The London School of Economics and Political Science

Whether to Insure Against the Weather: Demand for Extreme Weather Insurance in Developing and Developed Country Contexts

APPENDICES

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Abstract

Many households in developing and developed countries will face increased extreme weather events due to climate change. Insurance could be a key coping strategy against the associated impacts of extreme weather. There is value in better understanding the characteristics that make insurance an appropriate means of coping for some sub-groups over others. The framework for household decisions to insure used in this research focuses on four factors: 1. economic, 2. social and cultural, 3. structural, and 4. personal and demographic.

This thesis considers two case studies: agricultural index-based microinsurance in rural Uganda and home flood insurance in the U.S.A. It seeks to understand intended demand and the related drivers for insurance in these settings through the use of large-N surveys, field games, and on-line simulations.

The rural Ugandan survey tool was implemented using innovative smart-phone technology and yielded 3000+ observations of expressed willingness-to-join (WTJ) and willingness-to-pay (WTP) for agricultural microinsurance. This tool also obtained information concerning propensity to engage with alternative coping strategies, both formal and informal. It also obtained household indicators of the factor classes noted above.

A separate field game in Uganda investigated attitudes towards basis risk arising from index insurance using a novel, iterative game involving farmers allocating their wealth between insurance and crop production. The game is played in partner sets to gauge the relative influence of others' decisions and outcomes on one's choice to insure.

The U.S.A. study compares propensity to purchase flood insurance between those affected and unaffected by Hurricane Sandy in the same geographic areas. We obtained 800 observations from an online survey tool, combining survey questions and a flood insurance purchase simulation. In the simulation we include as a treatment a more extensive (graphical) presentation of expected losses to assess the effect on insurance uptake rates.

In the Ugandan case, WTJ is over 95% and the average WTP is moderate relative to household wealth. For our sample there is evidence that microinsurance and loans are substitutes and the most frequently chosen traditional coping strategy is selling cattle. In the American study, respondents insure in just over 50% of the presented simulations and over 60% have a positive stated WTJ. Notably, there is little insurance demand difference between cohorts affected and unaffected by Hurricane Sandy. In both studies, a significant proportion of respondents with disparate personal characteristics chose to always or never insure, regardless of the details of the simulation scenarios, though WTJ varies positively with expected losses; this behaviour may be related to affect from the feeling of insurance.

In the Ugandan study, occurrence of basis risk reduces WTJ in the following period and respondents clearly are affected by the choices made by their partners. In the American study, insurance adoption is greater for the cohort exposed to the more extensive (graphical) presentation of expected losses.

In both cases we find that of the four factor classes social and cultural as well as structural factors are frequently significant in regression models for intended insurance demand.

As weather-related covariate risks increase in the future, households need coping mechanisms that are culturally viable and conform to individuals' preferences. This thesis demonstrates methods by which to determine intended demand for extreme weather insurance in the developing and developed country contexts. Such information can inform the development of insurance tools consistent with consumer preferences and help identify households that may be the best candidates for use of insurance.

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Appendix A1. Rural Uganda survey and field game mobile app.

Please note that this is a print copied from the code I programmed into an app for Android mobile phones. The interface and how the CKWs saw the survey differed greatly.

Q1	Does the farmer agree to participate in the interview? (**Read *Informed Consent* to the respondent and obtain response)**	1=Yes 2=No
Q2	Name of the Respondent	
Q3	District	1=Amuru 2=Bushenyi 3=Gulu 4=Kapchorwa 5=Kasese 6=Mbale 7=Nwoya 8=Oyam
Q4	Sub county	
Q5	Parish	
Q6	Village(LC1)	
Q7	Number of rooms in the house*(Do not ask-just observe)*	
Q8	Does the house have electricity? *(Do not ask-just observe)*	1=Yes 2=No
Q9	Roof—material and condition (*(Do not ask-just observe)*	1=Good 2=Average 3=Poor
Q10	Floor— material condition*(Do not ask-just observe)*	1=Good 2=Average 3=Poor
Q11	Windows—materials and condition *(Do not ask-just observe)*	1=Good 2=Average 3=Poor 4=No windows
Q12	Main Door—material and condition*(Do not ask-just observe)*	1=Good 2=Average 3=Poor
Q13	How old are you?	
Q14	Did you attend school?	1=Yes 2=No
Q15	What was your highest level of education?	1=No formal schooling 2=Nursery 3=Primary 4=Secondary (O Level) 5=Secondary (A Level) 6=Tertiary, Certificate, or Trade School 7=University or Higher Education

Q16	How many people lived in your house last night? (This number should not include the person answering the survey.)	
Q17	Are you married?	1=Yes 2=No
Q18	How many children do you have?	
Q19	How many years have you lived within 5 kilometres of where you live today?	
Q20	Which of the following does your household own?	1=bicycle 2=radio 3=mobile phone 4=cow 5=goat 6=chicken 7=pig 8=vegetable garden 9=water pump 10=plough 11=none
Q21	How many acres do you farm?	
Q22	How many kilos of crops did you sell last season? (Kgs)	
Q23	Does your household own land?	1=Yes 2=No
Q24	Do you share the land you farm with others?	1=Yes 2=No
Q25	How many farmers other than you share the land?	
Q26	What share of your household income comes from farming? (If participant does not readily respond please ask the following leading questions: do you get income?)	1=Very little (0%-25%) 2=Less than half 3=Half or more 4=Almost all (75%-100%)
Q27	In your opinion, when is your busiest time for farming?	1=Field preparation 2=Planting 3=Weeding 4=Harvesting 96=Other (specify)
Q29	How many individuals are needed to cultivate the household's land each season?	
Q30	Does the household grow surplus crops to sell on the market?	1=Yes 2=No
Q31	What characteristics are most important to you when deciding which seed varieties to grow?	
Q32	If there was no help available after a large scale disaster, how would you have to cope with the disaster?	1=Sell land or home 2=Sell livestock 3=Change profession 4=Begging 5=Take children out of school 6=Send children to live elsewhere 7=Sell household items 8=Migrate 9=Eat less 10=Borrow food 11=Send kids to work

		12=Reduce expenditures
Q33	In the last 5 years, have you ever experienced problems with your farming?	1=Yes 2=No
Q34	Which crops?	
Q35	Did you borrow money during this difficult time?	1=Yes 2=No
Q36 Q37	Were losses ever weather-related?	1=Flooding 2=Drought 96=Other (specify)
Q38	Were the losses ever not weather-related?	1=Yes 2=No
Q39	How many times have you borrowed money in the past FIVE years?	
Q40	How many times have you borrowed money in the past 12 months?	
Q41	Did you change anything about your farming practices following this experience to try to avoid suffering any losses from drought or flood in subsequent years?	1=Yes 2=No
Q42	What did you do to change your farming practices?	
Q43	Now we would like to ask you whom you have borrowed money from in the past 12 months	1=Family member 2=Friend 3=Neighbour 4=Microfinance Institution (specify which) 5=Lending group in the village / community 6=Local moneylender 7=Local bank 8=None
Q44	Number of loans in the past 12 months	
Q45	Importance of loan to livelihood	1=High 2=Medium 3=Low
Q46	Before this survey, did you know about insurance? (This section of the survey asks you to answer some questions about insurance and your feelings about insurance products).	1=Yes 2=No
Q47	What kind of things does insurance protect against?	
Q48	Do you know about insurance specifically for weather-related events, such as to protect against losses from an unusual drought or flood?	1=Yes 2=No
Q49	Which of the following farming issues do you discuss with your friends?	1=Seed suppliers 2=Which crop to plant 3=Farming methods 4=Farming tools 5=Market/prices 6=Labour 7=None
Q50	After discussing these topics how often do you change your decisions?	1=Frequently 2=Sometimes 3=Not often 4=Never

Q51	Think of your immediate circle of friends (5-10 most important who would help in case of emergency). Do any of them have insurance for crop loss?	1=Yes 2=No 3=Not sure
Q52	Do you know anyone who has insurance for things other than crops? Give examples if necessary; e.g. funeral?	1=Yes 2=No
Q53	What do they have insurance for? (specify)	
Q54	Which company or association would it be easiest for you to buy insurance from? (Enter 99 if response is I do not know)	
Q55	In your farming, are you more concerned about flooding or droughts? (We are going to ask you to think about two weather disasters, one severe and the other very severe, which might occur next year. We will first ask for your own view on how likely they are to occur, and then how much you would pay to take out insurance against losing crops because of them.)	1=Flood 2=Drought
Q56	In your opinion, what is the likelihood that a flood/drought would occur that would eliminate half of your total crop in a given season? (Read to the respondent: Please consider a flood/drought that affected your crops in the next growing season. Due to this flood/drought, you lose half (50%) of your crop. There is the option to borrow funds and take a loan to cover the loss of half of your crop yield. Please answer the following questions given this scenario).	1=1 out of every 2 yrs. 2=1 out of every 4 yrs. 3=1 out of every 5 yrs. 4=1 out of every 10 yrs. 5=1 out of every 50 yrs.
Q57	About how much money would half of your crop be worth in the market? (if respondent is having trouble, please try to elicit the value of the entire crop and halve this figure)	
Q58	If you took a loan to cover the loss of half your crop and to recover from a disaster, the lender would ask for extra money in interest as you repay the loan. About how much more than the value of half your crop do you think you would have to pay back to the lender in UGX per month? (CKW: If the farmer is confused, please remind the farmer of the value of half the crop given in the earlier question.)	
Q59	Would you pay 100UGX per month in exchange for a loan to cover the value of your crop in the case of a flood/drought?	1=Yes 2=No
Q60	Would you pay 200UGX per month in exchange for a loan to cover the value of your crop?	1=Yes 2=No
Q61	Would you pay 500UGX per month in exchange for a loan to cover the value of your crop?	1=Yes 2=No
Q62	Would you pay 1000UGX per month in exchange for a loan to cover the value of your crop?	1=Yes 2=No
Q63	Would you pay 5000UGX per month in exchange for a loan to cover the value of your crop?	1=Yes 2=No
Q64	Would you pay 10000UGX per month in exchange for a loan to cover the value of your crop?	1=Yes 2=No
Q65	Would you pay 50000UGX per month in exchange for a loan to cover the value of your crop?	1=Yes 2=No
Q66	Would you pay 100000UGX per month in exchange for a loan to cover the value of your crop?	1=Yes 2=No
Q67	Would you definitely NOT pay 100000UGX per month in exchange for a loan to cover the value of your crop?	1= I would definitely not pay that much to insure half my crop.

		2= I might pay that much to insure half my crop.
Q68	Would you definitely NOT pay 50000UGX per month in exchange for a loan to cover the value of your crop?	1= I would definitely not pay that much to insure half my crop. 2= I might pay that much to insure half my crop.
Q69	Would you definitely NOT pay 10000UGX per month in exchange for a loan to cover the value of your crop?	1= I would definitely not pay that much to insure half my crop. 2= I might pay that much to insure half my crop.
Q70	Would you definitely NOT pay 5000UGX per month in exchange for a loan to cover the value of your crop?	1= I would definitely not pay that much to insure half my crop. 2= I might pay that much to insure half my crop.
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Q72	Would you definitely NOT pay 500UGX per month in exchange for a loan to cover the value of your crop?	1= I would definitely not pay that much to insure half my crop. 2= I might pay that much to insure half my crop.
Q73	Would you definitely NOT pay 200UGX per month in exchange for a loan to cover the value of your crop?	1= I would definitely not pay that much to insure half my crop. 2= I might pay that much to insure half my crop.
Q74	Would you definitely NOT pay 100UGX per month in exchange for a loan to cover the value of your crop?	1= I would definitely not pay that much to insure half my crop. 2= I might pay that much to insure half my crop.
Q75	Please explain why you would not be willing to pay at least 100UGX for the proposed loan. (If the respondent will not pay at least 100UGX for the proposed loan, please ask them to explain this choice)	1= I/our household cannot afford to pay 2= I think this problem is not a priority. 3= I am not very interested in this matter 4= It is not my responsibility to take care of this issue. 5= I need more time to think about the question.
Q76	When deciding to purchase insurance, would you compare the cost of insurance to your income or to the size of a potential disaster?	1=Compare to income 2=Compare to disaster 3=Compare to both income and disaster
Q77	Intentionally left blank	
Q78	Now imagine that a drought or flood has destroyed your entire crop. In this case, all of your village/area has been affected and there is no possibility of getting a loan.	1=1 out of every 2 yrs. 2=1 out of every 4 yrs. 3=1 out of every 5 yrs.

	Instead of a loan, it is possible that you could have paid for insurance cover in advance of the drought or flood. In your opinion, what is the likelihood that a drought or flood would occur that would eliminate your entire crop in a given season?	4=1 out of every 10 yrs. 5=1 out of every 50 yrs.
Q79	Would you pay 100UGX per month in exchange for insurance cover for your entire crop?	1=Yes 2=No
Q80	Would you pay 200UGX per month in exchange for insurance cover for all of your crop?	1=Yes 2=No
Q81	Would you pay 500UGX per month in exchange for insurance cover for all of your crop?	1=Yes 2=No
Q82	Would you pay 1000UGX per month in exchange for insurance cover for all of your crop?	1=Yes 2=No
Q83	Would you pay 5000UGX per month in exchange for insurance cover for all of your crop?	1=Yes 2=No
Q84	Would you pay 10000UGX per month in exchange for insurance cover for all of your crop?	1=Yes 2=No
Q85	Would you pay 50000UGX per month in exchange for insurance cover for all of your crop?	1=Yes 2=No
Q86	Would you pay 100000UGX per month in exchange for insurance cover for all of your crop?	1=Yes 2=No
Q87	Would you definitely not pay 100000UGX per month in exchange for insurance cover for all of your crop?	1=I would definitely not pay that much to insure all of my crop. 2=I might pay that much to insure all my crop.
Q88	Would you definitely not pay 50000UGX per month in exchange for insurance cover for all of your crop?	1=I would definitely not pay that much to insure all of my crop. 2=I might pay that much to insure all my crop.
Q89	Would you definitely not pay 10000UGX per month in exchange for insurance cover for all of your crop?	1=I would definitely not pay that much to insure all of my crop. 2=I might pay that much to insure all my crop.
Q90	Would you definitely not pay 5000UGX per month in exchange for insurance cover for all of your crop?	1=I would definitely not pay that much to insure all of my crop. 2=I might pay that much to insure all my crop.
Q91	Would you definitely not pay 1000UGX per month in exchange for insurance cover for all of your crop?	1= I would definitely not pay that much to insure all of my crop 2= I might pay that much to insure all my crop.
Q92	Would you definitely not pay 500UGX per month in exchange for insurance cover for all of your crop?	1= I would definitely not pay that much to insure all of my crop. 2= I might pay that much to insure all my crop.

Q93	Would you definitely not pay 200UGX per month in exchange for insurance cover for all of your crop?	1= I would definitely not pay that much to insure all of my crop. 2= I might pay that much to insure all my crop.
Q94	Would you definitely not pay 100UGX per month in exchange for insurance cover for all of your crop?	1= I would definitely not pay that much to insure all of my crop. 2= I might pay that much to insure all my crop.
Q95	There are different types of agricultural insurance available. We are going to describe the two most prevalent. We are interested in which one option you prefer.	1= One type of insurance pays you when less rain than is normally expected falls on your farm or areas near your farm. 2= Another type insurance pays you when your farm grows fewer crops than you normally expect to grow.
Q96	Please briefly describe why you made that choice.	
Q97	Imagine all the farming in your village could be insured. Would you be more comfortable paying a part of your village insurance costs, or would you rather only pay your own insurance costs?	1= Prefer COMMUNITY premium 2= Prefer INDIVIDUAL premium 3= I have no preference between COMMUNITY or INDIVIDUAL premiums.
Q98	The coin game begins here. Please remove the five coins from your CKW package. Each coin represents a crop the farmer could plant in the coming season. Only show the farmer the two coins the application instructs you to choose between. (If you were given money to compensate the farmer for his or her participation, tell the farmer that at the end of the game, the coin the farmer chooses will be tossed in the air and the farmer will be paid 500UGX for each picture of a piece of maize on the side of the coin that lands facing up.)	
Q99	Show only the coins Alpha and Beta to the farmer. (You should not show the farmer the other three coins.)	
Q100	Alpha Vs Beta (Explain to the farmer that the two coins, Alpha and Beta, represent different crops he can choose to grow in the coming season. Alpha is a safe crop and produces five bags every time, while Beta has more risk and sometimes produces nine bags and sometimes three bags.)	1=Alpha 2=Beta
Q101	Alpha vs. Delta	1=Alpha 2=Delta
Q102	The farmer chose Alpha. Ask the farmer to toss the coin	1= The farmer flipped the coin and the result was 5. I paid the farmer 2500UGX
Q103	Delta vs. Beta	1=Delta 2=Beta

Q104	The farmer chose Delta. Ask the farmer to toss the coin.	1= The farmer flipped the coin and the result was 4. I paid the farmer 2000UGX. 2= The farmer flipped the coin and the result was 8. I paid the farmer 4000UGX.
Q105	The farmer chose Beta. Ask the farmer to toss the coin.	1= The farmer flipped the coin and the result was 3. I paid the farmer 1500UGX. 2= The farmer flipped the coin and the result was 9. I paid the farmer 4500UGX.
Q106	Beta vs. Gamma	1=Beta 2=Gamma
Q107	The farmer chose Beta. Ask the farmer to toss the coin.	1= The farmer flipped the coin and the result was 3. I paid the farmer 1500UGX. 2= The farmer flipped the coin and the result was 9. I paid the farmer 4500UGX.
Q108	Gamma vs. Epsilon	1=Gamma 2=Epsilon
Q109	The farmer chose Gamma. Ask the farmer to toss the coin.	1= The farmer flipped the coin and the result was 2. I paid the farmer 1000UGX. 2= The farmer flipped the coin and the result was 10. I paid the farmer 5000UGX.
Q110	The farmer chose Epsilon. Ask the farmer to toss the coin.	1= The farmer flipped the coin and the result was 1. I paid the farmer 500UGX 2= The farmer flipped the coin and the result was 11. I paid the farmer 5500UGX.
Q111	The coin game is over. (Take the five coins and put them back in the CKW kit)	
Q112	The dice game begins here. Please remove four dice from your CKW package (If you were given money to compensate the farmer for his or her participation, tell the farmer that at the end of the game, the farmer will be paid 500 shilling for each turn of the game when his farm succeeds. The game will end if the farmer suffers a disaster that he has not bought insurance against)	
Q113	Explain to the farmer that he will roll dice to determine the weather on his farm. If he rolls four dice and gets four rain, there will be a flood, and he will lose. If he rolls four sun, there will be a drought, and he will lose. If he rolls a mix of rain and sun, he will continue playing.	
Q114	Explain to the farmer that if he buys insurance, he will only roll three dice instead of rolling four. He will be protected from drought (3 sun) but will not be protected from flood (3 rain). (If the farmer has trouble understanding why he rolls three dice instead of four if he buys insurance,	

	explain that he is paying one of the dice to the insurance company.)	
Q115	Ask the farmer whether he would like insurance against drought (roll 4 dice. If the farmer wants insurance, take one of the dice and have the farmer roll the other 3 dice.)	1=Farmer does not want insurance (roll 4 dice). 2=Farmer wants insurance (roll 3 dice).
Q116	Rolled 4 dice. What happened?	1= All Sun or All Rain, Farmer Loses 2= Mix of Sun and Rain (pay 500UGX)
Q117	Rolled 3 dice. What happened?	1= All rain, Farmer Loses 2= Not all rain (pay 500UGX)
Q118	Ask the farmer whether he would like insurance against drought.	1= The farmer already lost the game. 2= Farmer does not want insurance (roll 4 dice). 3= Farmer wants insurance (roll 3 dice).
Q119	Rolled 4 dice. What happened?	1= The farmer already lost the game. 2= All Sun or All Rain, Farmer Loses 3= Mix of Sun and Rain (pay 500UGX)
Q120	Rolled 3 dice. What happened?	1= The farmer already lost the game. 2= All rain, Farmer Loses 3= Not all rain (pay 500UGX)
Q121	Ask the farmer whether he would like insurance against drought.	1= The farmer already lost the game. 2= Farmer does not want insurance (roll 4 dice). 3= Farmer wants insurance (roll 3 dice).
Q122	Rolled 4 dice. What happened?	1= The farmer already lost the game. 2= All Sun or All Rain, Farmer Loses 3= Mix of Sun and Rain (pay 500UGX)
Q123	Rolled 3 dice. What happened?	1= The farmer already lost the game. 2= All rain, Farmer Loses 3= Not all rain (pay 500UGX)
Q124	How much did you pay the farmer in total?	1= Nothing. The farmer lost the game on the first turn. 2= 500UGX. The farmer lost the game on the second roll. 3= 1000UGX. The farmer lost the game on the third roll. 4= 1500UGX. The farmer finished the game.

Q125	The dice game is over. (Take the four dice from the farmer and put them back in the CKW kit.)	
Q126	In which times of year do you usually HARVEST your crop? (Tap all that apply)	1=January-February 2=March-April 3=May-June 4=July-August 5=September-October 6=November-December
Q127	In which times of year do you usually SELL your crop? (Tap all that apply)	1=January-February 2=March-April 3=May-June 4=July-August 5=September-October 6=November-December
Q128	If you were able to sell your crop 30 days later than you currently do, could you make 20% more money?	1=Yes 2=No
Q129	Would you rather save crops to sell a few months later or save (money) to spend in a few months	1=Save crops 2=Save money
Q130	Have you ever saved crops after your harvest to get a higher price later? What happened? (Make sure the farmer understands this question is about saving crops to sell later for a higher price, not saving crops after the harvest for his family to consume)	1=I have never saved crops. I sell my crops immediately after I harvest them. 2=I save crops, but not to try to get a higher price. 3=I saved crops to try to get a higher price later and got a higher price later. 4=I saved crops to try to get a higher price later and lost money. 5=I don't understand the question.
Q131	Thinking about the overall conditions for farming, do you believe farming is getting easier or harder for you compared with twenty years ago in your village?	1=Harder 2=Same 3=Easier
Q132	During your time farming, have you noticed changes to the environment? (If the farmer is confused, explain that the environment includes the weather, the fertility of the soil, the amount of rain, how often the rains come, and how often there are natural disasters.)	1=Yes 2=No 3=Not sure
Q133	Do you think any changes to the difficulty of farming are caused by people? (If the farmer is confused, explain that you are asking about pollution, soil becoming worse due to too much farming or planting the wrong crops, and other similar actions by people that might affect a farm.)	1=Yes 2=No
Q134	If you believe other people have an effect on your farming, is the difficulty of your farming more affected by people nearby or people far from Uganda?	1=Far 2=Near 3=Not sure 4=I don't believe actions by people change the environment

Q135	Which crops do you grow? (Select all crops the farmer grows, even if the amount is small.)	1=Banana 2=Barley 3=Beans (typical) 4=Beans (drought resistant or improved) 5=Bioengineered or Unimproved Maize 6=Cassava 7=cotton 8=Groundnut 9=Fruits (citrus fruits like lemons, limes, and oranges) 10=Fruits (soft fruits like mango, melon, or pineapple) 11=Peas 12=Potato (Irish Potato) 13=Potato (Sweet Potato) 14=Rice (highland or swamp) 15=Rice (lowland) 16=Sim-sim 17=Soya (typical) 18=Soya (improved) 19=Sunflower 20=Wheat (typical) 21=Wheat (drought resistant or improved)
Q136	From one to five, how much do you worry about drought or flood? (The following is a list of sources of hardship. Please consider each possibility separate from the others. For each, please rate your level of concern on a scale of 1 to 5. 1 represents no concern and 5 represents very high concern over the likely consequences of the source of hardship.)	1=1 2=2 3=3 4=4 5=5
Q137	From one to five, how much do you worry about becoming ill or injured?	1=1 2=2 3=3 4=4 5=5
Q138	From one to five, how much do you worry about illness or injury of a family member?	1=1 2=2 3=3 4=4 5=5
Q139	From one to five, how much do you worry about losing your home?	1=1 2=2 3=3 4=4 5=5

Q140	From one to five, how much do you worry about HIV and AIDS? (The following is a list of threats to overall livelihood. Please consider each possibility separate from the others. For each, please rate your level of concern on a scale of 1 to 5. 1 represents no concern and 5 represents very high concern over the likely consequences of the source of hardship.)	1=1 2=2 3=3 4=4 5=5
Q141	From one to five, how much do you worry about a decrease in the price of your crops?	1=1 2=2 3=3 4=4 5=5
Q142	From one to five, how much do you worry about crime and disorder in your area?	1=1 2=2 3=3 4=4 5=5
Q143	If you have to place trust in someone, would you rather trust a private businessman or a government bureaucrat?	1=Trust the businessman 2=Trust the bureaucrat. 3=I'm not sure. 4=I have no preference
Q144	Do you have close family outside of your village?	1=Yes 2=No
Q145	Do you ever send / receive money or other valuables to / from anyone outside of your village?	1=Yes 2=No
Q146	Do you physically send money, or do you send money electronically using your cell phone, for instance through MTN Mobile Money?	1=I send physical notes, coins, and other things 2=I use my cell phone to send money to friends and family
Q147	Do you send more money than you receive? From others outside your immediate family?	1=I receive more money than I send. 2=I send more money than I receive 3=I do not send or receive money.
Q148	What is the main role with which you identify within your community? (If the farmer does not know, ask whether the person considers himself a leader, a follower, a teacher, and so on.)	
Q149	Do you think this is the role others expect of you?	1=Yes, this is the role others expect me to play. 2=No, this is often not the role others expect me to play. 3=I am not sure about what role I play in the community.
Q150	I am going to read a scenario about insurance, and would like you to tell me what you think. "One of the members of your village recently purchased insurance for his bicycle. Do you think that he will stop taking good care of his bicycle because he knows that it is insured and he may get money if something happens in the future." Please choose one of the following:	1=Strongly agree 2=Agree 3=Disagree 4=Strongly disagree 5=I do not know/I cannot say
Q151	There are ten mangoes in a bowl. If you eat three, how many are left?	1=Ten 2=Seven 3=Five

		4=Three
Q152	Here is a list of mobile phone numbers of some friends. Which number should you use to telephone Ajok? (Please show the mobile phone to the farmer to answer this question)	1=Okello - 0546 2=Odongo - 6455 3=Ajok - 5546 4=Apio – 5798
Q153	You thought you had twenty coins, but when you count them, there are seven fewer than you expected. How many coins do you have?	1=Seventeen 2=Fourteen 3=Thirteen 4=Seven
Q154	You save 150UGX per week. How much do you have after three weeks?	1=350UGX 2=450UGX 3=1500UGX 4=3150UGX
Q155	You hear on the radio that 5% of farmers in your village of 500 farmers were affected by a drought. How many farmers were affected?	1=5 2=25 3=100 4=2500
Q156	Does the farmer have any comments he would like to send to us? (If the farmer has comments or questions, please enter this here)	
Q157	Thank the farmer for his participation in the survey and for playing the games. Inform the farmer that someone may check in with him during the coming months. (Please tap OK below and record your GPS location to complete the survey)	
Q158	Record the GPS location*	

**Smart phone automatically took GPS coordinates as a control for location of respondents / where the survey was conducted.*

Appendix A2. Rural Uganda field discussion group notes (short-version)

Note that the following qualitative field notes have been distilled from over 200 typed pages of such notes from focus group dialogues, which informed the structure of the mobile app.

QUESTIONS ABOUT WEALTH AND FARMING ACTIVITIES

Qn: What work do all of us do?

R: The farmers went ahead to explain their various farming activities which included: growing fruits, maize, beans, matooke, coffee, climbing beans; and keeping livestock.

Qn: Assets: which of these items listed is possessed by an ordinary farmer in Chepkwanda?

R: (1) Radio (2) Mobile (3) Cattle (4) Goats (5) Children (6) Pigs (7) Plough
(8) Treadle pump (9)Vegetable garden.

Note: the bicycle can be replaced by a motorbike because of the terrain in this area which mountainous.

Qn: In Chepkwanda, are there families that share the same land?

R: It is common for farmers (esp. women) to hire land jointly and use it to carry out vegetable farming. The farmers work on this piece of land jointly from planting season to harvest time; and after harvest, they share the profits from the garden.

Qn: Are there any other crops others than vegetables where it is common for farmers to share land?

R: Farmers said Yes, for crops like maize, beans, because these are cash crops and so to have a big yield to take to the market, farmers prefer to work in groups. This is especially done by the youth. Why? They need to put resources together because they have less resource.

Qn: Do people have land titles here?

R: No because land in Chepkwanda is owned through hereditary/customary system e.g. a father may give part of his land to the sons.

Qn:How do you prove ownership?

R: Individuals with the community have boundaries and everybody has consent to it.

Back to farming

Qn:What is the busiest time for you in farming (most time consuming)

- Planting (If you are working on a big field)
- Weeding (Because one does more than once, and when there is too much rain, it can be hectic)

Qn: Is it common for you to live your land un-cultivated for years?

R: No because there is shortage of land in Kapchorwa.

Qn:What crops do you grow?

R: maize, beans, matooke, coffee, vegetables, cassava, and Irish potatoes.

Qn: Do farmers grow a single crop or they grow a variety?

R: Farmers grow a variety of crops to ensure that they have enough fo*od during hard times.*

Qn: How do you then differentiate between what you grow for home consumption and for selling?

R: For example, if one grows 3 bags beans, 2 are sold and 1 is consumed.

Qn: **Which crop among the crops you grow has the lowest level of risk?**

R: It iscoffee and maize, but beans are a high risk especially during rainy season.

Qn:Basing on the understand that there are high risk and low risk crops does it mean that rich farmers plant more risky crops?

R: Although the rich have better ways of coping with high risk, the less poor farmers also plant risky crops.

Qn:Do you know money lenders?

R: Yes.

Qn:Do you trust them?

R: We don't trust them because they charge high interest and un-reasonable payment terms.

Qn: How about banks?

R: We detest banks because they have tough regulations. If you borrow and fail to pay, even if it for a genuine reason, the bank can confiscate your house.

Qn: If you had to borrow 5000 right now, who would you ask?

R: Borrow from a trusted friend but if you fail, sell one of your household's assets like a radio or a goat.

Qn: How about if you needed 50,000 UGX who would you go to?

R: Again from a trusted friend or relative. If I fail, I can sell my goat or chicken.

Qn:What is your picture of a wealthy Ugandan?

R: Must have a good house, enough farm land, for example 10 acres, one cow 4 milking, chicken, a structure for the cow, chicken, land for grazing.

Qn: How do you identify a good variety of seed to plant?
R: It has to be hybrid seed. Also depend on advice from other farmers.
Qn:If there not enough money to pay for seeds upfront at the beginning of the season how can one obtain seed?
R: One can obtain seed on credit from the supplier, or use the left-over from the last harvest. Also, some people end up selling their household assets.
Qn: Do many people in your community take up loans where there is crop loss or not enough money for seeds?
R: Some people may borrow from their friend and relative when they want to buy seeds, but they don't borrow from banks. People have a negative view about banks as banks are known to confiscate people's property when one fails to pay.
Qn: Do you use none household members help in farming.
R: YES, but this is usually paid labor.
Qn:Is it more difficult to get good harvest these days or its easier?
R: It's easier because of modernizing agriculture.
Qn: Taking a period of 10 years back, how many times has the harvest been bad and why?
R: In 1997 the rains destroyed crops.
Qn:Has the amount of rains decreased or increased in the recent years?
R: In 2007 there was good weather and people oven planted twice (2 season successfully). In 2009 sunshine was much, and in early 2010 there was much rain which destroyed crops.
Qn:Why?
R: Its Gods arrangement. Also, there has been too much deforestation in the area in the recent past.
QUESTIONS ABOUT INSURANCE
Qn: Have you ever heard insurance?
R: We have heard about it but we don't know how it works.
(**Julius defines insurance to the farmers)**
Qn: Do you think such an arrangement is something you could suggest to a friend?
R: Yes, but the insurance service providers are far from this village how can we access the service.
Qn: Are there people in this village with insurance policies and what kind of policies are these?
R: Yes, those who have vehicles but farming there's none.
Qn:Do you trust the idea of insurance?
R: We trust the idea but our fear is the premium, it might be unaffordable.
Qn: Do you think loans after disaster are a better option than taking up insurance beforehand?
R: Insurance is better because with insurance you pay little by little and when a problem strikes, you get compensated.
QUESTIONS ABOUT ATTITUDES:
Qn: Government should make sure that everyone has a good standard of living:
R: Strongly agree (22 people)
Qn: When a person helps others, he will receive help in return
R: (16 people) strongly agree; (2 people) agree; (4 people) no opinion.
Qn: Cooperation is superior to competition
R: Strongly agree (22 people)
Qn: The future is too uncertain for a person to make serious plans
R: (15 people); (2 people) strongly disagree; (1person) disagree; (4 people) no opinion
Qn: It is good for a person to trust the new people he meets
R: Strongly agree (22 people)
Qn: It is possible to protect land if someone was to try to take it away
R: (16 people) agree (6 people) disagree
Qn: Life is based on chance
R: Strongly agree (22)
Qn: The natural environment is very adaptable and will recover from harm caused to it by people
R: (8 people) strongly agree; (12) disagree; (2) No opinion
Qn: The environment is very fragile and the slightest human interference can cause major disasters
R: strongly agree (22 people)
Qn: No matter what we do, the environment will change in un-predictable ways both for the better or worse in the future
R: No opinion (20); agree (2 people)
Qn: Large businesses are able to solve problems more effectively than small entrepreneurs

R: strongly agree (21); disagree (1)

Qn: Business men have brought more wealth to this country than have bureaucrats

Strongly agree (21); agree (1)

SOURCES OF HARDSHIPS:

Ranking explained below:

(1) Most pressing, (2) pressing, (3) no opinion, (4) most pressing, (5) not at all pressing.

- **Loss of crops:** (21 people) say it's most pressing; (1 person) says pressing.
- **Illness:** (22 people) say its most pressing
- **Illness of a family member**: (22 people) says it's most pressing.
- **Loss of a home**: (22 people) Say it's most pressing.
- **HIV/AIDS:** (22 people) pressing
- **Decrees in prices of crops:** (22 people) pressing
- **Natural disasters (floods and drought):** (22 people) most pressing.
- **Crime or civil disorder**: (22 people) most pressing.

QUESTIONS ABOUT NETWORKS

Qn: What options are available to farmers who cannot afford the cost of seed at the beginning of a growing season?

R: They sell their livestock, assets, lent out land, go for farm labour; or some get seeds on credit from the suppliers.

Qn: Does this village have links with other nearby villages:

R: Yes we do.

Qn: Do people in the village send and receive money or other valuable to other villages:

R: Yes, it's common that they exchange money mostly with friends and business members.

SECOND GROUP MEETING

Meeting held at Gamatu village, the area is served by CKW called Tabitha

QUESTIONS ABOUT WEALTH AND FARMING ACTIVITIES

Qn: Assets commonly owned by people in Gamatui:

(1)	Bicycle	(4)	Cattle	(7)	Pigs
(2)	Radio	(5)	Goat	(8)	Plough
(3)	Mobile phone	(6)	Chicken	(9)	treadle pump
(10)	Vegetable garden				

Qn: Do farmers in this village share land for their farming activities:

R: No, land isn't shared. Most of the land mountainous and not usable and so there is no land to share.

Qn: Are there individual who own land by having land titles?

R: There are few individuals because it is an expensive process to register land under a title.

Qn: How do individuals here own land?

R: Mainly through in-heritance, but one can also purchase land, but with no title.

Qn: Which is the busiest time of farming?

R: Weeding takes more of our time because one has to do it several times before harvest.

Qn: Is there a time when you leave your land un-cultivated?

R: It depends on how much land you own. Most people have small pieces so what is common is that most of the land is cultivated.

Qn: What crops do you grow here?

R: Irish potatoes, bananas, cowpeas, coffee, and vegetables such as cabbages, sukuma etc.

Qn: Do farmers grow only one crop?

R: No they grow a variety of crops because people have limited land

Qn: Among the crops listed, which of them has the lowest level of risk?

R: Maize and beans because it takes 3 months; and Matooke (bananas) is also low when there is less sunshine.

Qn: Which crops have the highest level of risk?

R: Vegetables are the highest risk crops because they require enough rainfall and they are easily attacked by pests.

Qn: Does it mean that more wealthy farmers tend to grow more risky crops?

R: Rich and poor all plant the same crops, but may be the difference is that rich farmers will cope better when a problem happens.

Qn: Do you know money lenders and do you trust them?
R: Yes we know them, we don't trust them but we go to them because sometimes you have a problem in the home, but you have no money and you have no other option. For example, if someone is sick in the home and you to urgently need to take them to hospital and you have no money. You find yourself going to the money lender.
Qn:If you needed 5000 who would you go to for that money?
R: Use your savings or borrow from friends.
Qn: How about if you needed 50,000**/=:**
R: Then you can go the money lenders or use your savings; lent out land; or offer your coffee in the garden as security to the neighbour to give you the money. In case you fail to pay; the neighbour harvests the coffee for the entire season in exchange for the money.

Qn: How do you identify the best seed?
R: It must have good packaging. It must be from reputable dealer.
Qn: If someone doesn't have enough money to buy the seed up front at the beginning of the planting season, what would you do?
R: Borrow in the banks, money lenders. Sell an asset like furniture, goats, coffee, and chicken.
Qn: Using your criteria in Gamatui, how can we identify wealth person?
R: Must have:

- permanent house
- children in better schools
- more than 10 acres of land
- a good business
- one thousand and more coffee trees
- owns a cow
- good feeding

Qn: Do the members in your household do other non-farming activities?
R: Yes, they do activities such as:

- trading in produce (maize and beans)
- civil servants
- Boda- boda (motor cycle taxi) riders

Qn: Do households help with farming from non-household members:
R: They can get help as longer as they willing to pay for it.
Qn: Is getting good harvest becoming more difficult or less difficult from season to season?
R: It was easy to get good harvest long time ago. Today poor rains and deforestations have resulted into soil erosion, poor soils; and hence poor harvests.
Qn: Do you have an idea of the last time the season was good.
R: Yes, there was time when everyone got good output, it was around 2009.
QUESTIONS ABOUT INSURANCE
Qn: Have you heard about Insurance:
R: Yes, but need to know more how it works
Qn: What is insurance?
R: A farmer describes insurance as: anything that guarantees the safety of a property.

Qn: Do you think insurance is something you would sell to your neighbour to take up?
R: Yes.
Qn: Are there people who have insurance policies?
R: Yes, they are there. For example motor vehicle insurance and motorcycles.
Q: How about your self do you trust the idea of insurance?
R: Yes
Qn: What are the good aspects of it?
R: They compensate you or help you in re-covering the lost property.
Qn:How can we improve insurance?
R: We haven't used insurance so we can't tell how to improve it.
Qn:Who can give us an example of disasters? Example include

- Drought

- Animal eat up crops
- Pests

Qn: Are loans after disaster a better option than buying insurance beforehand?
R: It's better if you had gone for insurance because for a loan, one would have to pay it back.
Qn: What would you consider most important before you take up an insurance policy.

- weather
- to know the amount charge
- the expiry date of the insurance product
- the amount of risk

Note: One of the farmers noted that it's better to improve insurance through providing insurance policies that cover against everything (problems) on the farms.

QUESTIONS ABOUT ATTITUDES
Q: The government should make sure everyone has a good standard of living
R: (14/ out 22 people) strongly agree
Q: When a person helps others he will receive help in return
R: (14/22 people) strongly agree
Q: Cooperation is superior to competition
R: (14 of 22 people) strongly agree
Q: The future is too un-certain for a person to make serious plans
R: (14 people out of 22) strongly agree
Q: It's good for a person to trust the new people he meets
R: (11 out of 22); disagree (7); strongly disagree; (4) no opinion
Q: It is possible to protect land if someone was to try to take it away
R: (14 of 22) strongly agree
Q: Life is based on chance
R: (14 of 22 people) strongly agree
Q: The natural environment is adaptable and will recover from harm caused by people
R: (13 out of 22 people) agree (1) strongly agree
Q: The environment is very fragile and the slightest human interference can cause a major disaster
R: (14 out of 22 people) strongly agree
Q: No matter what we do, the environment will change in un-predictable ways, both for the better and the, in the future.
R: (9 out of 22 people) strongly (5) agree; they have no position
Q: Large businesses are able to solve problems more effectively than small entrepreneurs
R: (14) strongly agree
Q: Business men have brought more wealth to this country than bureaucrats
R: (14) strongly agree
SOURCES OF HARDHIPS
(1) Most pressing, (2) pressing, (3) no opinion, (4) most pressing, (5) not at all pressing.

- **Loss of crops:** (14 out 22 people) very pressing
- **Illness /injury to yourself:** (14 out 22 people) very pressing
- **Illness / injury of a family member:** (14 out of 22 people) very pressing
- **Loss of home:** (14 out of 22 people) very pressing
- **HIV / AIDS:** (13 out of 22 people) very pressing (1) pressing
- **Decrease in the price of crops:** (10 out of 22) very pressing (4) pressing
- **Natural disasters:** (14) very pressing
- **Crime / civil disorder :(**14) very pressing

QUESTIONS ABOUT NETWORKS
Q: What options are available for a farmer in your community who cannot afford the cost of seeds at the beginning of a growing season?

- they sell off their assets
- they plant home saved seed
- they sell off fire wood from the forest
- others ferry and sell off bamboo stems.

Q: Does Gamatu have links with other villages?
R: Yes
Q: What sort of links?
R: selling fire wood, agricultural labor.
Q:Do most people in your village send and receive money or property to and from your village.
R: They bring us things which we buy and what we sell also **them** some of our things.

THIRD GROUP MEETING
Tereges farmers group at Kewel Village. The CKW who serves this area is EstaKibet
QUESTIONS ABOUT WEALTH AND FARMING ACTIVITIES
Q: Common assets owned by farmers in Kewel village:

(1)	Bicycle	(5)	Goat	(9)	Treadle pump
(2)	Radio	(6)	Chicken	(10)	Vegetable garden
(3)	Mobile Phone	(7)	Pigs		
(4)	Cattle	(8)	Plough		

Q: Do farmers here share land?
R: No.
Q: Are there individuals in this village owning land with land title?
R: No, we own land but without land titles
Q: Which is the most time consuming activity in farming?
R: Weeding as it's done several times before harvest.
Q: Is it common for farmers to live land uncultivated?
R: Yes due to lack of oxen and finances it might not be cultivated.
Q: What crops do you grow?
R: matooke, sweet and Irish potatoes, cassava, maize, beans, and yams.
Q: Does the average farmer only grow one crop or a variety.
R: Yes and this is due to:

- Most farmers mix their crops to get balanced diet.
- for commercial purposes
- for food security

Q: How do you then differentiate between the crops grown for household consumption and the crops grown for the market?
R: There are particular crops grown purposely for sale (coffee) though others can be divided depending on the weight of the weight of the problem.

Q: Which crops have the lowest level of risk in this village?
R: Matooke which is a little more resistant but the highest risk crops are Irish potatoes, maize as they don't require too much rain and they don't need too much sunshine.

Q: Is it true that the wealthier farmers tend to grow high risk crops?
R: No. They all (rich and poor) plant the same crops
Q: Have you heard about money lenders?
R: Yes.
Q: Do you trust a money lender?
R: He/she can be trusted because he has bailed you out a problem.
Q: If you need 5000 who would you go to for that money?
R: You go to the neighbour.
Q: How about if it was 5000?
R: It would obviously be the money lender.
Q: How would you define a wealthy person in this village?
R: The assets of the home like a good house, cattle, farming, land ownership, he just takes his children to school he doesn't always borrow money.
Q: Howwould you identify the best quality seed here in Kewel?
R: We check the expiry date, and packaging
Q: If there is not enough money to pay seeds upfront at the beginning, how does obtain the seed:
R: You use home saved seed (one left /saved from last harvest).
Q: Do many people take up loans on crop loss or when there is no enough money to buy seed?

R: It's only the ones who are credit worth, for example those with land titles can offer their land to get loans.
Q: Is getting good harvest becoming more difficult or less difficult from season to season:
R: Previously it used to be good harvest but now days it more difficult because of un-predicable weather.
Q: Ten years back which year had the worst or the best yield?
R: Since 7 years back our stores have never been full with maize as it was in the past.
Q: **How about rain?**
R: It has decreased and we don't know the reason. May be it because people have cut down all the trees in this area

QUESTIONS ABOUT INSURANCE
Q: Have you heard about insurance?
R: Yes, like car insurance, medical insurance
Q: How does it work:
R: One pays money to the company? When a problem strikes, the company pays back
Q: Does insurance policy seem like something you would suggest to a friend?
R: Yes
Q: Is there any one you know in this village who has taken up insurance?
R: None.
Q: Do you buy the idea of insurance?
R: Yes we buy the idea. The best idea is the insurance that covers everything.
Q: Are loan after disaster a better option that taking insurance beforehand?
R: Insurance is better because it pays off the loss un like a loan when you have to worry about paying the loan back.

