Household	Non victim	7.05	3.71	.83	
	size	Victim	7.72	2.49	.59	.26
	Monthly	Non victim	43,890	27200	6410	
	income	Victim	108,125	101930	25480	.02
Flood 3	Age	Non victim	38.74	11.63	2.67	
		Victim	36.52	10.21	2.23	.26
	Household	Non victim	6.58	2.41	.55	
	size	Victim	5.92	2.06	.57	.21
	Monthly	Non victim	54,740	35650	8180	
	income	Victim	53,570	11340	3030	.45

Notes: 1. Household income has been rounded to the nearest FCFA 5; 2. 1 US$=FCFA 550

Table 3. Previous gambling experience of experimental population prior to floods

Flood type	Participant type	Participation in gambling before floods?		p-value
		No (%)	Yes (%)	
Flood 1	Victim	73.3	26.7	.09
	Non-victim	60	40	
Flood 2	Victim	100	0	.07
	Non-victim	90	10	
Flood 3	Victim	61.9	38.1	.40
	Non-victim	57.9	42.1	

Table 4. Hypothetical choice preference for investments after floods

Flood type	Participant type	High possible benefits-high risk game (%)	High possible benefits-moderate risk game(%)	High possible benefits-low risk game(%)	Acceptable (constant) benefits-low risk game (%)	Low possible benefits-low risk game(%)	p-value
Flood 1	Victim	10	26.7	63.3	0	0	.29
	Non-victim	20	20	60	0	0	
Flood 2	Victim	10	25	65	0	0	.13
	Non-victim	0	25	40	10	15	
Flood 3	Victim	0	0	61.9	0	38.1	.15
	Non-victim	0	0	52.6	10.5	36.9	

Table 5. Hypothetical willingness to pay for gambling tickets (FCFA)

Flood community	Gambling capacity	State of participant	Mean	Std. deviation	Std. error mean	p-value
Flood 1	Up to 50000	Non victim	7900	9215	2060	.00
		Victim	4065	3015	550	
	Up to 1000000	Non victim	18200	17890	4000	.00
		Victim	9115	9625	1755	
	Up to 2000000	Non victim	32400	36000	8050	.00
		Victim	15580	14060	2565	
Flood 2	Up to 50000	Non victim	6130	5130	1145	.08
		Victim	5485	8965	2005	
	Up to 1000000	Non victim	49680	73230	16375	.01
		Victim	19885	45345	10140	
	Up to 2000000	Non victim	59330	79720	17825	.02
		Victim	25385	60370	13500	
Flood 3	Up to 50000	Non victim	730	1785	410	.64
		Victim	1210	1900	415	
	Up to 1000000	Non victim	1000	880	205	.01
		Victim	10685	29755	6495	
	Up to 2000000	Non victim	2970	5430	1245	.01
		Victim	20950	59545	12995	

Notes: Household income has been rounded to the nearest FCFA 5
1 US$=FCFA 550

3.3 Experimental Results

The results from questionnaire administration tended to be mixed, and sometimes did not match previous experience, existing theory or logic. In addition, previous research tends to suggest that interviews are less reliable than field experiments, since the former are often exposed to biases [11]. Field experiments were therefore needed to ratify or refute the patterns established

through the questionnaires. For simplicity sake, the risk experiments provided players with only two options: risk-taking (game 1) or risk-averse (game 2). Five iterations were carried out. The results of the first two iterations and switching dynamics are analyzed below, to capture any form of hidden discrepancies in risk attitudes captured through interviews and experiments. Interestingly, the experimental analysis revealed that both victims and non-victims played more of the risky game than the risk-averse game (Table 6). On average, the ratio of preference for risk taking over risk aversion for all three flood communities was 4 to 1. This was significantly higher among flood victims and non-victims from flood 2 and 3 communities (P=.00 respectively). This was not significant for flood 3 community, where risk taking seems to be common.

The trends above are confirmed by the analysis presented in Table 7. Around 54% of victims played the risky game 1 in the first iteration as opposed to nearly 46% who played risk-averse game 2, across players from all flood communities. The situation was similar for the non-victims as well in all three flood communities as the majority of them (almost 70%) played the risky game 1 as opposed to around 30% of them who played the risk-averse game. During the second game, on average, more victims (over 70%) and non-victims (90%) in all three communities opted for the risky game 1, representing at least a 20 percentage point shift of preference for risky over risk aversion attitudes.

These results are in line with that of [11,13,41] and [43] who contend that experimental results present more realistic risk preference distributions compared to hypothetical surveys.

The results in Table 7 indicate that some players switched their choice preferences in game 2. This was understandable, given that participants were allowed to express their satisfaction or disappointments openly after the first game Thus while the first choices is a demonstration of absolute risk behavior, switching under influence elicits partial risk preferences [7]. This drives us to look at the switching dynamics. The results are presented in Table 8.