QUESTIONS ABOUT ATTITUDE:
Q: The govt should make sure every has a good standard of living
R: (21 out 22 people) strongly agree (1) agree
Q: When a person helps others, he or she should receive help in return
R: (22) strongly agree
Q: Cooperation is better than competition
R: (22) strongly agree
Q: The future is too uncertain for a person to make serious plans
R: (22) strongly disagree
Q: It's good for a person to trust the new people he/she meets
R: (22) disagree
Q: It is possible to protect land if some was to try to take it away
R: (22) strongly agree
Q: Life is based on chance
R: (21) strongly agree (1) No opinion
Q: The natural environment is very adaptable and will recover from harm caused to it by people
R: (2 people) strongly agree (20) agree
Q: The environment is very fragile and the slightest human interference ca cause a major disaster
R: (11) no opinion (8) agree
Q: No matter what we do, the environment will change in un-predictable ways, both for the better and worse, in the future
R: Disagree (8) no opinion (6) agree
Q: Large businesses are able to solve problems more effectively than small entrepreneurs
R: (21) strongly agree (1) disagree
Q: Business men have brought more wealth to this country than bureaucrats
R: (8) no opinion, (5) disagree, (9) agree

SOURCES OF HARDSHIP:
(1) Most pressing, (2) pressing, (3) no opinion, (4) most pressing, (5) not at all pressing.

- **Loss of crops**: Very pressing (22)
- **Illness/ injury to yourself**: Very pressing (22)
- **Illness or injury of a family member**: Very pressing (22)

- **Loss of a home**: Very pressing (22)
- **HIV/AIDS**: Very pressing (22)
- **Decrease in the prices of crops in the market**: Pressing (16) no opinion (6)
- **Natural disasters**: Very pressing (22)
- **Crime / Civil disorder**: Very pressing (22)

QUESTIONS ABOUT NETWORKS:

What options are available to farmers who can't afford seed?

- They do cost sharing with their neighbours
- Offer Farm labor
- Sell off livestock or household assets
- Merry go rounds
- Rely on government hand outs of seeds
- Fetch firewood sell it for seed

Q:Does Kewel have links with other villages?

R: Yes

Q: Do they receive or send money and other valuable to other villages.

R: Yes we share a lot even merry go round and we buy produce and sell from other villages.

4 GROUP MEETING

4th Meeting held at Chebonet Parish. Area is served by CKW called Chebet Winnie.

QUESTIONS ABOUT WEALTH AND FARMING ACTIVITIES

Q: Common assets in Chebonet village

(1) Bicycle x the terrain
(2) Radio
(3) Mobile phones
(4) Cattle
(5) Goat
(6) Chicken
(7) Pigs
(8) Plough
(9) Treadle pump
(10) Vegetable garden - onions, tomatoes, eggplant.

Q: Do many farmers share land in this village.

R: The vegetable nursery beds along the stream are shared and hired jointly.

Q: Do individuals here own land titles?

R: No because the process of acquiring a title is long and expensive.

So how do you own land?

R: Customary, local agreements witnessed by elders are also believed in /respected.

Q: Which is the busiest time for farming: Harvesting

Q: In this village are there people who leave land un-cultivated:

R: Yes when soils are poor or place is rocky, that when land is left un-cultivated.

Q: What crops do we grown here?

R: Matooke, onions, avocado, coffee, beans, maize, tomatoes, passions, green vegetable, eggplant and cassava.

Q: Does the average farmer only grown one crop or a variety?

R: They grow a variety because they have limited land.

Q: Is there a difference between what is for sell and for home consumption?

- Coffee is dedicated for sell while others are for both.

Q: Among the crops that were mentioned which one is considered high risk?

- Onions because it's easily attacked by pests.
- Coffee because of a disease named live rust.
- Tomatoes any reduction in rain / lack of water causes them to dry quickly.

Q: How about the low risk:

R: Matooke because of its resistant. Avocado and cassava are also resistant.

Q: Do the farmers with higher incomes tend to plant high risk crops?
R: No it doesn't matter because you can find a poor person also growing a risky crop at small scale. So it's only the scale that matters.
Q: **Question, assuming you needed 5000 who would you go to get that money.**

- Borrow a friend
- Asset sales (goats, chicken)
- Offer farm labor
- I would visit my shopkeeper and borrow from him.

Q: How about if you needed 50000 UGX.

- I would hire out land
- I would sell off my goat or my asset.
- Borrow from the shopkeeper here in the village.

Q: Do you know money lenders?
R: Yes
Q: Do you trust them?

- No they are cheats, they charge high interest rates
- They advantage of us because of our ignorance over some things like how to write a good agreement.
- Depending on the agreement they could even take away your land if you delay to pay.
- They buy coffee at 1000 per kg when the coffee is wet yet it costs more than that.

Q: What are the most important characteristic of determining which seed to grow?

- I acquire my seed from gazetted points, recommended by seed manufacturers,
- I depend on the expert's advice from CKW.

Q: If there is not enough money to pay for the upfront at the beginning of the planting season, how can one obtain seeds?

- Farming loans from Centenary Bank /Post Bank.
- Home saved seed

Q: Do most household have members with other livelihoods other than farming.
R: Yes, but not very common.
Q: What are these other livelihood options?
R: Making local beer from bananas, boda- boda (motorcycle taxi operator), others are government employees.
Q: Do households get help with farming from non-household members?
R: Yes, but not very common. Once in a while you get friends who may offer help.
Q: Is getting good harvest becoming more difficult or less difficult from season to season?
R: There is a great improvement because of interventions like NAADS (National Agricultural Advisory Services) who have provided farmers with advice on how to improve their output.
QUESTIONS ABOUT INSURANCE
Q: Have you ever heard of insurance?
R: Yes but we cannot define it. We need to be sensitized about it.
Q: Does insurance seem like something you would recommend to a friend to take?
R: Yes because in case of a loss, you get compensation from the insurance company.
Q: Do you know of people who have insurance policies in this village?
R: Yes, some people have vehicle insurance.
Q: Would you trust insurance?
R: Not very much because if you pay your premium and nothing (no disaster) happens to your farm, then you will have lost that money.
One farmer said:*I feel the farmers should first be helped to boosted farming such that their farming activities are profitable before taking on insurance. This boost can be in the form of providing them with fertilizers and other key farm implements like seeds*.
Q: What aspects of the insurance agreement are most important when considering whether or not to take up insurance?

- the amount of premium to be paid

- the risks covered
- the payment period of the premium

QUESTIONS ABOUT ATTITUDES:

Q: The government should make sure every has a good standard of living

R: (23 people) every one. strongly agree (1) no opinion

Q: When a person helps others, he will receive help in return

R: (24 people) strongly agree

Q: Competition is better than cooperation

R: (24 people) strongly agree

Q: The future is too uncertain for a person to make serious plans

R: (24 people) strongly disagree

Q: It's good for a person to trust the new people he or she meets

R: (24 people) strongly disagree

Q: It is possible to protect land if a person was to try to take it away

R: (24) strongly agree

Q: Life is based on chance

R: (17) strongly disagree (7) agree

Q: The natural environment is very adaptable and will recover from harm caused by people

R: (23 people) strongly disagree (1) agree

Q: The environment is very fragile and the slightest human interference can cause a major disaster

R: (24 people) strongly agree

Q: No matter what we do the environment will change in un-predictable ways both for the better and worse, in the future.

R: (24) strongly disagree

Q: Large business are able to solve problems more effectively than small business

R: (24) strongly agree

Q: Businessmen have brought more wealth to this country than have bureaucrats

R: (24) strongly agree

SOURCES OF HARDSHIPS

(1) Most pressing, (2) pressing, (3) no opinion, (4) most pressing, (5) not at all pressing.

- **Loss of crops**: (24 people) Very pressing
- **Illness / injury to yourself** : (22)Very pressing (2) pressing
- **Illness of injury to a family member**: (23) Very pressing (1) pressing
- **Loss of home**: (24) very pressing
- **HIV/AIDS:** (24) very pressing
- **Decrease in the prices of crops in the market** (22) pressing (2) very pressing
- **Natural disasters**: (24) very pressing
- **Crime/ civil disorder:** (23) very pressing (1) pressing

QUESTION ABOUT NETWORKS:

What options are available to some who can't afford the cost of seed at the beginning of the season?

- Borrow a loan/a friend
- Sell of an asset or livestock/produce home saved sell.
- Farm labor.
- Question:

Q: Does Tabongon have links with other villages yes. Do people from this village receive money from other village?

R: Yes, we sell to them some things or we have relatives in other villages who give us money.

Q: Do you also send out money?

R: Yes, we do especially to our relatives, we also lend out money.

Appendix A3. Complex Dice game scorecard and survey

Please note that this is a copy of the scorecard used by the researchers in order to keep track of game play.

Note that when explaining the game, we use the following definition of insurance: a contract where you pay money monthly or yearly to protect against an unexpected loss

Date: _____ Farmer ID: _____

Is this played as a group: Yes / No (circle)

If it is played a group, please record the IDs of other farmer(s) in the group: _____

Is this player shown the pay-out grid for the first two rounds: Yes / No (circle)

Numeracy:

1. You hear on the radio that 5% of farmers in your village of 500 farmers were affected by drought. How many farmers were affected?
   A. 5 B. 25 C. 100 D. 2500

2. There are ten mangoes in a bowl. If you eat three, how many are left?
   A. 10 B. 7 C. 5 D. 3

3. You save 150Ugs per week. How much do you have after three weeks?
   A. 350 B. 450 C. 1500 D. 3150

4. You hear on the radio that 5% of farmers in your village of 500 farmers were affected by a drought. How many farmers were affected?
   A. 5 B. 25 C. 100 D. 2500

5. If the chance of having a drought on your farm is 20 out of 100, this would be the same as having a _____ % chance.

Game starts here.

Round 1:

Player Allocation of chips:

Farming _____ Insurance _____

Dice Roll: Sun _____ Rain _____

Payout (total chips for next round) _____

Round 2:

Player Allocation of chips:

Farming _____ Insurance _____

Dice Roll: Sun ____ Rain _____

Payout (total chips for next round) _____

Round 3:

Player Allocation of chips:

Farming _____ Insurance _____

Dice Roll: Sun ____ Rain _____

Payout (total chips for next round) _____

Round 4:

Player Allocation of chips:

Farming _____ Insurance _____

Dice Roll: Sun ____ Rain _____

Payout (total chips for next round) _____

Round 5:

Player Allocation of chips:

Farming _____ Insurance _____

Dice Roll: Sun ____ Rain _____

Payout (total chips for next round) ____

Ask the participant the following questions and record the responses below.

1. How old are you?

2. What was your highest level of education?

3. How many people in your house last night other than yourself?

4. Which of the following does your household own (circle): bicycle; radio; mobile phone; cow; goat; chicken; pig; vegetable garden; water pump; plough; none

5. What share of your household income comes from farming? 1. Very little (0-25%); 2. Less than half; 3. Half or more; 4. Almost all (100%)

6. In your farming, are you more concerned about flooding or droughts?

7. Before this survey, did you know about insurance, a contract where you pay money monthly or yearly to protect against an unexpected loss? Yes / No

8. Would you consider purchasing insurance for your crops? Yes/No
    a. Why?
    b. Why not?

9. Would you rather save crops to sell a few months later or save (money) to spend in a few months? 1. Crops 2. Money

10. During your time farming, have you noticed changes to the environment? Yes / No

Explain / Why?

11. Would you consider purchasing insurance for your crops? Yes/No

12. Which are the main crops that you grow?

13. If you have to place trust in someone, would you rather trust a private businessman or a government bureaucrat?

14. If you experienced a drought or flood that destroyed your crop, what would you do to recover? (take notes)

Appendix B. Online Hurricane Sandy survey and simulation tool

Please note that this is a print copied from the output of the code we programmed into Qualtrics© and does not accurately portray how the survey is viewed by the respondent. For example, in places where a drop-down list was presented, it is not apparent in the following copy. We include the version with the "table treatments."

Components of the online survey

Survey: series of stated-preference questions related to demographic data, as well as risk perceptions and attitudes towards insurance. These questions are spread throughout the online tool, both before and after the experimental section.

Experiment: test under controlled conditions by which we test hypotheses regarding flood insurance adoption and attitudes towards gambling. Our online experiment encompasses the flood simulation activity and the gambling exercise.

(Flood) Simulation: the flood simulation is a subsection of our online experiment, which addresses one's insurance behaviour over a number of flood scenarios. It is an exercise that is representative of features of potential losses from extreme flooding.

Scenario: the flood simulation is made up of a number of scenarios, which vary in detail about expected loss from extreme flooding.

Gambling exercise: the gambling exercise is a subsection of our online experiment, which addresses respondents' preference for gambling behaviour.

Are you willing to insure against flood?

survey and simulation

Survey Description

Are you willing to insure against flooding?

What is this survey about?
Thank you for your interest in our survey. We want to learn about your willingness to insure against flooding and how this is linked with your past experiences of flooding, your attitudes to risk, and other aspects of your life. We will ask you some factual questions, plus you will go through a simulation activity with hypothetical questions. Please respond to the hypothetical questions as if you were making real choices.

What will the results be used for?
The results will be used to improve our understanding of how flooding affects households, and the use of flood insurance. Our research is independent of regulators and insurance companies. The results will be openly accessible, but in an anonymous and confidential form.

How will my participation be rewarded?
You will receive a basic payment for completion of the FULL survey. You can earn additional money, depending on your performance in the simulation activity. There is a small chance that you could earn as much as $30 extra.

About the research team
This project is led by Jennifer Helgeson at the London School of Economics. Inquiries can be sent to her at j.helgeson@lse.ac.uk. Jennifer is a native of Silver Spring, Maryland, USA. She has worked at the National Institute of Standards and Technology, and has been the recipient of National Science Foundation funding and a Fulbright grant. For more information, see: http://www2.lse.ac.uk/GranthamInstitute/whosWho/Students/JenniferHelgeson.aspx

A note on confidentiality
Your responses will be kept anonymous and confidential. All data will be used in a form that makes it impossible to determine the identity of individual respondents.

Please remember that it is important to answer all of the questions in this survey. Failure to do so will result in loss of the participation payment.

Pilot User Data

Please verify that you would like to continue the survey at this time:

- ○ YES
- ○ NO

So that we can tailor the survey to you specifically, please indicate if you own or rent your current primary dwelling:

- ○ I OWN my current primary dwelling
- ○ I RENT my current primary dwelling

In which state do you currently reside?

We will ask more questions about your primary dwelling later in the survey. For now, please type your 5-digit postal zip code:

Did you suffer any kind of financial loss as a result of Hurricane Sandy?

- Yes
- No

Simulation Explanation

Simulation activity EXPLANATION

What is the aim of this activity?
Floods can damage your property and other belongings, but it is possible to purchase insurance to cover your losses. We would like to know how much you are willing to pay for flood insurance. We will present you with several scenarios.

Let's describe the simulation activity in more detail.

Simulation activity EXPLANATION con't.

Flood return periods
In each scenario, there are two possible outcomes: either there is a flood, or there isn't. The chance of a flood varies from one scenario to the next. It is described by the 'return period' of a flood: i.e. how many years would you expect to wait to experience a flood. For example, a flood that occurs once in 100 years is equivalent to having a 1% chance of flooding in any particular year.

What you should assume about government help and deductibles on the insurance policy
In order to keep the simulation simple, please assume that (1) there will be no government funds to compensate you for flood damage and (2) there is no deductible on the insurance policy.

Lab dollars
Before each scenario you will be given an endowment of 'Lab Dollars'. This endowment represents your property and belongings. 1 US Dollar is worth 10,000 Lab Dollars. The endowment in each scenario is Lab$ 30,000.

Our hope is that you will answer the questions as if you are thinking of the best course of action to take with your real money and property.

Simulation activity EXPLANATION con't.

In each scenario, you are asked whether to spend your Lab Dollars on insurance. If you do, the premium (amount you pay for insurance cover) will be taken out of your endowment, and you will be covered for a flood event. If you don't insure, you don't pay the premium, but could suffer losses on your endowment in the event of a flood.
At the end of each simulation scenario, your endowment is updated. The results from each scenario are stored to calculate your final prize.

What is my payment for completion of the simulation exercise?
At the start of each scenario of play, you are provided with an endowment of Lab$ 30,000. You decide whether

or not to put some of this money towards insurance. What you get at the end of the simulation scenario depends on whether a flood took place and whether you were insured against damage from it.
Your endowment is then reset to Lab$ 30,000 at the beginning of the next scenario.

Once you have played all simulation scenarios, the outcome of one scenario will be chosen at random and translated from Lab$ to US$. You then have a choice between three forms of payment for your participation in the simulation:

1. Payout of the money left in the endowment at the end of a scenario chosen at random. *OR*
2. A gamble with a 50 % chance of doubling your money -- two times the money left in the endowment at the end of the scenario chosen at random -- and a 50 % chance of zero payout. *OR*
3. A gamble with a payout of ten times the money left in the endowment at the end of the scenario chosen at random, with probability of 10 %; otherwise a zero payout.

Example Purchase Insurance

Here is an example simulation scenario:

You start with Lab$ 30,000.

There is a **3%** chance that a flood will occur **(i.e. it will occur, on average, every 3 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 12,000.

The cost of insurance to cover a flood event is Lab$ 575.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	Flood
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 12,000 (damage) **18,000**
Insurance	Lab $ 30,000 - 575 (premium) **29,425**	Lab $ 30,000 - 575 (premium) **29,425**

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_Example = no

Example Simulation

You began with an endowment of Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_Example = flood

Example Simulation

You began with an endowment of Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 18,000

Major insurance and Outcome_Example = no

Example Simulation

You began with an endowment of Lab$ 30,000

There was NO flood.

Since you purchased flood insurance, you have Lab$ 29,425

Major insurance and Outcome_Example = flood

Example Simulation

You began with an endowment of Lab$ 30,000

There was a FLOOD.

Since you purchased flood insurance, you have Lab$ 29,425

Ready to start simulation

Now that you have seen an example, are you ready to begin the REAL simulation?

- YES
- NO

Sim 1a Purchase Insurance

Simulation #1

You start with Lab$ 30,000.

There is a **10%** chance that a flood will occur **(i.e. it will occur, on average, every 10 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 7,000.

The cost of insurance to cover the flood is Lab$ 805.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 7,000 (damage) **23,000**
Insurance	Lab $ 30,000 - 805 (premium) **29,195**	Lab $ 30,000 - 805 (premium) **29,195**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s1a = no

Simulation #1

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s1a = flood

Simulation #1

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 23,000

Major insurance and Outcome_s1a = no

Simulation #1

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 29,195

Major insurance and Outcome_s1a = flood

Simulation #2

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 29,195

sim1b Purchase Insurance

Simulation #2

Again you start with Lab$ 30,000.

There is a **14%** chance that a flood will occur **(i.e. it will occur, on average, every 14 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 5,000.

The cost of insurance to cover a flood event is Lab$ 805.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 5,000 (damage) **25,000**
Insurance	Lab $ 30,000 - 805 (premium) **29,195**	Lab $ 30,000 - 805 (premium) **29,195**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s1b = no

Simulation #2

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s1b = flood

Simulation #2

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 25,000

Major insurance and Outcome_s1b = no

Simulation #2

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 29,195

Major insurance and Outcome_s1b = flood

Simulation #2

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 29,195

sim2a Purchase Insurance

Simulation #3

Again you start with Lab$ 30,000.

There is a **20%** chance that a flood will occur **(i.e. it will occur, on average, every 20 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 7,000.

The cost of insurance to cover a flood event is Lab$ 1,610.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 7,000 (damage) **23,000**
Insurance	Lab $ 30,000 - 1,610 (premium) **28,390**	Lab $ 30,000 - 1,610 (premium) **28,390**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s2a = no

Simulation #3

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s2a = flood

Simulation #3

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 23,000

Major insurance and Outcome_s2a = no

Simulation #3

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 28,390

Major insurance and Outcome_s2a = flood

Simulation #3

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 28,390

sim2b

sim2b Purchase Insurance

Simulation #4

Again you start with Lab$ 30,000.

There is a **14%** chance that a flood will occur **(i.e. it will occur, on average, every 14 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 10,000.

The cost of insurance to cover a flood event is Lab$ 1,610.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 10,000 (damage) **20,000**
Insurance	Lab $ 30,000 - 1,610 (premium) **28,390**	Lab $ 30,000 - 1,610 (premium) **28,390**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s2b = no

Simulation #4

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s2b = flood

Simulation #4

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 20,000

Major insurance and Outcome_s2b = no

Simulation #4

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 28,390

Major insurance and Outcome_s2b = flood

Simulation #4

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 28,390

sim3a

sim3a Purchase Insurance

Simulation #5

Again you start with Lab$ 30,000.

There is a **30%** chance that a flood will occur **(i.e. it will occur, on average, every 30 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 7,000.

The cost of insurance to cover a flood event is Lab$ 2,415.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 7,000 (damage) **23,000**
Insurance	Lab $ 30,000 - 2,415 (premium) **27,900**	Lab $ 30,000 - 2,415 (premium) **27,900**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s3a = no

Simulation #5

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s3a = flood

Simulation #5

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 23,000

Major insurance and Outcome_s3a = no

Simulation #5

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 27,585

Major insurance and Outcome_s3a = flood

Simulation #5

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 27,585

sim3b

sim3b Purchase Insurance

Simulation #6

Again you start with Lab$ 30,000.

There is a **14%** chance that a flood will occur **(i.e. it will occur, on average, every 14 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 15,000.

The cost of insurance to cover a flood event is Lab$ 2,415.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 15,000 (damage) **15,000**
Insurance	Lab $ 30,000 - 2,415 (premium) **27,900**	Lab $ 30,000 - 2,415 (premium) **27,900**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s3b = no

Simulation #6

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s3b = flood

Simulation #6

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 15,000

Major insurance and Outcome_s3b = no

Simulation #6

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 27,585

Major insurance and Outcome_s3b = flood

Simulation #6

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 27,585

sim4a Purchase Insurance

Simulation #7

Again you start with Lab$ 30,000.

There is a **40%** chance that a flood will occur **(i.e. it will occur, on average, every 50 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 7,000.

The cost of insurance to cover a flood event is Lab$ 3,220.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 7,000 (damage) **23,000**
Insurance	Lab $ 30,000 - 3,220 (premium) **26,780**	Lab $ 30,000 - 3,220 (premium) **26,780**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s4a = no

Simulation #7

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s4a = flood

Simulation #7

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 23,000

Major insurance and Outcome_s4a = no

Simulation #7

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 26,780

Major insurance and Outcome_s4a = flood

Simulation #7

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 26,780

sim4b Purchase Insurance

Simulation #8

Again you start with Lab$ 30,000.

There is a **14%** chance that a flood will occur **(i.e. it will occur, on average, every 14 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 20,000.

The cost of insurance to cover a flood event is Lab$ 3,220.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 20,000 (damage) **10,000**
Insurance	Lab $ 30,000 - 3,220 (premium) **26,780**	Lab $ 30,000 - 3,220 (premium) **26,780**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s4b = no

Simulation #8

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s4b = flood

Simulation #8

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 10,000

Major insurance and Outcome_s4b = no

Simulation #8

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 26,780

Major insurance and Outcome_s4b = flood

Simulation #8

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 26,780

sim5a Purchase Insurance

Simulation #9

Again you start with Lab$ 30,000.

There is a **50%** chance that a flood will occur **(i.e. it will occur, on average, every 50 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 7,000.

The cost of insurance to cover a flood event is Lab$ 4,025.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 7,000 (damage) **23,000**
Insurance	Lab $ 30,000 - 4,025 (premium) **25,975**	Lab $ 30,000 - 4,025 (premium) **25,975**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s5a = no

Simulation #9

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s5a = flood

Simulation #9

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 23,000

Major insurance and Outcome_s5a = no

Simulation #9

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 25,975

Major insurance and Outcome_s5a = flood

Simulation #9

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 25,975

sim5b Purchase Insurance

Simulation #10

Again you start with Lab$ 30,000.

There is a **14%** chance that a flood will occur **(i.e. it will occur, on average, every 14 in 100 years)**.

In the case of a flood, you would experience damage of Lab$ 25,000.

The cost of insurance to cover a flood event is Lab$ 4,025.

This table sets out the possible outcomes, depending on whether you purchase insurance:

	NO Flood	**Flood**
NO insurance	Lab $ 30,000 - 0 **30,000**	Lab $ 30,000 - 25,000 (damage) **5,000**
Insurance	Lab $ 30,000 - 4,025 (premium) **25,975**	Lab $ 30,000 - 4,025 (premium) **25,975**

Please indicate if you would like to:

- a. Purchase NO insurance cover.
- b. Purchase insurance cover against a flood.

No insurance and Outcome_s5b = no

Simulation #10

You began with Lab$ 30,000

There was NO flood.

Since you did NOT purchase insurance, you have Lab$ 30,000

No insurance and Outcome_s5b = flood

Simulation #10

You began with Lab$ 30,000

There was a FLOOD.

Since you did NOT purchase insurance, you have Lab$ 5,000

Major insurance and Outcome_s5b = no

Simulation #10

You began with Lab$ 30,000

There was NO flood.

Since you purchased insurance, you have Lab$ 25,975

Major insurance and Outcome_s5b = flood

Simulation #10

You began with Lab$ 30,000

There was a FLOOD.

Since you purchased insurance, you have Lab$ 25,975

Simulation Summary

Thank you for participating in the simulation activity.

Please continue to the next part of the survey.

At the end of the survey you will have a choice between three forms of payment for your participation in the simulation.

Please note that to receive payment for the simulation, you must complete the rest of the survey.

Thank you.

Section 3: Past Experience with Flood – "Sandy Survey"

In this section we ask questions about your personal experiences with flooding. Most of the questions relate to flood damage and the use of insurance. Some questions look at your perception of flood-related risks.

Do you live in an area that was affected by Storm Sandy? ('Yes' indicates any level from very minor to severe)

- ○ YES
- ○ NO

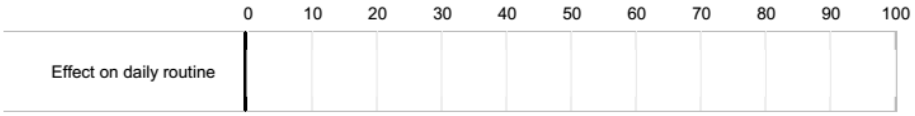
APART FROM Storm Sandy, have you ever experienced flooding in the area where you live? (Check all that apply)

- ☐ a. No, I have never experienced any other type of flood
- ☐ b. Yes, I have experienced a river flood
- ☐ c. Yes, I have experienced a seawater flood
- ☐ d. Yes, I have experienced drain flooding
- ☐ e. Yes, I have experienced flooding from the hot water heater, toilet, or another household problem.

In what way were you affected by Storm Sandy? (Check all that apply)

- ☐ a. Evacuation from home
- ☐ b. Loss of electricity
- ☐ c. Loss of water
- ☐ d. Loss of internet/telephone
- ☐ e. Disruption to public transport
- ☐ f. Other (Please indicate in the text box below.)

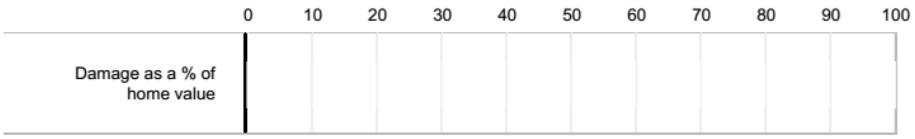
On the scale below, please indicate roughly how much your daily routine was affected by Storm Sandy (zero being "not at all" and 100 being completely).



Please indicate which of the following were affected by Storm Sandy (check all that apply).

- ☐ The structure of my home
- ☐ My home contents
- ☐ My automobile
- ☐ Health / Life (of self or family member)

Please estimate the damage to your home's structure as a percentage of the home's value.



Did you have insurance for the damage to your home's structure?

- ○ YES
- ○ NO

Did you make a claim against the insurance to cover the structure of your home?

- ○ Yes
- ○ No

Please estimate the damage to the contents of your home.

- a. Less than $100
- b. $100 - $1,000
- c. $1,000 - 2,000
- d. $2,000 - 3,000
- e. $3,000 - 5,000
- f. $5,000 - 10,000
- g. $10,000 - 20,000
- h. $20,000 - 30,000
- i. $30,000 - 50,000
- j. Greater than $50,000

Did you have insurance for the damage to the contents of your home?

- YES
- NO

Did you make a claim against the insurance to cover the contents of your home?

- YES
- NO

Please estimate the damage to your automobile.

- a. Less than $100
- b. $100 - $1,000
- c. $1,000 - 2,000
- d. $2,000 - 3,000
- e. $3,000 - 5,000
- f. $5,000 - 10,000
- g. $10,000 - 20,000
- h. $20,000 - 30,000
- i. $30,000 - 50,000
- j. Greater than $50,000

Did you have insurance for the damage to your automobile?

- YES
- NO

Did you make a claim against the insurance to cover the damage to your automobile?

- YES
- NO

Did you have insurance for the loss of health/life experienced?

- YES
- NO

Did you make a claim against the insurance to cover loss of health/life?

- YES
- NO

Have you had any problems with insurance claims related to Storm Sandy?

- a. YES
- b. NO

Have you lost money due to being unable to work as a result of Storm Sandy?

- YES
- NO

Please estimate the amount of money lost from uncompensated work time, or direct income from your main profession, due to Storm Sandy.

Did you seek assistance following Storm Sandy through FEMA claims or other public programs?

- YES
- NO

Section on use of insurance:

Please indicate which types of insurance you hold at the moment (check all that apply).

- a. Health insurance
- b. Dental insurance
- c. Home contents insurance
- d. All risk car insurance
- e. Travel insurance with all year coverage
- f. Home insurance (covers home building/structure)
- g. Life insurance
- h. Other (Please indicate in the text box below)

Some people avoid financial risks as much as possible. They are also well insured. How similar are these people to you?

a. Not at all similar	b. Not similar	c. Slightly similar	d. Similar	e. Very similar	f. Extremely similar

What is the estimated value of your primary dwelling in U.S. Dollars? Please keep in mind that your responses are confidential. We need this information in order to reliably analyze the outcome of the survey.

What is the monthly rent of your primary dwelling in U.S. Dollars? If you share the dwelling with others, please indicate the total rent, not just the portion you pay. Please keep in mind that your responses are confidential. We need this information in order to reliably analyze the outcome of the survey.

If you could obtain insurance that completely covers flood damage on your house and home contents at an affordable rate, would your household be willing to pay for it?

- NO; my household would never take out flood insurance.
- YES

Section on Relative Risks

How high do you estimate the probability that your household will suffer financial damage on property due to the events mentioned below? Rate each possible event on the scale beside the event description from 0% (no chance) to 100% (certainty).

	0	10	20	30	40	50	60	70	80	90	100
Terrorist Attack											
Burglary											
House fire											
Car theft											
Fire in car											
Flood / water inside dwelling											
Traffic accident											

How would you rate your flood risk compared to that of an average person in the area covering your 5-digit ZIP code?

- a. Average flood risk
- b. Higher than average flood risk
- c. Lower than average flood risk

Demographics

In this section we ask demographic questions about you. Please answer every question, as any missing data means we cannot use your survey responses at all. Remember your responses will be kept anonymous and confidential.

Do you own other residential property, such as a summer home or rental property?

- YES
- NO

How long have you lived at your current residence?

- a. Less than 1 year
- b. 1-2 years
- c. 2-4 years
- d. 4-6 years
- e. 6-8 years
- f. 8-10 years
- g. Longer than 10 years

What is your gender?

- Male
- Female

Please give the year of your birth

What is your relationship status?

- a. Single
- b. Married
- c. Widowed
- d. Divorced
- e. In a civil union
- f. In a domestic partnership

How many children do you have living at your home?

What is the "dwelling type" of your home?

a. Single Family House	b. Town-home / Brownstone style	c. Apartment on ground level (i.e. first floor)	d. Apartment on a floor above ground level (i.e. first floor)

On which floor is your apartment situated?

In which year was your home constructed?

What is the primary construction material of the outside of your house?

- a. Aluminum siding
- b. Wood siding
- c. Brick
- d. Brick façade
- e. Stone
- f. Stone façade
- g. Stucco
- h. Vinyl siding
- i. Other (Please indicate in the text box below.)

What is your highest completed education?

- a. Some high school
- b. High school
- c. Associate's degree
- d. Course Diploma
- e. Bachelor's degree
- f. Master's degree
- g. PhD, M.D., J.D., or other Advanced Degree

Please indicate into which income category your yearly TOTAL (GROSS) HOUSEHOLD INCOME falls:

- a. Less than $ 15,000
- b. $15,000 - $24,999
- c. $25,000 - $39,999
- d. $40,000 - $49,999
- e. $50,000 - $59,999
- f. $60,000 - $69,999
- g. $70,000 - $99,999
- h. $100,000 - $149,999
- i. $150,000 - $199,999
- j. Greater than $200,000

Do you belong to an environmental society or give donations to an environmental causes?

- Yes
- No

Block 8

Imagine we throw a five-sided die 50 times. On average, out of these 50 throws how many times would this five-sided die show an odd number (1, 3 or 5)?

comments

Thank you for your time. Please share any thoughts or questions regarding the survey and simulation in the box below.
Feel free to contact us directly at: j.helgeson[at]lse.ac.uk.
If you would like to receive feedback on the study, please provide your e-mail address.

Please continue for your payment for the simulation section of the survey.

E-mail address:

Simulation Summary re-intro

Thank you for your participation in the survey and simulation activity.

At this time, we will organize payment for your participation in the simulation activity.

The outcome of one of the 10 simulation scenarios will be chosen at random.

You will have a choice between three forms of payment for your participation in the simulation based on the selected scenario outcome.

Random Simulation Round Selection.

The OUTCOME of Simulation # ${e://Field/Round} was chosen at random.

According to your performance in Simulation # ${e://Field/Round}, you now have Lab $ ${e://Field/OptionValue}.

Outcome Gamble Choice

Please indicate what you would like to do with your Lab$ ${e://Field/OptionValue}.

Your final payment for participation in the simulation activity will depend on your choice and will then be exchanged for USA Dollars.

- Take the Lab$ ${e://Field/OptionValue} now.
- Invest the Lab$ ${e://Field/OptionValue} with a 50% chance of doubling it and a 50% chance of zero payout.
- Invest the Lab$ ${e://Field/OptionValue} with a 10% chance of getting 10 times its value and 90% chance of zero payout.

Outcome Gamble 1 -- Option 1, 100 %

Your payment for the simulation section of the survey is Lab $ ${e://Field/OptionValue}.

This translates to USA Dollars /10000}

Outcome Gamble -- Option 2, 50 % ZERO money

The 50 % chance of a ZERO payout occurred.

So, your payment for the simulation section of the survey is ZERO.

You will not receive any money for the simulation section of the survey.

Outcome Gamble -- Option 2, 50 % double money

The 50 % chance of DOUBLING your investment occurred.

You will receive Lab $ *2}

This translates to USA Dollars {Invalid Expression}/5000,2)}

Outcome Gamble -- Option 3, 10 % 10 X money

The 1 % chance of receiving 10 times your investment occurred.

You will receive Lab $ *10}

This translates to USA Dollars {Invalid Expression}*10/10000,2)}

Outcome Gamble -- Option 3, 90 % ZERO money

The 99 % chance of a ZERO payout occurred.

So, your payment for the simulation section of the survey is ZERO.

You will not receive any money for the simulation section of the survey.

thank you

Thank you for your participation !

END OF SURVEY

Appendix C. Heuristics relevant to the decision to insure

Context—System I and System II thinking

Simon (1955) suggested that the analytical demands of Bayesian probability updating[1] and utility maximisation generally exceed the typical cognitive capacity of households faced with complex decisions. Under *bounded rationality*, Simon (1979) notes that individuals employ heuristics to make decisions opposed to a strict, rigid rule set, as would be the case under rational choice theory. There is no standardised definition of a heuristic, but we take it to be an expression of fast, intuitive, unconscious processing of information or rather the "adaptive intelligence of the unconscious" (Gigerenzer, 2007). Conceptually heuristics encompass a number of decision approaches, but all are defined by a three level process rule structure: 1. search rules; 2. stopping rule; and 3. decision rule (Czerlinski et al., 1999). For an extensive treatment of heuristics, (see Tversky & Kahneman, 1974). Kunreuther et al. (2013) provide a detailed treatment of heuristics related to insurance behaviour in the developed world context.

While heuristics are helpful in many decision making situations, they can also lead to biases in subjective probabilities and perceptions (e.g., Kahneman & Tversky, 1972). A great deal of research on the use of heuristics for formulating perception has been done in the field of adaptive behaviour and cognition (ABC) (e.g., Czerlinski et al., 1999). These studies find that simple heuristics frequently do lead to relatively better decisions in single-stage decisions than would be the case following the theoretically optimal procedure (Czerlinski et al., 1999; Gigerenzer, 2007). Yet, tracing the use of heuristics in compound, complex decisions, such as coping against extreme weather, poses challenges, especially when there are so many competing uncertain options that are subject to individual perception and affect can test the limits of the study of heuristics at present (Gigerenzer, 2010).

Camerer & Kunreuther (1989) offer a review of decision processes for low probability events and the relevant biases in probability judgement. They include: optimism bias, availability, ignoring low probability risks (e.g. Slovic, 1987), mental accounting (e.g., Thaler, 1985), reframing, endowment effects, regret (i.e., hindsight bias) (e.g., Fischhoff, 2003), status quo bias, and emotional dimensions of risk as well (e.g., Loewenstein & Thaler, 1989). Yet, judging subjective probability is only one, albeit important, step in the decision to insure. In looking at such complex decisions a useful step can be to account for the existence of bounded rationality in constituent decisions (e.g., forming subjective probabilities) without tracing the path when there are so many systemic factors that contribute to heterogeneity between individuals (e.g., Gigerenzer & Gaissmaier, 2011).

[1] Bayesian inference is used to update probability distributions when evidence or observations are used to infer the probability of occurrence. There are some experiments concerning belief revision that suggest humans change their beliefs faster throughout Bayesian methods than when informal judgment is employed (Edwards et al., 1963). This has been extended to a model of Bayesian Risk Management (e.g., Haas & Jaeger, 2005; Barton et al., 2012).

Relevant Heuristics

Note that this list of heuristics is non-exhaustive. We include the most common heuristics found in the literature that are linked to individuals' choice to enrol in flood insurance.

Budgeting heuristics

A large proportion of homeowners have affordability considerations; serious trade-offs between costs and benefits arise when they consider flood insurance cover. Individuals (unknowingly) set separate "mental" accounts for different expenditure types (Thaler, 2000). Thus, flood insurance inherently competes with other mitigation investments, while not weighted directly against different classes of payments. Budgeting heuristics are further augmented by the domain specificity of risk-taking (Weber et al., 2002), which contends that individuals unconsciously categorise risk types.

Anchoring

Humans are notably poor at validly estimating probabilities, but this myopic understanding of probability increases with small probabilities. Tversky & Kahneman (1992) note that the probability weighting function is not well-behaved near zero. An explanation for this behaviour is that people only pay attention to risks when the likelihood of occurrence is above a probability threshold that is unique across individuals (e.g., Slovic et al., 1977; Kunreuther & Pauly, 2006). Kunreuther & Pauly (2004, pp. 23-24)extend this idea to individuals' "attention threshold" for obtaining relevant information: "events that have a low expected value also have a low expected return from searching for information on the benefits of insurance relative to its cost." Koszegi & Rabin's (2006) idea of "reference dependent risk attitudes" allows prediction of the reference point against which gains and losses are measured by an individual. Kőszegi & Rabin (2007) specify that an individual has an "unacclimating personal equilibrium," where the stochastic outcome is generated by the utility-maximising choices conditional on expectations actually coinciding with their expectations.

Anchoring is most detrimental to flood insurance decisions when insufficient adjustment takes place. This can happen from biases in the evaluation of conjunction and disjunctive events or simply by anchoring in the individual's assessment of her subjective probability distribution.

Temporal planning bias

There is extensive evidence that humans are hyperbolic discounters; temporally distant events are disproportionately discounted relative to those in the present; individuals tend to value common outcomes differently over time with regards to natural disaster preparedness (Kunreuther, 2009). A fundamental feature of human cognition is that we are influenced more by cues that are concrete and immediate than those that are abstract and delayed, especially with no past experience.

Excessive optimism

Individuals display excessive optimism in the belief that likelihood of occurrence is sufficiently low such that a flood will not take place in their area (Kunreuther, 2012). As a result, they often

feel that they do not need to voluntarily invest in protective measures, like flood insurance. We do know that decisions about mitigation are rarely based on formal probabilities. Lerner et al. (2003) find that when asked, individuals have no problem expressing (subjective) beliefs about the relative riskiness of hazards; but, these beliefs are not well-calibrated and strongly underestimate the possibility of them being affected specifically. Excessive optimism is complimented by hindsight bias. It is only after the fact that a flood occurs that these same individuals say that they would have liked to invest in insurance ahead of time (Kunreuther, 2006).

Social norms and interdependencies

Individuals' flood insurance decisions are influenced by perceptions of social norms for insurance uptake (Schelling, 1978; Gladwell, 2002). There appears to be a tipping point for behaviour as the adoption of insurance becomes more common within a community. Heal & Kunreuther (2007) provide a game-theoretic treatment of the topic and find that there are a number of contributing factors from coordinating the actions of those at risk to cascading effects of national regulations. This is connected to the discussion of differing values for risk across cultures (Douglas & Wildavsky, 1982). For example, preparedness came into the national discussion of the Netherlands in force during 1953 and residents of the country, as it is a matter of national security, hold flood insurance.

Availability heuristic

The availability heuristic is strongly related to learning in the realm of insurance adoption. Individuals assess the probability of an event by how easily examples of such events come to mind (Tversky & Kahneman, 1973). A major disaster may be an attention-focusing effect, increasing perceived risk of another event (e.g., Hansen et al., 2006). Yet, biases related to retrievability (irretrievability) of instances may increase (decrease) one's adoption of insurance above to the optimum level. This effect is also influenced by the extent to which the individual believes that her past experience is representative of the status quo. As early as 1981, a study by Palm revealed that the majority of USA home buyers did not understand or recall warnings about vulnerability to flood when no flood had occurred at the property during their tenure.

Learning effects/failures

Once the consequences of under mitigation are observed, e.g. uninsured flood occurs, intuition suggests that the homeowner would correct in the following period, e.g. in the next period adoption of insurance would be more highly considered by the individual. There is some suggestion that learning can take place from observation of the experience of others; but there is also evidence that people learn little from vicarious feedback. Meyer (2006) found that decisions to increase investment [in mitigation] were driven almost exclusively by whether the decision maker personally suffered losses in the previous period; in contrast, losses suffered by others did not have such a triggering effect.

Appendix D1. Sample comparisons for large-N Uganda survey

This appendix presents statistical analyses comparing attributes of the sub-samples from the Oyam and Kapchorwa, Uganda regions.

Fifteen questions from the Large-N survey tool were analysed in order to determine whether there are significant differences between the sub-samples of Oyam and Kapchorwa. These are listed below and correspond to the noted questions in the survey tool.

q14: Did you attend school?
q15: What was your highest level of education?
q17: Are you married?
q20: Which of the following does your household own?
q26: What share of your household income comes from farming?
q27: In your opinion, when is your busiest time for farming?
q32: If there was no help available after a large scale disaster, how would you have to cope with the disaster?
q33: In the last 5 years, have you ever experienced problems with your farming?
q36: Were losses ever weather-related?
q41: Did you change anything about your farming practices following this experience to try to avoid suffering any losses from drought or flood in subsequent years?
q55: In your farming, are you more concerned about flooding or droughts?
q56: In your opinion, what is the likelihood that a flood/drought would occur that would eliminate half of your total crop in a given season?
q126: In which times of year do you usually HARVEST your crop?
q132: During your time farming, have you noticed changes to the environment?
q135: Which crops do you grow?

In order to compare differences in variables between the two regions, Chi-square test of proportions from independent samples was used.

To test if the differences in sample proportions are likely to have occurred by chance due to random sampling. We use the chi-square test to assess the null hypothesis of no relationship between the variables of 2 by 2 table. A chi-square statistics is set up as follows:

H_0: $p_1 = p_2$ H1: $p_1 \neq p_2$

The formula for the test statistic is:

$$X^2 = \sum \frac{(O - E)^2}{E}$$

Where X^2 is the chi-square, *O* the observed values and *E* is the expected values. The expected *E* values in any cell of a 2 by 2 table when H_0 is true is:

$$E = \frac{row\ total\ x\ column\ total}{n}$$

where *n* is the total number of samples.

Attended schools: The survey reached a total of 3178 farmers of whom 1818 were from Kapchorwa regions while 1360 were from Oyam region. More than 80% of the sample attended school for some period in each region. School attendance did not significantly vary across regions; indications are that the sample proportions of the two regions do not differ from each other by chance.

Table D1.1. Test for equality of proportions for attending schools

	Kapchorwa	Oyam	Chi-square value	P-value
Attended schools	1,473 (81)	1,170 (86)	0.5807	0.4461

Levels of education: Table D1.2 presents the numbers and percentage of levels of education for Oyam and Kapchorwa regions. Majority of farmers in both regions stopped at primary school (38.6% for Kapchorwa region, and 52.8% for Oyam region, respectively). Levels of education did not significantly vary across regions. The sample proportions of the two regions do not differ from each other by chance.

Table D1.2. Test for equality of proportions for levels of education

Highest Education level	Kapchorwa	Oyam	Chi-square value	P-value
No formal schooling	351 (19.4)	208 (15.3)	0.676	0.411
Primary	701 (38.6)	718 (52.8)	3.260	0.071
Secondary (O-Level)	539 (29.7)	243 (17.9)	2.781	0.095
Secondary (A-Level)	39 (2.1)	29 (2.1)	0	1.000
Certificate or Trade School	121 (6.7)	93 (6.8)	0	1.000
University or Higher Education	61 (3.4)	7 (0.5)	0.944	0.331

Marital status: The percentage of those married did not differ between Kapchorwa and Oyam. In both districts above 90% of the sample are married. The majority of farmers stop primary school and get married at an early age (W. Okello 2011, per. comm., 18 February). Being married indicates stability to the community and clans. There are not many farmers who get divorced after getting married.

Table D1.3. Test for equality of proportions for marriage

	Kapchorwa	Oyam	Chi-square value	P-value
Married	1698 (93.4)	1224 (90%)	2.300	0.1293

Household ownership: Radios are most frequently owned households in both the samples from Kapchorwa and Oyam. Kapchorwan farmers had significantly higher percent holdings for cows, chicken, and vegetable gardens. The Oyam sample had a higher holding of bicycles; Kapchorwa district is located at Mt. Elgon that could be the reason why there are few farmers with bicycles due to the terrain of the mountain.

Table D1.4. Test for equality of proportions for household ownership

Household own	Kapchorwa	Oyam	Chi-square value	P-value
Bicycle	110 (6.0)	1122 (82.5)	136.283	<0.001
Radio	1454 (80.1)	1107 (81.4)	0	1
Mobile phone	964 (53.0)	733 (53.9)	0	1
Cow	1414 (77.8)	671 (49.3)	16.323	<0.001
Goat	1204 (66.2)	979 (72.0)	0.5395	0.4626
Chicken	1633 (89.8)	1114 (81.9)	1.9077	0.1672
Pig	143 (7.9)	199 (14.6)	1.7686	0.1836
Vegetable garden	793 (43.6)	354 (26.0)	6.3516	0.0117
Water pump	74 (4.1)	7 (0.5)	1.4209	0.2333
Plough	190 (10.5)	233 (17.1)	1.5414	0.2144
None	6 (0.3)	33 (2.4)	0.5813	0.4458

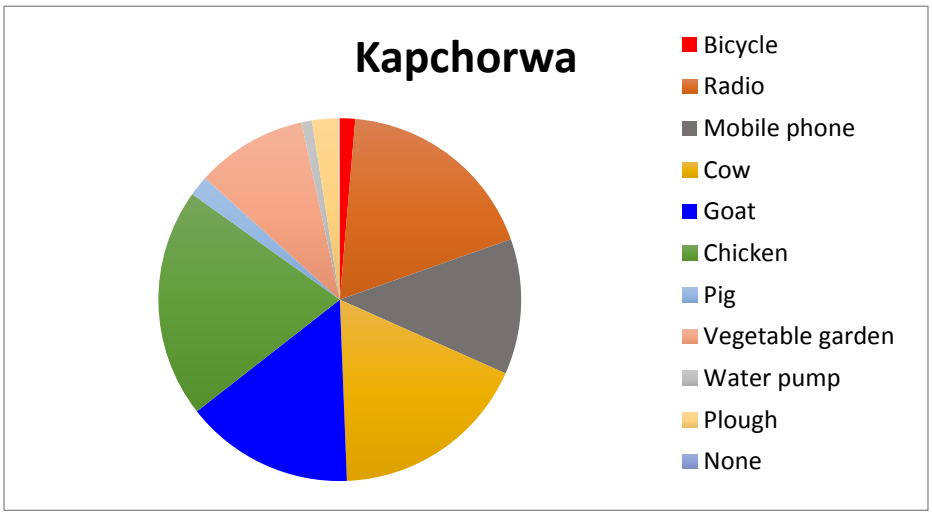


Figure D1.1a. Pie chart of household ownership: Kapchorwa

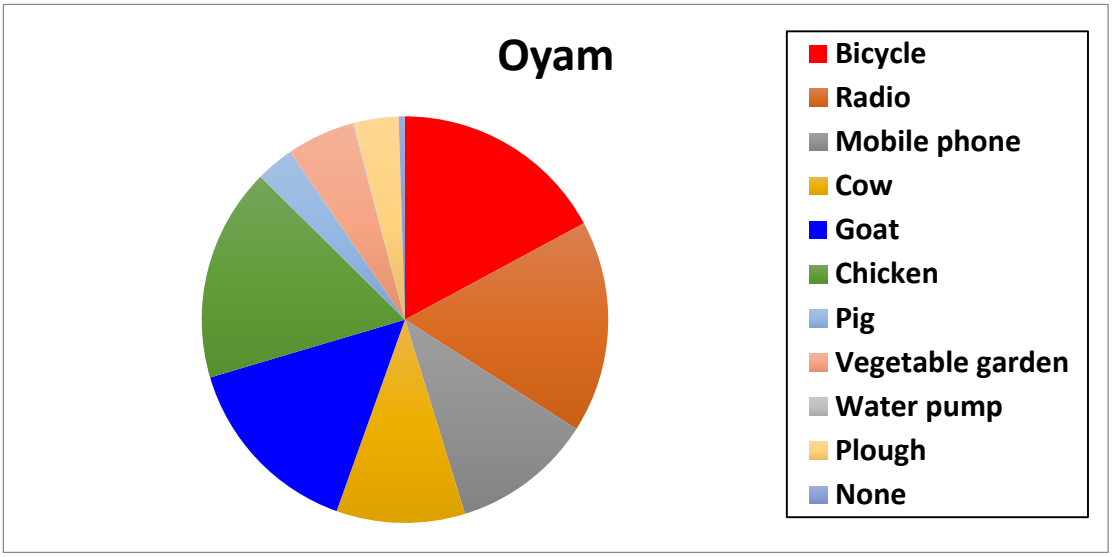


Figure D1.1b. Pie chart of household ownership: Oyam

Share of income from farming: The percentage of share of income from farming did not differ between Kapchorwa and Oyam regions, and Income of more than 30% of farmers from the regions comes from farming.

Table D1.5. Test for equality of proportions for share of income from farming

Share of income from farming	Kapchorwa	Oyam	Chi-square value	P-value
Very little (0% to 25%)	371 (20.4)	248 (18.2)	0.033	0.857
Less than half	360 (19.8)	220 (16.2)	0.305	0.581
Half or more	493 (27.1)	408 (30.0)	2.963	0.085
Almost all (75% to 100%)	594 (32.7)	471 (34.6)	0.090	0.765

Busiest time for farming: The busiest time for farming is reported to be field preparation in Oyam (47.2%) and weeding in Kapchorwa (44.6%). This report from Kapchorwa is consistent with the high-level of weeding associated with most cash crop varieties (M. Musheshe 2010, per. comm., 18 April).

Table D1.6. Test for equality of proportions for busiest time for farming

Busiest time for farming	Kapchorwa	Oyam	Chi-square value	P-value
Field preparation	561 (30.9)	642 (47.2)	5.406	0.020
Planting	326 (17.9)	163 (12.0)	0.980	0.322
Weeding	811 (44.6)	317 (23.3)	9.826	0.002
Harvesting	106 (5.8)	234 (17.2)	4.913	0.027
Other	15 (0.8)	3 (0.2)	0	1

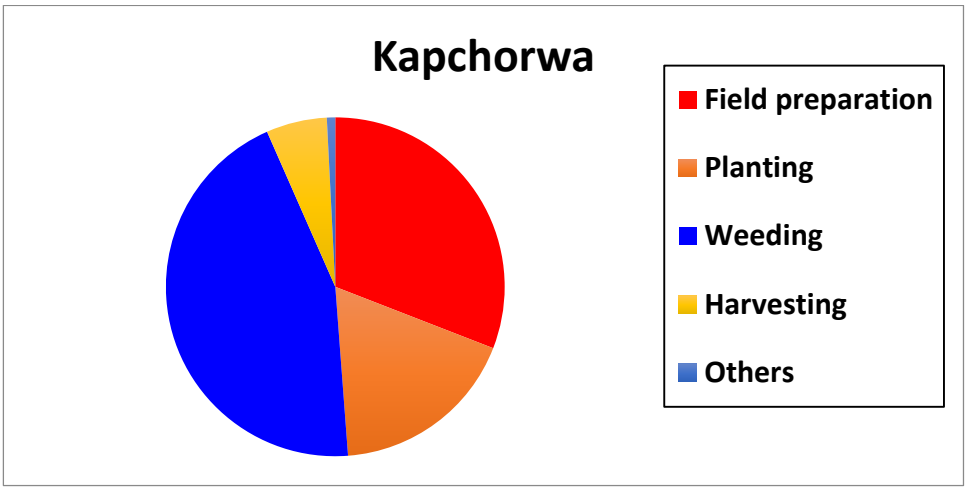


Figure D1.2a. Pie chart of Busiest time for farming: Kapchorwa region

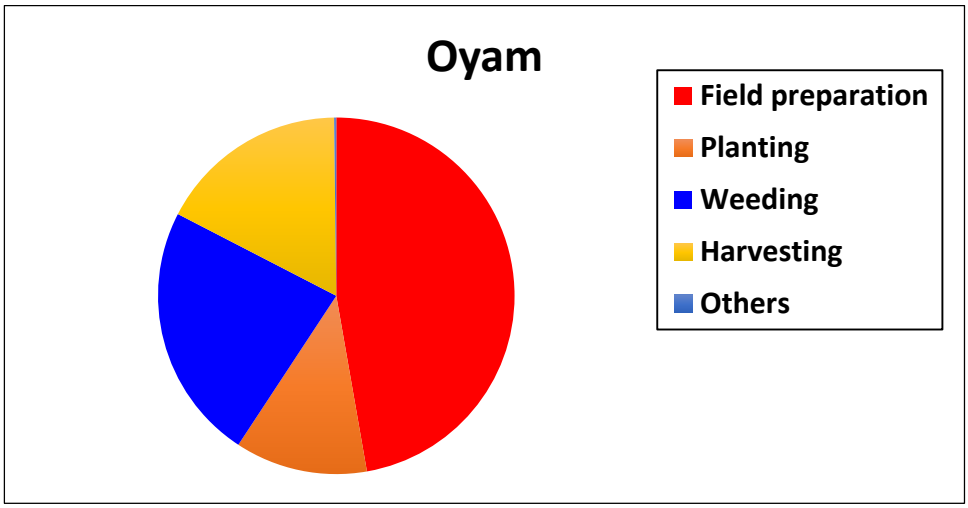


Figure D1.2b. Pie chart of busiest time for farming: Oyam region

Coping with a large scale disaster: Table D1.7 shows numbers and percentages of coping with a large scale disaster with no help. No significant differences were observed across the regions except the percentages of selling land or home. Farmers in both regions will sell livestock to cope with a large-scale disaster (>65%). Farmers in both regions do not appear to interfere with children's activities as a means by which to cope with the disasters.

Table D1.7. Test for equality of proportions for coping with a large-scale disaster

Coping with a large scale disaster	Kapchorwa	Oyam	Chi-square value	P-value
Sell land or home	37 (4.0)	54 (4.1)	5.162	0.023
Sell livestock	1263 (69.7)	885 (66.3)	0.023	0.879
Change profession	142 (7.8)	128 (9.6)	0.0611	0.805
Begging	177 (9.7)	145 (10.8)	0.0556	0.814
Send children to live elsewhere	28 (1.5)	15 (1.1)	0	1
Take children out of school	33 (2.8)	39 (2.9)	0	1
Sell household items	177 (9.7)	151 (11.3)	0.0556	0.814
Migrate	37 (2.0)	91 (6.8)	1.8615	0.172
Eat less	411 (22.6)	312 (23.4)	0	1
Borrow food	376 (20.7)	241 (18.1)	0.3113	0.570
Send kids to work	81 (5.6)	97 (7.3)	0.0768	0.782
Reduce expenditure	683 (37.7)	542 (40.7)	0.021	0.885

Experience of problems with farming: About 90% of the farmers in both Kapchorwa and Oyam regions have experienced problems with farming. This is not surprising with the type of farming practiced in both regions. Farmers in both regions are too poor to afford inputs like fertilizers and pesticides, and the majority of the farmers have limited access to loans.

Table D1.8. Test for equality of proportions for farming problems experienced

	Kapchorwa	Oyam	Chi-square value	P-value
Experience Problems with farming	1618 (89.0)	1213 (89.2)	0	1

Relationship between crop losses and weather: As shown in Table D1.9, more than 50% of the farmers from both regions reported crop losses due to drought. No significance differences were observed across the regions.

Table D1.9. Test for equality of proportions for relationship of crops losses with weather

Losses related to	Kapchorwa	Oyam	Chi-square value	P-value
Flooding	702 (38.6)	488 (35.9)	0	1
Drought	798 (58.7)	866 (63.7)	0.888	0.346
Other	47 (2.5)	35 (2.6)	0	1

Changing farming practices ex-post disaster: Change of farming practice after disaster was not significant across the regions. 60% of farmers from Kapchorwa change farming practice after disaster while 49% of farmers from Oyam change their practice after disaster. Kapchorwa farmers grow vegetables, wheat and maize. Farmers from Kapchorwa can easily change from growing maize to wheat after a crop failure. However, farmers in Oyam do not have a favourable climate for growing wheat (M.Musheshe 2012, per. comm., 20 April).

Table D1.10. Test for equality of proportions for changing farming practices ex-post disaster

	Kapchorwa	Oyam	Chi-square value	P-value
Change of farming practice	1151 (61.3)	736 (49.1)	2.4444	0.1179

Concern about flooding or drought: Farmers from both Kapchwora and Oyam regions are most concerned about droughts compared to floods, 74.6% and 79.2% respectively. However, floods do occur in both regions. For example, about 300 ha of wheat (*Triticumaestivum* L.) was destroyed by a large flood in Kapchorwa in 2007 (MWE, 2010).

Table D1.11. Test for equality of proportions for concern about flooding or droughts

Concern about	Kapchorwa	Oyam	Chi-square value	P-value
Flood	461 (25.4)	283 (20.8)	0.3648	0.546
Drought	1357 (74.6)	1077 (79.2)	0.3648	0.546

Likelihood of flood/drought would occur: 68% of farmers from Oyam believe that flood or drought will occur in 1 out of every 2 years while 45.9% of farmers from Kapchorwa believe the same. No significant differences were observed for likelihood of flood/drought occurring in 1 out of 4 years, 1 out of 10 years, and 1 out of 50 years, respectively.

Table D1.12. Test for equality of proportions for the likelihood of flood/drought

Likelihood of flood/drought	Kapchorwa	Oyam	Chi-square value	p-value
1 out of every 2 years	835 (45.9)	831 (61.1)	3.939	0.047
1 out of every 4 years	607 (33.4)	382 (28.1)	0.377	0.539
1 out of every 5 years	393 (21.6)	118 (8.7)	5.497	0.019
1 out of every 10 years	59 (3.2)	29 (2.1)	0	1
1 out of every 50 years	17 (0.9)	1 (0.1)	0	1

Harvest times: The majority of farmers from Kapchorwa harvest their crops from September-December while majority of farmers from Oyam harvest their crops from July-December. Farmers in Oyam grow several crops with different maturity groups, compared to Kapchorwa regions where relatively fewer crops are grown and many qualify as cash crops (J. Matovu 2011, per. comm. 16 April).

Table D1.13. Test for equality of proportions for times of the year for harvesting

Time of the year for harvest	Kapchorwa	Oyam	Chi-square value	P-value
January – February	90 (4.9)	63 (4.6)	0	1
March – April	36 (1.9)	27 (1.9)	0	1
May – June	953 (52.4)	339 (24.9)	14.275	<0.0001
July – August	415 (22.8)	1063 (78.1)	60.5	<0.0001
September – October	1180 (64.9)	608 (44.7)	7.267	0.0070
November – December	925 (50.9)	812 (59.7)	1.482	0.2234

Noticed changes to environment: Table D1.14 shows numbers and percentages of farmers who indicated that they have noticed changes in environment. The largest percentages of farmers from both Kapchorwa (90.8%) and Oyam (87.4%) regions responded that they noticed changes in environment.

Table D1.14. Test for equality of proportions for changes to the environment

Noticed changes to environment	Kapchorwa	Oyam	Chi-square value	P-value
Yes	1651 (90.8)	1189 (87.4)	0.460	0.498
No	1345 (7.4)	106 (7.8)	0	1
Not sure	33 (1.8)	65 (4.8)	0.592	0.442

Crops grown: Seventy-nine percent of farmers from Kapchorwa farmers grow banana compared to only 20.4% of farmers from Oyam. Banana is staple food crop for the Sabiny tribe of Kapchorwa, and cassava and millet are stable food crops for the Acholi and Langi tribes who live in Oyam. This evidenced by the percentage of farmers who grow cassava in Kapchorwa (18.1%), and Oyam (87.3%). Beans (typical) is a staple food crop for grown by tribes in both regions. The percentage of farmers who grow beans (typical) grown in Kapchorwa is 58.2%, while 71.2% of farmers from beans Oyam grow beans. Crops such as wheat, barley, and Irish potatoes are mainly grown in Kapchorwa because they don't grow well in low elevations. Similarly, crops such as simsim, and sunflower only grow well in low elevations, and are mainly grown in Oyam region.

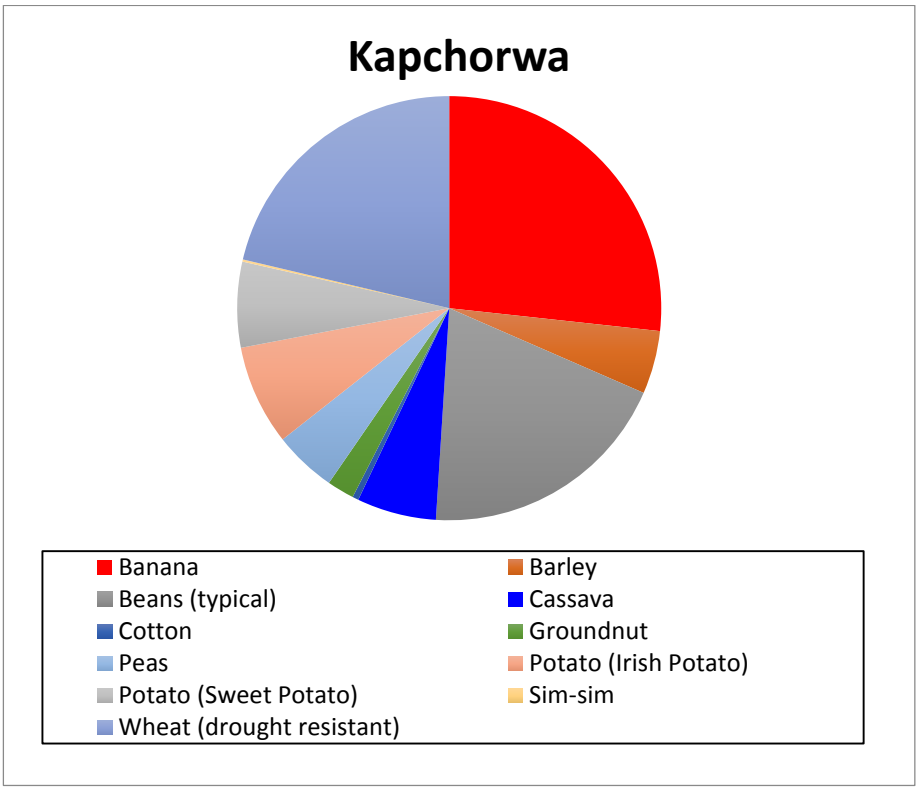


Figure D1.3a. Pie chart of type of crops grown: Kapchorwa region

Table D1.15. Test for equality of proportions for crops grown

Crops grown	Kapchorwa	Oyam	Chi-square value	p-value
Banana	1453 (79.9)	418 (30.7)	48.5051	<0.0001
Barley	262 (14.4)	46 (3.4)	5.8115	0.0159
Beans (typical)	1058 (58.2)	968 (71.2)	2.7919	0.0947
Beans (drought resistant or improved)	445 (24.5)	512 (37.7)	3.3966	0.0653
Bioengineered or Unimproved maize	440 (24.2)	514 (37.8)	3.3972	0.06522
Cassava	329 (18.1)	1187 (87.3)	92.7118	<0.0001
Cotton	25 (1.4)	608 (44.7)	52.2021	<0.0001
Groundnut	113 (6.2)	734 (54.0)	36.5067	<0.0001
Fruits (citrus fruits like lemons, limes, and oranges)	120 (6.6)	222 (16.3)	3.1442	0.0762
Fruits (soft fruits like mango, melon, or pineapple)	49 (2.7)	230 (16.9)	8.3745	0.0038
Peas	260 (14.3)	412 (30.3)	6.5559	0.0104
Potato (Irish Potato)	414 (22.8)	73 (5.4)	48.1935	<0.0001
Potato (Sweet Potato)	355 (19.5)	768 (56.5)	27.3678	<0.0001
Rice (highland or swamp)	46 (2.5)	44 (3.2)	0.1826	0.6691
Rice (lowland)	17 (0.9)	56 (4.1)	0.8205	0.365
Sim-sim	9 (0.5)	827 (60.8)	79.349	<0.0001

Soya (typical)	62 (3.4)	446 (32.8)	27.1515	<0.0001
Soya (improved)	147 (8.1)	302 (22.2)	6.6275	0.0100
Sunflower	42 (2.3)	505 (37.1)	37.2932	<0.0001
Wheat (typical)	147 (8.1)	42 (3.1)	1.5392	0.2147
Wheat (drought resistant)	1158 (63.7)	27 (2.0)	26.1317	<0.0001

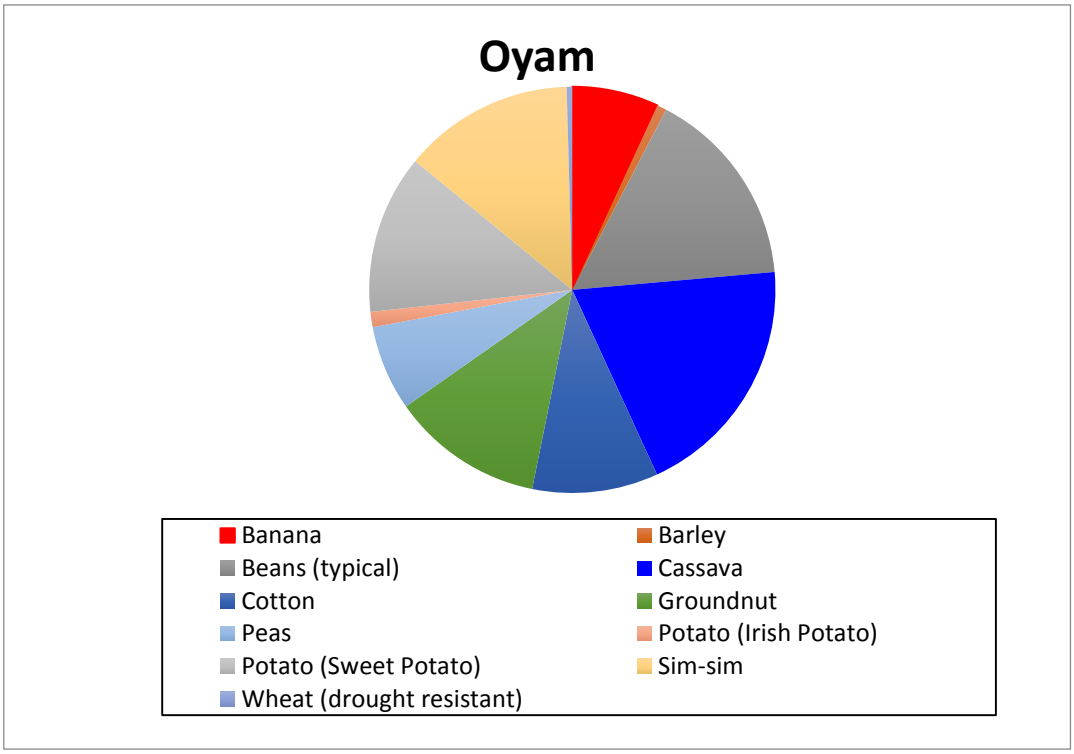


Figure D1.3b. Pie chart of type of crops grown by farmers: Oyam region

Appendix D2. Sample and population comparisons for large-N Uganda sample

This appendix presents analyses comparing attributes of the sub-samples from the Oyam and Kapchorwa regions to population-level data, as possible.

A note on population data publicly available for the populations in Oyam and Kapchorwa: The last population and housing census was conducted during 2014 in Uganda. Yet, only the provisional results from the census have been released, with no information on population for crops planted, household ownership, and many other factors on the regional level(UBOS, 2014).Other sources of information are available, such as the 2008/2009 Crop Census data, but they are not very accurate (M. Musheshe 2012, per. comm., 20 April). Population data from the 2002 Ugandan Population and Housing Census were used (UBOS, 2006).

Most of the information in the 2002 Census is presented in either percentages or proportions. Thus, z-tests were used to test whether a sample proportion differs significantly from a population proportion.

Population information on Education: Population information on proportions of school attendance of persons age six and above by district were obtained from The Uganda 2002 Population and Housing Census. The proportions for school attendance for primary, secondary, post-secondary, and those that never been to school were given for each district. In 2002, Oyam district was part of Apac district; therefore, information from Apac district was used to represent Oyam district (population: 683,993). Population proportions concerning education for Oyam/Apac, and Kapchorwa (population: 190,391) are presented in Tables D2.1 and D2.2.

Table D2.1. Population attending school: Kapchorwa and Oyam/Apac regions (2002)

Attended schools	Percent of population Kapchorwa	Percent of population Oyam/Apac
Yes	0.83	0.77
No	0.17	0.23

Table D2.2. Population by education levels in Kapchorwa and Oyam/Apac regions (2002)

Highest education levels	Population Kapchorwa	Population Oyam/Apac
No formal schooling	0.15	0.20
Nursery	*No info.*	*No info.*
Primary	0.55	0.61
Secondary (Level)	0.33	0.20
Tertiary, Certificate, or Trade School	*No info.*	*No info.*
Post-secondary (University or Higher Education)	0.03	0.02

Population information for property owned, crops grown, and animals reared: Population information on crops grown and animals reared in each district were obtained from The Uganda 2002 Population and Housing Census. As mentioned previously, Oyam was part of Apac district

in 2002. Population proportions on properties owned, crops grown, and animals reared for Oyam/Apac, and Kapchorwa are presented in Tables D2.3 and D2.4.

Table D2.3. Population household ownership: Kapchorwa and Oyam/Apac regions (2002)

Household own	Population Kapchorwa	Population Oyam/Apac
Bicycle	0.039	0.54
Radio	0.35	0.39
Mobile phone	*No info.*	*No info.*
Cow	0.65	0.10
Goat	0.42	0.31
Chicken	0.63	0.64
Pig	0.04	0.04
Vegetable garden	*No info.*	*No info.*
Water pump	*No info.*	*No info.*
Plough	*No info.*	*No info.*
None	*No info.*	*No info.*

Table D2.4. Population data for crops grown and animals reared: Kapchorwa and Oyam/Apac regions (2002)

Crops grown	Population Kapchorwa	Population Oyam/Apac
Banana	0.31	0.02
Barley	*No info.*	*No info.*
Beans (typical)	0.13	0.65
Beans (drought resistant or improved)	*No info.*	*No info.*
Bioengineered or Unimproved maize	0.76	0.12
Cassava	0.03	0.62
Cotton	*No info.*	*No info.*
Groundnut	0.02	0.08
Fruits (citrus) (e.g., lemons, limes, and oranges)	*No info.*	*No info.*
Fruits (soft) (e.g., mango, melon, or pineapple)	*No info.*	*No info.*
Peas	0.025	0.15
Potato (Irish Potato)	0.25	0.03
Potato (Sweet Potato)	0.07	0.11
Rice (highland or swamp)	0.0	0.04
Rice (lowland)	*No info.*	*No info.*
Sim-sim	0.03	0.17
Soya (typical)	0.0	0.11
Soya (improved)	*No info.*	*No info.*
Sunflower	*No info.*	*No info.*
Wheat (typical)	0.04	*No info.*
Wheat (drought resistant or improved)	0.07	*No info.*

The data obtained for farmers in Kapchorwa and Oyam in the large-N survey tool is used to compare against population-level data in the two regions.

There are four variables for which sample and population data were compared, drawn from the survey, as follows:

Q14: Did you attend school?
Q15: What was your highest level of education?
Q20: Which of the following does your household own?
Q135: Which crops do you grow?

These were the only variables for which there is relevant data from the 2002 Ugandan Population and Housing Census. Population proportions from the 2002 Census were compared with the sample proportions using Z-test statistics. The null hypothesis is that there is no difference between sample proportions and population proportions for the variables.
Sample means, standard deviations, and proportions for the four variables from Kapchorwa and Oyam are presented in Tables D2.5a-D2.8b.

The population proportions were compared with sample proportions using Z-test. A Z-test tests whether a sample proportion differs significantly from a population proportion. A test statistic Z is defined by the following equation:

$$Z = (\rho - \mathcal{P}) / \sigma$$

where $\mathcal{P}$ is the value of population proportion in the null hypothesis, ρ is the sample proportion, and σ is the standard deviation of the samples. R software (R version 3.1.2) was used to analysis the data.

School attendance: Tables D2.5a and D2.5b show Z-test results of school attendance for Kapchorwa. D2.6a and D2.6b show results of school attendance for Oyam. There were no significant differences between population and samples in both regions for school attendance. The results show that these samples are representative of the populations for both regions.

Table D2.5a. School attendance Z-test for population and sample proportions for Kapchorwa

	Sample s.d.	Sample proportion	Population proportion	Z-value	P-value
Attended some school	0.13	0.81	0.83	-0.0764	0.9382

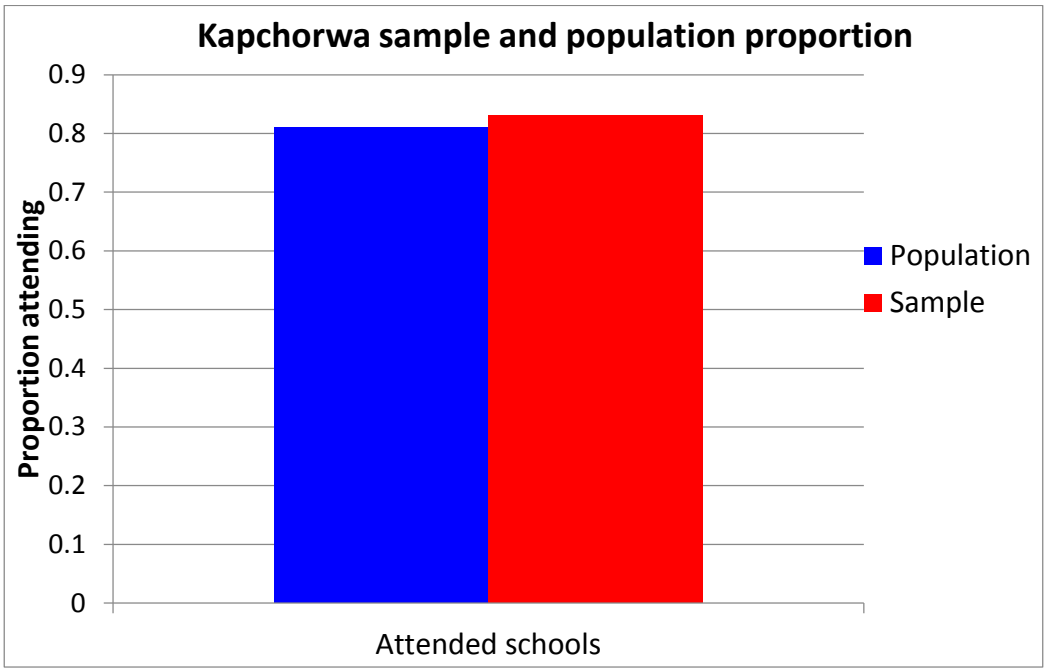


Figure D2.1a. Graph of sample and population for school attendance in Kapchorwa

Table D2.5b. School attendance Z-test for population and sample proportions: Oyam/Apac

	Sample s.d.	Sample proportions	Population proportions	Z-value	P-value
Attended some school	0.11	0.86	0.77	0.9090	0.3633

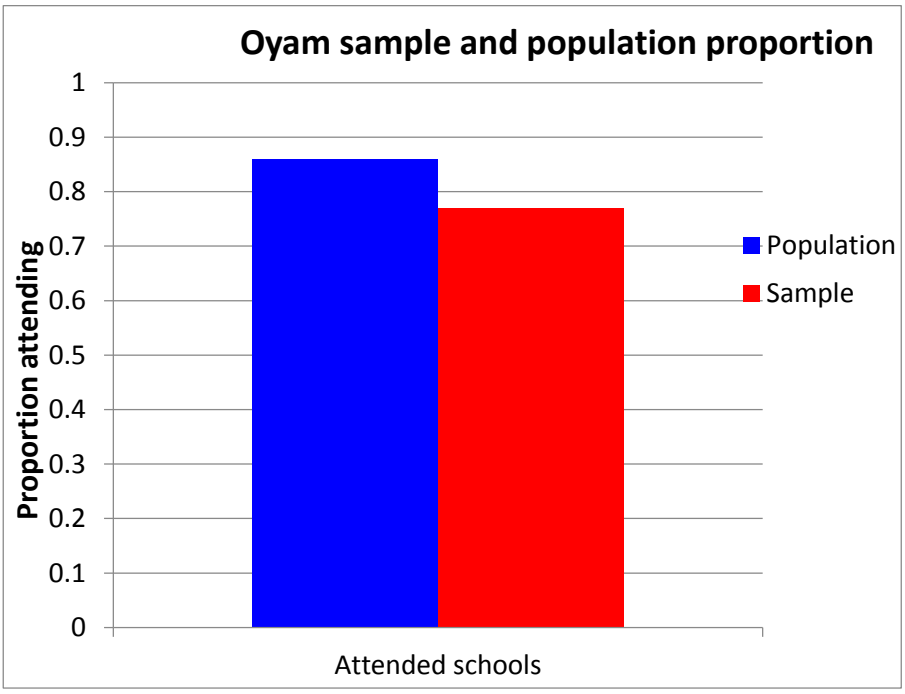


Figure D2.1b. Graph of sample and population for school attendance in Oyam

Levels of education: There were no significant differences between samples and populations for the highest levels of education for Oyam overall. For Kapchorwa there was a significant difference for the categories of "no formal education" and "post-secondary education." The levels of education for Kapchorwa and Oyam samples are compared against the population proportions in Tables D2.6a and D2.6b, respectively.

Table D2.6a.Highest education levels Z-test for population and sample proportions: Kapchorwa

Highest education levels	Sample s.d.	Sample proportions	Population proportions	Z-value	P-value
No formal schooling	0.01	0.2	0.15	5.000	<0.001
Nursery	0.13	0.16	*No info.*	*N/A*	*N/A*
Primary	0.12	0.39	0.55	-1.5333	0.125
Secondary (Level)	0.12	0.20	0.33	0.2666	0.689
Tertiary, Certificate, or Trade School	0.10	0.06	*No info.*	*N/A*	*N/A*
Post-secondary (University or Higher Education)	0.01	0.05	0.03	2.000	0.045

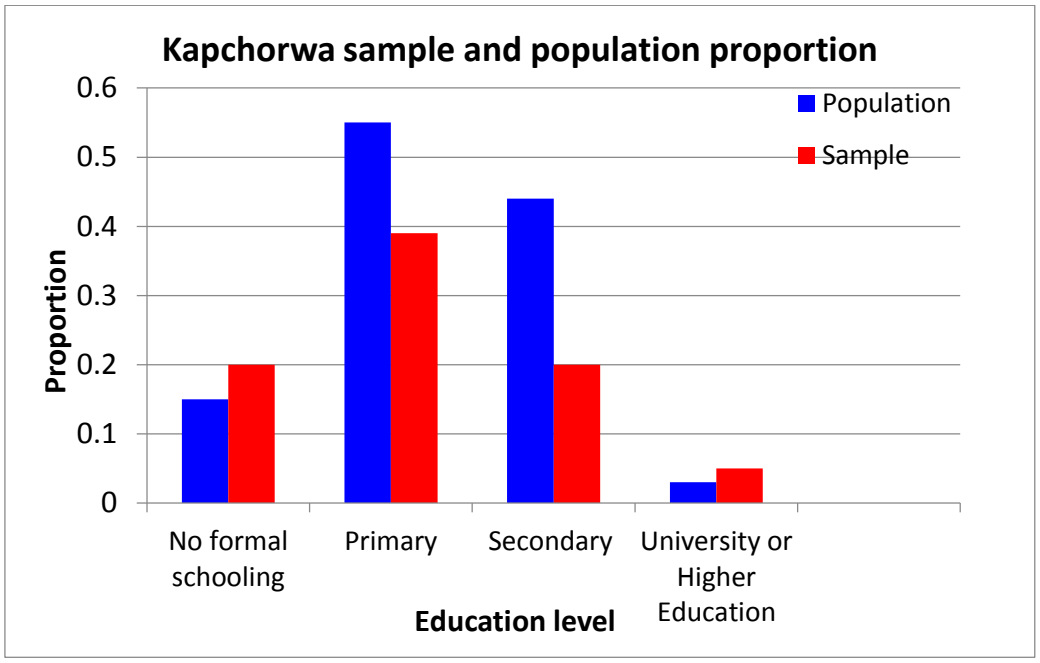


Figure D2.2a. Sample and population for levels of education: Kapchorwa

Table D2.6b. Highest education levels Z-test for population and sample proportions: Oyam/Apac

Highest education levels	Sample s.d.	Sample proportions	Population proportions	Z-value	P-value
No formal schooling	0.11	0.13	0.20	-0.64	0.52
Nursery	0.18	0.13	*No info.*	*N/A*	*N/A*
Primary	0.11	0.44	0.61	-0.17	0.87
Secondary (O and A level)	0.20	0.24	0.18	0.30	0.84
Tertiary, Certificate, or Trade School	0.01	0.03	*No info.*	*N/A*	*N/A*
Post-secondary (University or Higher Education)	0.01	0.02	0.02	0	1

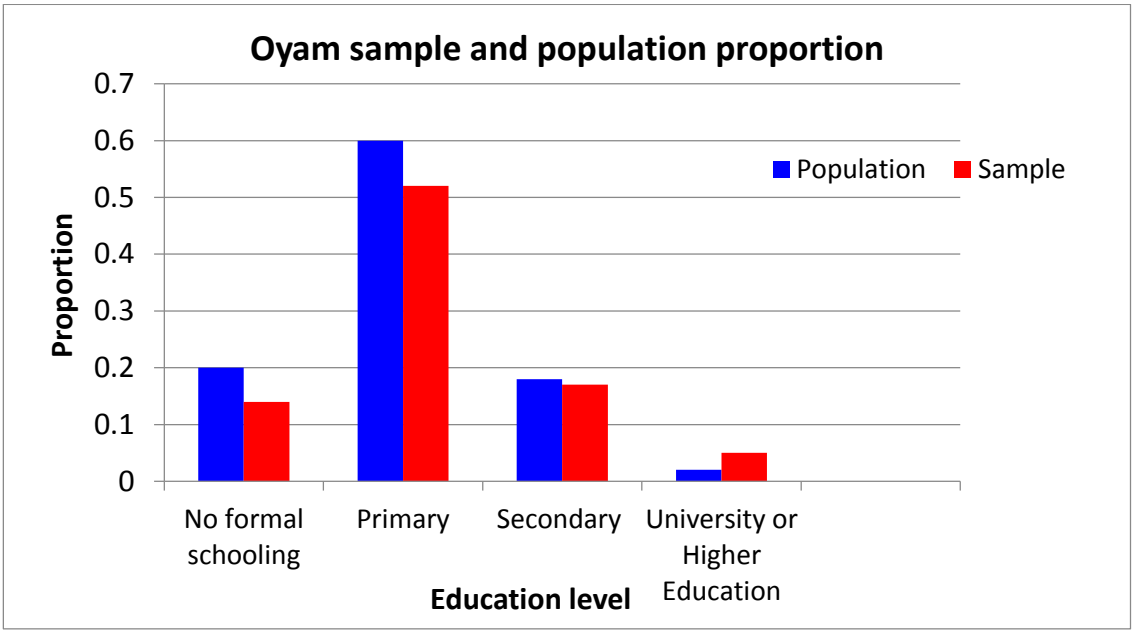


Figure D2.2b. Sample and population for levels of education: Oyam

Household ownership: No significant differences were observed for household ownership in the Kapchorwa region, except the proportions for ownership of radios and chickens. The proportion of radio is much higher in sample (0.80) compared to population (0.35). No significant differences for household own were observed for Oyam region, except for the proportions of radio and goat. Again the results show that the samples are representative of the populations of the two regions.

Table D2.7a. Household ownership Z-test for population and sample proportions: Kapchorwa

Household own	Sample Standard deviation	Sample proportions	Population proportions	Z-value	P-value
Bicycle	0.07	0.06	0.039	0.3	0.7641
Radio	0.11	0.80	0.35	4.0909	<0.0001
Mobile phone	0.14	0.53	*No info.*	*N/A*	*N/A*
Cow	0.10	0.78	0.65	1.3	0.6170
Goat	0.17	0.66	0.42	1.4117	0.9530
Chicken	0.11	0.89	0.63	2.4545	0.0141
Pig	0.09	0.08	0.04	0.4444	0.6567
Vegetable garden	0.13	0.44	*No info.*	*N/A*	*No info.*
Water pump	0.08	0.04	*No info.*	*N/A*	*No info.*
Plough	0.15	0.11	*No info.*	*N/A*	*No info.*
None	0.001	0.003	*No info.*	*N/A*	*No info.*

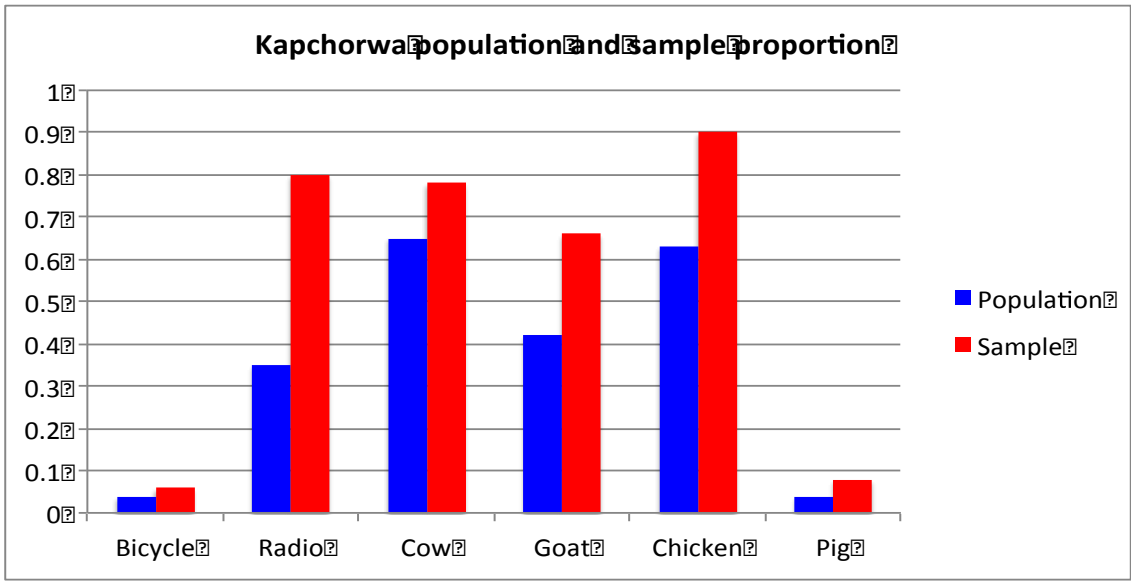


Figure D2.3a. Sample and population for household ownership: Kapchorwa

Table D2.7b. Household ownership Z-test for population and sample proportions: Oyam/Apac

Household own	Sample Standard deviation	Sample proportions	Population proportions	Z-value	P-value
Bicycle	0.14	0.83	0.54	2.0714	0.0383
Radio	0.15	0.81	0.39	2.8	0.0051
Mobile phone	0.13	0.53	*No info.*	*N/A*	*N/A*
Cow	0.16	0.49	0.10	2.4375	0.0148
Goat	0.11	0.72	0.31	0.4200	0.6744
Chicken	0.14	0.81	0.64	1.2142	0.2246
Pig	0.04	0.14	0.04	0.7142	0.4750
Vegetable garden	0.17	0.26	*No info.*	*N/A*	*N/A*
Water pump	0.13	0.01	*No info.*	*N/A*	*N/A*
Plough	0.14	0.17	*No info.*	*N/A*	*N/A*
None	0.30	0.02	*No info.*	*N/A*	*N/A*

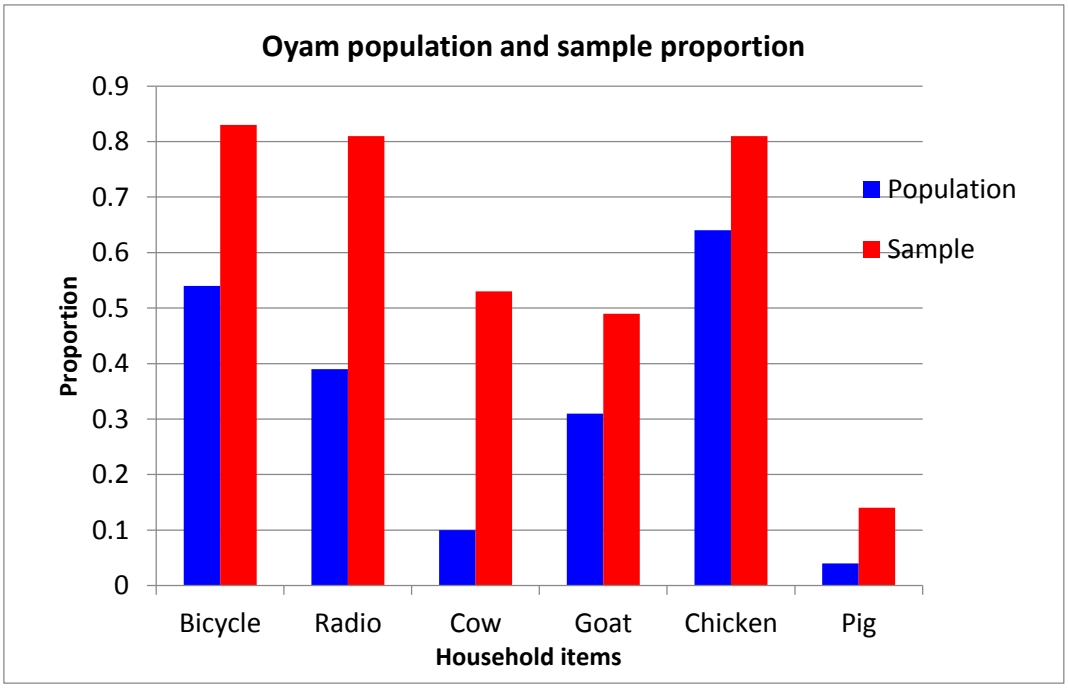


Figure D2.3b. Sample and population for household ownership: Oyam

Crops grown: Z-tests results for crops grown in Kapchorwa and Oyam are presented in Table D2.8a-b. No significant differences were observed for proportions of all crops in Kapchorwa, except for banana, beans (typical), groundnuts, maize, sim sim, and wheat. For Oyam, only the proportions of sweet potatoes, rice, and sim-sim were significantly different. Overall, the results show that the samples are representative of the populations.