An analysis of results presented on Table 8 show that over 25%, 15% and 30% of the victims from floods 1, 2 and 3 respectively switched from the risk-averse game 2 to the risky game 1 during the second iteration. In the same line, 30%, 25% and 10% of the non-victims from floods 1, 2 and 3 respectively also switched from the risk-averse game 2 to the risky game 1 during the second round. No participant switched from the risky game 1 to the risk-averse game 2 during the second round. However, switching from risk-averse game 2 to the risky game 1 was slightly higher for victims (≈24 percentage points) than for the non-victims (≈22 percentage points) across all three flood communities. While it is true that more people opted for the risky game 2 in the second iteration, it is seen as a demonstration of low risk aversion under influence, since their decisions were largely contingent on the wins of the risks takers in the first game. It has been proven that direct communication between subjects during risk experiments have an effect on the risk behavior of participants. [34] and [45] showed that advices given during risk experiments resulting from direct contacts during their coordination games

Table 6. Mean number of games 1 and 2 played in five iterations

Flood community	Game type	State of participant	Mean	Std. deviation	Std. error mean	p-value
Flood 1	1 (risk taking)	Non victim	3.10	2.02	.45	
		Victim	3.70	1.71	.31	.20
	2 (risk averse)	Non victim	1.90	2.02	.45	
		Victim	1.30	1.71	.31	.20
Flood 2	1 (risk taking)	Non victim	4.75	.44	.10	
		Victim	3.95	1.82	.41	.00
	2 (risk averse)	Non victim	0.25	.44	.10	
		Victim	1.05	1.82	.41	.00
Flood 3	1 (risk taking)	Non victim	4.68	.95	.22	
		Victim	3.43	2.06	.45	.00
	2 (risk averse)	Non victim	0.32	.95	.22	
		Victim	1.57	2.06	.45	.00

Table 7. Choice of first two games by type of players in flood communities

Flood community	Game 1				p-value	Game 2				p-value
	Victims		Non-victims			Victims		Non-victims		
	Risky (%)	Risk averse (%)	Risky (%)	Risk averse (%)		Risky (%)	Risk averse (%)	Risky (%)	Risk averse (%)	
1	50	50	40	60	.34	76.7	23.3	70	30	.52
2	65	35	75	25	.37	75	25	100	0	.02
3	47.6	52.4	89.5	10.5	.01	66.7	33.3	100	0	.01

Table 8. Switching dynamics

Flood community	Victims		Non-victims		P-value
	From risky to risk averse game (%)	From risk averse to risky game (%)	From risky to risk averse game (%)	From risk averse to risky game (%)	
1	0	26.7	0	30	0.39
2	0	15	0	25	0.02
3	0	30	0	10	0.01

affected risk behavior of their participants in the University of Nottingham (UK) and New York City respectively. Similar results were reported by [47]. Our results are in line with the findings of [7], as well as [48]. [7] found out in their experiments in Cameroon that both resettled and self relocated victims preferred risky games in the second iteration as a result of the influence of the wins of those who announced their wins in the first round. Similar patterns were reported by [48] in their work in the United Kingdom. Subjects are therefore more likely to follow another's recommendation or copy their actions during risk experiment games that involve direct contact with one another. This is a probable explanation for the change in risk behavior. Floods induced risk attitudes of victims are likely to spill over to non-victims of same communities.

4. CONCLUSIONS

The objective of this paper is twofold: (1) to find out if floods affect risk attitudes of victims, and (2) to compare the validity of hypothetical interviews and field experiments in measuring risk attitudes. Data was collected from both victims and non-victims of floods in three communities in Cameroon, using structured questionnaires and field experiments.

Data analysis leads us to a number of conclusions. Firstly, flood experience seems to have positively influenced risk taking attitudes in the test agriculture-dependent communities. In our case study, low levels of risk aversion reported prior to flood experiences were transformed into higher risk taking behavior after the floods. However, the positive relation between income and risk taking widely reported in the literature was only observed in one community, which hitherto fore, demonstrated generally high risk taking attitudes. High hypothetical risk aversion attitudes demonstrated prior to the floods (captured through structured questionnaires) were generally transformed into better risk taking behaviors (captured through field experiments) after floods, irrespective of player type and flood community. The switching dynamics observed especially among non-victims seem to suggest that living next to flood victims and participating in, or observing their experiences is likely to affect risk attitudes in agriculture-dependent communities, even beyond those experiencing floods. Secondly, risk experiments tended to capture cognitive risk attitudes better than interviews, supporting prior contentions and findings [e.g 7,11] that hypothetical risk preferences are less accurate than field experiments. Thirdly, income was found to be inversely correlated to risk taking attitudes. In fact, victims who generally reported higher incomes were less reluctant to pay higher amounts for lottery tickets than non-victims, irrespective of flood community and experience. This rather 'conservative' attitude could be arguably attributed to the flood hazard effects.

Based on the above mentioned results, it seems plausible to conclude that floods are likely to have direct effects on the risk attitudes of agriculture-dependent victims and indirect effects on non-victims. The direction of the effects may be contingent on how fast intervention efforts create wealth and income-generating options for victims. In our case study, risk taking was inversely correlated with income levels. Thus experiencing floods is not the sole variable that influences risk attitudes. Other factors such as the magnitude and the level of flood impacts, risk attitudes prior to flood occurrence, access to institutional support, discounting, belief, trust in flood related institutions (such as insurance companies) have been reported to influence risk attitudes [7,38,49-51]. Context-specific analysis is therefore needed to draw conclusions of relevance for policy.

CONSENT

The author declares that written informed consent was obtained from the participants for publication of this paper.

ETHICAL APPROVAL

Author hereby declares that all field experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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