Table D2.8a. Crops grown: Z-test for population and sample proportions: Kapchorwa

Crops grown	Sample Standard deviation	Sample proportions	Population proportions	Z-value	P-value
Banana	0.08	0.80	0.31	6.125	<0.0001
Barley	0.14	0.14	*No Info.*	*N/A*	*N/A*
Beans (typical)	0.20	0.71	0.13	2.9	0.0037
Beans (drought resistant or improved)	0.14	0.24	*No info.*	*N/A*	*N/A*
Bioengineered or Unimproved maize	0.13	0.24	0.76	-4	<0.0001
Cassava	0.01	0.02	0.03	-0.0666	0.9468
Cotton	0.14	0.01	*No info.*	*N/A*	*N/A*
Groundnut	0.01	0.07	0.02	-5	<0.0001
Fruits (citrus fruits like lemons, limes, and oranges)	0.13	0.02	*No info.*	*N/A*	*N/A*
Fruits (soft fruits like mango, melon, or pineapple)	0.11	0.06	*No info.*	*N/A*	*N/A*
Peas	0.11	0.14	0.025	-0.8214	0.4114
Potato (Irish Potato)	0.14	0.23	0.25	0.36	0.7188
Potato (Sweet Potato)	0.13	0.19	0.07	-0.6428	0.5203
Rice (highland or swamp)	0.12	0.02	0.0	0.1666	0.8676
Rice (lowland)	0.0	0.01	*No info.*	*N/A*	*N/A*
Sim-sim	0.11	0.05	0.03	0.1818	0.8557
Soya (typical)	0.0	0.03	0.0	0	*N/A*
Soya (improved)	0.11	0.07	*No info.*	*N/A*	*N/A*
Sunflower	0.12	0.08	*No info.*	*N/A*	*N/A*
Wheat (typical)	0.12	0.08	0.04	0.3333	0.8939
Wheat (drought resistant or improved)	0.14	0.63	0.07	4	<0.0001

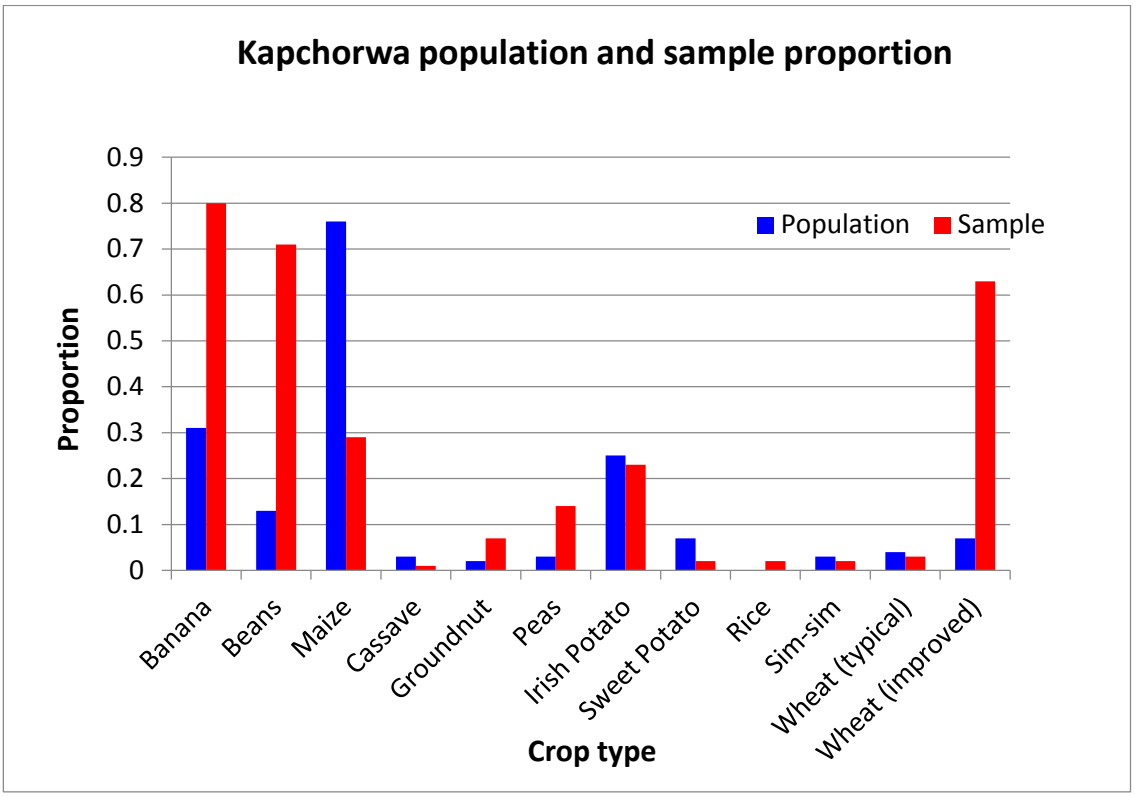


Figure D2.4a. Sample and population data for crops grown: Kapchorwa

Table D2.8b. Crops grown Z-test for population and sample proportions: Oyam/Apac

Crops grown	Sample Standard deviation	Sample proportions	Population proportions	Z-value	P-value
Banana	0.18	0.31	0.02	-1.6111	0.1071
Barley	0.12	0.03	*No info.*	*N/A*	*N/A*
Beans (typical)	0.16	0.71	0.65	0.375	0.7076
Beans (drought resistant or improved)	0.2	0.30	*No info.*	*N/A*	*N/A*
Bioengineered or Unimproved maize	0.21	0.24	0.12	0.5714	0.5677
Cassava	0.12	0.87	0.62	2.0833	0.0372
Cotton	0.21	0.44	*No info.*	*N/A*	*N/A*
Groundnut	0.16	0.54	0.08	2.875	0.004
Fruits (citrus) (e.g., lemons, limes, and oranges)	0.15	0.16	*No info.*	*N/A*	*N/A*
Fruits (soft) (e.g., mango, melon, or pineapple)	0.12	0.17	*No info.*	*N/A*	*N/A*
Peas	0.12	0.30	0.15	1.25	0.2112
Potato (Irish Potato)	0.01	0.05	0.03	-1	0.3173
Potato (Sweet Potato)	0.14	0.56	0.11	3.214	0.0013

Rice (highland or swamp)	0.01	0.03	0.04	-1	0.3173
Rice (lowland)	0.01	0.04	*No info.*	*N/A*	*N/A*
Sim-sim	0.12	0.61	0.17	3.6666	0.0002
Soya (typical)	0.13	0.32	0.11	-1.6153	0.1062
Soya (improved)	0.16	0.22	*No info.*	*N/A*	*N/A*
Sunflower	0.13	0.37	*No info.*	*N/A*	*N/A*
Wheat (typical)	0.15	0.03	*No info.*	*N/A*	*N/A*
Wheat (drought resistant or improved)	0.14	0.02	*No info.*	*N/A*	*N/A*

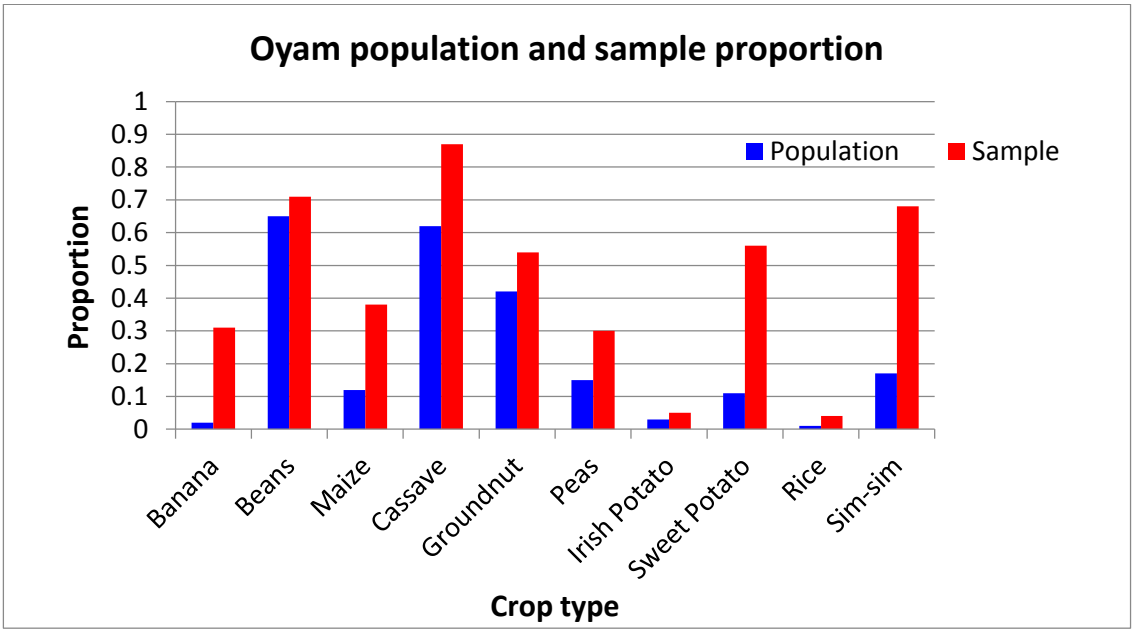


Figure D2.4b. Sample and population data for crops grown: Oyam

Appendix D3. Sample vs. population comparisons for Hurricane Sandy analysis

Table D3.1. Population affected by Hurricane Sandy from DE, NJ, NY, PA, RI, and CT

State	Population affected	2010 population census by state[2]	Proportion of population affected by sandy[3]
Delaware[4]	25,104	897,937	0.027
New Jersey[5]	437,309	8,791,894	0.049
New York[6]	821,030	19,378,102	0.042
Pennsylvania[7]	171,653	12,702,379	0.014
Rhode Island[8]	6,000	1,052,567	0.005
Connecticut[9]	57,000	3,574,097	0.015

Table D 3.2. Population with health, and home insurance (building/structure) from DE, NJ, NY, PA, RI, and CT

State	Population insurance	2010 population census for each state	Proportion with insurance
Health Insurance			
Delaware	766,000	897,937	0.853
New Jersey	7,309,000	8,791,894	0.831
New York	16,347,000	19,378,102	0.843
Pennsylvania	11,004,000	12,702,379	0.866
Rhode Island	918,234	1,052,567	0.877
Connecticut	3,212,454	3,574,097	0.911
Home insurance (building/structure)			
Delaware	26,274	897,937	0.029
New Jersey	239,830	8,791,894	0.027
New York	195,144	19,378,102	0.011
Pennsylvania	68,936	12,702,379	0.005
Rhode Island	15,815	1,052,567	0.015
Connecticut	42,393	3,574,097	0.012

[2]USCB, (2010)
[3]Marketsmith(2012)
[4]FEMA(2012a)
[5]FEMA(2012b)
[6]FEMA(2012c)
[7]FEMA(2012d)
[8]FEMA, (2012e)
[9]FEMA(2012f)

Table D3.3. Percentage of population completed education from DE, NJ, NY, PA, RI, and CT

Level of education attained	DE	NJ	NY	PA	RI	CT
High school graduate (incl. equivalency)	31.4	29.4	27.3	32.8	28.2	28.6
Some college credit, less than 1 year	6.9	6.1	5.6	6.4	7.2	7.2
1 or more years of college, no degree	12.6	11.5	11.2	11.8	10.5	17.3
Associate degree	6.6	5.3	8.0	7.3	7.6	7.3
Bachelor's degree	15.6	18.8	15.6	16.3	18.8	19.9
Master's degree	6.2	7.3	8.0	7.8	7.8	8.4
Professional degree	1.7	2.5	2.7	2.1	2.3	4.3
Doctorate degree	1.5	1.2	1.1	1.0	1.2	2.0

Source: USCB(2013)

Table D 3.4. Population percent for relationship status from DE, NJ, NY, PA, RI, and CT

Relationship	DE	NJ	NY	PA	RI	CT
Single	35.2	32.3	36.3	31.5	31.2	34.2
Married	52.3	50.8	46.4	50.3	44.3	53.4
Separated	1.8	2.0	2.8	2.2	1.5	1.1
Widowed	3.0	6.0	6.2	7.3	3.0	2.7
Divorced	9.7	8.1	8.2	8.3	11.8	8.5

Source USCB(2013)

Table D3.5. Population median household income for DE, NJ, NY, PA, RI, and CT

State	Median Household Income (USD)
Connecticut	64,461
Delaware	59,878
New Jersey	69,811
New York	51,617
Pennsylvania	52,548
Rhode Island	54,902

Source: USCB(2013)

Table D3.6. Information on sample variables: CT

	Connecticut (n=39)	
Variables	**Frequency**	**Proportions**
Do you live in an area that was affected by storm "Sandy"	Yes: 8	Yes: 0.25
	No: 31	No: 0.75
Apart from storm Sandy, have you ever experienced flooding in the area where you live?	No other flood: 17	No other flood: 0.43
	Household flood: 8	Household flood: 0.21
	River flood: 6	River flood: 0.15
	Drain flood: 8	Drain flood: 0.21
	Sea water flood: 3	Sea water flood: 0.07
Do you have insurance?	Health insurance	Health insurance
	Yes: 37	Yes: 0.97
	No: 3	No: 0.03
	Insurance home (building/structure)	Insurance home (building/structure)
	Yes: 11	Yes: 0.38
	No: 18	No: 0.62
Estimated damage to home's structure as a percentage of home value	0: 0	0: 0.72
	1 to 100: 0	1 to 100: 0
Estimated value of your primary dwelling in the US OR monthly rent	Value own mean: 382,783	N/A
	Value rent mean: 790	N/A
What is your relationship status?	Single: 11	Single: 0.28
	Married: 18	Married: 0.46
	Widowed: 1	Widowed: 0.02
	Divorce: 5	Divorce: 0.13
	Civil union: 2	Civil union: 0.05
	Domestic partner: 2	Domestic partner: 0.05
What is your highest completed education?	High school graduate and equivalency: 6	High school graduate and equivalency: 0.15
	Associate degree and diploma: 3	Associate degree and diploma: 0.07

	Bachelor: 7	Bachelor: 0.18
	Masters: 7	Masters: 0.18
	PhD, MD, JD and other advanced degrees: 3	PhD, MD, JD and other advanced degrees: 0.07
Dwelling type?	Owner occupied: 22	Owner occupied: 0.56
	Renter occupied 17	Renter occupied: 0.44
Estimated damage to home's structure as a percentage of home		
	0: 28	0: 0.72
	1-100: 11	1:100: 0.28

Table D 3.7. Information on sample variables: DE

	Delaware (n=61)	
Variables	**Number**	**Proportions**
Do you live in an area that was affected by storm "Sandy"	Yes: 20	Yes: 0.32
	No: 41	No: 0.68
Apart from storm Sandy, have you ever experienced flooding in the area where you live?	No other flood: 32	No other flood: 0.52
	House hold flood: 14	House hold flood: 0.23
	River flood: 4	River flood: 0.07
	Drain flood: 4	Drain flood: 0.07
	Sea water flood: 5	Sea water flood: 0.08
Do you have insurance?	Health insurance	Health insurance
	Yes: 51	Yes: 0.82
	No: 10	No: 0.18
	Insurance home (building/structure)	Insurance home (building/structure)
	Yes: 6	Yes: 0.09
	No: 55	No: 0.91
Estimated damage to home's structure as a percentage of home value	0: 50	0: 0.82
	1 to 100: 10	1 to 100: 0.18
Estimated value of your primary dwelling in the US OR monthly rent	Value own mean: 183,846	Not applicable
	Value rent mean: 815	Not applicable
What is your relationship status?	Single: 18	Single: 0.29
	Married: 25	Married: 0.41
	Widowed: 3	Widowed: 0.05
	Divorce: 8	Divorce: 0.13
	Civil union: 0	Civil union: 0
	Domestic partner: 7	Domestic partner: 0.11
What is your highest completed education?	High school graduate and equivalency: 29	High school graduate and equivalency: 0.48

	Associate degree and diploma: 17	Associate degree and diploma: 0.28
	Bachelor: 11	Bachelor: 0.18
	Masters: 3	Masters: 0.05
	PhD, MD, JD and other advanced degrees: 1	PhD, MD, JD and other advanced degrees: 0.02
Dwelling type?	Owner occupied: 39	Owner occupied: 0.64
	Renter occupied 22	Renter occupied: 0.36
Estimated damage to home's structure as a percentage of home		
	0: 16	0: 0.26
	1-100: 45	1:100: 0.74

Table D 3.8. Information on sample variables: NJ

	New Jersey (n=248)	
Variables	**Number**	**Proportions**
Do you live in an area that was affected by storm "Sandy"	Yes: 227	Yes: 0.92
	No: 21	No: 0.08
Apart from storm Sandy, have you ever experienced flooding in the area where you live?	No other flood: 110	No other flood: 0.48
	House hold flood: 68	House hold flood: 0.27
	River flood: 47	River flood: 0.19
	Drain flood: 12	Drain flood: 0.05
	Sea water flood: 10	Sea water flood: 0.04
Do you have insurance?	Health insurance	Health insurance
	Yes: 219	Yes: 0.88
	No: 29	No: 0.12
	Insurance home (building/structure)	Insurance home (building/structure)
	Yes: 69	Yes: 0.28
	No: 179	No: 0.72
Estimated damage to home's structure as a percentage of home value	0: 158	0: 0.63
	1 to 100: 90	1 to 100: 0.36
Estimated value of your primary dwelling in the US OR monthly rent	Value own mean: 507,218	Not applicable
	Value rent mean: 1,307	Not applicable
What is your relationship status?	Single: 83	Single: 0.33
	Married: 133	Married: 0.54
	Widowed: 7	Widowed: 0.03
	Divorce: 12	Divorce: 0.05
	Civil union: 1	Civil union: 0.004
	Domestic partner: 12	Domestic partner: 0.05
What is your highest completed education?	High school graduate and equivalency: 69	High school graduate and equivalency: 0.27

	Associate degree and diploma: 39	Associate degree and diploma: 0.15
	Bachelor: 102	Bachelor: 0.41
	Masters: 33	Masters: 0.13
	PhD, MD, JD and other advanced degrees: 5	PhD, MD, JD and other advanced degrees: 0.02
Dwelling type?	Owner occupied: 172	Owner occupied: 0.69
	Renter occupied 76	Renter occupied: 0.31
Estimated damage to home's structure as a percentage of home		
	0: 158	0: 0.63
	1-100: 90	1:100: 0.37

Table D 3.9. Information on sample variables: NY

	New York (n=196)	
Variables	**Number**	**Proportions**
Do you live in an area that was affected by storm "Sandy"	Yes: 8	Yes: 0.4
	No: 188	No: 0.96
Apart from storm Sandy, have you ever experienced flooding in the area where you live?	No other flood: 99	No other flood: 0.51
	House hold flood: 42	House hold flood: 0.21
	River flood: 23	River flood: 0.11
	Drain flood: 50	Drain flood: 0.25
	Sea water flood: 24	Sea water flood: 0.12
Do you have insurance?	Health insurance	Health insurance
	Yes: 173	Yes: 0.88
	No: 23	No: 0.12
	Insurance home (building/structure)	Insurance home (building/structure)
	Yes: 54	Yes: 0.27
	No: 142	No: 0.73
Estimated damage to home's structure as a percentage of home value	0: 117	0: 0.59
	1 to 100: 79	1 to 100: 0.41
Estimated value of your primary dwelling in the US OR monthly rent	Value own mean: 507,216	Not applicable
	Value rent mean: 1,307	Not applicable
What is your relationship status?	Single: 83	Single: 0.42
	Married: 80	Married: 0.40
	Widowed: 5	Widowed: 0.03
	Divorce: 17	Divorce: 0.09
	Civil union: 0	Civil union: 0
	Domestic partner: 11	Domestic partner: 0.06
What is your highest completed education?	High school graduate and equivalency: 46	High school graduate and equivalency: 0.26

	Associate degree and diploma: 40	Associate degree and diploma: 0.20
	Bachelor: 73	Bachelor: 0.37
	Masters: 29	Masters: 0.15
	PhD, MD, JD and other advanced degrees: 8	PhD, MD, JD and other advanced degrees: 0.04
Dwelling type?	Owner occupied: 128	Owner occupied: 0.63
	Renter occupied 68	Renter occupied: 0.37
Estimated damage to home's structure as a percentage of home		
	0: 7	0: 0.4
	1-100: 189	1:100: 0.96

Table D 3.10. Information on sample variables: PA

	Pennsylvania (n=251)	
Variables	**Number**	**Proportions**
Do you live in an area that was affected by storm "Sandy"	Yes: 83	Yes: 0.33
	No: 168	No: 0.67
Apart from storm Sandy, have you ever experienced flooding in the area where you live?	No other flood: 101	No other flood: 40
	House hold flood: 83	House hold flood: 0.33
	River flood: 48	River flood: 0.19
	Drain flood: 77	Drain flood: 0.30
	Sea water flood: 8	Sea water flood: 0.03
Do you have insurance?	Health insurance	Health insurance
	Yes: 219	Yes: 0.87
	No: 32	No: 0.13
	Insurance home (building/structure)	Insurance home (building/structure)
	Yes: 57	Yes: 0.87
	No: 194	No: 0.13
Estimated damage to home's structure as a percentage of home value	0: 178	0: 0.71
	1 to 100: 73	1 to 100: 0.29
Estimated value of your primary dwelling in the US OR monthly rent	Value own mean: 269,999	Not applicable
	Value rent mean: 1074	Not applicable
What is your relationship status?	Single: 102	Single: 0.40
	Married: 103	Married: 0.41
	Widowed: 4	Widowed: 0.02
	Divorce: 25	Divorce: 0.1
	Civil union: 2	Civil union: 0.007
	Domestic partner: 15	Domestic partner: 0.06
What is your highest completed education?	High school graduate and equivalency: 89	High school graduate and equivalency: 0.35

	Associate degree and diploma: 44	Associate degree and diploma: 0.18
	Bachelor: 74	Bachelor: 0.29
	Masters: 34	Masters: 0.13
	PhD, MD, JD and other advanced degrees: 14	PhD, MD, JD and other advanced degrees: 0.06
Dwelling type?	Owner occupied: 180	Owner occupied: 0.72
	Renter occupied 71	Renter occupied: 0.28
Estimated damage to home's structure as a percentage of home	0: 178	0: 0.71
	1-100: 78	1:100: 0.29

Table D 3.11. Information on sample variables: RI

	Rhode Island (n=5)	
Variables	**Number**	**Proportions**
Do you live in an area that was affected by storm "Sandy"	Yes: 0	Yes: 0
	No: 5	No: 1
Apart from storm Sandy, have you ever experienced flooding in the area where you live?	No other flood: 2	No other flood: 0.4
	House hold flood: 2	House hold flood: 0.4
	River flood: 1	River flood: 0.2
	Drain flood: 2	Drain flood: 0.4
	Sea water flood: 1	Sea water flood: 0.2
Do you have insurance?	Health insurance	Health insurance
	Yes: 0	Yes: 0
	No: 5	No: 1
	Insurance home (building/structure)	Insurance home (building/structure)
	Yes: 0	Yes: 0.
	No: 5	No: 1
Estimated damage to home's structure as a percentage of home value	0: 0	0: 0
	1 to 100: 0	1 to 100: 0
Estimated value of your primary dwelling in the US OR monthly rent	Value own mean: 432,500	Not applicable
	Value rent mean: Not applicable	Not applicable
What is your relationship status?	Single: 2	Single: 0.40
	Married: 3	Married: 0.6
	Widowed: 0	Widowed: 0
	Divorce: 0	Divorce: 0
	Civil union: 0	Civil union: 0
	Domestic partner: 0	Domestic partner: 0
What is your highest completed education?	High school graduate and equivalency: 2	High school graduate and equivalency: 0.4

	Associate degree and diploma: 1	Associate degree and diploma: 0.2
	Bachelor: 2	Bachelor: 0.4
	Masters: 0	Masters: 0
	PhD, MD, JD and other advanced degrees: 0	PhD, MD, JD and other advanced degrees: 0
Dwelling type?	Owner occupied: 4	Owner occupied: 0.8
	Renter occupied 1	Renter occupied: 0.2
Estimated damage to home's structure as a percentage of home	0: 0	0: 0
	1-100: 0	1:100: 0

Statistical Analysis: Samples from DE, NJ, NY, PA, RI, and CT were combined to form a total sample across various factors. Total population proportions were compared with total sample proportions using Z-test. A Z-test assesses whether a sample proportion differs significantly from a population proportion. A test statistic Z is defined equation 1, below.

$$Z = (\rho - \mathcal{P}) / \sigma$$

where$\mathcal{P}$ is the value of population proportion in the null hypothesis, ρ is the sample proportion, and σ is the standard deviation of the samples.

Similarly, population mean for the estimated value of primary dwelling in the U.S.A. or monthly rent was compared to sample using Z-test represented in equation 2, below. R software (R version 3.1.2) was use to analysis the data.

$$Z = (u - U) / \sigma$$

where U is the value of population mean in the null hypothesis, u is the sample mean, and σ is the standard deviation of the samples.

Table D 3.12. Details for “total population” obtained by combining state population data

Variable	**Total Population**	**2010 population from all six states**	**Proportions**
Sandy			
Affected by Sandy	1,518,096	46,396,976	0.032
Insurance			
Health Insurance	39,556,688	46,396,976	0.852
Home insurance	588,392	46,396,976	0.012
Dwelling			
Home value avg.	256,617	46,396,976	*N/A*
Rent (average)	1,161	46,396,976	*N/A*
Education		46,396,976	
High school graduate (incl. equivalency)	13,455,123	46,396,976	0.29
Some college credit, less than 1 year	3,015,803	46,396,976	0.065
1 or more years of college, no degree	5,567,637	46,396,976	0.12
Associate degree	3,247,788	46,396,976	0.07
Bachelor's degree	8,119,471	46,396,976	0.175
Master's degree	3,711,758	46,396,976	0.08
Professional degree	1,391,909	46,396,976	0.03
Doctorate degree	463,970	46,396,976	0.01
Relationship			
Single	15,311,002	46,396,976	0.33
Married	22,734,518	46,396,976	0.49
Separated	1,391,909	46,396,976	0.03
Widowed	2,783,819	46,396,976	0.06
Divorced	4,175,728	46,396,976	0.09
Home Ownership			
Owner occupied	29,230,095	46,396,976	0.63
Renter occupied	17,166,881	46,396,976	0.37
Income		46,396,976	
Median	58,870	46,396,976	N/A

Table D 3.13. Details for total sample obtained by combining state sample data

Variable	**Total Population**	**2010 population from all six states**	**Proportions**
Sandy			
Affected by Sandy	300	800	0.625
Insurance			
Health Insurance	698	800	0.87
Home insurance	198	800	0.25
Dwelling			
Home value (average)	354,946.45	800	*N/A*
Rent (average)	1,371.47	800	*N/A*
Education			
High school graduate (incl. equivalency)	245	800	0.310
Some college credit, less than 1 year	40	800	0.050
1 or more years of college, no degree	60	800	0.075
Associate degree	50	800	0.065
Bachelor's degree	271	800	0.330
Master's degree	106	800	0.130
Professional degree	14	800	0.010
Doctorate degree	14	800	0.010
Relationship			
Single	301	800	0.370
Married	362	800	0.460
Separated	24	800	0.030
Widowed	66	800	0.080
Divorced	47	800	0.060
Home Ownership			
Owner occupied	546	800	0.680
Renter occupied	254	800	0.320
Income			
Median	*N/A*	800	*N/A*

Table D 3.14. Z-test for total sample and population proportions

	Sample s.d.	Sample proportion	Population proportion	Z-value	P-value
Households affected by Sandy	0.38	300 (0.625)	1,518,096 (0.032)	0.394	0.6969

Insurance: No significant difference was observed between total populations and samples for the proportions holding health insurance. Similarly, no significant difference was observed for the home insurance (building/structure) proportions between total populations and samples for the states. The majority of people have health insurance in all six states (85% at total population level, and 87 at total sample level). However, less than 30% of the total sample has home flood insurance for building/structure.

Table D 3.15. Z-tests for total sample and population proportions for insurance coverage

Health coverage	Sample s.d.	Sample proportion	Population proportion	Z-value	P-value
Health insurance	0.33	698 (0.87)	3, 556,688 (0.85)	0.0606	0.9516
Home insurance	0.43	198 (0.25)	588,392 (0.012)	0.5534	0.5799

Table D 3.16. Z-test for total sample and population mean estimated value of primary dwelling

Dwelling	Sample s.d.	Sample proportion	Population proportion	Z-value	P-value
Home value	417,337.96	354,946.45	256,617	0.2356	0.8137
Rent	3,990.90	1,371.47	1,161	0.0527	0.9579

Table D 3.17. Z-tests for total sample and population proportions for levels of education

Education	Sample s.d.	Sample proportions	Population proportions	Z-value	P-value
High school graduate (incl. equivalency)	0.41	245 (0.36)	13,455,123 (0.29)	0.1707	0.8644
Associate degree	0.40	100 (0.18)	3,247,788 (0.14)	0.100	0.9203
Bachelor's degree	0.42	271 (0.29)	8,119,471 (0.18)	0.2619	0.7933
Master's degree	0.34	106 (0.13)	3,711,758 (0.08)	0.14705	0.8830
Professional degree, PhD	0.23	28 (0.06)	1,391,909 (0.04)	0.0869	0.9307

Table D 3.18. Z-tests for total sample and population proportions for relationships

Relationship status	Sample s.d.	Sample proportions	Population proportions	Z-value	P-value
Single	0.48	301 (0.37)	15,311,002 (0.33)	0.0833	0.9335
Married-	0.48	362 (0.46)	22,734,518 (0.49)	-0.062	0.9501
Separated	0.17	24 (0.03)	1,391,909 (0.03)	0	1
Widowed	0.21	66 (0.05)	2,783,819 (0.06)	-0.046	0.9620
Divorced	0.23	47 (0.06)	4,175,728 (0.09)	-0.0130	0.8962

Table D 3.19. Z-test for total sample and population for dwelling

	Sample s.d.	Sample proportions	Population proportions	Z-value	P-value
Owner occupied	0.48	546 (0.68)	29,230,095 (0.63)	0.104	0.9834
Renter occupied	0.46	254 (0.32)	17,161,881 (0.37)	-0.108	0.9106

Table D 3.20. Z-test for total sample and population for household income

	Sample standard deviation	Sample proportions	Population proportions	Z-value	P-value
Income	62,950	80,000	58,870	0.3357	0.7370

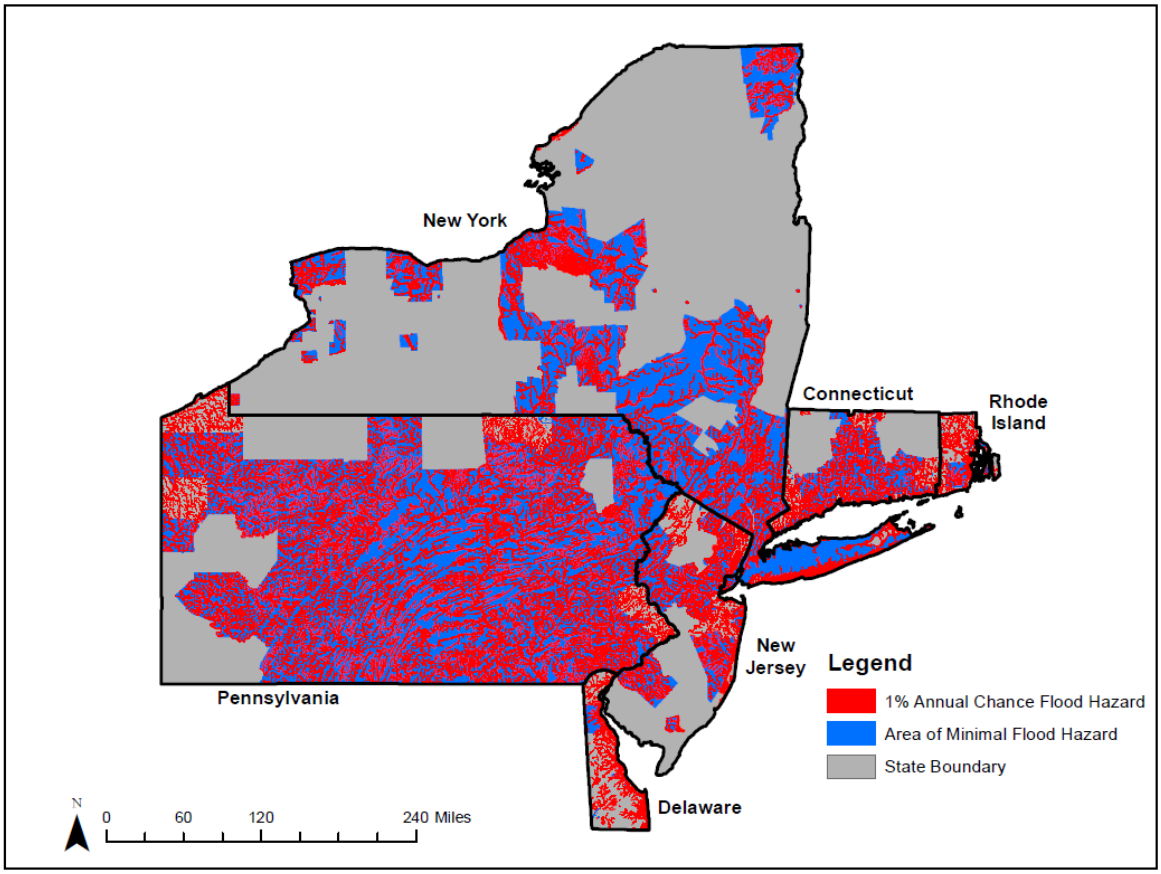


Figure D3.1. FEMA NFHL maximum (1% annual chance) and minimum flood probability in the study states[10]

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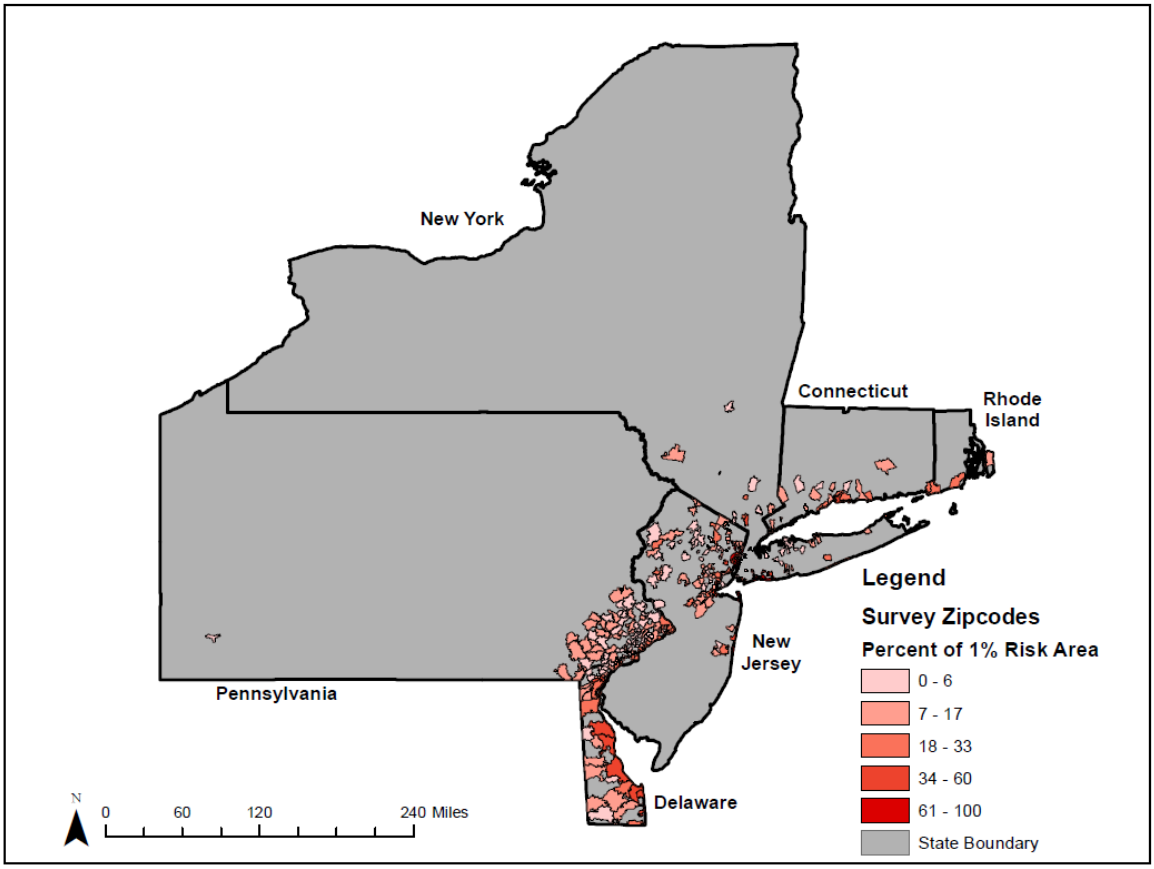

Figure D3.2. Percent of houses (in ZIP codes surveyed) situated in a 1% annual probability of flood (i.e., maximum level in the NFHL)[11]

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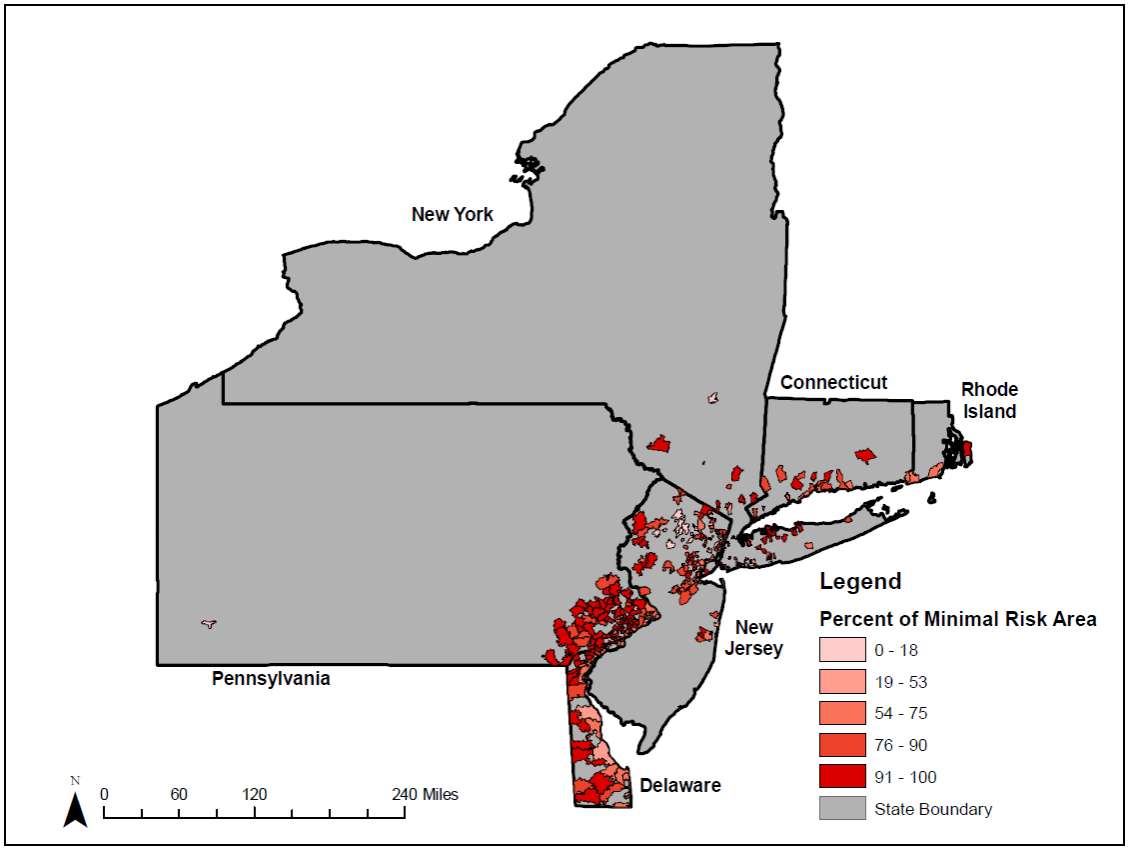

Figure D3.3. Percent of houses in ZIP codes surveyed situated in a minimal probability of flood area (according to the NFHL) [12]

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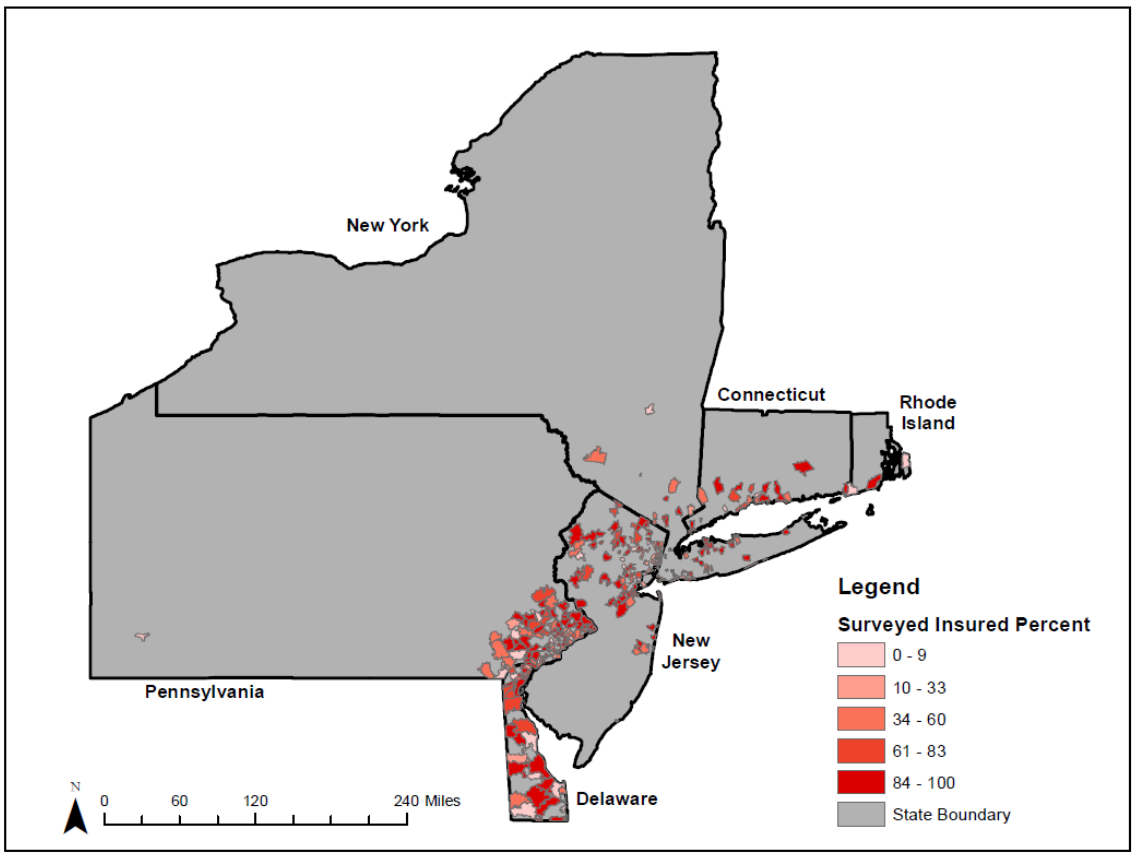

Figure D3.4. Percent of households enrolled in home flood insurance in surveyed ZIP codes ahead of Hurricane Sandy[13]

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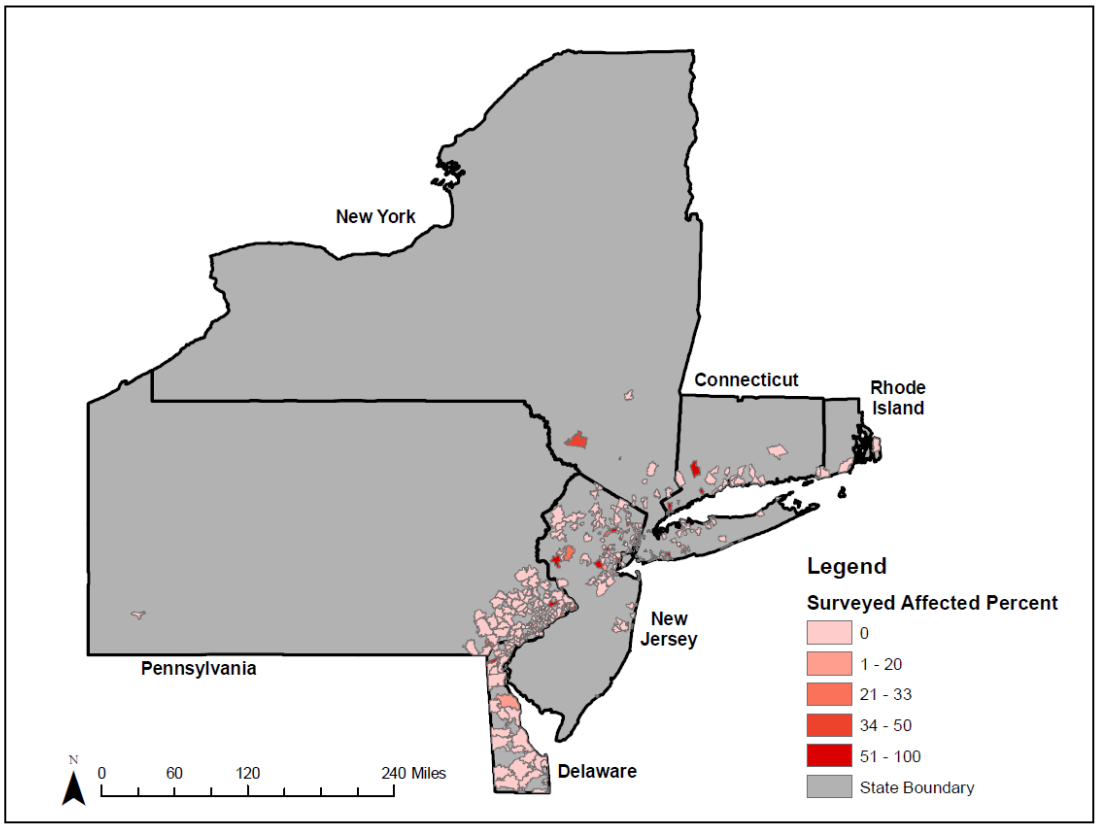

Figure D3.5 Percent of sampled households affected by Hurricane Sandy by ZIP code[14]

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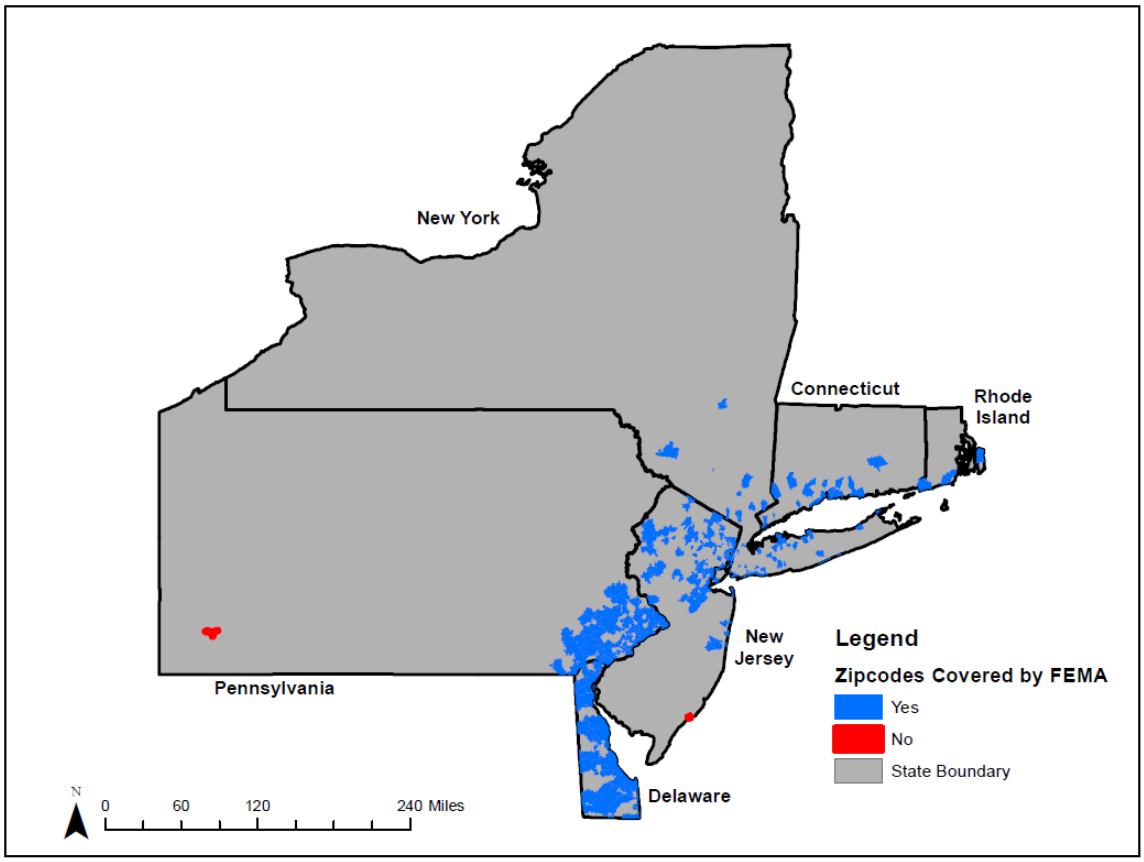

Figure D3.6 FEMA coverage of ZIP codes contained sampled households[15]

FEMA Flood Hazard is administered by FEMA Panels mapping using FIRM data. Note that FIRM data is directly accessible in ArcGIS© more information is here: http://www.fema.gov/flood-insurance-rate-map-firm#. Accessed 1 November 2015.

Note that in the Hurricane Sandy survey we ask respondents to indicate whether or not they had received FEMA assistance and if they planned to follow-up with this effort. Given that the survey took place temporally close to Sandy few respondents (less than 10%) indicated that they had formally obtained payments from FEMA or indications that payments would be forthcoming. In the open comments of the survey a number of individuals complained about FEMA responsiveness. The correlation between those indicating frustration with FEMA and those uninsured ahead of Hurricane Sandy was relatively strong and significant (corr.=0.58, P<0.05). This factor did not enter into our analysis much as it was: 1. based on a relatively small percentage of respondents; 2. Was analysed from responses to an informal, open question (e.g., the question did not focus respondents on FEMA specifically); 3. It introduces collinearity with some variables of greater importance to the analysis.

[15] *Map created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved.*

Appendix E1. TAMSAT rainfall data analysis

Note that the historical mean monthly rainfall for Kapchorwa and Oyam, Uganda (Tables E.1-2) was obtained using the World Bank Climate Change Knowledge Portal for Uganda (World Bank, 2015).The dataset used in the Knowledge Portal was produced by the Climatic Research Unit (CRU) of the University of East Anglia (UEA).

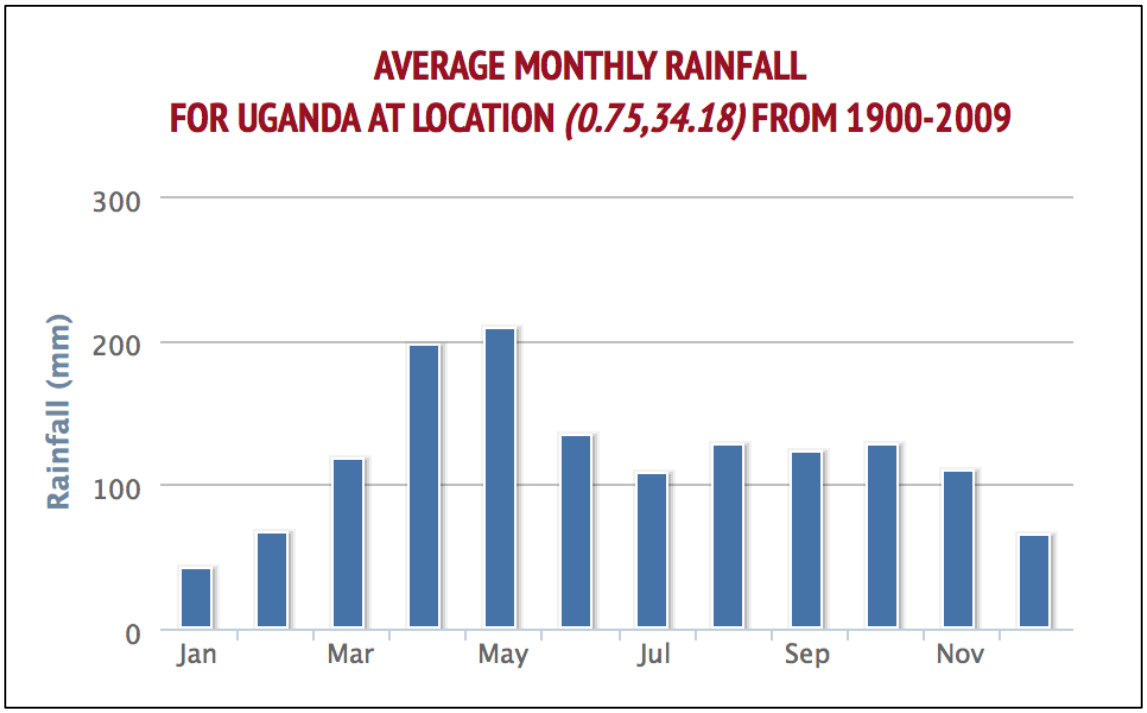

Figure E1.1. Average rainfall in Kapchorwa per month from 1900-2009

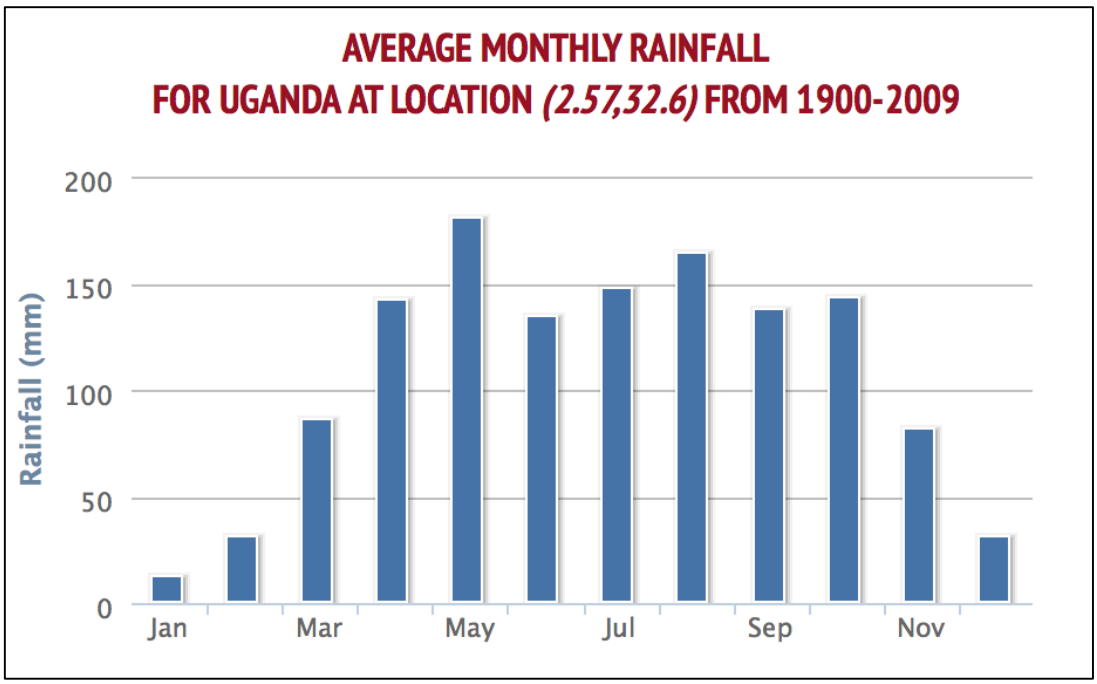

Figure E1.2. Average rainfall in Oyam per month from 1900-2009

Comparison of TAMSAT rainfall data with survey response data: Details of this process are given in Chapter 3. In summary, households were grouped based on the areas of 10 kmX10km. Farmers from Kapchorwa were separated into five such groups, and farmers from Oyam were separated into six groups. The dataset was broken-down by of perceived frequency of flood/drought that would destroy the farmer's entire group by area grouping, using GIS data from the large-N survey tool. TARCAT data available from TAMSAT was downloaded.

In order to compare rainfall information from TAMSAT with the responses from the survey data, decadal rainfall data from 2009, 2007, 2006, 2005, 2003, and 2001 was downloaded from the TAMSAT database. Rainfall data from 2009, 2007, 2005, and 2003 provide information on rainfall data of every 2 years starting from 2011. Similarly rainfall information from 2007 and 2003 provide information of rainfall data for every 4 years starting from 2011. Rainfall data from 2006 and 2001 provide information for every five years starting from 2011; and rainfall data of 2001 provide information on 10 years from 2011.

Multiple regression analysis was conducted to find evidence of association between decadel rainfall data (independent variables) and survey response data (dependent variable).

The regression coefficients (betas) and the p-values of regressing rainfall data in decadel to responses for Kapchorwa and Oyam regions are presented in Table E1.1. The F-statics for both regions were significant at p-values of 0.05; which implies that the regression models were significant. The t-statistics decadel 1 was significant for both regions (p = 2e-16 for Kapchorwa, and p = 3.1e-14 for Oyam, respectively).

Table E 1.1. Regression coefficients of decadel on q 56 for Kapchorwa and Oyam regions

	Kapchorwa			Oyam		
Decadel	**Beta**	**S.E**	**P-value**	**Beta**	**S.E**	**P-value**
Decadel 1	0.00126	0.0002	<0.0001	0.0023	0.0001	<0.0001
Decadel 2	0.00039	0.0010	0.7200	0.0001	0.0005	0.2220
Decadel 3	-0.0002	0.0009	0.8380	-0.0005	1.3	0.3500
**Kapchorwa: F-statistics = 7.162e-07; R^2 = 0.0014*						
**Oyam: F-statistics = 1.2e-15; R^2 = 0.0056*						

Table E.2 gives the mean and standard deviation of decadal rainfall data for Kapchorwa and Oyam in 2001. Both regions have a dry season in the period June-September, but no indication of extreme drought or flood. The results show that there is no association between TAMSAT rainfall data and the likelihood of having a flood/drought 1 out of every ten years.

Table E1.2. Mean and standard deviation TAMSAT data for 2001 for Kapchorwa and Oyam

Kapchorwa							
		Decadal 1		Decadal 2		Decadal 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2001	January	-35.00	15.50	54.00	21.80	25.30	28.30
2001	February	0.20	6.70	-21.40	10.10	-4.00	20.00
2001	March	-1.80	4.50	8.80	12.50	0.40	4.60
2001	April	-9.20	5.20	2.80	4.90	2.30	1.70
2001	May	0.10	1.50	0.70	1.50	0.97	1.70
2001	June	0	0	0	0	0	0
2001	July	0	0	0	0	0	0
2001	August	0	0	0.28	0	0	0
2001	September	0	0	0	0	0	0
2001	October	0.25	0.43	-0.90	2.30	5.25	4.50
2001	November	-8.40	7.50	-1.60	11.20	-12.70	12.30
2001	December	0.26	12.50	-36.00	28.00	8.30	16.30
Oyam							
		Decadal 1		Decadal 2		Decadal 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2001	January	-16.10	1.60	-5.20	1.70	4.50	2.90
2001	February	-11.20	1.30	-8.60	2.50	-20.30	2.70
2001	March	-2.40	0.60	10.70	3.20	-2.70	0.70
2001	April	10.20	1.20	35.00	4.00	0.10	1.50
2001	May	-0.50	0.50	-0.02	0.20	-1.00	0
2001	June	0	0	0	0	0	0
2001	July	0	0	0	0	0	0
2001	August	0	0	0	0	0	0
2001	September	0	0	0.05	0.08	0.21	0.02
2001	October	-0.02	0.21	-0.07	0.73	-3.70	1.90
2001	November	-2.00	0.11	-5.40	0.69	-2.30	0.54
2001	December	-11.10	1.30	-0.32	1.60	-8.60	1.70

Table E1.3 shows TAMSAT rainfall data for the year 2006 for Kapchorwa and Oyam. The results from 2006 are similar to the results from Table E.2. The results show that there is no evidence that a flood/drought occur every 1 out of 5 years. TAMSAT results are in agreement with the multiple regression results.

Table E1.3. Mean and standard deviation TAMSAT data for 2006 for Kapchorwa and Oyam

Kapchorwa							
		Decadel 1		Decadel 2		Decadel 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2006	January	-26.00	2.50	-26.00	22.10	21.50	23.10
2006	February	-23.00	19.00	34.60	0.03	1.40	0.25
2006	March	12.40	15.30	1.40	0.30	1.50	0.80
2006	April	3.10	12.60	10.20	9.10	-2.70	2.20
2006	May	2.50	2.20	4.30	3.30	-0.50	0.50
2006	June	0	0	0	0	0	0
2006	July	0	0	-0.28	0	0	0
2006	August	0	0	0	0	0	0
2006	September	0	0	0	0	0	0
2006	October	0.33	0.47	-1.10	1.39	-6.90	5.70
2006	November	7.20	7.60	1.50	11.60	3.60	10.20
2006	December	32.40	16.10	-28.90	16.80	9.80	15.20
Oyam							
		Decadal 1		Decadal 2		Decadal 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2006	January	-11.60	0.50	-11.60	0.50	-10.10	1.20
2006	February	-19.50	0.50	32.20	0	2.30	0.06
2006	March	-2.40	0.60	10.70	3.20	-2.70	0
2006	April	55.10	9.30	64.50	4.70	-0.03	0.30
2006	May	-0.58	0.49	-0.02	0.21	-1.00	0
2006	June	0	0	0	0	0	0
2006	July	0	0	0	0	0	0
2006	August	0	0	0	0	0	0
2006	September	0.03	0	0	0	0	0
2006	October	0.59	0.51	2.20	1.59	4.90	2.20
2006	November	1.10	1.20	7.30	0.90	30.90	1.50
2006	December	-2.40	1.10	6.40	2.30	-7.10	1.10

Table E1.4 gives the TAMSAT rainfall data from 2007 to assess if there is a relationship between rainfall data and the likelihood of flood/drought 1 out of every 4 years. The results show no evidence of either food or drought occurred in Kapchorwa or Oyam regions in the last four years. Therefore, there is no relationship between TAMSAT rainfall data and the likelihood of flood/drought 1 out of every 4 years.

Table E1.4. Mean and standard deviation TAMSAT data for 2007: Kapchorwa and Oyam

Kapchorwa							
		Decadal 1		Decadal 2		Decadal 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2007	January	32.40	16.90	14.90	16.80	43.50	15.50
2007	February	55.00	38.90	12.40	14.40	17.80	5.80
2007	March	-41.80	10.90	9.80	15.70	14.40	5.60
2007	April	-4.70	5.20	-4.70	5.20	2.40	6.60
2007	May	0	1.50	-1.70	0.90	0.50	1.60
2007	June	0	0	0	0	0	0
2007	July	0	0	-0.10	0.29	0	0
2007	August	0	0	0	0	0	0
2007	September	0	0	0	0	0	0
2007	October	-1.00	1.40	-0.88	3.00	5.90	5.10
2007	November	-4.40	3.10	6.10	6.40	4.30	6.70
2007	December	-25.30	24.60	-17.80	32.20	74.00	41.40
Oyam							
		Decadal 1		Decadal 2		Decadal 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2007	January	-2.40	1.10	6.4	2.30	-7.00	1.10
2007	February	-0.67	1.10	-0.74	1.90	-3.90	2.30
2007	March	0.50	1.40	16.5	2.70	0.90	2.40
2007	April	9.40	2.10	9.4	2.10	4.40	1.00
2007	May	-0.50	0.43	-0.02	0.21	-1.00	0
2007	June	0	0	0	0	0	0
2007	July	0	0	0	0	0	0
2007	August	0	0	0	0	0	0
2007	September	0	0	0	0	-0.10	0
2007	October	-0.02	0.21	-0.04	0.40	-3.60	1.80
2007	November	0.33	0.67	12.30	0.56	-2.60	0.62
2007	December	-11.10	1.10	-9.10	1.00	-7.40	0.80

Table E1.5 shows the mean and standard deviation of Dekadel rainfall data for Kapchorwa and Oyam in 2009. Both regions have dry season from the month of June to September, and no extreme flood/drought. There is no evidence that flood/drought occurred every two years before 2011.

Table E1.5. Mean and standard deviation TAMSAT data for 2009: Kapchorwa and Oyam

Kapchorwa							
		Decadal 1		Decadal 2		Decadal 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2009	January	-8.10	19.50	17.80	27.80	-38.90	15.50
2009	February	6.50	24.70	-34.80	25.10	-16.80	24.60
2009	March	-11.90	34.10	73.60	40.70	17.70	2.30
2009	April	16.50	13.80	-3.60	2.50	6.90	5.90
2009	May	0	1.50	-1.10	0.90	1.70	1.40
2009	June	0	0	0	0	0	0
2009	July	3.60	5.10	1.10	5.20	0	0
2009	August	0	0	0	0	0	0
2009	September	0	0	0	0	0.40	0.60
2009	October	0.60	0.90	-0.30	1.20	4.30	3.70
2009	November	-8.10	8.60	-9.00	9.30	1.20	2.00
2009	December	35.70	38.90	-20.90	14.80	-26.30	16.70
Oyam							
		Decadal 1		Decadal 2		Decadal 3	
Year	Month	Mean	SD	Mean	SD	Mean	SD
2009	January	-8.06	1.10	-13.20	2.10	-9.50	0.70
2009	February	-3.50	0.60	21.00	3.40	-1.10	4.40
2009	March	-15.10	1.60	-19.30	0.60	-19.20	1.80
2009	April	57.40	6.60	-10.10	1.10	-0.03	0.30
2009	May	-0.23	3.20	-0.23	0.21	-1.00	0
2009	June	0	0	0	0	0	0
2009	July	0	0	0	0	0	0
2009	August	0	0	0	0	0	0
2009	September	0	0	0	0	0.16	1.50
2009	October	-0.02	0.20	0.80	3.00	1.50	1.90
2009	November	-4.60	0.60	-5.10	1.20	-0.43	1.10
2009	December	-11.00	1.10	-4.70	1.80	27.60	2.20

Comparison of farmers' reports to TAMSAT data: TAMSAT data did not show any evidence of flooding from the years that were analysed. However, TAMSAT rainfall data indicated that there was a drought one in every two years, one in every four years, one in every five years, and one in every six years, respectively. Information from individual farmers' reports were compared to TAMSAT rainfall data from Kapchorwa and Oyam. Reports from 1354 farmers from Kapchorwa, and 1062 farmers form Oyam support TAMSAT data. In contrast, reports from only 442 farmers from Kapchorwa and 271 farmers from Oyam did not support TAMSAT data.

Table E1.6. Farmers whose reports do (not) support TAMSAT data

Report supports the TAMSAT data	Support	Not in support
Kapchorwa	1354	442
Oyam	1062	271

Mean annual rainfall varied across the regions, and both regions had droughts. Rainfall increased in the period 2005-06 in both Oyam and Kapchorwa; however, there is no clear trend in the rainfall data.

Table E1.7. TAMSAT mean annual rainfall in mm from Kapchorwa and Oyam (2001 2003, 2005, 2006, 2007, and 2009)

	Kapchorwa	Oyam
Year	Mean	Mean
2001	4.35	7.47
2003	3.21	2.37
2005	1.40	1.38
2006	10.90	10.50
2007	11.20	3.59
2009	6.40	4.15

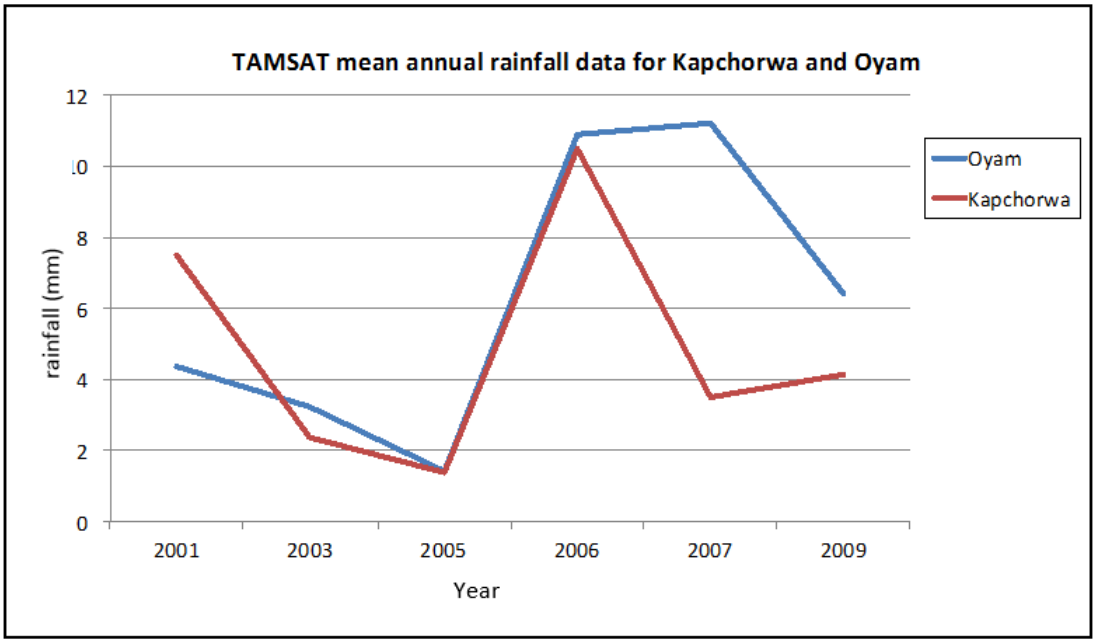

Figure E1.3.TAMSAT rainfall data for Kapchorwa and Oyam regions

Appendix E2. CHIRPS weather data

Table E2.1. Chi-square test for independence

	Responses from samples	Sampled selected based on (500/300) sampling	Chi-square value	P-value
Affected by Hurricane Sandy	144 (18)	500 (62.5)	16.15	<0.0001

Comparing CHRIPS data with (500/300) selection. There was no significant difference between CHIRPS data and the selection of sampled households affected vs. unaffected by the Hurricane Sandy. The result shows that CHIRPS data could be used to predict flooding associated with the Hurricane.

Table E2.2. Z-test for equality of proportions

	CHIRPS s.d.	CHIRPS	(500/300) proportion	Z-value	p-value
Flooding/Sandy	0.21	448 (0.56)	500 (0.625)	-0.065	0.9481

Comparison of CHIRPS weather data with survey data

CHIRPS stands for Climate Hazards Group InfraRed Precipitation with Station data (Funk et al., 2014). CHIRPS data are available on levels of: day, pentad, decad, month, bi-monthly, quarter, and annually. In order to compare rainfall information from CHIRPS with the responses from the survey data, I downloaded pentad rainfall in NetCDF format. Pentad data is defined as follows: 6 pentads are equal to one calendar year. Each of the first pentads in a month have 5 days, and the last pentad contains all the days from 26th to the end of the month. The units of CHIRPS is in total mm for a given time step, mm/pentad, mm/month, etc. We work with pentad rainfall data from 2001 to 2014 for the sampled areas.

Sample data were given by ZIP code. ZIP codes from Delaware, New Jersey, New York, and Pennsylvania were matched to geo-coordinates to obtain latitudes and longitudes (OpenGeoDB project) for each state for the survey data. Samples were matched with coordinates (latitude and longitude) from CHIRPS rainfall data and according to latitude were converted into km. In each state, samples were grouped based on grids measuring 10 km X 10 km.

Affected by Hurricane Sandy:

Hurricane Sandy landed on the Eastern Cost of United States on 27 October 2012, and the incident period was from 27 October 2012 to 9 November 2012 (FEMA, 2012c). Therefore, CHIRPS pentad data used to compare responses from survey to hurricane Sandy came from

October pentad 6, and November pentads 1 to 4, 2012. For a CHIRPS rainfall data point to qualify as a flood, the average of the three pentads must be greater than or equal to 10 mm of rainfall.

Other floods:

Apart from Hurricane Sandy, some participants reported that they were affected with other floods such as river flood sea flood, etc. However, no information on when the floods happened was given. As an indicator, CHIRPS rainfall data from 2001 to 2014 was used to compare responses from survey data to CHIRPS data.

Statistical analysis:

Single-Sample Proportion Test was used to compare the observed responses from the survey participants and weather data from CHIRPS. To test the null hypothesis that the observed sample data support CHRIPS data is that proportions of observed samples data p is equal to value p_0 (proportion of the CHRIPS data). That is H_0: $p = p_0$ and used the observed value of Z of the test statistics indicated below.

$$Z = \frac{p - po}{\sqrt{\frac{po(1-po)}{n}}}$$

Table E2.3 shows the Z-test results for comparing the sample-provided observations of Sandy-related damages for (no) flooding from the following states: DE, NJ, NY, and PA and CHIRPS rainfall data of October pentad 6, and November pentads 1 and 2. There were no significant differences between the samples observations and CHIRPS for the four states, except in New York. The results show that samples from DE, NJ, and PA support CHIRPS weather data (flood yes and flood no). Table E2.4 shows the percentage of samples affected by Hurricane Sandy. It ranged from 4% in NY to 39% in DE.

Information from individual state samples compared to CHIRPS data (flood = yes) from Delaware, New Jersey, New York, and Pennsylvania are presented in Table E2.3. Eighteen out of 24 samples from Delaware supported CHRIPS data (flood =yes); 17 out of 21 samples from New Jersey supported CHIRPS data (flood =yes); 4 out of 8 samples from New York supported CHIRPS data; and 48 out of 83 samples from Pennsylvania support CHIRPS data. In contrast, reports from 7 samples from Delaware, 4 samples from New Jersey, 4 samples from New York, and 33 samples from Pennsylvania did not support CHIRPS data. The results are similar to the affected populations. Only relatively small proportions of the whole populations were affected by Hurricane Sandy from DE, NJ, NY, and PA (http://www.fema.gov/).

Table E2.3. Z-test for the proportions of samples supporting CHIRPS data (floods and no floods): DE, NJ, NY, and PA

State	Frequency	Proportions supporting CHIRPS data floods and	p-value
Delaware	61	39/61 = 0.64	0.9679
New Jersey	248	149/248 = 0.60	0.5532
New York	196	40/196 = 0.20	<0.0001
Pennsylvania	251	173/251 = 0.69	0.8840

Table E2.4.The numbers and percentage of samples affected by hurricane: DE, NJ, NY, and PA

State	Respondents	Samples affected	Percent affected
Delaware	61	24	39
New Jersey	248	21	8
New York	196	8	4
Pennsylvania	251	83	33

Table E2.5. Samples with reports supporting CHIRPS Hurricane Sandy (flood = yes)

CHIRPS (flood = yes)	Samples	Samples not
Delaware	17	7
New Jersey	17	4
New York	4	4
Pennsylvania	48	35

Other Floods: Besides Hurricane Sandy, participants reported other floods household flood types. Outdoor drain floods are the most commonly reported type in the four states analysed. All these reported flood types have a relationship to the weather; they are combined with data from Hurricane Sandy outcomes and compared with CHIRPS pentad rainfall data from 2001 to 2014.

Table E2.6. Summary of different types of floods reported: DE, NJ, NY, and PA

State	River	Sea water flood	Drain flood	Household
Delaware	4	5	20	14
New Jersey	47	10	75	68
New York	23	24	50	42
Pennsylvania	48	8	77	83

Mean rainfall values and standard deviations for 14 years for DE, NJ, NY, and PA are presented in Table E2.6. There were no significant differences between the samples observations and CHIRPS rainfall data for fourteen years average for the four states, except NY. The results show that CHIRPS rainfall data could be used to infer samples observations from DE, NY, PA. However, CHIRPS rainfall data should not be used to infer sample observations from NY.

Information from individual sample compared to CHIRPS data (flood = yes) for the last 14 years from Delaware, New Jersey, New York, and Pennsylvania are presented in Table E2.6. Twenty-eight out of 32 samples from Delaware supported CHRIPS data (flood =yes); 144 out of 156 samples from New Jersey supported CHIRPS data (flood =yes); 72 out of 78 samples from New York supported CHIRPS data; and 167 out of 180 samples from Pennsylvania support CHIRPS data. In contrast, reports from 4 samples from Delaware, 12 samples from New Jersey, 6 samples from New York, and 13 samples from Pennsylvania did not support CHIRPS data.

Table E2.7. Z-test for the proportions of samples supporting CHIRPS data: DE, NJ, NY, and PA

State	Frequency	Proportions supporting	p-value
Delaware	61	32/61 = 0.52	0.9998
New Jersey	248	156/248 = 0.62	0.8199
New York	196	78/196 = 0.39	0.0053
Pennsylvania	251	180/251 = 0.72	0.9753

Table E2.8. Samples whose reports support CHIRPS (flood = yes)

CHIRPS (flood = yes)	Samples in support	Samples not
Delaware	28	4
New Jersey	144	12
New York	72	6
Pennsylvania	167	13

Figure E2.1 and Table E2.7 provide CHIRPS annual rainfall data from sampled areas in DE, NJ, NY, and PA over the last 14 years. Mean annual rainfall varied across the states. On average, DE had the highest rainfall and NJ had the least rainfall. DE had the highest rainfall of 1290.82 mm in 2007, and NJ had the highest rainfall of 800.77 mm in 2012. NY had the highest rainfall of 1216.91 mm in 2009, and PA had it highest rainfall of 1046.52 mm in 2011. The amount of rainfall increase from 2008 to 2009 in all four states, and decrease from 2009 to 2010 in all four states except Delaware.

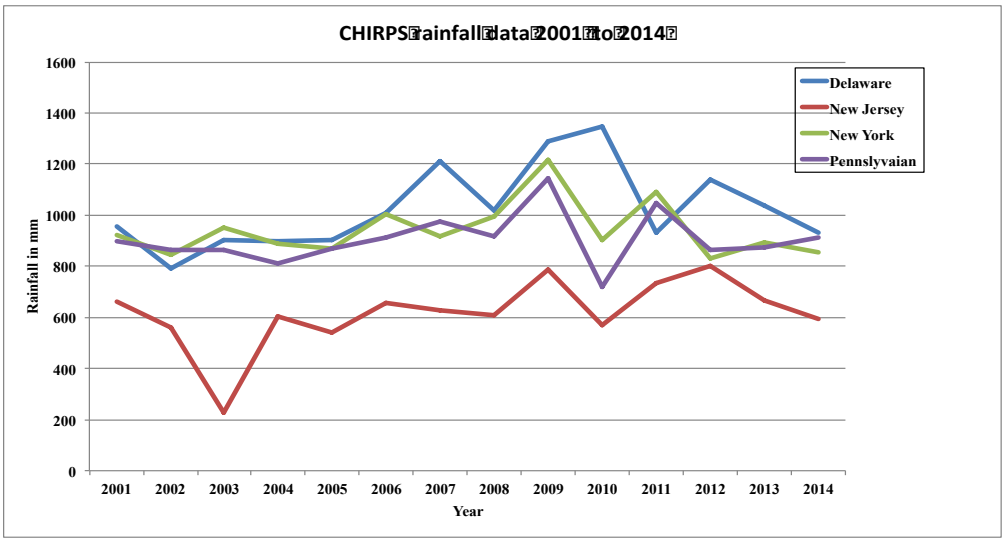

Figure E2.1. CHIRPS rainfall data for sampling areas: DE, NJ, NY, and PA

Table E2.9. CHIRPS mean annual rainfall in mm from sampling areas: DE, NJ, NY, and PA (2001 to 2014)

	Delaware	**New Jersey**	**New York**	**Pennsylvania**
Year	Mean	Mean	Mean	Mean
2001	954.19	659.69	924.56	895.90
2002	790.13	559.60	843.15	863.3
2003	903.48	227.20	951.14	863.3
2004	898.07	603.58	887.03	810.45
2005	900.64	542.21	869.88	913.6
2006	1008.20	655.87	1006.05	976.46
2007	1213.56	629.17	919.79	917.02
2008	1016.76	607.25	995.17	1142.92
2009	1290.82	785.63	1216.91	718.16
2010	1347.31	568.32	830.89	846.96
2011	929.75	734.09	901.9	1046.52
2012	1139.93	800.77	1090.57	864.96
2013	1038.21	664.10	895.03	875.72
2014	929.65	595.41	853.92	911.76

CHIRPS data supported observations from provided by samples in DE, NJ, and PA. Yet, CHIRPS data did not support samples observations from NY. There was no trend in rainfall data except an increase from 2008 to 2009, and a decrease from 2009 to 2010, in all states analysed, excepting Delaware.

Appendix F. Supplementary analysis for traditional coping strategies

Our main focus in Chapter 6 is to study the behaviour of the farmers with respect to their coping strategies. In this section of analysis we conceptualise the strategic behaviour of the farmers regarding vulnerability to extreme weather as forming distinct categories or typologies. We are interested in determining the subgroups into which the farmers fall, but since subgroup memberships cannot be explicitly observed, it is treated as a latent class. We do, however, have a number of indicators at our disposal, which are useful for categorising the farmers in one of these latent classes. Here our motivation is not only to find the subgroup memberships but also the optimal number of classes (groups) for our sample of

farmers.

We perform latent class analysis in Stata for a number of classes and then use the Bayesian Information Criteria (BIC) for selecting the optimal model. Table F.1 gives the BIC values for the latent models for different number of classes. The indication is that the optimal number of classes for our analysis is five. Our finding is in conformation with the previous finding under the PCA.

Table F.1. Number of classes for LCA of traditional coping strategies

Number of classes	BIC
n = 3	2349.124
n = 4	1927.719
n = 5	1811.639
n = 6	1824.822
n = 7	1825.661

The BIC is given as:

$$BIC = -2 \ln(L) + p\ln(N)$$

Where L is the log-likelihood of the model, adjusted for the number of parameters in the model, N.

Note that the BIC is advocated when the primary goal of the modelling application is descriptive, which is the case for the LCA—it aids in building a model that features the most meaningful factors influencing the outcome (traditional coping choice), based on an assessment of relative importance (e.g., Burnham & Anderson, 2004).

Table F.2. Table of predicted probabilities from multinomial probit model

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10
age x1	1									
education x2	-0.196 *	1								
famSize x3	0.016	-0.004	1							
acres x4	0.005	-0.233	-0.037	1						
Surplus X5	0.016	-0.011	0.019	0.005	1					
lShare x6	0.029	0.086	0.130	-0.096	-0.061	1				
netRem x7	0.023	-0.081	-0.044	-0.047	0.002	-0.045	1			
diceFeeling x8	-0.006	0.068	0.069	0.090 *	-0.030	0.029	-0.038**	1		
coinRisk x9	0.020	-0.004	0.010	0.042	-0.041	-0.020	-0.027	0.004	1	
Region x10	0.011	-0.059 *	0.023	0.052	0.003*	0.047	0.081	-0.035*	0.191*	1

*10% sig. level, ** 5% sig. level

Table F.3. Table of predicted probabilities from multinomial probit model

Variable	Levels	Non-erosive Coping		Sell Livestock		Erosive Coping		Failed Coping	
		Margins	Std. Errors	Margins	Std. Errors	Margins	Std. Errors	Margins	Std. Errors
Region									
	Kapchorwa	0.4055083	0.0124075	0.3870712	0.0123001	0.0558006	0.005844	0.15162	0.009009
	Oyam	0.4203211	0.0146562	0.3191358	0.0137722	0.0841421	0.0083147	0.176401	0.011277
Education									
	No formal education	0.3988273	0.0225125	0.3282618	0.0214645	0.1036108	0.0139885	0.1693	0.017177
	Primary school	0.4176919	0.0133652	0.3653962	0.0130611	0.0653267	0.0067635	0.151585	0.009728
	O-level equivalent	0.411765	0.0175494	0.3565877	0.0171016	0.0618366	0.0086627	0.169811	0.013437
	Above O-level	0.4098158	0.0292102	0.3706527	0.0287429	0.0398794	0.0116053	0.179652	0.023085
Acres									
	0	0.4144673	0.0111111	0.3489473	0.0105694	0.0717553	0.0059132	0.16483	0.008302
	10	0.4007101	0.0136878	0.3640791	0.013305	0.073872	0.0069709	0.161339	0.010229
	20	0.3869414	0.0289977	0.3793605	0.0285251	0.0759562	0.0152478	0.157742	0.021389
	30	0.3731862	0.0452262	0.3947639	0.0453906	0.0780022	0.0246387	0.154048	0.033142
	40	0.3594693	0.0612772	0.410261	0.0628156	0.0800044	0.0345262	0.150265	0.044685
	50	0.3458159	0.0769179	0.425823	0.0805522	0.0819573	0.0447917	0.146404	0.055868
	60	0.3322506	0.0920368	0.4414211	0.0984707	0.0838554	0.0553845	0.142473	0.066628
	70	0.318798	0.1065555	0.4570263	0.1164726	0.0856937	0.06627	0.138482	0.076932
	80	0.3054821	0.1204091	0.4726099	0.1344715	0.0874671	0.0774189	0.134441	0.086752
	90	0.2923263	0.1335405	0.4881433	0.1523876	0.0891707	0.0888034	0.13036	0.096067
	100	0.2793533	0.1458991	0.5035986	0.1701461	0.0908001	0.1003963	0.126248	0.104858
Age									
	10	0.4173364	0.0235703	0.3205048	0.0217968	0.0571496	0.01051	0.205009	0.019873
	20	0.4153579	0.017061	0.3320768	0.0160604	0.0618652	0.0082167	0.190700	0.013778
	30	0.4128271	0.0114844	0.3434838	0.0110103	0.066779	0.0059611	0.17691	0.008885
	40	0.4097575	0.0087378	0.3546965	0.0085030	0.0718828	0.0046344	0.163663	0.006603
	50	0.4061653	0.0110901	0.3656873	0.0108455	0.0771679	0.005779	0.150980	0.008117
	60	0.4020691	0.0164451	0.376431	0.0162125	0.0826245	0.0089668	0.138875	0.011371
	70	0.3974896	0.022744	0.3869042	0.0226469	0.0882424	0.0131371	0.127364	0.014798
	80	0.3924495	0.0293591	0.3970863	0.0295299	0.0940105	0.0179143	0.116454	0.017945
	90	0.3869733	0.0360906	0.4069588	0.0366607	0.0999179	0.0231772	0.106150	0.020680
Family Size									
	1	0.4259848	0.0163403	0.3556153	0.0156343	0.0520715	0.0063955	0.166329	0.011856
	2	0.421915	0.0134531	0.3556887	0.0129194	0.0566477	0.0057611	0.165749	0.009808
	3	0.4177313	0.0109883	0.3556383	0.010603	0.0615319	0.0051551	0.165099	0.008084

	4	0.4134301	0.0092727	0.3554584	0.0089965	0.0667356	0.0047108	0.164376	0.006920
	5	0.4090082	0.0087398	0.3551434	0.0085083	0.0722698	0.0046324	0.163579	0.006606
	6	0.4044627	0.0095704	0.3546877	0.0093116	0.0781451	0.0051106	0.162705	0.007239
	7	0.3997909	0.0114549	0.3540858	0.0111259	0.0843716	0.0061849	0.161752	0.008597
	8	0.3949904	0.013958	0.3533325	0.0135467	0.0909588	0.0077664	0.160718	0.010386
	9	0.3900595	0.0167916	0.3524226	0.0163022	0.0979151	0.0097543	0.159603	0.012407
	10	0.3849964	0.0198016	0.3513514	0.0192453	0.1052484	0.0120819	0.158404	0.014550
	11	0.3798003	0.0229065	0.3501141	0.0222985	0.1129656	0.014711	0.15712	0.016757
	12	0.3744703	0.0260607	0.3487064	0.0254188	0.1210727	0.0176203	0.155751	0.018992
	13	0.3690065	0.029237	0.3471243	0.0285811	0.1295743	0.020797	0.154295	0.021234
	14	0.3634093	0.0324177	0.3453641	0.0317699	0.1384743	0.0242327	0.152752	0.023468
	15	0.3576795	0.0355905	0.3434227	0.034975	0.1477751	0.0279207	0.151123	0.025686
	16	0.3518188	0.038746	0.3412971	0.0381892	0.1574778	0.0318544	0.149406	0.027879
Income share from farming									
	Less than 25%	0.2811795	0.019214	0.4354561	0.0213952	0.0836154	0.0118068	0.199749	0.017141
	Between 25% to 50%	0.4259761	0.0212319	0.3349595	0.0202835	0.076489	0.0114315	0.162575	0.015824
	Between 50% to 75%	0.4748357	0.0171446	0.3168294	0.0160315	0.0591075	0.0081356	0.149227	0.012263
	More than 75%	0.4323991	0.0155497	0.3574301	0.0150427	0.0593726	0.0074348	0.150798	0.011288
Surplus									
	Yes	0.4106207	0.0100891	0.3642892	0.0098487	0.0656739	0.0051787	0.159416	0.007503
	No	0.4222042	0.0220735	0.3293981	0.020801	0.0729277	0.0113302	0.175470	0.016726
Coin risk									
	<0.1	0.4416696	0.02497	0.328675	0.0235411	0.0788005	0.0139219	0.150855	0.018056
	0.1-1.3	0.4701939	0.0330267	0.3610587	0.0316855	0.0319212	0.0117302	0.136826	0.023095
	1.3-3.2	0.4141019	0.0157755	0.3806122	0.0155461	0.0592994	0.0075901	0.145987	0.011320
	3.2-5.0	0.3496974	0.0251371	0.4390685	0.0261049	0.0619298	0.0126303	0.149304	0.018704
	>5.0	0.4066103	0.015271	0.3180871	0.0144651	0.0824244	0.0085519	0.192878	0.012250
Net remittance									
	Net-receiver	0.3913645	0.0151314	0.3800662	0.0150166	0.0596584	0.0074315	0.168911	0.011622
	Net-provider	0.427308	0.0123979	0.3605836	0.0120145	0.0691578	0.0064184	0.142951	0.008738
	No remittance behaviour	0.4010046	0.0265929	0.2749150	0.0241378	0.0786923	0.0142252	0.245388	0.023300

Appendix G1. Supplementary analysis—WTP for microinsurance and loan in Uganda

Table G 1.1.Characteristics of average respondent in Kapchorwa and Oyam for WTP

Variable	**Average values by region**	
region	Kapchorwa	Oyam
house_cond	above average	average
net_rem	net-receiver	no remittance behaviour
coin_risk	1.3-3.2	0.1 – 1.3
worry	29	12
IShare	50-75%	50-75%
trust	bureaucrats (government)	businessmen
know_in	no prior knowledge	both friends' and self-knowledge of insurance
save_sell	saved and lost money	saved and made profit
wea_type	more concerned about flood	more concerned about drought
tamsat	"agreement"	"agreement"
coping	selling livestock	non-erosive
Num_loans	1	0
in_mot	compare to both income and disaster losses	compare to both income and disaster losses
ch_env	environment changed and farming became harder	environment changed and farming became harder
age	43	26
education	primary school	O-level equivalent
dice_feeling	positive feeling for insurance	positive feeling for insurance

Table G1.2.Correlation matrix: Independent variables for WTP for microinsurance & WTP for loan

		X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18
X1	**age**	1***																	
X2	**region**	0.011	1***																
X3	**education**	-0.196*	-0.059*	1***															
X4	**no_loans**	-0.007	0.056*	0.018	1***														
X5	**know_In**	0.000	-0.115	-0.235	-0.073	1***													
X6	**house_cond**	-0.023	-0.034*	-0.050	0.041	0.037	1***												
X7	**IShare**	0.029	0.047	0.086	-0.096	-0.048	0.131	1***											
X8	**net_rem**	0.023	0.081	-0.081	-0.007	0.031	0.017	-0.045	1***										
X9	**worry**	0.016	0.078	-0.010	0.005	-0.004	0.038*	0.059*	-0.004	1***									
X10	**coping**	-0.044*	0.055*	0.005	-0.014	-0.054	0.024	0.019	0.054*	-0.016	1***								
X11	**wea_type**	-0.031	0.043	0.095	-0.062	0.059	0.027	0.130	0.021	0.078	-0.0003	1***							
X12	**en_ch**	-0.031	0.024	-0.103	0.030	0.064*	0.005	-0.145	0.050	-0.105	-0.003	-0.032*	1***						
X13	**trust**	0.028	0.064	-0.036*	-0.050	-0.036	-0.044	-0.016	0.024)	0.009	0.054	0.006	-0.024	1***					
X14	**in_mot**	-0.005	-0.039	0.014	-0.045	0.020	-0.018	0.061*	0.003	-0.032	0.047*	0.010	0.020	0.054*	1***				
X15	**save_sell**	0.023	-0.035	0.076	0.003	-0.061	0.024	0.114**	-0.086	0.001	-0.018	0.071	-0.118	-0.048	0.035	1***			
X16	**tamsat**	0.046	-0.024	-0.080	0.051*	-0.061	-0.029	-0.075	-0.029	-0.055	0.045	-0.604	0.025	-0.022	-0.025	-0.077	1***		
X17	**dice_feeling**	-0.006	-0.035	0.068	0.090	-0.032	0.044	0.029	-0.038	0.066	0.014	0.049	-0.062	-0.058	0.053*	0.115	-0.038	1***	
X18	**coin_risk**	0.020	0.191	-0.004	0.042*	-0.052	-0.088	-0.020	-0.027	0.012	0.025	-0.010	0.001	-0.024	-0.036	-0.018	0.022	0.004	1***

The Heckman two-stage selection model is employed to look at potential motivations for the WTJ for farmers.

Theoretical background:

The equation for LB is given by:

$$y_j = \sum_{i=1}^{N} v_i \mathbf{I}\left(k_{i-1} < x_j \boldsymbol{\beta} + u_{1j} \leq k_i\right)$$

Where x_j is the outcome covariates, $\boldsymbol{\beta}$is the coefficients and u_{1j} is a random-error term. The observed outcome values $v_1, \ldots, v_N$ are integers such that $v_i < v_m$for $i < m$. $k_1, \ldots, k_{N-1}$are real numbers such that $k_i < k_m$ for $i < m$. $k_0$is taken as $-\infty$ and k_N is taken as $+\infty$. $\mathbf{I}$is an indicator function.

The selection equation is:

$$s_j = \mathbf{I}(z_j \gamma + u_{2j} > 0)$$

Where $s_j = 1$ if we observed y_j and 0 otherwise, z_j is the covariates used to model the selection process, γ is the coefficients for the selection process, and u_{2j} is a random-error term.

(u_{1j}, u_{2j})have bivariate normal distribution with mean zero and covariance matrix:

$$\begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix}$$

Table G1.3.Heckman model WTP/WTJ for microinsurance (Part 1/2)

WTP (lower bound)	Coefficients	Robust. S.E.	z-value	P>z	[95% Interval]	Conf.
Education						
Primary school	0.0506	0.0788	0.64	0.521	-0.104	0.205
O-level equivalent	0.0908	0.0845	1.07	0.283	-0.073	0.257
Above O-level	0.2325	0.1164	2.00	0.046	0.004	0.461
Knowledge of insurance						
Self but not friends' knowledge	-0.3506	0.1915	-1.83	0.067	-0.726	0.025
No self but friends' knowledge	-0.3520	0.1825	-1.93	0.054	-0.710	0.006
No prior knowledge	-0.5221	0.1872	-2.79	0.005	-0.889	-0.155
Number of loans						
1	0.2927	0.06529	4.48	0.000	0.165	0.421
2	0.1939	0.09492	2.04	0.041	0.008	0.380
3	0.3573	0.16147	2.21	0.027	0.041	0.673
4	0.2162	0.2891	0.75	0.454	-0.350	0.783
5	0.5182	0.1750	2.96	0.003	0.175	0.861
Coping strategies						
Non-erosive coping	0.0740	0.0819	0.90	0.366	-0.087	0.235
Erosive coping	0.1039	0.1228	0.85	0.398	-0.137	0.345
Failed coping	0.2360	0.0936	2.52	0.012	0.052	0.420
Income share from farming						
Between 25% to 50%	0.1933	0.0896	2.16	0.031	0.018	0.369
Between 50% to 75%	0.3356	0.1017	3.30	0.001	0.136	0.535
More than 75%	0.3195	0.09593	3.33	0.001	0.131	0.508
Worry	-0.0130	0.0048	-2.66	0.008	-0.023	-0.003
Insurance motive						
Compared to disaster	-0.0210	0.0709	-0.30	0.767	-0.159	0.118
Compare to disaster & income losses	0.1718	0.0749	2.29	0.022	0.025	0.319
Save and sell						
Saved but not for higher price	0.1148	0.1079	1.06	0.287	-0.097	0.326
Saved and got a higher price	-0.0576	0.0815	-0.71	0.480	-0.217	0.102
Saved and lost money	0.1067	0.1172	0.91	0.363	-0.123	0.336
Not sure	0.5944	0.4516	1.32	0.188	-0.291	1.480
TAMSAT Compliance						
No	0.0075	0.0822	0.09	0.927	-0.154	0.169
Dice feeling						
Feeling of insurance	0.1589	0.0889	1.79	0.074	-0.015	0.333
Coin risk						
0.1-1.3	0.0574	0.1191	0.48	0.63	-0.176	0.291
1.3-3.2	0.0957	0.0888	1.07	0.283	-0.079	0.270
3.2-5.0	0.0701	0.1193	0.59	0.557	-0.164	0.304
>5.0	0.0274	0.0834	0.33	0.742	-0.136	0.191

Table G 1.3. Heckman model WTP/WTJ microinsurance (Part 2/2)

WTJ						
Age	-0.0012	0.0036	-0.34	0.731	-0.008	0.006
Knowledge of insurance						
Self but not friends' knowledge	0.099	0.191	0.52	0.604	-0.276	0.474
No self but friends' knowledge	-0.463	0.181	-2.56	0.010	-0.817	-0.109
No prior knowledge	-0.131	0.160	-0.82	0.413	-0.443	0.182
Household condition						
Average	0.162	0.090	1.80	0.072	-0.014	0.339
Above Average	0.800	0.382	2.03	0.127	-0.418	2.018
Good	-0.928	0.565	-1.64	0.101	-2.034	0.180
Income from farming						
Between 25% to 50%	0.2063	0.1392	1.48	0.138	-0.066	0.479
Between 50% to 75%	0.3446	0.1271	2.71	0.007	0.095	0.593
More than 75%	0.2984	0.1335	2.24	0.025	0.0361	0.560
Change in environment and farming						
Change in Env& Farming became easier	-0.0859	0.1398	-0.62	0.539	-0.360	0.188
No change in Env& Farming became harder	-0.1848	0.2488	-0.74	0.458	-0.672	0.303
No Change in Env& Farming became easier	-0.7771	0.2196	-3.54	0.000	-1.207	-0.347
Farming difficulties are same irrespective of weather	-0.4501	0.1357	-3.32	0.001	-0.716	-0.184
_cons	1.3148	0.2369	5.55	0.000	0.851	1.779
rho	0.0083	0.4047			-0.656	0.665

N = 2378 Df = 52

Log likelihood = -4585.82 AIC = 9275.641 BIC = 9575.89

Table G 1.4. Heckman model WTP/WTJ for loan (Part 1/2)

WTP (lower bound)	Coefficients	Robust. S.E.	z-value	P>z	[95% Interval]	Conf.
Education						
Primary school	0.0929	0.0834	1.11	0.266	-0.070	0.256
O-level equivalent	0.0937	0.0836	1.12	0.262	-0.070	0.258
Above O-level	0.2946	0.1145	2.57	0.010	0.070	0.519
Knowledge of insurance						
Self but not friends' knowledge	-0.1369	0.1874	-0.73	0.465	-0.504	0.230
No self but friends' knowledge	-0.2232	0.1787	-1.25	0.212	-0.573	0.127
No prior knowledge	-0.3226	0.1799	-1.79	0.073	-0.675	0.030
Number of loans						
1	0.2645	0.0617	4.29	0.000	0.143	0.385
2	0.1559	0.0888	1.76	0.079	-0.018	0.323
3	0.3608	0.1858	1.94	0.052	-0.003	0.725
4	0.3577	0.2689	1.33	0.184	-0.169	0.885
5	0.6797	0.1686	4.03	0.000	0.349	1.010
Coping strategies						
Non-erosive coping	0.1061	0.1126	0.94	0.346	-0.114	0.327
Erosive coping	0.0859	0.0737	1.16	0.244	-0.058	0.230
Failed coping	0.2066	0.0928	2.23	0.026	0.025	0.389
Income share from farming						
Between 25% to 50%	0.2084	0.0920	2.26	0.024	0.028	0.389
Between 50% to 75%	0.3347	0.0950	3.53	0.000	0.149	0.520
More than 75%	0.2884	0.0976	2.95	0.003	0.097	0.480
Worry	-0.0076	0.0049	-1.53	0.126	-0.017	0.002
Insurance motive						
Compared to disaster	0.0121	0.0705	0.17	0.863	-0.126	0.150
Compare to disaster & income losses	0.1488	0.0712	2.09	0.037	0.009	0.288
Save and sell						
Saved but not for higher price	0.1392	0.1027	1.36	0.175	-0.062	0.341
Saved and got a higher price	0.0194	0.0812	0.24	0.811	-0.140	0.179
Saved and lost money	0.1863	0.1139	1.64	0.102	-0.037	0.410
Not sure	0.2431	0.4616	0.53	0.598	-0.662	1.148
TAMSAT Compliance						
No	-0.0351	0.0830	-0.42	0.672	-0.197	0.128
Dice feeling						
Feeling of insurance	0.2000	0.0857	2.33	0.02	0.032	0.368
Coin risk						
0.1-1.3	0.0097	0.1142	0.08	0.932	-0.214	0.233
1.3-3.2	-0.0711	0.0782	-0.91	0.363	-0.224	0.082
3.2-5.0	0.0199	0.1143	0.17	0.862	-0.204	0.244
>5.0	-0.0628	0.0823	-0.76	0.445	-0.222	0.099

Table G1.4. Heckman model WTP/WTJ loan (Part 2/2)

WTJ						
Age	-0.0012	0.0036	-0.34	0.731	-0.008	0.006
Knowledge of insurance						
Self but not friends' knowledge	0.1034	0.1894	0.55	0.585	-0.267	0.475
No self but friends' knowledge	-0.4584	0.1796	-2.55	0.011	-0.810	-0.106
No prior knowledge	-0.1286	0.1591	-0.81	0.419	-0.440	0.183
Household condition						
Average	0.1635	0.0913	1.79	0.073	-0.015	0.342
Above Average	0.3365	0.4227	0.80	0.510	-1.482	2.155
Good	-0.9570	0.5602	-1.71	0.087	-2.055	0.140
Income from farming						
Between 25% to 50%	0.2069	0.1391	1.49	0.137	-0.066	0.498
Between 50% to 75%	0.3444	0.1273	2.70	0.007	0.095	0.594
More than 75%	0.2960	0.1358	2.18	0.029	0.030	0.562
Change in environment and farming						
Change in Env& Farming became easier	-0.0957	0.1476	-0.65	0.517	-0.385	0.194
No change in Env& Farming became harder	-0.1785	0.2221	-0.8	0.422	-0.613	0.257
No Change in Env& Farming became easier	-0.7522	0.2619	-2.87	0.004	-1.266	-0.238
Farming difficulties are same irrespective of weather	-0.4604	0.1398	-3.29	0.001	-0.734	-0.183
cons	1.3227	0.2320	5.7	0	0.868	1.777
rho	0.0905	0.4578			-0.672	0.760

N = 2378 Df = 53

Log likelihood = 4698.677 AIC = 9503.354 BIC = 809.377

Table G1.5. DBDC Model – WTP for Microinsurance

	Total Sample			Kapchorwa			Oyam		
Variables	Coeff..		Std. Err.	Coefficient		Std. Err.	Coeff.		Std. Err.
region	-9326.11	***	1637.61	-		-	-		-
age	91.03	*	54.99	121.86	*	70.41	-19.76		75.87
education	1803.27	**	855.89	2309.53	**	1066.24	286.27		1313.75
no_loans	4344.11	***	671.60	6167.06	***	861.58	-92.42		924.43
know_In	-5332.05	***	717.72	-5777.94	***	939.99	-3020.90	***	947.80
house_con	1028.22		1388.16	1957.96		1747.41	-1995.10		1995.50
IShare	1189.81	*	628.07	1071.87		791.23	2642.94	***	954.36
net_rem	739.85		1074.49	1579.06		1341.52	-1838.32		1591.80
worry	-400.82	***	98.89	-631.95	***	126.49	617.02	***	158.69
coping	1900.34	***	616.71	1816.89	**	779.02	3043.31	***	907.52
wea_type	-470.02		2224.80	1006.30		4407.46	3888.19	*	2323.10
en_Ch	213.48		501.18	206.72		621.81	-77.37		783.38
trust	-1469.41	*	857.21	-1696.35		1122.78	-2466.84	**	1139.48
in_Mot	2594.77	***	874.28	2720.28	**	1119.62	4220.83	***	1274.65
save_sell	297.00		770.40	-39.33		955.81	802.25		1174.64
tamsat	3711.64	*	2237.64	6288.13		4419.01	-568.28		2329.89
dice_feeling	1496.38		2017.08	1896.93		2624.90	4513.68		2742.81
coin_risk	136.61		508.52	108.84		625.03	-473.52		793.55
const.	29105.20	***	9325.41	15943.38		14907.7	-11559.11		11688.0
N	*2313*			*1695*			*618*		
DF	*20*			*19*			*19*		
Log-likelihood	*-8177.254*			*-6150.974*			*-1939.90*		
AIC	*16394.51*			*12339.95*			*3917.80*		
BIC	*16509.43*			*12443.22*			*4001.90*		

Table G1.6. DBDC – WTP for Loan

	Total Sample			Kapchorwa			Oyam		
Variables	Coefficient		Std. Err.	Coefficient		Std. Err.	Coefficient		Std. Err.
region	-8569.493	***	1506.227	-		-	-		-
age	55.950		50.66861	62.81442		70.411	19.216		77.670
education	2225.873	***	787.7827	2599.038	***	1066.236	811.097		1337.510
no_loans	3742.371	***	618.3197	5175.040	***	861.580	-111.1339		951.883
know_In	-4045.414	***	659.6737	-4735.942	***	940.000	-1782.561	*	968.829
house_con	500.276		1280.573	-10.350		1747.408	1769.957		2049.888
IShare	1277.214	**	579.1157	1715.786	**	791.2278	737.161		979.760
net_rem	1329.904		990.3022	2020.873	*	1341.524	-287.574		1637.768
worry	-335.912	***	91.10964	-495.620	***	126.486	286.904	*	162.395
coping	1634.961	***	568.3437	1600.509	**	779.023	2456.305	** *	935.908
wea_type	-1784.340		2047.896	-2035.731		4407.464	1116.506		2391.026
en_Ch	714.805		462.3043	928.136	*	621.813	-392.740		810.997
trust	-1297.264		788.8127	-1174.986		1122.776	-2357.846	**	1161.695
in_Mot	1184.703		804.9594	1612.093		1119.623	1714.161		1305.314
save_sell	92.53438		709.9265	127.093		955.812	-324.914		1206.979
tamsat	3144.748		2059.53	3460.436		4419.015	1675.736		2391.966
dice_feeling	1943.449		1858.33	2708.342		2624.897	2902.272		2818.743
coin_risk	57.602		469.0081	59.322		625.035	-278.454		815.948
const.	25915.550	***	8586.308	17510.890		14907.730	-2925.535		11985.890
N	*2313*			*1695*			*618*		
DF	*20*			*19*			*19*		
Log-likelihood	*-8353.199*			*-6198.320*			*-2108.881*		
AIC	*16746.400*			*12434.600*			*4255.762*		
BIC	*16861.320*			*12537.880*			*4339.865*		

Table G1.7. Probit regression – number of loans in last 12 months (for reference)

		Coefficient	Std. Err.	Z	P>z	[95% Conf.Interval]	
region							
	Oyam	-7060.427	1914.381	-3.69	0.000	-10812.50	-3308.31
education							
	Primary school	1704.793	1750.195	0.97	0.330	-1725.53	5135.11
	O-level equivalent	4915.066	2050.286	2.40	0.070	896.58	8933.55
	Above O-level	5987.56	2841.361	2.11	0.035	418.60	11556.53
acres		262.763	126.2009	2.08	0.037	15.41	510.11
age		32.45709	55.44487	0.59	0.558	-76.21	141.13
FamSize		-241.6893	263.0165	-0.92	0.358	-757.19	273.81
IShare							
	Between 25% to 50%	4940.262	2277.064	2.17	0.030	477.30	9403.23
	Between 50% to 75%	4444.242	2103.734	2.11	0.035	320.99	8567.49
	More than 75%	1913.394	1967.072	0.97	0.331	-1942.00	5768.78
Surplus							
	No	-2758.772	1956.63	-1.41	0.159	-6593.70	1076.15
Coin risk							
	0.1-1.3	460.6973	2768.41	0.17	0.868	-4965.30	5886.70
	1.3-3.2	4351.620	2354.63	1.85	0.065	-263.38	8966.62
	3.2-5.0	5285.734	2824.33	1.87	0.061	-249.86	10821.3
	>5.0	2694.746	2241.73	1.20	0.229	-1698.97	7088.46
Net							
	Net sender	734.800	1360.33	0.54	0.589	-1931.41	3401.01
	No remittance behaviour	2232.597	2209.446	1.01	0.312	-2097.84	6563.03
Cons.		11857.47	4000.90	2.96	0.003	4015.83	19699.1
/lnsigma		10.299	0.03206	321.19	0	10.24	10.36
sigma		29697.60	952.247			27888.67	31623.8

N = 3098 Df = 19

Log likelihood = -13755.20 AIC = 27548.44 BIC = 27663.18

Table G 1.8. Standardised descriptive statistics for WTP model variables

Variables		N	Mean	Std. dev	Min.	Max.
WTP (lower bound)		3178	14581.120	29379.540	100	100000
WTP (upper bound)			24878.540	34577.050	200	100000
Region	region	3178	1.428	0.495	1	2
Age	age	3177	40.424	12.974	1	98
Education	education	3178	1.280	0.861	0	3
Number of loans	num_loans	3145	0.744	1.072	0	5
Knowledge of Insurance	know_in	2466	3.273	1.023	1	4
Household condition	house_cond	3178	1.437	1.437	1	4
Income share from farming	IShare	3175	2.766	1.117	1	4
Net remittance behaviour	net_rem	3098	1.765	0.640	1	3
Total worry	worry	3178	21.220	7.482	0	35
Coping Strategy	coping	3178	2.393	1.131	1	4
Weather concern	wea_type	3171	1.766	0.423	1	2
Change in environment and farming difficulty	en_ch	3178	2.114	1.441	1	5
Trust	trust	3127	1.931	0.794	1	4
Insurance purchase motivation	in_mot	3146	2.253	0.793	1	3
Save and sell strategy	save_sell	3142	2.582	0.903	1	5
TAMSAT Compliance Status	tamsat	3115	1.229	0.420	1	2
Dice feeling	dice_feeling	3178	0.843	0.364	0	1
Coin risk	coin_risk	3178	2.462	1.379	0	4

Table G1.9. Frequency distribution of the factor variables for sample (Part 1/2)

Variable definition	Levels	Frequency	Percent value
Region			
	Kapchorwa	1818	57.21
	Oyam	1360	42.79
Education			
	No formal education	558	17.56
	Primary school	1470	46.26
	O-level equivalent	852	26.81
	Above O-level	298	9.38
Number of loans			
	0	1716	53.99
	1	936	29.44
	2	327	10.30
	3	93	2.93
	4	35	1.11
	5	71	2.23
Knowledge of insurance	Self and friends' knowledge	227	7.14
	Self but no friends' knowledge	665	20.92
	No self but friends' knowledge	299	9.41
	No prior knowledge	1987	62.53
Household condition			
	Poor	1503	47.30
	Average	1354	42.60
	Above Average	226	7.10
	Good	95	3.00
Income share from farming	Less than 25%	619	19.5
	Between 25% to 50%	582	18.33
	Between 50% to 75%	897	28.25
	More than 75%	1077	33.92
Net remittance behaviour	Net receiver	1191	37.46
	Net sender	1796	56.52
	No remittance beahaviour	191	6.02
Coping strategy			
	Sell livestock	1118	35.18
	Erosive coping	228	7.17
	Non-erosive coping	1296	40.78
	failed coping	536	16.87

Table G1.9. Frequency distribution of the factor variables for sample (Part 2/2)

Weather concern			
	Flood	744	23.4
	Drought	2434	76.6
Change in environment and farming difficulty	Change in Env. & Farming became harder	1476	46.44
	Change in Env& Farming became easier	989	31.12
	No change in Env& Farming became harder	125	3.93
	No Change in Env& Farming became easier	51	1.60
	Farming difficulties are same irrespective of env	537	16.90
Trust			
	Businessman	932	29.33
	Bureaucrats	1718	54.05
	Not sure	343	10.78
	No preference	186	5.85
Insurance purchase motivation	Compare with income	698	21.96
	Compared to disaster	979	30.80
	Compare to Both	1501	47.23
Save and sell			
	Never save crops	583	18.33
	Saved but not for higher price	469	14.77
	Saved and got a higher price	1839	57.86
	Saved and lost money	268	8.43
	Not sure	19	0.60
TAMSAT			
	Compliant	2449.6024	77.08
	Not compliant	728.3976	22.92
Dice feeling			
	No Feeling of insurance	498	15.67
	Feeling of insurance	2680	84.33
Coin risk			
	<0.1	433	13.62
	0.1-1.3	236	7.43
	1.3-3.2	1032	32.47
	3.2-5.0	382	12.02
	>5.0	1095	34.46

Table G1.10. Marginal effects of variables for WTP for microinsurance (Part 1/2)

Variable definitions	Levels	Marginal effects	Standard
Region			
	Kapchorwa	21813.53***	1398.793
	Oyam	13082.38***	3456.125
Education			
	No formal education	15607.91***	2599.478
	Primary school	19806.40***	1214.901
	O-level equivalent	20084.62***	1650.583
	Above O-level	23364.42***	3097.681
Number of loans			
	0	15979.03***	2095.273
	1	23150.43***	1929.869
	2	21734.70***	2660.547
	3	27371.38***	6029.804
	4	29411.18***	9233.900
	5	29869.16***	7373.846
Knowledge of insurance			
	Self and friends' knowledge	35926.87***	7856.379
	Self but no friends' knowledge	21226.15***	2236.361
	No self but friends' knowledge	25372.01***	3808.381
	No prior knowledge	16189.06***	2003.554
Household condition			
	Poor	19235.33***	1296.026
	Average	19951.01***	1325.009
	Above Average	4198.772	8004.862
	Good	3491.135***	1296.026
Income share from farming			
	Less than 25%	15679.49***	2748.432
	Between 25% to 50%	19869.96***	2005.046
	Between 50% to 75%	21271.14***	1586.546
	More than 75%	20133.56***	1490.188
Net remittance behaviour			
	Net receiver	18894.31***	1420.208
	Net sender	20089.94***	1310.588
	No remittance behaviour	18625.58***	2099.045
Coping strategy			
	Sell livestock	18025.15***	1780.471
	Erosive coping	20495.26***	2712.655
	Non-erosive coping	18237.87***	1621.383
	failed coping	25550.83***	3207.326
Weather concern			
	Flood	19640.42***	1844.757
	Drought	19430.63***	1178.400

Table G1.10. Marginal effects of variables for WTP for microinsurance (Part 2/2)

Change in environment and farming difficulties			
	Change in Env. & Farming became harder	19202.94***	1553.221
	Change in Env. & Farming became easier	21177.34***	1607.786
	No change in Env. & Farming became harder	10983.21**	4608.458
	No Change in Env. & Farming became easier	14483.33**	6570.536
	Farming difficulties are same irrespective of weather	19917.58***	2223.983
Trust			
	Businessman	22551.83***	1725.066
	Bureaucrats	17368.81***	1753.951
	Not sure	19793.6***	2014.572
	No preference	20535.7***	2366.467
Insurance purchase motivation			
	Compare with income	16339.12***	2315.691
	Compared to disaster	19142.59***	1564.564
	Compare to Both	21152.12***	1313.296
Save and sell strategy			
	Never save crops	18992.26***	1869.755
	Saved but not for higher price	22465.98***	2425.871
	Saved and got a higher price	18277.13***	1382.464
	Saved and lost money	22447.18***	3091.262
	Not sure	34172.62***	11990.49
TAMSAT Compliance Status			
	Yes	18920.31***	1215.010
	No	21365.91***	2057.243
Dice feeling			
	No feeling of insurance	17842.18***	2321.536
	Feeling of insurance	19743.78***	1071.771
Coin risk			
	<0.1	17363.29***	2403.549
	0.1-1.3	17575.44***	2931.626
	1.3-3.2	21183.47***	1491.777
	3.2-5.0	19838.92***	2099.691
	>5.0	19159.44***	1515.764

Table G1.11. Probit models for lower and upper interval bounds: WTP for microinsurance

		WTP for microinsurance			WTP for microinsurance		
Var.	***levels***	***Coeff.***		***Std. Err.***	***Coeff.***		***Std. Err.***
Age		0.0029		0.0020	0.0028		0.0020
Region							
	Oyam	-0.1129		0.0761	-0.1002		0.0777
Education							
	Primary school	0.1975	**	0.0789	0.1977	**	0.0794
	O-level equivalent	0.2189	**	0.0856	0.2179	**	0.0857
	Above O-level	0.4336	***	0.1082	0.4406	***	0.1076
Number of loans							
	1	0.2941	***	0.0593	0.2946	***	0.0605
	2	0.2133	**	0.0893	0.2036	**	0.0891
	3	0.4497	***	0.1655	0.4433	***	0.1669
	4	0.2238		0.2895	0.2689		0.3129
	5	0.4959	***	0.1712	0.5094	***	0.1757
Knowledge of insurance							
	Self but not friends' knowledge	-0.3036	*	0.1564	-0.3036	*	0.1628
	No self but friends' knowledge	-0.4120	**	0.1609	-0.4173	**	0.1683
	No prior knowledge	-0.4640	***	0.1530	-0.4553	***	0.1598
Household condition							
	Average	0.0461		0.0520	0.0482		0.0525
	Above Average	0.0892		0.1377	0.0537		0.1382
	Good	-0.7498	*	0.4376	-0.7411	*	0.4335
Income share from farming							
	Between 25% to 50%	0.1681	**	0.0826	0.1691	**	0.0833
	Between 50% to 75%	0.3076	***	0.0830	0.3242	***	0.0840
	More than 75%	0.3138	***	0.0818	0.3191	***	0.0828
Net remittance behaviour							
	Net sender	0.0327		0.0554	0.0233		0.0555
	No remittance	-0.0077		0.0800	-0.0106		0.0807
Worry		-0.0139	***	0.0042	-0.0133	***	0.0042
Coping							
	Non-erosive	0.0149		0.0680	0.0179		0.0680
	Erosive	0.2481	**	0.1022	0.2396	**	0.1009
	Failed	0.2198	***	0.0846	0.2185	**	0.0847
Weather							
	Drought	0.0801		0.0738	0.0784		0.0758

Change in Env and farming difficulties						
Change in Env& Farming became easier	0.0946		0.0723	0.0955		0.0742
No change in Env& Farming became harder	-0.2973	**	0.1193	-0.3048	**	0.1180
No Change in Env& Farming became easier	-0.4749	**	0.2399	-0.4843	**	0.2356
Farming difficulties are same irrespective of weather	0.0055		0.0880	0.0157		0.0880
Trust						
Bureaucrats	-0.1623	**	0.0659	-0.1494	**	0.0665
Not sure	-0.0802		0.0987	-0.0820		0.0980
No preference	-0.0416		0.0929	-0.0249		0.0954
Insurance purchase motivation						
Compared to disaster	0.0558		0.0761	0.0487		0.0770
Compare to Both	0.1696	**	0.0730	0.1687	**	0.0746
Save and sell strategy						
Saved but not for higher price	0.2514	**	0.1037	0.2533	**	0.1042
Saved and got a higher price	0.1979	***	0.0698	0.2073	***	0.0702
Saved and lost money	0.3445	***	0.1030	0.3652	***	0.1038
Not sure	0.1370		0.4417	0.0774		0.4239
TAMSAT						
No	0.0497		0.0790	0.0499		0.0799
Dice feeling						
Feeling of	0.3201	***	0.0880	0.3394	***	0.0870
Coin risk						
0.1-1.3	-0.0775		0.1126	-0.0629		0.1134
1.3-3.2	0.0491		0.0758	0.0531		0.0756
3.2-5.0	-0.0272		0.1002	-0.0065		0.1015
>5.0	0.0547		0.0769	0.0739		0.0766
		N	*3098*		*N*	*3098*
		LL	*-4314.618*		*LL*	*-4114.44*
		df	*51*		*df*	*50*
		AIC	*8731.236*		*AIC*	*8328.880*
		BIC	*9024.297*		*BIC*	*8616.196*

Table G1.12. Probit models for lower and upper interval bounds: WTP for loan

	WTP for loan (Lower Bound)			WTP for loan (Lower Bound)		
Var.	**Coeff.**		**Std. Err.**	**Coeff.**		**Std. Err.**
Age	0.0025		0.0021	0.0026		0.0022
Region						
Oyam	-0.1258		0.0778	-0.1324	*	0.0779
Education						
Primary school	0.2441	***	0.0812	0.2550	***	0.0811
O-level equivalent	0.2298	***	0.0839	0.2375	***	0.0836
Above O-level	0.4842	***	0.1116	0.4928	***	0.1107
Number of loans						
1	0.2732	***	0.0570	0.2770	***	0.0583
2	0.2015	**	0.0849	0.2054	**	0.0846
3	0.3912	*	0.2087	0.3559	*	0.2025
4	0.3178		0.2632	0.3657		0.2791
5	0.5592	***	0.1553	0.5432	***	0.1502
Knowledge of insurance						
Self but not friends' knowledge	-0.1314		0.1557	-0.1354		0.1625
No self but friends' knowledge	-0.1566		0.1525	-0.1699		0.1562
No prior knowledge	-0.2979	**	0.1494	-0.3045	*	0.1565
Household condition						
Average	0.0081		0.0524	0.0103		0.0525
Above Average	0.2945	**	0.1475	0.2823	*	0.1484
Good	0.6038		0.5405	0.5587		0.5236
Income share from farming						
Between 25% to 50%	0.1622	**	0.0820	0.1511	*	0.0826
Between 50% to 75%	0.2750	***	0.0851	0.2805	***	0.0858
More than 75%	0.2974	***	0.0877	0.2926	***	0.0886
Net remittance behaviour						
Net sender	0.0416		0.0590	0.0334		0.0593
No remittance behaviour	-0.0260		0.0797	-0.0344		0.0809
Worry	-0.0121	**	0.0046	-0.0126	***	0.0047
Coping strategy						
Non-erosive coping	0.0444		0.0664	0.0513		0.0669
Erosive coping	0.2234	**	0.1002	0.2223	**	0.0997
Failed coping	0.2450	***	0.0858	0.2523	***	0.0855
Weather concern						
Drought	0.0631		0.0728	0.0728		0.0735
Change in Env and farming difficulties						
Change in Env& Farming became easier	0.1193	*	0.0689	0.1211	*	0.0704
No change in Env& Farming became harder	-0.2243	*	0.1255	-0.2196	*	0.1229
No Change in Env& Farming became easier	-0.6799	***	0.2390	-0.6905	***	0.2311
Farming difficulties same irrespective of weather	0.1052		0.0831	0.1160		0.0847

Trust						
	Bureaucrats	-0.0916		0.0655	-0.0810	0.0663
	Not sure	-0.1133		0.0947	-0.1065	0.0960
	No preference	-0.0075		0.1042	-0.0062	0.1035
Insurance purchase motivation						
	Compared to disaster	0.1071		0.0760	0.0987	0.0765
	Compare to Both	0.1517	**	0.0733	0.1519 **	0.0733
Save and sell strategy						
	Saved but not for higher price	0.3095	***	0.0994	0.3049 ***	0.0989
	Saved and got a higher price	0.1966	***	0.0754	0.2002 ***	0.0753
	Saved and lost money	0.3532	***	0.1093	0.3616 ***	0.1117
	Not sure	-0.0412		0.4279	-0.0423	0.4316
TAMSAT compliance						
	No	-0.0334		0.0817	-0.0390	0.0809
Dice feeling						
	Feeling of insurance	0.3358	***	0.0864	0.3391 ***	0.0871
Coin risk						
	0.1-1.3	-0.1029		0.1065	-0.1002	0.1084
	1.3-3.2	-0.0654		0.0707	-0.0628	0.0709
	3.2-5.0	-0.0480		0.0992	-0.0448	0.1005
	>5.0	-0.0192		0.0763	-0.0124	0.0768
			N	*3098*	*N*	*3098*
			LL	*-4254.529*	*LL*	*-4095.459*
			df	*51*	*df*	*50*
			AIC	*8611.058*	*AIC*	*8290.918*
			BIC	*8904.119*	*BIC*	*8578.233*

Table G1.13. Frequencies of independent variable values by WTP bound: microinsurance and loan

		WTP microinsurance		WTP loan	
WTP 0-100 UGX					
Education		Frequency	%	Frequency	%
	No formal education	114	30.4	122	31.94
	Primary school	171	45.6	161	42.15
	O-level equivalent	77	20.53	85	22.25
	Above O-level	13	3.47	14	3.66
Numeracy					
	Low Numeracy	12	3.2	12	3.14
	Medium Numeracy	151	40.27	148	38.74
	High Numeracy	212	56.53	222	58.12
Literacy					
	Literate	100	26.67	109	28.53
	Illiterate	275	73.33	273	71.47
Family Size					
	0	7	1.87	5	1.31
	1	33	8.8	30	7.85
	2	39	10.4	35	9.16
	3	68	18.13	66	17.28
	4	55	14.67	73	19.11
	5	50	13.33	58	15.18
	6	45	12	49	12.83
	7	30	8	22	5.76
	8	14	3.73	19	4.97
	9	16	4.27	9	2.36
	10	10	2.67	7	1.83
	11	3	0.8	2	0.52
	12	1	0.27	2	0.52
	13	1	0.27	-	-
	14	1	0.27	1	0.26
	15	-	-	-	-
	16	2	0.53	4	1.05
Knowldge of insurance					
	Self and friends knowledge	15	5.36	14	4.93
	Self but no friends' knowledge	36	12.86	39	13.73
	No self but friends' knowledge	48	17.14	47	16.55
	No prior knowledge	181	64.64	184	64.79
Household condition					
	Poor	244	65.07	242	63.35
	Average	127	33.87	137	35.86
	Above average	-	-	-	-
	Good	4	1.07	3	0.79

Income share from farming					
	Less than 25%	119	31.99	115	30.34
	25% - 50%	83	22.31	83	21.9
	50% - 75%	78	20.97	79	20.84
	More than 75%	92	24.73	102	26.91
Net remittance behaviour					
	Net receiver	93	33.57	121	33.61
	Net sender	149	53.79	181	50.28
	No remittance behaviour	35	12.64	58	16.11
Coping strategy					
	Sell livestock	133	35.47	136	35.6
	Erosive coping	14	3.73	15	3.93
	Non erosive coping	162	43.2	161	42.15
	Failed coping	66	17.6	70	18.32
Weather concern					
	Flood	127	34.42	136	36.27
	Drought	242	65.58	239	63.73
Change in env and farming difficulties					
	Environment changed and farming became harder	154	41.07	168	43.98
	Environment changed and farming became easier	86	22.93	84	21.99
	Environment didn't changed and farming became harder	26	6.93	29	7.59
	Environment didn't changed and farming became easier	13	3.47	17	4.45
	Farming difficulties are same irrespective of weather	96	25.6	84	21.99
Trust					
	Businessman	104	28.81	104	28.34
	Bureaucrats	181	50.14	185	50.41
	Not sure	55	15.24	53	14.44
	No preference	21	5.82	25	6.81
Insurance purchase decision					
	Compared to income	93	25.91	100	27.62
	Compared to disaster	109	30.36	107	29.56
	Compared to both	157	43.73	155	42.82

Save and sell strategy					
	Never save crops	121	33.7	116	31.61
	Saved but not for higher price	56	15.6	54	14.71
	Save and got a higher price	150	41.78	166	45.23
	Saved and lost money	26	7.24	23	6.27
	Not sure	6	1.67	8	2.18
TAMSAT					
	Compliant	267	72.55	255	68.36
	Non-compliant	101	27.45	118	31.64
Dice feeling					
	No feeling of insurance	132	35.2	132	34.55
	Feeling of insurance	243	64.8	250	65.45
Coin risk					
	<0.1	30	8	33	8.64
	0.1-1.3	34	9.07	33	8.64
	1.3-3.2	139	37.07	154	40.31
	3.2-5.0	55	14.67	51	13.35
	>5.0	117	31.2	111	29.06
WTP 100-200 UGX					
Education					
	No formal education	33	18.97	39	20.86
	Primary school	91	52.3	101	54.01
	O-level equivalent	44	25.29	37	19.79
	Above O-level	6	3.45	10	5.35
Numeracy					
	Low Numeracy			-	-
	Medium Numeracy	60	34.48	59	31.55
	High Numeracy	114	65.52	128	68.45
Literacy					
	Literate	31	17.82	33	17.65
	Illiterate	143	82.18	154	82.35
Family Size					
	0	3	1.72	3	1.6
	1	10	5.75	14	7.49
	2	14	8.05	13	6.95
	3	47	27.01	49	26.2
	4	31	17.82	31	16.58
	5	16	9.2	22	11.76
	6	23	13.22	24	12.83
	7	10	5.75	8	4.28
	8	8	4.6	10	5.35
	9	3	1.72	8	4.28
	10	3	1.72	2	1.07
	11	1	0.57	-	-
	12	3	1.72	2	1.07

	13	1	0.57	1	0.53
	14	-	-	-	-
	15	-	-	-	-
	16	1	0.57	-	-
Knowledge of insurance					
	Self and friends knowledge	5	4.03	11	7.91
	Self but no friends' knowledge	15	12.1	20	14.39
	No self but friends' knowledge	13	10.48	16	11.51
	No prior knowledge	91	73.39	92	66.19
Household condition					
	Poor	106	60.92	115	61.5
	Average	68	39.08	72	38.5
	Above average	-	-	-	-
	Good	-	-	-	-
Income share from farming					
	Less than 25%	36	20.69	46	24.6
	25% - 50%	39	22.41	39	20.86
	50% - 75%	50	28.74	54	28.88
	More than 75%	49	28.61	48	25.67
Net remittance behaviour					
	Net receiver	114	32.11	66	35.68
	Net sender	183	51.55	108	58.38
	No remittance behaviour	58	16.34	11	5.95
Coping strategy					
	Sell livestock	70	40.23	77	41.18
	Erosive coping	7	4.02	9	4.81
	Non erosive coping	77	44.25	75	40.11
	Failed coping	20	11.49	26	13.9
Weather concern					
	Flood	40	22.99	42	22.46
	Drought	134	77.01	145	77.54
Change in env and farming difficulties					
	Environment changed and farming became harder	110	63.22	114	60.96
	Environment changed and farming became easier	31	17.82	36	19.25
	Environment didn't changed and farming became harder	11	6.32	9	4.81

	Environment didn't changed and farming became easier	4	2.3	6	3.21
	Farming difficulties are same irrespective of weather	18	10.34	22	11.76
Trust					
	Businessman	45	26.01	51	27.42
	Bureaucrats	101	58.38	101	54.3
	Not sure	15	8.67	17	9.14
	No preference	12	6.94	17	9.14
Insurance purchase decision					
	Compared to income	20	11.56	24	12.9
	Compared to disaster	62	35.84	65	34.95
	Compared to both	91	52.6	97	52.15
Save and sell strategy					
	Never save crops	26	14.94	33	17.65
	Saved but not for higher price	8	4.6	13	6.95
	Save and got a higher price	128	73.56	124	66.31
	Saved and lost money	12	6.9	17	9.09
	Not sure	-	-	-	-
TAMSAT					
	Compliant	130	76.02	143	77.72
	Non-compliant	41	23.98	41	22.28
Dice feeling					
	No feeling of insurance	41	23.56	43	22.99
	Feeling of insurance	133	76.44	144	77.01
Coin risk					
	<0.1	15	8.62	12	6.42
	0.1-1.3	17	9.77	20	10.7
	1.3-3.2	62	35.63	67	35.83
	3.2-5.0	30	17.24	30	16.04
	>5.0	50	28.74	58	31.02
WTP 200-500 UGX					
Education					
	No formal education	61	20.54	59	17.4
	Primary school	134	45.12	159	46.9
	O-level equivalent	75	25.25	97	28.61
	Above O-level	27	9.09	24	7.08
Numeracy					

	Low Numeracy	2	0.67	2	0.59
	Medium Numeracy	121	40.74	145	42.77
	High Numeracy	174	58.59	192	56.64
Literacy					
	Literate	66	22.22	73	21.53
	Illiterate	231	77.78	266	78.47
Family Size					
	0	4	1.35	4	1.18
	1	14	4.71	19	5.6
	2	24	8.08	33	9.73
	3	43	14.48	46	13.57
	4	54	18.18	52	15.34
	5	40	13.47	43	12.68
	6	36	12.12	48	14.16
	7	31	10.44	40	11.8
	8	24	8.08	30	8.85
	9	11	3.7	8	2.36
	10	8	2.69	10	2.95
	11	3	1.01	2	0.59
	12	1	0.34	1	0.29
	13	1	0.34	-	-
	14	1	0.34	-	-
	15	-	-	1	0.29
	16	2	0.67	2	0.59
Knowledge of insurance					
	Self and friends knowledge	15	6.7	15	6.1
	Self but no friends' knowledge	51	22.77	52	21.14
	No self but friends' knowledge	29	12.95	24	9.76
	No prior knowledge	129	57.59	155	63.01
Household condition					
	Poor	172	57.91	195	57.52
	Average	124	41.75	144	42.48
	Above average	-	-	-	-
	Good	1	0.34	-	-
Income share from farming					
	Less than 25%	70	23.57	72	21.24
	25% - 50%	48	16.16	56	16.52
	50% - 75%	81	27.27	91	26.84
	More than 75%	98	33	120	35.4
Net remittance behaviour					
	Net receiver	60	34.88	110	32.84
	Net sender	102	59.3	182	54.33
	No remittance behaviour	10	5.81	43	12.84
Coping strategy					
	Sell livestock	114	38.38	125	36.87

	Erosive coping	25	8.42	29	8.55
	Non erosive coping	118	39.73	139	41
	Failed coping	40	13.47	46	13.57
Weather concern					
	Flood	70	23.57	78	23.01
	Drought	227	76.43	261	76.99
Change in env and farming difficulties					
	Environment changed and farming became harder	173	58.25	191	56.34
	Environment changed and farming became easier	79	26.6	94	27.73
	Environment didn't changed and farming became harder	9	3.03	10	2.95
	Environment didn't changed and farming became easier	7	2.36	4	1.18
	Farming difficulties are same irrespective of weather	29	9.76	40	11.8
Trust					
	Businessman	65	22.03	90	26.71
	Bureaucrats	185	62.71	205	60.83
	Not sure	34	11.53	33	9.79
	No preference	11	3.73	9	2.67
Insurance purchase decision					
	Compared to income	63	21.21	81	23.89
	Compared to disaster	135	45.45	151	44.54
	Compared to both	99	33.33	107	31.56
Save and sell strategy					
	Never save crops	70	23.73	72	21.36
	Saved but not for higher price	41	13.9	46	13.65
	Save and got a higher price	162	54.92	196	58.16
	Saved and lost money	22	7.46	22	6.53
	Not sure	-	-	1	0.3
TAMSAT					
	Compliant	222	76.55	246	74.1
	Non-compliant	68	23.45	86	25.9

Dice feeling					
	No feeling of insurance	46	15.49	37	10.91
	Feeling of insurance	251	84.51	302	89.09
Coin risk					
	<0.1	38	12.79	46	13.57
	0.1-1.3	23	7.74	30	8.85
	1.3-3.2	109	36.7	116	34.22
	3.2-5.0	33	11.11	44	12.98
	>5.0	94	31.65	103	30.38
WTP500-1,000 UGX					
Education					
	No formal education	117	15.33	122	14.51
	Primary school	397	52.03	427	50.77
	O-level equivalent	189	24.77	213	25.33
	Above O-level	60	7.86	79	9.39
Numeracy					
	Low Numeracy	4	0.52	5	0.59
	Medium Numeracy	317	41.55	341	40.55
	High Numeracy	442	57.93	495	58.86
Literacy					
	Literate	136	17.82	140	16.65
	Illiterate	627	82.18	701	83.35
Family Size					
	0	7	0.92	7	0.83
	1	38	4.98	36	4.28
	2	72	9.44	66	7.85
	3	112	14.68	141	16.77
	4	139	18.22	150	17.84
	5	122	15.99	137	16.29
	6	107	14.02	116	13.79
	7	71	9.31	85	10.11
	8	49	6.42	44	5.23
	9	22	2.88	24	2.85
	10	11	1.44	13	1.55
	11	4	0.52	8	0.95
	12	3	0.39	5	0.59
	13	3	0.39	4	0.48
	14	1	0.13	1	0.12
	15	-	-	1	0.12
	16	2	0.26	3	0.36
Knowledge of insurance					
	Self and friends knowledge	25	4.45	39	6.09
	Self but no friends' knowledge	106	18.86	123	19.22
	No self but friends' knowledge	40	7.12	42	6.56

	No prior knowledge	391	69.57	436	68.13
Household condition					
	Poor	380	49.8	435	51.72
	Average	381	49.93	404	48.04
	Above average	-	-	-	-
	Good	2	0.26	2	0.24
Income share from farming					
	Less than 25%	165	21.63	172	20.45
	25% - 50%	131	17.17	140	16.65
	50% - 75%	189	24.77	224	26.63
	More than 75%	278	36.44	305	36.27
Net remittance behaviour					
	Net receiver	94	31.97	287	34.75
	Net sender	165	56.12	451	54.6
	No remittance behavior	35	11.9	88	10.65
Coping strategy					
	Sell livestock	317	41.55	346	41.14
	Erosive coping	60	7.86	62	7.37
	Non erosive coping	267	34.99	308	36.62
	Failed coping	119	15.6	125	14.86
Weather concern					
	Flood	176	23.07	193	22.95
	Drought	587	76.93	648	77.05
Change in env and farming difficulties					
	Environment changed and farming became harder	348	45.61	396	47.09
	Environment changed and farming became easier	234	30.67	253	30.08
	Environment didn't changed and farming became harder	54	7.08	47	5.59
	Environment didn't changed and farming became easier	9	1.18	9	1.07
	Farming difficulties are same irrespective of weather	118	15.47	136	16.17
Trust					
	Businessman	219	28.97	224	26.92
	Bureaucrats	430	56.88	477	57.33
	Not sure	60	7.94	83	9.98

	No preference	47	6.22	48	5.77
Insurance purchase decision					
	Compared to income	205	26.97	198	23.6
	Compared to disaster	257	33.82	285	33.97
	Compared to both	298	39.21	356	42.43
Save and sell strategy					
	Never save crops	132	17.39	144	17.22
	Saved but not for higher price	120	15.81	125	14.95
	Save and got a higher price	433	57.05	489	58.49
	Saved and lost money	71	9.35	75	8.97
	Not sure	3	0.4	3	0.36
TAMSAT					
	Compliant	598	79.84	665	80.02
	Non-compliant	151	20.16	166	19.98
Dice feeling					
	No feeling of insurance	85	11.14	126	14.98
	Feeling of insurance	678	88.86	715	85.02
Coin risk					
	<0.1	128	16.78	139	16.53
	0.1-1.3	49	6.42	52	6.18
	1.3-3.2	244	31.98	264	31.39
	3.2-5.0	72	9.44	77	9.16
	>5.0	270	35.39	309	36.74
WTP 1,000-5,000 UGX					
Education					
	No formal education	94	14.26	96	14.57
	Primary school	294	44.61	299	45.37
	O-level equivalent	190	28.83	183	27.77
	Above O-level	81	12.29	81	12.29
Numeracy					
	Low Numeracy	2	0.3	3	0.46
	Medium Numeracy	207	31.41	206	31.26
	High Numeracy	450	68.29	450	68.29
Literacy					
	Literate	87	13.2	84	12.75
	Illterate	572	86.8	575	87.25
Family Size					
	0	5	0.76	6	0.91
	1	20	3.03	21	3.19
	2	51	7.74	62	9.41
	3	105	15.93	81	12.29
	4	121	18.36	133	20.18

	5	113	17.15	100	15.17
	6	93	14.11	96	14.57
	7	62	9.41	55	8.35
	8	40	6.07	47	7.13
	9	20	3.03	26	3.95
	10	12	1.82	18	2.73
	11	6	0.91	5	0.76
	12	5	0.76	4	0.61
	13	2	0.3	3	0.46
	14	2	0.3	2	0.3
	15	1	0.15	-	-
	16	1	0.15	-	-
Knowledge of insurance					
	Self and friends knowledge	26	4.83	26	4.8
	Self but no friends' knowledge	108	20.07	117	21.59
	No self but friends' knowledge	30	5.58	36	6.64
	No prior knowledge	374	69.52	363	66.97
Household condition					
	Poor	375	56.9	389	59.03
	Average	278	42.19	264	40.06
	Above average	1	0.15	1	0.15
	Good	5	0.76	5	0.76
Income share from farming					
	Less than 25%	102	15.48	95	14.42
	25% - 50%	109	16.54	107	16.24
	50% - 75%	184	27.92	196	29.74
	More than 75%	264	40.06	261	39.61
Net remittance behavior					
	Net receiver	270	35.95	227	34.92
	Net sender	399	53.13	353	54.31
	No remittance behavior	82	10.92	70	10.77
Coping strategy					
	Sell livestock	221	33.54	197	29.89
	Erosive coping	47	7.13	50	7.59
	Non erosive coping	301	45.68	313	47.5
	Failed coping	90	13.66	99	15.02
Weather concern					
	Flood	117	17.75	102	15.48
	Drought	542	82.25	557	84.52
Change in env and farming difficulties					
	Environment changed and farming became harder	302	45.83	278	42.19

	Environment changed and farming became easier	216	32.78	257	39
	Environment didn't changed and farming became harder	12	1.82	14	2.12
	Environment didn't changed and farming became easier	7	1.06	6	0.91
	Farming difficulties are same irrespective of weather	122	18.51	104	15.78
Trust					
	Businessman	202	30.93	212	32.47
	Bureaucrats	352	53.91	327	50.08
	Not sure	66	10.11	80	12.25
	No preference	33	5.05	34	5.21
Insurance purchase decision					
	Compared to income	132	20.09	132	20.06
	Compared to disaster	178	27.09	153	23.25
	Compared to both	347	52.82	373	56.69
Save and sell strategy					
	Never save crops	90	13.7	90	13.7
	Saved but not for higher price	97	14.76	99	15.07
	Save and got a higher price	414	63.01	415	63.17
	Saved and lost money	53	8.07	52	7.91
	Not sure	3	0.46	1	0.15
TAMSAT_Compliance					
	Compliant	519	81.09	539	84.35
	Non-compliant	121	18.91	100	15.65
Dice feeling					
	No feeling of insurance	81	12.29	65	9.86
	Feeling of insurance	578	87.71	594	90.14
Coin risk					
	<0.1	130	19.73	117	17.75
	0.1-1.3	54	8.19	51	7.74
	1.3-3.2	183	27.77	174	26.4
	3.2-5.0	64	9.71	61	9.26
	>5.0	228	34.6	256	38.85

WTP 5,000-10,000 UGX					
Education					
	No formal education	64	14.04	57	14.29
	Primary school	195	42.76	177	44.36
	O-level equivalent	135	29.61	120	30.08
	Above O-level	62	13.6	45	11.28
Numeracy					
	Low Numeracy	2	0.44	3	0.75
	Medium Numeracy	140	30.7	133	33.33
	High Numeracy	314	68.86	263	65.91
Literacy					
	Literate	64	14.04	67	16.79
	Illiterate	392	85.96	332	83.21
Family Size					
	0	7	1.54	8	2.01
	1	21	4.61	17	4.26
	2	31	6.8	25	6.27
	3	61	13.38	58	14.54
	4	94	20.61	73	18.3
	5	56	12.28	61	15.29
	6	82	17.98	66	16.54
	7	27	5.92	32	8.02
	8	38	8.33	32	8.02
	9	14	3.07	11	2.76
	10	15	3.29	9	2.26
	11	1	0.22	-	-
	12	2	0.44	1	0.25
	13	4	0.88	3	0.75
	14	-	-	-	-
	15	2	0.44	2	0.5
	16	1	0.22	1	0.25
Knowledge of insurance					
	Self and friends knowledge	30	7.79	23	7.17
	Self but no friends' knowledge	130	33.77	102	31.78
	No self but friends' knowledge	18	4.68	21	6.54
	No prior knowledge	207	53.77	175	54.52
Household condition					
	Poor	285	62.5	235	58.9
	Average	171	37.5	164	41.1
	Above average	-	-	-	-
	Good	-	-	-	-
Income share from farming					
	Less than 25%	44	9.65	55	13.78
	25% - 50%	64	14.04	67	16.79

	50% - 75%	184	40.35	146	36.59
	More than 75%	164	35.96	131	32.83
Net remittance behaviour					
	Net receiver	229	35.39	163	41.37
	Net sender	342	52.86	195	49.49
	No remittance behaviour	76	11.75	36	9.14
Coping strategy					
	Sell livestock	117	25.66	120	30.08
	Erosive coping	43	9.43	35	8.77
	Non erosive coping	222	48.68	172	43.11
	Failed coping	74	16.23	72	18.05
Weather concern					
	Flood	81	17.8	78	19.55
	Drought	374	82.2	321	80.45
Change in env and farming difficulties					
	Environment changed and farming became harder	178	39.04	165	41.35
	Environment changed and farming became easier	207	45.39	149	37.34
	Environment didn't changed and farming became harder	4	0.88	8	2.01
	Environment didn't changed and farming became easier	4	0.88	4	1
	Farming difficulties are same irrespective of weather	63	13.82	73	18.3
Trust					
	Businessman	134	29.58	108	27.48
	Bureaucrats	222	49.01	224	57
	Not sure	66	14.57	35	8.91
	No preference	31	6.84	26	6.62
Insurance purchase decision					
	Compared to income	89	19.6	80	20.2
	Compared to disaster	104	22.91	105	26.52
	Compared to both	261	57.49	211	53.28
Save and sell strategy					
	Never save crops	55	12.11	51	12.88

	Saved but not for higher price	48	10.57	48	12.12
	Save and got a higher price	319	70.26	261	65.91
	Saved and lost money	31	6.83	34	8.59
	Not sure	1	0.22	2	0.51
TAMSAT_Compliance					
	Compliant	354	78.67	302	76.84
	Non-compliant	96	21.33	91	23.16
Dice feeling					
	No feeling of insurance	50	10.96	41	10.28
	Feeling of insurance	406	89.04	358	89.72
Coin risk					
	<0.1	34	7.46	39	9.77
	0.1-1.3	28	6.14	28	7.02
	1.3-3.2	135	29.61	124	31.08
	3.2-5.0	54	11.84	58	14.54
	>5.0	205	44.96	150	37.59
WTP 10,000-50,000 UGX					
Education					
	No formal education	25	15.82	17	14.17
	Primary school	65	41.14	49	40.83
	O-level equivalent	48	30.38	40	33.33
	Above O-level	20	12.66	14	11.67
Numeracy					
	Low Numeracy	5	3.16	3	2.5
	Medium Numeracy	54	34.18	40	33.33
	High Numeracy	99	62.66	77	64.17
Literacy					
	Literate	25	15.82	24	20
	Illiterate	133	84.18	96	80
Family Size					
	0	3	1.9	2	1.67
	1	10	6.33	9	7.5
	2	19	12.03	15	12.5
	3	25	15.82	16	13.33
	4	22	13.92	21	17.5
	5	26	16.46	10	8.33
	6	21	13.29	21	17.5
	7	16	10.13	10	8.33
	8	10	6.33	6	5
	9	2	1.27	4	3.33
	10	3	1.9	4	3.33
	11	-	-	-	-
	12	1	0.63	1	0.83
	13	-	-	1	0.83

	14	-	-	-	-
	15	-	-	-	-
	16	-	-	-	-
Knowledge of insurance					
	Self and friends knowledge	15	14.42	14	17.5
	Self but no friends' knowledge	20	19.23	19	23.75
	No self but friends' knowledge	11	10.58	9	11.25
	No prior knowledge	58	55.77	38	47.5
Household condition					
	Poor	93	58.86	68	56.67
	Average	65	41.14	52	43.33
	Above average	-	-	-	-
	Good	-	-	-	-
Income share from farming					
	Less than 25%	24	15.19	21	17.5
	25% - 50%	36	22.78	25	20.83
	50% - 75%	55	34.81	45	37.5
	More than 75%	43	27.22	29	24.17
Net remittance behaviour					
	Net receiver	172	37.97	38	33.63
	Net sender	240	52.98	60	53.1
	No remittance behaviour	41	9.05	15	13.27
Coping strategy					
	Sell livestock	47	29.75	32	26.67
	Erosive coping	11	6.96	9	7.5
	Non erosive coping	60	37.97	47	39.17
	Failed coping	40	25.32	32	26.67
Weather concern					
	Flood	40	25.32	21	17.5
	Drought	118	74.68	99	82.5
Change in env and farming difficulties					
	Environment changed and farming became harder	70	44.3	49	40.83
	Environment changed and farming became easier	51	32.28	40	33.33
	Environment didn't changed and farming became harder	1	0.63	-	-

	Environment didn't changed and farming became easier	1	0.63	-	-
	Farming difficulties are same irrespective of weather	35	22.15	31	25.83
Trust					
	Businessman	35	23.18	28	24.14
	Bureaucrats	94	62.25	71	61.21
	Not sure	10	6.62	12	10.34
	No preference	12	7.95	5	4.31
Insurance purchase decision					
	Compared to income	31	20.13	25	20.83
	Compared to disaster	36	23.38	25	20.83
	Compared to both	87	56.49	70	58.33
Save and sell strategy					
	Never save crops	21	13.55	19	16.24
	Saved but not for higher price	36	23.23	26	22.22
	Save and got a higher price	81	52.26	58	49.57
	Saved and lost money	16	10.32	13	11.11
	Not sure	1	0.65	1	0.85
TAMSAT					
	Compliant	354	78.67	91	77.78
	Non-compliant	96	21.33	26	22.22
Dice feeling					
	No feeling of insurance	13	8.23	14	11.67
	Feeling of insurance	145	91.77	106	88.33
Coin risk					
	<0.1	13	8.23	12	10
	0.1-1.3	13	8.23	7	5.83
	1.3-3.2	46	29.11	42	35
	3.2-5.0	34	21.52	22	18.33
	>5.0	52	32.91	37	30.83
WTP 50,000-100,000 UGX					
Education					
	No formal education	50	16.89	46	18.33
	Primary school	123	41.55	97	38.65
	O-level equivalent	94	31.76	77	30.68
	Above O-level	29	9.8	31	12.35
Numeracy					

	Low Numeracy	7	2.36	6	2.39
	Medium Numeracy	130	43.92	108	43.03
	High Numeracy	159	53.72	137	54.58
Literacy					
	Literate	80	27.03	59	23.51
	Illiterate	216	72.97	192	76.49
Family Size					
	0	6	2.03	7	2.79
	1	10	3.38	10	3.98
	2	21	7.09	22	8.76
	3	39	13.18	43	17.13
	4	68	22.97	51	20.32
	5	51	17.23	43	17.13
	6	54	18.24	41	16.33
	7	21	7.09	16	6.37
	8	17	5.74	12	4.78
	9	2	0.68	-	-
	10	4	1.35	3	1.2
	11	2	0.68	3	1.2
	12	-	-	-	-
	13	-	-	-	-
	14	-	-	-	-
	15	-	-	-	-
	16	1	0.34	-	-
Knowledge of insurance					
	Self and friends knowledge	45	18.07	34	15.89
	Self but no friends' knowledge	50	20.08	44	20.56
	No self but friends' knowledge	43	17.27	37	17.29
	No prior knowledge	111	44.58	99	46.26
Household condition					
	Poor	160	54.05	136	54.18
	Average	136	45.95	113	45.02
	Above average			-	-
	Good	-	-	2	0.8
Income share from farming					
	Less than 25%	59	19.93	43	17.13
	25% - 50%	72	24.32	65	25.9
	50% - 75%	76	25.68	62	24.7
	More than 75%	89	30.07	81	32.27
Net remittance behaviour					
	Net receiver	51	34.23	71	30.21
	Net sender	78	52.35	128	54.47
	No remittance behaviour	20	13.42	36	15.32
Coping strategy					
	Sell livestock	99	33.45	85	33.86

	Erosive coping	21	7.09	19	7.57
	Non erosive coping	89	30.07	81	32.27
	Failed coping	87	29.39	66	26.29
Weather concern					
	Flood	91	30.74	92	36.65
	Drought	205	69.26	159	63.35
Change in env and farming difficulties					
	Environment changed and farming became harder	141	47.64	115	45.82
	Environment changed and farming became easier	85	28.72	76	30.28
	Environment didn't changed and farming became harder	8	2.7	8	3.19
	Environment didn't changed and farming became easier	6	2.03	5	1.99
	Farming difficulties are same irrespective of weather	56	18.92	47	18.73
Trust					
	Businessman	113	39.65	100	41.15
	Bureaucrats	125	43.86	100	41.15
	Not sure	31	10.88	24	9.88
	No preference	16	5.61	19	7.82
Insurance purchase decision					
	Compared to income	58	19.86	51	20.73
	Compared to disaster	88	30.14	78	31.71
	Compared to both	146	50	117	47.56
Save and sell strategy					
	Never save crops	61	21.11	51	20.82
	Saved but not for higher price	58	20.07	53	21.63
	Save and got a higher price	131	45.33	109	44.49
	Saved and lost money	34	11.76	29	11.84
	Not sure	5	1.73	3	1.22
TAMSAT					
	Compliant	200	68.03	160	65.04
	Non-compliant	94	31.97	86	34.96

Dice feeling					
	No feeling of insurance	50	16.89	40	15.94
	Feeling of insurance	246	83.11	211	84.06
Coin risk					
	<0.1	45	15.2	35	13.94
	0.1-1.3	18	6.08	15	5.98
	1.3-3.2	114	38.51	91	36.25
	3.2-5.0	40	13.51	39	15.54
	>5.0	79	26.69	71	28.29

Table G1.14. Descriptive statistics for independent variable values by WTP bound

		WTP for microinsurance	WTP for loan
WTP Bound	**Independent variable**	**Mean / Median (SD)**	**Mean / Median (SD)**
0 - 100	Age	41.013 (14.544)	41.03675 (14.544)
	Education	1 (Primary School Level) (0.806)	1 (Primary School Level) (0.831)
	Numeracy	2 (High Numeracy) (0.560)	2 (High Numeracy) (0.558)
	Literacy	1 (Literate) (0.443)	1 (Literate) (0.452)
	Family Size	4 (2.668)	4 (2.590)
	Amount of land farmed	3.108333 (4.712)	3.191557 (6.113)
	Surplus	1 (Yes) (0.476)	1 (Yes) (0.4717)
	Number of loans	0 (1.018)	0 (0.989)
	Knowledge of insurance	4 (No Prior Knowledge) (0.907)	4 (No Prior Knowledge) (0.903)
	Household condition	1 (Poor) (0.546)	1 (Poor) (0.533)
	Income share from farming	2 (25% - 50%) (1.172)	2 (25% - 50%) (1.181)
	Net remittance behaviour	2 (Net Sender) (0.679)	2 (Net Sender) (0.684)
	Total worry	20.37333 (8.371)	20.42932 (8.452)
	Coping strategy	3 (Non-Erosive Coping) (1.144)	3 (Non-Erosive Coping) (1.152)
	Weather concern	2 (Drought) (0.476)	2 (Drought) (0.481)
	Change in environment and farming difficulty	2 (Environment changed and farming became easier) (1.638)	2 (Environment changed and farming became easier) (1.591)
	Trust	2 (Bureaucrats) (0.821)	2 (Bureaucrats) (0.837)
	Insurance purchase motivation	2 (Compared to disaster) (0.816)	2 (Compared to disaster) (0.827)
	Save and sell strategy	3 (Saved and got a higher price) (1.060)	3 (Saved and got a higher price) (1.054)
	TAMSAT Compliance	1 (Compliant) (0.447)	1 (Compliant) (0.466)
	Dice Feeling	1 (0.478)	1 (0.476)
	Coin risk	2 (0.33333) (1.240)	2 (0.33333) (1.234)
100 - 200	Age	39.02299 (14.846)	39.71658 (14.846)
	Education	1 (Primary School Level) (0.752)	1 (Primary School Level) (0.783)
	Numeracy	2 (High Numeracy) (0.477)	2 (High Numeracy) (0.466)
	Literacy	1 (Literate) (0.384)	1 (Literate) (0.382)
	Family Size	4 (2.597)	4 (2.398)
	Amount of land farmed	3.191954 (3.487)	3.591979 (4.181)

	Surplus	1 (Yes) (0.410)	1 (Yes) (0.414)
	Number of loans	0 (0.810)	0 (0.957)
	Knowledge of insurance	4 (No Prior Knowledge) (0.860)	4 (No Prior Knowledge) (1.000)
	Household condition	1 (Poor) (0.489)	1 (Poor) (.487)
	Income share from farming	3 (50% - 75%) (1.023)	3 (50% - 75%) (1.122)
	Net remittance behaviour	2 (Net Sender) (0.570)	2 (Net Sender) (0.574)
	Total worry	21.33908 (6.688)	20.79144 (6.538)
	Coping strategy	3 (Non-Erosive Coping) (1.113)	3 (Non-Erosive Coping) (1.142)
	Weather concern	2 (Drought) (0.422)	2 (Drought) (0.418)
	Change in environment and farming difficulty	1 (Environment changed and farming became harder) (1.297)	1 (Environment changed and farming became harder) (1.354)
	Trust	2 (Bureaucrats) (0.798)	2 (Bureaucrats) (0.857)
	Insurance purchase motivation	3 (Compared to income & disaster) (0.689)	3 (Compared to income & disaster) (0.706)
	Save and sell strategy	3 (Saved and got a higher price) (0.800)	3 (Saved and got a higher price) (0.872)
	TAMSAT	1 (Compliant) (0.429)	1 (Compliant) (0.417)
	Dice Feeling	1 (.043)	1 (0.422)
	Coin risk	2 (0.33333) (1.241)	2 (0.33333) (1.214)
200 - 500	Age	40.848 (13.802)	40.436 (13.802)
	Education	1 (Primary School Level) (0.878)	1 (Primary School Level) (0.825)
	Numeracy	2 (High Numeracy) (0.508)	2 (High Numeracy) (0.508)
	Literacy	1 (Literate) (0.416)	1 (Literate) (0.411)
	Family Size	5 (2.649)	5 (2.583)
	Amount of land farmed	4.336 (5.886)	4.381 (7.047)
	Surplus	1 (Yes) (0.3558464)	1 (Yes) (0.3662014)
	Number of loans	0 (1.218315)	0 (1.062812)
	Knowledge of insurance	4 (No Prior Knowledge) (1.014)	4 (No Prior Knowledge) (1.000)
	Household condition	1 (Poor) (0.515)	1 (Poor) (0.495)
	Income share from farming	3 (50% - 75%) (1.160)	3 (50% - 75%) (1.148)
	Net remittance behaviour	2 (Net Sender) (0.632)	2 (Net Sender) (0.646)
	Total worry	22.89899 (7.030)	23.42773 (7.100)
	Coping strategy	3 (Non-Erosive Coping) (1.112)	3 (Non-Erosive Coping) (1.107873)

	Weather concern	2 (Drought) (0.421)	2 (Drought) (0.4215114)
	Change in environments and farming difficulty	1 (Environment changed and farming became harder) (1.243)	1 (Environment changed and farming became harder)(1.297)
	Trust	2 (Bureaucrats) (0.696)	2 (Bureaucrats) (0.678)
	Insurance purchase motivation	2 (Compared to disaster) (0.730)	2 (Compared to disaster) (0.7418311)
	Save and sell strategy	3 (Saved and got a higher price) (0.9355083)	3 (Saved and got a higher price) (0.9099834)
	TAMSAT Compliance	1 (Compliant) (0.4281945)	1 (Compliant) (0.4387668)
	Dice Feeling	1 (0.4256181)	1 (0.3122814)
	Coin risk	2 (0.33333) (1.343007)	2 (0.33333) (1.356193)
500 - 1,000	Age	40.348 (12.941)	40.390 (12.941)
	Education	1 (Primary School Level) (0.808)	1 (Primary School Level) (0.829)
	Numeracy	2 (High Numeracy) (0.505)	2 (High Numeracy) (0.505)
	Literacy	1 (Literate) (0.383)	1 (Literate) (0.373)
	Family Size	5 (2.364)	5 (2.427)
	Amount of land farmed	4.017235 (5.995)	3.801011 (3.888)
	Surplus	1 (Yes) (0.409)	1 (Yes) (0.401)
	Number of loans	0 (1.050)	0 (1.040)
	Knowledge of insurance	4 (No Prior Knowledge) (0.942)	4 (No Prior Knowledge) (0.994)
	Household condition	2 (Average) (0.515)	1 (Poor) (0.514)
	Income share from farming	3 (50% - 75%) (1.160)	3 (50% - 75%) (1.142)
	Net remittance behaviour	2 (Net Sender) (0.632)	2 (Net Sender) (0.630)
	Total worry	22.06684 (7.077)	21.51011 (7.079)
	Coping strategy	3 (Non-Erosive Coping) (1.15338)	3 (Non-Erosive Coping) (1.65234)
	Weather concern	2 (Drought) (0.425)	2 (Drought) (0.470)
	Change in environment and farming difficulty	2 (Environment changed and farming became easier) (1.399)	2 (Environment changed and farming became easier) (1.420)
	Trust	2 (Bureaucrats) (0 .782)	2 (Bureaucrats) (0.773)
	Insurance purchase motivation	2 (Compared to disaster) (0.805)	2 (Compared to disaster) (0.790)
	Save and sell strategy	3 (Saved and got a higher price) (0.897)	3 (Saved and got a higher price) (0.886)
	TAMSAT Compliance	1 (Compliant) (0.424)	1 (Compliant) (0.400)
	Dice Feeling	1 (0.314)	1 (0.357)

	Coin risk	2 (0.33333) (1.442)	2 (0.33333) (1.449)
1,000 - 5,000	Age	40.26404 (11.476)	40.42185 (11.476)
	Education	1 (Primary School Level) (0.878)	1 (Primary School Level) (0.879)
	Numeracy	2 (High Numeracy) (0.470)	2 (High Numeracy) (0.477)
	Literacy	1 (Literate) (0.339)	1 (Literate) (0.335)
	Family Size	5 (2.383)	5 (2.413)
	Amount of land farmed	3.980273 (5.177)	4.159636 (6.392)
	Surplus	1 (Yes) (0.369)	1 (Yes) (0.343)
	Number of loans	0 (0.980)	0 (1.012)
	Knowledge of insurance	4 (No Prior Knowledge) (0.9657807)	4 (No Prior Knowledge) (0.9758322)
	Household condition	1 (Poor) (0.544)	1 (Poor) (0.541)
	Income share from farming	3 (50% - 75%) (1.086)	3 (50% - 75%) (1.064)
	Net remittance behaviour	2 (Net Sender) (0.637)	2 (Net Sender) (0.631)
	Total worry	20.5478 (7.022)	20.80425 (6.985)
	Coping strategy	3 (Non-Erosive Coping) (1.088)	3 (Non-Erosive Coping) (1.144)
	Weather concern	2 (Drought) (0.421)	2 (Drought) (0.420)
	Change in environment and farming difficulty	2 (Environment changed and farming became easier) (1.473)	2 (Environment changed and farming became easier) (1.376)
	Trust	2 (Bureaucrats) (0.776)	2 (Bureaucrats) (0.804)
	Insurance purchase motivation	3 (Compared to income & disaster) (0.789)	3 (Compared to income & disaster) (0.796)
	Save and sell strategy	3 (Saved and got a higher price) (0.828)	3 (Saved and got a higher price) (0.817)
	TAMSAT Compliance	1 (Compliant) (0.401)	1 (Compliant) (0.364)
	Dice Feeling	1 (0.329)	1 (0.298)
	Coin risk	2 (0.33333) (1.502)	2 (0.33333) (1.499)
5,000 - 10,000	Age	40.76316 (12.095)	40.3208 (12.095)
	Education	1 (Primary School Level) (0.894)	1 (Primary School Level) (0.866)
	Numeracy	2 (High Numeracy) (0.475)	2 (High Numeracy) (0.493)
	Literacy	1 (Literate) (0.348)	1 (Literate) (0.374)
	Family Size	5 (2.553)	5 (2.480)
	Amount of land farmed	4.113487 (5.900)	3.818672 (4.026)
	Surplus	1 (Yes) (0.280)	1 (Yes) (0.345)

	Number of loans	0 (1.016)	0 (1.120)
	Knowledge of insurance	4 (No Prior Knowledge) (1.090)	4 (No Prior Knowledge) (1.070)
	Household condition	1 (Poor) (0.485)	1 (Poor) (0.493)
	Income share from farming	3 (50% - 75%) (0.942)	3 (50% - 75%) (1.018)
	Net remittance behaviour	2 (Net Sender) (0.645)	2 (Net Sender) (0.634)
	Total worry	21.47149 (7.731)	21.66917 (8.207)
	Coping strategy	3 (Non-Erosive Coping) (1.042)	3 (Non-Erosive Coping) (1.072)
	Weather concern	2 (Drought) (0.382)	2 (Drought) (0.361)
	Change in environment and farming difficulty	2 (Environment changed and farming became easier) (1.296)	2 (Environment changed and farming became easier)(1.447)
	Trust	2 (Bureaucrats) (0.847)	2 (Bureaucrats) (0.792)
	Insurance purchase motivation	3 (Compared to income & disaster) (.792956)	3 (Compared to income & disaster)(0.796)
	Save and sell strategy	3 (Saved and got a higher price) (0.770)	3 (Saved and got a higher price)(0.815)
	TAMSAT Compliance	1 (Compliant) (0.391)	1 (Compliant) (0.422)
	Dice Feeling	1 (0.313)	1 (0.304)
	Coin risk	3 (0.5) (1.276)	3 (0.5) (1.310)
10,000 - 50,000	Age	39.39873 (12.728)	40.275 (12.728)
	Education	1 (Primary School Level) (0.903)	1 (Primary School Level) (0.876)
	Numeracy	2 (High Numeracy) (0.553)	2 (High Numeracy) (0.538)
	Literacy	1 (Literate) (0.366)	1 (Literate) (0.401)
	Family Size	4.5 (2.295)	4 (2.581)
	Amount of land farmed	3.922785 (4.078)	3.565 (3.440)
	Surplus	1 (Yes) (0.280)	1 (Yes) (0.381)
	Number of loans	1 (1.203)	1 (1.064622) (0.656)
	Knowledge of insurance	4 (No Prior Knowledge) (1.155)	4 (No Prior Knowledge) (1.192)
	Household condition	1 (Poor) (0.494)	1 (Poor) (0.498)
	Income share from farming	3 (50% - 75%) (1.023)	3 (50% - 75%) (1.029)
	Net remittance behaviour	2 (Net Sender) (0.622)	2 (Net Sender) (0.659)
	Total worry	21.652 (8.387)	20.133 (7.735)
	Coping strategy	3 (Non-Erosive Coping) (1.163)	3 (Non-Erosive Coping) (1.141)

	Weather concern	2 (Drought) (0.382)	2 (Drought) (0.397)
	Change in environment and farming difficulty	2 (Environment changed and farming became easier) (1.556)	2 (Environment changed and farming became easier) (1.618)
	Trust	2 (Bureaucrats) (0.7873728)	2 (Bureaucrats) (0.721)
	Insurance purchase motivation	3 (Compared to income & disaster) (0.799)	3 (Compared to income & disaster) (0.792)
	Save and sell strategy	3 (Saved and got a higher price) (0.871)	3 (Saved and got a higher price)(0.921)
	TAMSAT Compliance	1 (Compliant) (0.410)	1 (Compliant) (0.417)
	Dice Feeling	1 (0.272)	1 (0.322)
	Coin risk	3 (0.5) (1.249)	2 (0.33333) (1.262)
50,000 - 100,000	Age	40.65203 (13.234)	40.35857 (13.234)
	Education	1 (Primary School Level) (0.8730452)	1 (Primary School Level) (0.922)
	Numeracy	2 (High Numeracy) (0.546)	2 (High Numeracy) (0.546)
	Literacy	1 (Literate) (0.445)	1 (Literate) (0.425)
	Family Size	5 (2.113)	4 (2.077)
	Amount of land farmed	3.952027 (6.927)	4.371713 (8.149)
	Surplus	1 (Yes) (0.390)	1 (Yes) (0.380)
	Number of loans	1 (1.284)	1 (1.343)
	Knowledge of insurance	4 (No Prior Knowledge) (1.167)	4 (No Prior Knowledge) (1.143)
	Household condition	1 (Poor) (0.499)	1 (Poor) (0.546)
	Income share from farming	3 (50% - 75%) (1.109)	3 (50% - 75%) (1.093)
	Net remittance behaviour	2 (Net Sender) (0.660)	2 (Net Sender) (0.659)
	Total worry	19.23649 (7.641)	19.68924 (7.638)
	Coping strategy	3 (Non-Erosive Coping) (1.228)	3 (Non-Erosive Coping) (1.208)
	Weather concern	2 (Drought) (0.436)	2 (Drought) (0.483)
	Change in environment and farming difficulty	2 (Environment changed and farming became easier) (1.506525)	2 (Environment changed and farming became easier) (1.494372)
	Trust	2 (Bureaucrats) (0.837)	2 (Bureaucrats) (0.895)
	Insurance purchase motivation	2.5 (compared to disaster & compared to both) (0.780)	2 (Compared to disaster) (0.792)
	Save and sell strategy	3 (Saved and got a higher price) (1.007)	3 (Saved and got a higher price) (0.990)
	TAMSAT Compliance	1 (Compliant) (0.467)	1 (Compliant) (0.478)
	Dice Feeling	1 (0.375)	1 (0.367)

	Coin risk	2 (0.33333) (1.336)	2 (0.33333) (1.328)

Appendix G2. Excerpt from Grameen findings

Note: The following is an excerpt from the "Preliminary Summary of Findings 2009-2012: Risk in Rural Ugandan Agriculture: Natural Hazards and Perceptions." This Report was prepared by Jennifer Helgeson with input from Karl Muth; it was submitted to Grameen Foundation in Spring 2012. It specifically dealt with broad considerations in the Ugandan market and the potential for microinsurance product deployment. The suggestions made were based upon preliminary survey findings and specific market and deployment cost assumptions. Grameen Foundation holds proprietary rights to this Report for five years from the initial submissions date of March 2012.

Introduction

In typical markets, the level of communication and information parity between insurers, lenders, and farmers varies widely in the context of insurance types and individual programs. In order for the borrower's needs to be prioritized in this relationship, the interests of all parties must be better aligned with the farmer's interests. In particular, determinations as to payment on the policy must be more closely tied to the crop shortfalls being experienced by farmers in the field, rather than being completely dependent upon the quantity of rain received in a rain gauge at a weather station on the horizon. The strength that Grameen Foundation brings to this market is the pre-existing Community Knowledge Worker network. As local people who are familiar with the financial, agricultural, and logistical realities of the farmer's daily life, CKWs are trusted. He or she speaks the local language or dialect and lives in-country, often on an income similar to that of the farmers with whom he or she works. It is feasible to use the CKW network to distribute information about potential insurance products in the future. This type of network also allows for application of a more traditional insurance mechanism that explores actual loss information, potentially using the CKWs in the role of auditor. The lack of agricultural microinsurance in Uganda at present provides the appropriate context for rolling out a loss-mitigation product.

The most recent agricultural census in Uganda indicates that approximately 3.5 million hectares of arable land are cultivated in the country and that this land is subdivided into nearly two million farms. Uganda is a country characterized by small-plot, small-village farming and limited infrastructure. It is difficult for farmers to diversify. Farmers are price-takers and markets for the commodity crops farmers produce are nationally-stable but locally-volatile in wholesale price terms. Given these characteristics, it is not surprising that weather index insurance of the type popular elsewhere in Africa has not been deployed in Uganda. Much of the risk Ugandans face is not easily mitigated: inflation risk, price volatility, local events of instability or violence, and so on.

The largest land area is occupied by the lowest-risk crop, bananas. About 600,000 hectares is occupied by banana cultivation, with the other three million hectares split between various other crops. Given that even the cheapest loss-mitigation methodologies (e.g. manure fertilizer) are not used by most banana farmers, it is unlikely banana farmers will buy insurance. Because banana production is relatively stable (and has been growing slowly for decades) now at 4.5 to 5 million metric tons annually, maximum market size for the insurance product is likely around 3 million hectares, split among about 1.7 million farms.

Our recommended penetration target on a five-year horizon is 200,000 farms, which is around 12% of these non-banana farms. This suggests an acquisition target of between 26,000 and 27,000 farms in the first year (assuming an improvement-in-acquisition-rate of 20% year-on-year over the five years). This is admittedly a challenging number, given the low population density of Uganda generally and the small social networks of farmers in the north in particular. It would require a sales force of 500, for instance, to recruit a subscriber successfully every week in the first year (with a 20% year-on-year increase, not accounting for attrition among the subscriber base in subsequent years).

At a year-five penetration of 200,000 farms, with three quarters of them in regions more similar to Kapchorwa than Oyam, and no mass loss events in the 3+σ range (assuming a normal distribution across time and scale-of-loss calculations), a small, solvent insurance portfolio would be possible to construct in rural Uganda. Though these assumptions are optimistic, an initial financial backstop (or appropriately scaled line of credit) on the order of 28% of the anticipated net premium shortfall in the first three years would eliminate the majority of excess risk, making risk track at a more similar (inverse) slope to portfolio size.

This race-to-scale problem is, in our opinion, the largest problem with product deployment and the largest threat to short-term product solvency.

Suggestions for Trajectory-Dependent Product Development Approach

Because early-stage risk management products are disproportionately vulnerable to the risks they are designed to manage and disproportionately more likely to aggregate these risks in undesirable ways, trajectory-dependent product planning is crucial going forward.

A portfolio that does not grow at a rate of at least 20% year-on-year (including replacing any policies that are chronically overdue or lapsed) is unlikely to be financially solvent in the third year. A growth rate lower than this means that, even with minimal overhead, the float available would be insufficient to cover even a 3σ event, which is not a robust policy. Such a policy would need a substantial initial financial backstop or a generous line of credit until a “critical mass” of 150,000 to 200,000 subscribers was reached.

Focusing product sales efforts regionally will help shape the portfolio’s risk characteristics, but the trajectory of growth needed to reach the 200,000 subscriber threshold number in year 5 presents a substantial challenge. The cost of developing and administering new accounts in Uganda must be appreciated: many roads are impassable in the wet season, the sales process depends heavily upon personal relationships, and the penetration of smart phones lags far behind neighbouring Kenya. The sales process itself will be key to achieving a sufficient growth trajectory in the first 36 months.

Innovative ideas that use trusted intermediaries will be necessary to create these levels of growth. For instance, Google’s efforts to spread *gmail.com* accounts for email several years ago used “invitations” where key influencers in the community were given invitations to invite their friends, who would then invite their friends and so on. Some system in Uganda that uses the high-density, high-trust, low-spread social networks of most Ugandans would be ideal. As most people in Northern Uganda expect to be introduced to someone by a trusted neighbour or

intermediary before they conduct business with the new person, this could provide a valuable introduction for an insurance sales force.

Discussion of Strategic Risks and Available Adjustments

Deploying insurance selectively within quarantined markets allows initial agility in product design. However, a quarantined-market approach vastly restricts growth.

Growth must be substantial and sustained for the portfolio to be solvent by year five. Linear or sublinear growth will not be sufficient, even in the best regions, to create a self-sufficient insurance portfolio, given even optimistic risk ratio estimates. Further, the cost of acquiring new customers will presumably fall at a substantial rate as a the portfolio grows, and this early acquisition cost will be difficult to recoup without a superlinear growth rate in years two through five.

There is substantial risk associated with focusing marketing and sales in regions that cannot provide the long-term growth needed to reach the 200,000 subscriber threshold by year five. However, starting product outlay in these “safer” regions provides more self-sufficiency to the portfolio in the “startup” years, including the crucial first 24 to 36 months of operations. We estimate the difference between random or organic portfolio growth and structured or targeted growth is -0.4σ, consistent with uniform models, which is a statistically-relevant and financially-relevant risk delta. The variance effects of this shift are on the order of -15%, assuming a uniform loss distribution and minimal loss aggregation.

Cash flow from a portfolio of 200,000 subscribers at the year five mark with the recommended growth pattern and maximum payment profiles would be approximately 15 billion Ugandan shillings (+/-8%), using 5,000 to 7,000 UGX as a proxy for per policy per month gross income. Income-to-float acquired in the previous four years of customer acquisition, in gross terms, would be on the order of seven billion shillings, assuming growth rates between 15% and 25% year-on-year, perfect replacement of delinquent/cancelled accounts, and assuming willingness-to-pay and other characteristics similar to the samples from Oyam and Kapchorwa.

This means the value of the insured portfolio, assuming an average farm size, would be the value of the total crop yield in a given year from approximately one million acres. Crops are worth, on average, about 150,000 UGX per season per acre (wholesale price, maximum yield year), with a right tail primarily consisting of cash crops, including coffee, truncated at 4σ and discounted at 50%. This means the portfolio would consist of approximately 150 billion shillings of insured assets, with a premium ratio of 10. Income of 15 to 17 billion shillings on an insured asset base of 130 to 150 billion shillings (wholesale valuation, aggregated) is a very good return ratio compared to standard insurance industry models.

However, these models are based on a very low (developed country) cost of administration and customer acquisition. Given that these costs are likely far higher in Uganda, and given that delinquency and cancellation rates will likely be higher in Uganda than developed regions, the ratio may be as low as five when viewed net of costs. At these levels, the risk of a widespread loss (in the standard model, a 4σ event) to the solvency of the portfolio is substantial. Also, the portfolio itself runs the risk of being chronically cash poor, particularly if it must absorb early losses with no backstop capital.

The low cost of administration of an index insurance product is very attractive, given these portfolio risks. Further, it allows the insurer to shift a large portion of what would traditionally be variable costs and transform them into fixed costs (the main attraction of index insurance). However, due to the arbitrary outcomes inherent in an index insurance system, and due to the low density (and inaccessibility) of weather station sites in Uganda, Grameen Uganda should consider a plurality of product options. While adjusted actual loss policies are likely prohibitively expensive to administer, there is a middle ground between these policies and strict index insurance.

Recommendation

If Grameen Foundation believes, through its partner relationships and existing channels, it could deploy an insurance product capable of developing a subscriber base of 200,000 customers by 2018 (year 5), we recommend in favour of further developing the insurance product. Even with favourable interim loss conditions and the portfolio reaching 80,000 to 100,000 subscribers in year 4, the product would benefit greatly from having a small credit facility or third-party financial backstop available in case of a widespread loss that swamps the limits of the float account.

If the insurance product is deployed and fails to reach 25,000 subscribers (with paid-current accounts) by the close of year 2, we recommend re-examining the product's financial viability.

If these product scale ambitions seem out-of-reach, we recommend against developing the insurance product, as we believe there are too many risks to the financial viability of the insurance portfolio at a smaller scale than 200,000 subscribers.

Appendix H. Supplementary analysis for *Complex Dice* game

Bivariate analysis of effects: Below are the bivariate analysis results of all the effects on *in_perc*. Regular ANOVA was used in this analysis.

Table H.1. Results from bivariate ANOVA for all variables

Variable	***DF***	***FValue***	***P-Value***
basis_bad	1	3.76	0.06
basis_good	1	0.97	0.33
basisrisk_partner	1	0.63	0.43
disaster	1	7.68	0.01
education	2	2.01	0.14
env_ch	1	0.11	0.74
know_in	1	4.04	0.05
know_in	1	4.04	0.05
know_in	1	0.91	0.34
numeracy	3	1.64	0.18
region	1	0.23	0.63
save_crops	1	0.01	0.9
IShare	3	4.65	<0.001
Trust	1	4.46	0.06
fam_size	10	1.89	0.05
age	1	0.24	0.62
parterInvestIns	1	8.14	<0.001
own_Index	1	1.85	0.18

***Variables with _1 indicate lagged variables*

Bivariate Correlations: The table below shows the bivariate correlations between all variables with *in_perc*.

Table H.2. Correlations of all variables with *in_perc*

Variable	*Coeff*	*P-Value*	*Relationshi*	ROUND	*Variable*	*Coeff*	*P-Value*	*Relationship*
basis_bad	-0.04	<.0001	Monotonic	**1**	numeracy	0	<.0001	Monotonic
basis_bad	0.01	0.01	Monotonic	**2**	numeracy	0.06	0.06	none
basis_bad	0.08	0.08	none	**3**	numeracy	0.09	0.09	none
basis_bad	0.17	0.17	None	**4**	numeracy	0.23	0.23	none
basis_bad	0.04	0.04	Monotonic	**5**	numeracy	0.15	0.15	none
basis_good	0.03	0.03	Monotonic	**1**	region	-0.01	<.0001	Monotonic
basis_good	-0.1	<.0001	Monotonic	**2**	region	0.16	0.16	none
basis_good	-0.08	<.0001	Monotonic	**3**	region	0.11	0.11	none
basis_good	-0.12	<.0001	Monotonic	**4**	region	-0.25	<.0001	Monotonic
basis_good	-0.1	<.0001	Monotonic	**5**	region	-0.1	<.0001	Monotonic
basisrisk_partner	0.03	0.03	Monotonic	**1**	save_crops	-0.01	<.0001	Monotonic
basisrisk_partner	-0.13	<.0001	Monotonic	**2**	save_crops	-0.11	<.0001	Monotonic
basisrisk_partner	0.06	0.06	None	**3**	save_crops	0	<.0001	Monotonic
basisrisk_partner	-0.09	<.0001	Monotonic	**4**	save_crops	-0.07	<.0001	Monotonic
basisrisk_partner	0.07	0.07	None	**5**	save_crops	0.11	0.11	none
Disaster	0.06	0.06	None	**1**	IShare	0.06	0.06	none
Disaster	-0.21	<.0001	Monotonic	**2**	IShare	-0.29	<.0001	Monotonic
Disaster	-0.23	<.0001	Monotonic	**3**	IShare	-0.12	<.0001	Monotonic
Disaster	0.11	0.11	None	**4**	IShare	-0.17	<.0001	Monotonic
Disaster	-0.06	<.0001	Monotonic	**5**	IShare	-0.2	<.0001	Monotonic
education	-0.06	<.0001	Monotonic	**1**	fam_size	-0.04	<.0001	Monotonic
education	0.05	0.05	None	**2**	fam_size	0.03	0.03	Monotonic
education	0.11	0.11	None	**3**	fam_size	0	<.0001	Monotonic
education	0.01	0.01	Monotonic	**4**	fam_size	0.21	0.21	none
education	-0.02	<.0001	Monotonic	**5**	fam_size	0.18	0.18	none
env_change	0.12	0.12	None	**1**	age	0.02	0.87	none
env_change	0.04	0.04	Monotonic	**2**	age	-0.02	0.85	none
env_change	-0.13	<.0001	Monotonic	**3**	age	0.11	0.20	none
env_change	-0.05	<.0001	Monotonic	**4**	age	-0.08	0.35	none
env_change	0.02	0.02	Monotonic	**5**	age	-0.03	0.78	none
in_know	0.05	0.05	None	**1**	parterinvesti	0.2	0.02	linear
in_know	-0.15	<.0001	Monotonic	**2**	parterinvesti	0.23	0.01	linear
in_know	-0.07	<.0001	Monotonic	**3**	parterinvesti	0.14	0.12	none
in_know	-0.18	<.0001	Monotonic	**4**	parterinvesti	0.07	0.47	none
in_know	-0.08	<.0001	Monotonic	**5**	parterinvesti	0.13	0.14	none
trust	0.04	0.04	Monotonic	**1**	own_Index	-0.01	0.88	none
trust	0.01	0.01	Monotonic	**2**	own_Index	0	0.96	none
trust	0.11	0.11	None	**3**	own_Index	0.09	0.32	none
trust	0.04	0.04	Monotonic	**4**	own_Index	0.06	0.49	none
trust	-0.04	<.0001	Monotonic	**5**	own_Index	0.01	0.87	none

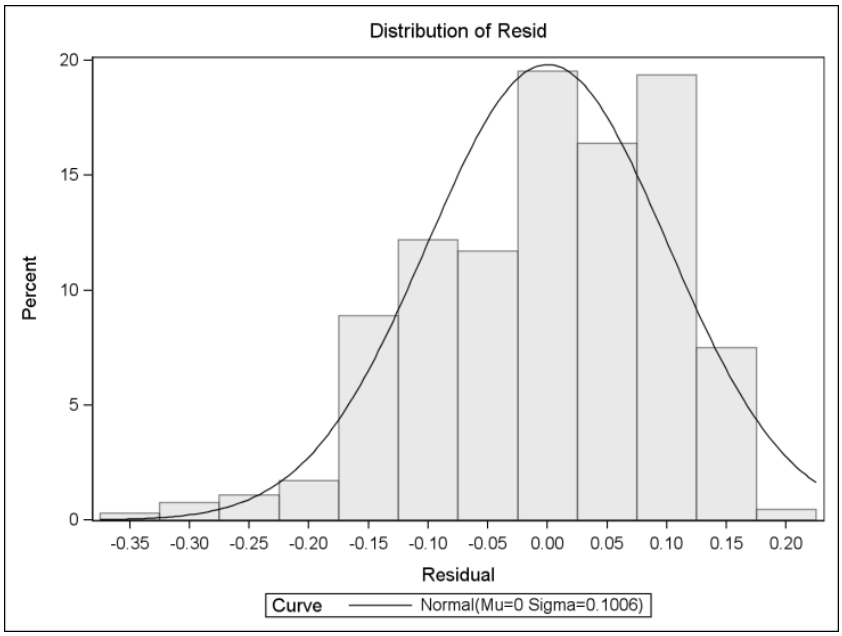

Figure H.1. Residual Plot 1 from mixed model regression fit using raw values

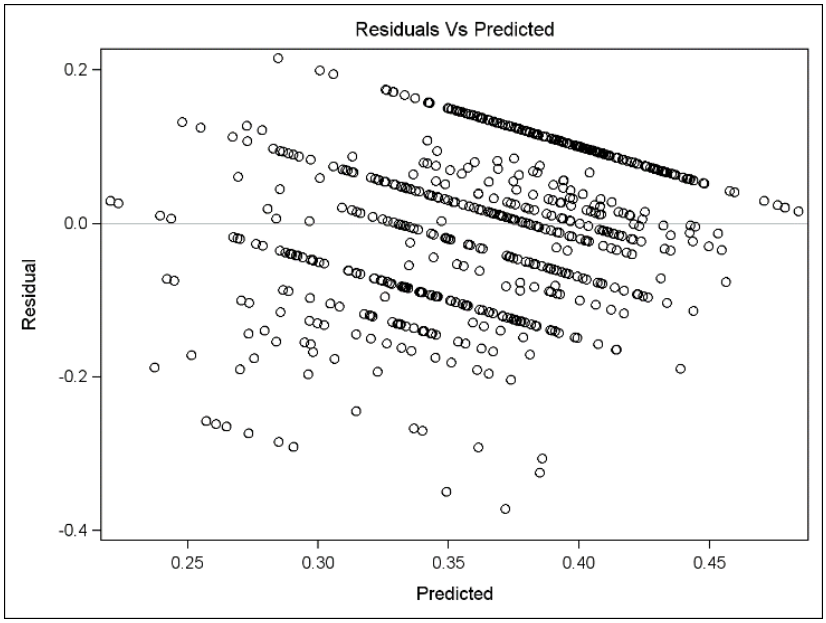

Figure H.2. Residual Plot 2 from mixed model regression fit using raw values

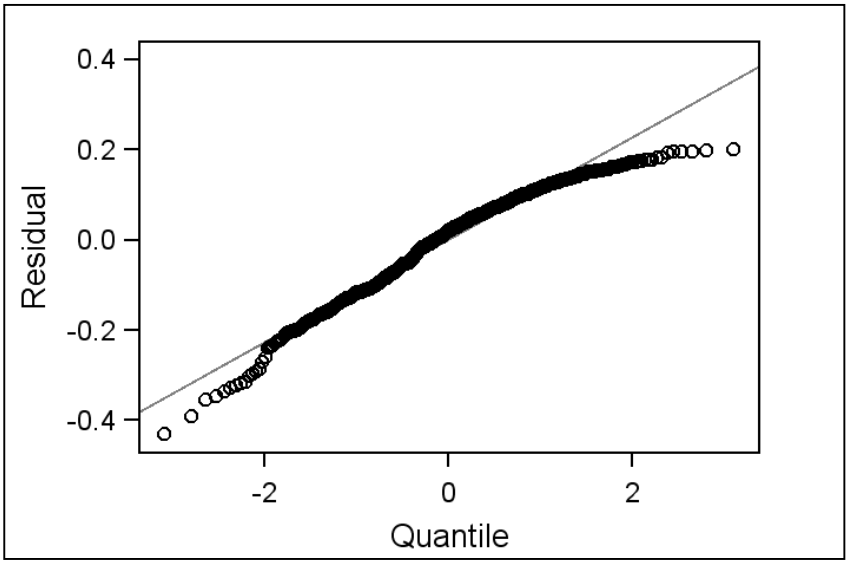

Figure H.3. Residual Plot 3 from mixed model regression fit using raw values

When the residuals are normal, the QQ plot should be a straight line, but as noted in Figure H.3 it touches the line, but the tails trail off. Thus, it is not exactly normal.

A review of the Pearson residual plots below shows a close to random pattern indicating a better fit.

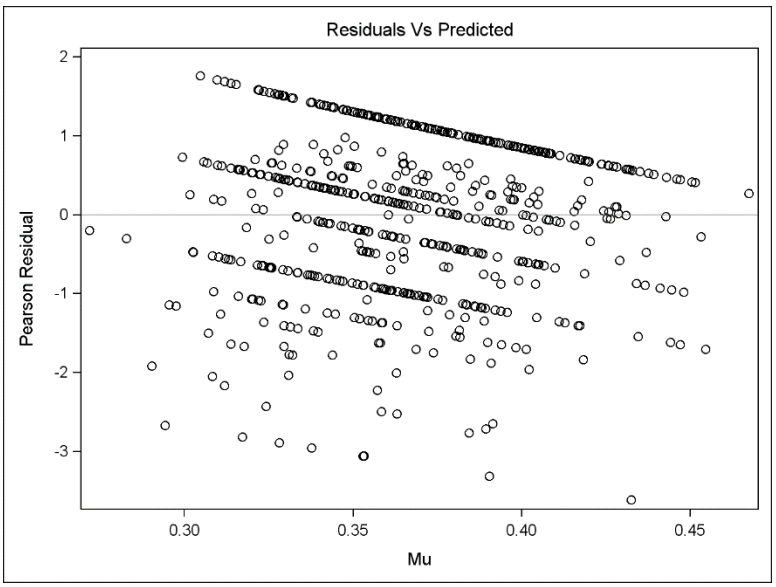

Figure H.4. Full Model Pearson residual plots

Table H.3. Covariance Matrix for beta regression

	X1	*X2*	*X3*	*X4*	*X5*	*X6*	*X7*	*X8*	*X9*	*X10*	*X11*	*X12*	*X13*	*X14*
X1	0.024	-0.002	0.000	-0.001	0.000	-0.001	0.000	-0.002	0.000	-0.005	-0.019	-0.019	-0.019	0.000
X2	-0.002	0.004	0.000	-0.002	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	0.000
X3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X4	-0.001	-0.002	0.000	0.005	0.000	-0.001	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000
X5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X6	-0.001	0.000	0.000	-0.001	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000
X7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X8	-0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	-0.001	0.000	0.000	0.000	0.000
X9	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X10	-0.005	0.000	0.000	0.000	0.000	0.000	0.000	-0.001	0.000	0.013	0.000	0.000	0.000	0.000
X11	-0.019	-0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.019	0.019	0.000
X12	-0.019	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.019	0.021	0.019	0.000
X13	-0.019	0.000	0.000	0.000	0.000	-0.001	0.000	0.000	0.000	0.000	0.019	0.019	0.029	0.000
X14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

		Variable	*Level*
X1	=	Intercept	
X2	=	basis_bad_1	0
X3	=	basis_bad_1	1
X4	=	basis_good_1	0
X5	=	basis_good_1	1
X6	=	basisrisk_partner_1	0
X7	=	basisrisk_partner_1	1

		Variable	*Level*
X8	=	Disaster_1	0
X9	=	Disaster_1	1
X10	=	parterinvestinsure_1	
X11	=	share_income	3
X12	=	share_income	4
X13	=	share_income	2
X14	=	share_income	1

Table H.4. Bivariate correlation matrix for independent variables

	x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13
region x1	1												
age x2	0.093 0.018	1											
fam_size x3	-0.07 0.077	-0.06 0.147	1										
numeracy x4	0.228 0.050	-0.17 0.065	-0.080 0.032	1									
Ishare x5	0.038 0.335	-0.04 0.295	-0.010 0.793	0.198 0.236	1								
know_ins x6	0.103 0.012	0.100 0.111	-0.020 0.534	0.060 0.130	0.269 0.700	1							
own_index x7	-0.11 0.080	0.145 0.044	0.429 0.052	-0.110 0.054	-0.090 0.020	0.034 0.394	1						
trust x8	0.008 0.831	0.195 0.101	-0.020 0.622	-0.040 0.347	0.255 0.312	0.107 0.007	0.087 0.028	1					
basis_bad x9	-0.050 0.213	-0.040 0.307	-0.060 0.119	0.175 0.235	0.040 0.311	-0.170 0.015	-0.090 0.032	0.015 0.709	1				
basis_good x10	0.036 0.365	-0.090 0.031	-0.040 0.267	-0.050 0.236	-0.100 0.014	0.051 0.195	0.048 0.228	-0.120 0.002	-0.310 0.248	1			
basisRisk_partner x11	-0.02 0.675	0.028 0.479	-0.040 0.322	0.051 0.199	0.127 0.001	0.039 0.326	-0.030 0.492	0.048 0.222	0.281 0.333	-0.070 0.068	1		
partner InvestIns x12	0.008 0.846	-0.040 0.363	0.005 0.904	-0.000 0.911	-0.070 0.082	0.005 0.906	-0.040 0.351	0.031 0.439	0.239 0.055	0.124 0.122	0.328 0.150	1	
disaster x13	-0.02 0.685	-0.010 0.844	-0.000 0.910	0.011 0.773	0.008 0.839	-0.050 0.212	-0.010 0.779	-0.050 0.206	0.081 0.060	0.095 0.016	0.124 0.062	0.064 0.105	1

Spearman Correlation coefficients, N=640 Prob> |r| under H_0: Rho=0

Appendix I. Supplementary analysis for Hurricane Sandy survey and simulation

As part of the diagnostic analysis and model fitting for *insure* we check for multicollinearity between variables (Hauke & Kossowski, 2011). A look at bivariate correlations shows significant correlations between variables *income* and *tables* as shown in the matrix of bivariate correlations below; Table I.1. Given that the table treatment was assigned randomly this is likely a coincidence. In Table I.2 we present the variance inflation factors (VIFs). All the VIFs were under the value 10 (O'Brien, 2007; Greene, 2011); thus collinearity was ruled out.

Table I.1. Matrix of bivariate correlations

Variable	X	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11
education	**1**	1	0.12	-0.06	0.16	0.24	-0.02	-0.03	0.16	0.00	0.14	-0.03
damage_pe	**2**	0.12	1	-0.04	0.10	0.10	0.12	0.13	0.02	0.00	0.16	0.14
gender	**3**	-0.06	-0.04	1	0.04	0.02	0.04	0.07	0.04	-0.09	0.06	0.07
home_ins	**4**	0.16	0.10	0.04	1	0.23	0.06	-0.10	0.23	0.02	0.16	0.05
income	**5**	0.24	0.10	0.02	0.23	1	0.04	-0.07	0.11	***-0.60***	0.08	0.16
kids	**6**	-0.02	0.12	0.04	0.06	0.04	1	0.16	0.09	0.04	0.06	0.18
worry_index	**7**	-0.03	0.13	0.07	-0.10	-0.07	0.16	1	0.06	0.00	0.16	-0.01
risk_fin	**8**	0.16	0.02	0.04	0.23	0.11	0.09	0.06	1	0.05	0.18	0.09
tables	**9**	0.00	0.00	-0.09	0.02	-0.60	0.04	0.00	0.05	1	-0.01	0.00
age	**10**	0.14	0.16	0.06	0.16	0.08	0.06	0.16	0.18	-0.01	1	0.01
impactRnk	**11**	-0.03	0.14	0.07	0.05	0.16	0.18	-0.01	0.09	0.00	0.01	1

Table I.2. Table of Variance Inflation Factors

Variable	***Tolerance***	***Variance Inflation***	***Variable***	***Tolerance***	***Variance***
education	0.14	7.01	*worry_index*	0.30	3.29
damage_perc	0.35	2.82	*risk_fin*	0.10	9.78
gender	0.46	2.16	*tables*	0.31	3.18
home_ins	0.31	3.18	*age*	0.34	2.97
income	0.17	5.83	*impactRnk*	0.30	3.29
kids	0.27	3.77			

Relationships between variables The logistic regression assumes linearity of independent variables and log odds. The relationship between variables was explored between all predictor variables. Visual inspection of the empirical logit plots does not show evidence of linear relationships among all variables except age. Transformation of the variables into logarithm, square, and reciprocals helped a little, but made no drastic difference. A look at the correlations between each variables and their transformations and how they are related to the response (empirical logit) at Scenario 5 (this was chosen arbitrarily) is shown in Table I.3.

Table I.3. Table of Correlations between empirical logit and dependent variables

Variable	Pearson Correlation	p-value	Spearman Correlation	p-value	Relationship
income (sqr)	***0.50***	***0.03***	0.58	0.01	linear
damage_structure (log)	***0.40***	***0.03***	0.39	0.04	linear
income	***0.46***	***0.05***	0.58	0.01	linear
age (sqr)	-0.26	0.06	***-0.37***	***0.01***	monotonic
age	-0.25	0.07	***-0.37***	***0.01***	monotonic
age (log)	-0.24	0.08	***-0.37***	***0.01***	monotonic
age (rec)	0.23	0.09	***0.37***	***0.01***	monotonic
iIncome (log)	0.37	0.12	***0.58***	***0.01***	monotonic
income (rec)	-0.24	0.32	***-0.58***	***0.01***	monotonic
worry_index (rec)	-0.12	0.22	***-0.26***	***0.01***	monotonic
worry_index (log)	0.20	0.05	***0.24***	***0.02***	monotonic
worry_index	0.18	0.08	***0.24***	***0.02***	Monotonic
worry_index (sqr)	0.14	0.18	***0.24***	***0.02***	Monotonic
damage_structure (rec)	-0.24	0.20	***-0.41***	***0.02***	Monotonic
damage_structure (sqr)	0.29	0.13	***0.37***	***0.04***	Monotonic
education (sqr)	-0.61	0.14	-0.46	0.29	None
education	-0.58	0.18	-0.46	0.29	None
education (log)	-0.55	0.20	-0.46	0.29	None
education (rec)	0.53	0.22	0.46	0.29	None
kids (log)	0.26	0.63	-0.26	0.62	None
kids	0.24	0.65	-0.26	0.62	None
kids (rec)	-0.24	0.65	0.26	0.62	None
kids (sqr)	0.18	0.73	-0.26	0.62	None
risk_fin (sqr)	0.39	0.45	0.09	0.87	None
risk_fin	0.22	0.67	0.09	0.87	None
risk_fin (rec)	0.07	0.89	-0.09	0.87	None
risk_fin (log)	0.05	0.93	0.09	0.87	None

**Significant relationships are shown in bold.

Table I.4. Model(1) results for all tested correlation structures

		One Dependant		***Unstructured***		***AR(1)***	
Parameter		***Estimate***	***Pr > |Z|***	***Estimate***	***Pr > |Z|***	***Estimate***	***Pr > |Z|***
Intercept		0.06	0.87	0.07	0.89	0.05	0.88
age		0.01	0.00	0.01	0.01	0.01	0.00
education		0.07	0.00	0.05	0.06	0.07	0.00
damage_perc		-0.08	0.22	-0.10	0.32	-0.08	0.23
ImpactRnk	1	0.10	0.73	0.01	0.99	0.10	0.74
ImpactRnk	2	0.17	0.56	0.08	0.87	0.17	0.58
ImpactRnk	3	0.22	0.51	0.14	0.79	0.23	0.52
income		0.00	0.44	0.00	0.69	0.00	0.47
kids		0.10	0.00	0.10	0.02	0.10	0.00
worry_index		0.00	0.00	-0.01	0.03	0.00	0.00
risk_fin		-0.18	<.0001	-0.17	<.0001	-0.18	<.0001
tables	1	-0.06	0.44	0.01	0.94	-0.06	0.47
home_ins	1	-0.70	<.0001	-0.67	<.0001	-0.70	<.0001
OutcomeLag	1	-0.03	0.54	-0.02	0.61	-0.02	0.66
Simulation	2	0.51	<.0001	0.51	<.0001	0.51	<.0001
Simulation	3	0.17	0.11	0.17	0.05	0.17	0.10
Simulation	4	0.38	0.00	0.38	<.0001	0.38	0.00
Simulation	5	-0.04	0.69	-0.04	0.61	-0.04	0.68
Simulation	6	0.52	<.0001	0.52	<.0001	0.52	<.0001
Simulation	7	0.23	0.04	0.23	0.01	0.22	0.04
Simulation	8	0.46	<.0001	0.46	<.0001	0.46	<.0001
Simulation	9	-0.24	0.02	-0.24	0.00	-0.24	0.02
Simulation	10	0.49	<.0001	0.49	<.0001	0.49	<.0001
Scale		1	.	1	.	1	.

Table I.5. Table of selected variables given a simulation round

Scenario	Variable		Estimate	SE	ChiSq	p-Value
1	*age*		-0.01	0.00	10.15	0.00
	kids		-0.17	0.07	6.57	0.01
	home_ins	0	-0.52	0.15	11.95	0.00
	risk_fin		0.33	0.05	39.24	<.0001
	worry_index		0.01	0.00	3.98	0.05
2	*education*		-0.11	0.04	8.46	0.00
	home_ins	0	-0.67	0.14	21.90	<.0001
	risk_fin		0.18	0.04	17.54	<.0001
3	*home_ins*	0	-0.79	0.14	30.32	<.0001
	risk_fin		0.11	0.04	10.03	0.00
	worry_index		0.01	0.00	10.43	0.00
	tables	0	-0.30	0.14	4.46	0.03
4	*home_ins*	0	-0.87	0.14	37.21	<.0001
	risk_fin		0.11	0.02	26.40	<.0001
5	*age*		-0.01	0.00	5.37	0.02
	home_ins	0	-0.34	0.15	5.26	0.02
	risk_fin		0.14	0.05	8.52	0.00
	Risk_Est		0.01	0.00	4.05	0.04
	tables	0	0.49	0.14	11.51	0.00
6	*education*		-0.08	0.04	4.44	0.04
	home_ins	0	-0.75	0.14	27.53	<.0001
	risk_fin		0.15	0.04	12.80	0.00
7	*education*		-0.12	0.04	9.26	0.00
	home_ins	0	-0.78	0.14	29.30	<.0001
	risk_fin		0.27	0.04	36.60	<.0001
8	*education*		-0.13	0.04	10.09	0.00
	home_ins	0	-0.72	0.14	24.94	<.0001
	risk_fin		0.20	0.04	21.77	<.0001
9	*age*		-0.02	0.00	18.39	<.0001
	kids		-0.16	0.07	5.07	0.02
	home_ins	0	-0.84	0.16	26.31	<.0001
	risk_fin		0.18	0.06	8.61	0.00
	ImpactRnk	0	1.35	0.34	15.96	<.0001
	ImpactRnk	1	1.38	0.35	15.89	<.0001
	ImpactRnk	1	1.55	0.60	6.75	0.01
	damage_perc	0	0.38	0.18	4.76	0.03
10	*income*		-0.02	0.01	3.92	0.05
	education		-0.09	0.04	4.91	0.03
	home_ins	0	-0.75	0.14	26.81	<.0001
	risk_fin		0.23	0.05	26.32	<.0001

A final list of variables was generated to be included in the model. As shown in Table I.6, *want_ins* and *risk_fin* are selected in all rounds, education was selected in five scenarios, *age*, *tables*, and *risk_est* in three scenarios, while the rest were selected once.

Table I.6. Variables for the mixed model

Variable	**# of rounds variable is selected**
risk_fin	10
home_ins	10
education	5
risk_est	3
age	3
kids	2
tables	2
ImpactRnk	1
damage_perc	1
income	1

Table I.7. Model(1) Covariance Matrix round

		B1	***B2***	***B3***	***B4***	***B5***	***B6***	***B7***	***B8***	***B9***	***B10***	***B11***	***B12***	***B13***	***B14***	***B15***	***B16***
Intercept	***B1***	0.03															
age	***B2***	0.00	0.00														
education	***B3***	0.00	0.00	0.00													
kids	***B4***	0.00	0.00	0.00	0.00												
risk_est	***B5***	0.00	0.00	0.00	0.00	0.00											
risk_fin	***B6***	0.00	0.00	0.00	0.00	0.00	0.00										
tables	***B7***	0.00	0.00	0.00	0.00	0.00	0.00	0.00									
Simulation2	***B8***	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01								
Simulation3	***B9***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01							
Simulation4	***B10***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01						
Simulation5	***B11***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01					
Simulation6	***B12***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01				
Simulation7	***B13***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01			
Simulation8	***B14***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01		
Simulation9	***B15***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Simulation10	***B16***	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Table I.8.Model(2) Covariance Matrix

Variable		**X1**	**X2**	**X3**	**X4**	**X5**	**X6**	**X7**	**X8**	**X9**	**X10**	**X11**	**X12**
Intercept	**X1**	0.025	0.000	-0.001	-0.001	0.000	-0.002	-0.001	-0.004	-0.005	-0.005	-0.005	-0.005
age	**X2**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
education	**X3**	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
kids	**X4**	-0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Risk_est	**X5**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
risk_fin	**X6**	-0.002	0.000	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
tables	**X7**	-0.001	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.000
Probability (0.14)	**X8**	-0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.005	0.005	0.005
Probability (0.20)	**X9**	-0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.009	0.005	0.005	0.005
Probability (0.30)	**X10**	-0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.010	0.005	0.005
Probability (0.40)	**X11**	-0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.005	0.010	0.005
Probability (0.50)	**X12**	-0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.005	0.005	0.010

Table I.9. Probability of (not) insuring given mean values in each scenario

scenario	*age*	*education*	*kids*	*risk_est*	*risk_fin*	*home_ins*	*P(1)*	*P(0)*
1	43	4	2	30	4	1	0.67503	0.32497
2	43	4	2	30	4	1	0.55700	0.44300
3	43	4	2	30	4	1	0.63827	0.36173
4	43	4	2	30	4	1	0.58791	0.41209
5	43	4	2	30	4	1	0.68589	0.31411
6	43	4	2	30	4	1	0.55570	0.44430
7	43	4	2	30	4	1	0.62831	0.37169
8	43	4	2	30	4	1	0.56994	0.43006
9	43	4	2	30	4	1	0.72732	0.27268
10	43	4	2	30	4	1	0.56477	0.43523

P(1) = Predicted Probability of Insure = 1; P(0) = Predicted Probability of Insure = 0

Sensitivity, specificity, accuracy, and error rate As part of the diagnostic analysis of the models fit for *insure*, model(1) and model(2), we look at the associated sensitivity, specificity, accuracy, and error rate. Discussion of the error rates, accuracy, specificity, and sensitivity for the two models are presented in Tables I.10. Table I.10 provides information for these misclassification statistics using three different cut-off points. The models are used to calculate the probability of *Insure*. All predicted probabilities greater than the given cut-off are coded as *insure* and otherwise coded as not insure. Specificity, accuracy, sensitivity and error rates for each model are then constructed at an arbitrary cut-off point.

In understanding sensitivity and specificity the following terms are useful:

True positive: respondent insures and the model correctly predicts that they insure.

False positive: respondent does not insure, but model predicts that they insure.

True negative: respondent does not insure and model predicts correctly that they do not insure.

False negative: responded insures but the model predicts that they do not insure.

The sensitivity refers to the ability of the model to correctly identify those respondents who will insure. A model with 100% sensitivity correctly identifies all respondent who insure. A model with 80% sensitivity detects 80% of respondents who insure (true positives) but 20% of those that insure go undetected (false negatives). What is considered as high sensitivity is context specific.

Sensitivity = (true positives) / (true positives + false negatives)

The specificity refers to the ability of the model to correctly identify those respondents who do not insure.

Specificity = (true negatives) / (true negatives + false positives)

Therefore, a test with 100% specificity correctly identifies all respondents who don't insure. A model with 80% specificity correctly reports 80% of respondents who don't insure (true negatives) but 20% of the respondents who insure are incorrectly identified as having insured (false positives).

Model accuracy is the rate of true positives and true negatives i.e., the number of events that the model correctly identifies.

Accuracy = (true positives + true negatives) / (total number of case)

The error rate is the opposite of accuracy. It is the number of false positives and false negatives as a percentage of the total # of cases.

Error rate = (false positives + false negatives) / (total number of cases)

The usefulness of these measures depends on context. In fraud detection, the goal may be to detect the highest percentage of fraud cases, thus maximising sensitivity. In our analysis, the goal is not necessarily to maximise insurance cases. Yet, in some instances it may be useful to develop a model to delineate those affected by insurance decisions prior to a hurricane (or other

disaster event) such that a central planning authority (e.g., FEMA) can budget for the next disaster. As such, the focus will not be on specificity, but on selecting a cut-off that will save the most money. In which case, one would identify a cut-off value that produces a model which maximizes savings.

Table I.10. Model Fit Statistics

	Specificity	***Accuracy***	***Sensitivity***	***Error Rate***
Cut off = 0.45				
Model(1)	31%	61%	85%	39%
Model(2)	31%	61%	85%	39%
Cut off = 0.5				
Model(1)	42%	61%	77%	39%
Model(2)	43%	62%	77%	38%
Cut off = 0.6				
Model(1)	71%	58%	47%	42%
Model(2)	71%	58%	47%	42%

At a cut off of 0.45, the models show the same statistics. When the cut-off is increased to 0.5, Model(2) performs better than Model(1) by one point on all classifications except sensitivity. Beyond 0.5, the models perform the same.

Table I.11. Scenario Conditions

Scenario	**Prob.**	**Mag.**	**InCost**	**ExLoss**
1	0.3	7000	2415	2100
2	0.14	15000	2415	2100
3	0.1	7000	805	700
4	0.14	5000	805	700
5	0.5	7000	4025	3500
6	0.14	25000	4025	3500
7	0.2	7000	1610	1400
8	0.14	10000	1610	1400
9	0.4	7000	3220	2800
10	0.14	20000	3220	2800

Table I.12. Correlations for insuring in each scenario with the binary choice to gamble

Scenario	*Y*	*X*	*Spearman*	*p-Value*
1	Insure_	GAMBLE_binary	0.02	0.52
2	Insure_	GAMBLE_binary	-0.03	0.44
3	Insure_	GAMBLE_binary	0.02	0.58
4	Insure_	GAMBLE_binary	0.02	0.49
5	Insure_	GAMBLE_binary	0.00	0.92
6	Insure_	GAMBLE_binary	-0.02	0.57
7	Insure_	GAMBLE_binary	0.00	0.96
8	Insure_	GAMBLE_binary	-0.02	0.49
9	Insure_	GAMBLE_binary	0.02	0.61
10	Insure_	GAMBLE_binary	-0.01	0.84

Table I.13. Gambling Probability of average respondent (at mean)

Gambling	*Description*	*P(Y=1)*	*P(Y=2)*	*P(Y=3)*
1	Using average of category 1	0.76	0.18	0.05
2	Using average of category 2	0.74	0.20	0.06
3	Using average of category 3	0.74	0.20	0.06
Overall	Using overall Average	0.76	0.19	0.06

Table I.14. Gambling Probability of Average Respondent(at median)

Gambling	*Description*	*P(Y=1)*	*P(Y=2)*	*P(Y=3)*
1	Using median of category 1	0.76	0.19	0.05
2	Using median of category 2	0.73	0.21	0.06
3	Using median of category 3	0.75	0.18	0.07
Overall	Using overall median	0.75	0.20	0.05

Table I.15. Pearson Correlation Coefficients, N = 8000, Prob > |r| under H_0: Rho=0

	x1	*x2*	*x3*	*x4*	*x5*	*x6*	*x7*	*x8*	*x9*	*x10*	*z1*	*z2*	*z3*
age	1	0.070	-0.107	0.018	-0.092	-0.122	0.075	0.039	-0.026	-0.012	0	0	0
education		1	0.120	0.220*	-0.022	-0.014	0.164	-0.002	0.138	-0.002	0	0	0
damage_perc			1	0.093	0.113	0.117	0.019	0.0	0.159	0.003	0	0	0
income				1	0.020	-0.048	0.099	-0.641	0.072*	0.074	0	0	0
Kids					1	0.152	0.061	0.055	0.046	0.012	0	0	0
worry_index						1	0.100	0.003	0.161	0.001	0	0	0
risk_fin							1	0.051	0.180	-0.004	0	0	0
tables								1	-0.013	-0.109	0	0	0
gender									1	0.002	0	0	0
outcomeLag										1	-0.154	0.251	0.088
prob											1	-0.390	0.552
mag												1	0.552
ExLoss													1

x1	X2	X3	X4	X5	X6	X7	X8	X9	x10	z1	z1	z1
age	education	damage_perc	income	kids	worry_index	risk_fin	tables	gender	outcomeLag	prob	mag	ExLoss

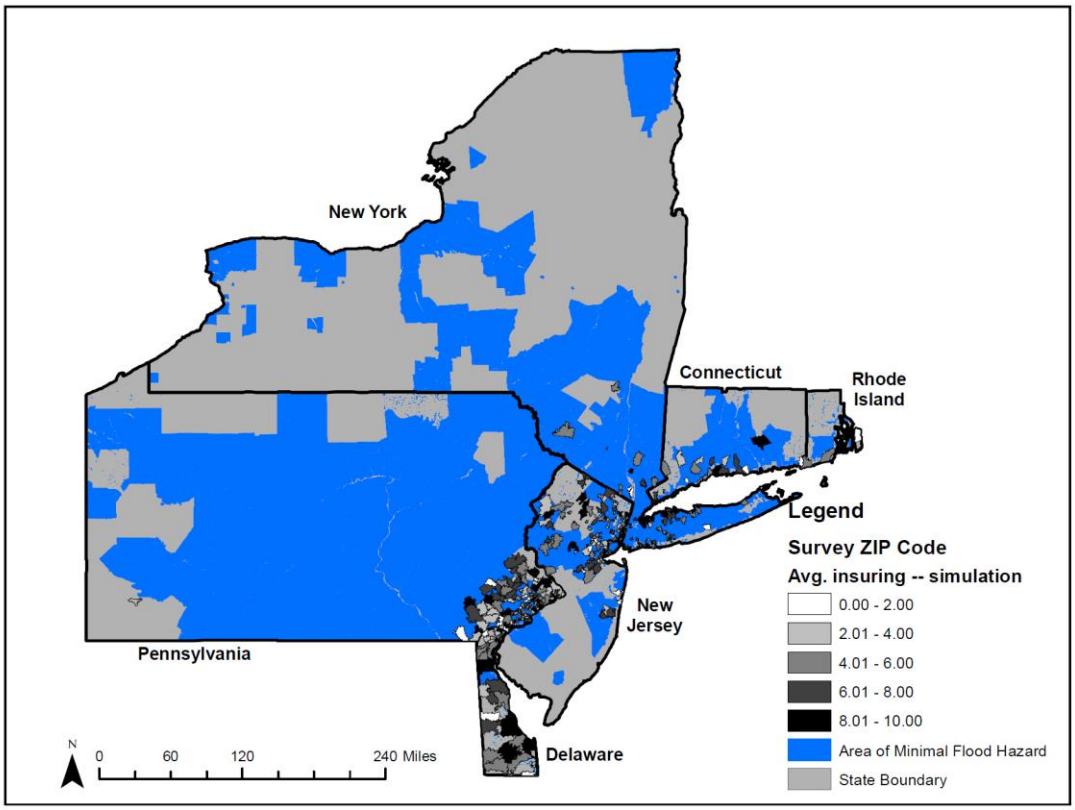

Figure I.1 Simulation insuring behaviour for households in area of minimal flood hazard[16]

[16] *Map created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved.*

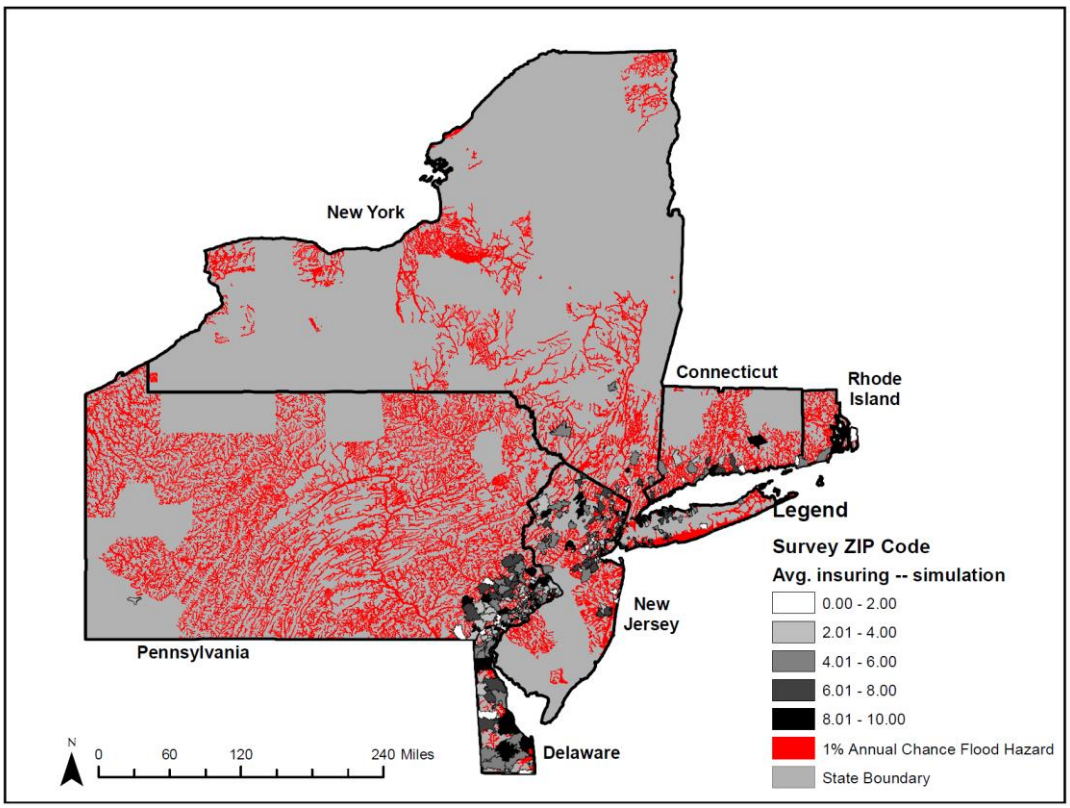

Figure I.2 Simulation insuring behaviour for households in area of minimal flood hazard[17]

[17] *Map created using ArcGIS® software by Esri. ArcGIS® and ArcMap™ are the intellectual property of Esri and are used herein under license. Copyright © Esri. All rights reserved.*

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