Appendix A: Methodology for defining the rainfall insurance contracts in Kilimanjaro and Ruvuma

The purpose of this Appendix is to describe the steps that have been utilized to specify the rainfall insurance contracts for the Kilimanjaro Round II Survey, and for the Ruvuma Round II Survey. These contracts are utilized in the surveys, to elicit farmers' WTP for them. As such they must be relevant to the farmer, in the sense that they should specify events and probabilities that are within the range of events that affect the farmer, and also specify likely losses and costs that are also within the range of events that are likely to affect the farmer. As will be seen below this is not an easy task, and requires a first round survey to assess them. As the surveys that are conducted in the context of the Tanzania vulnerability project involve two rounds, we utilize the first round information to specify the rainfall insurance contracts and the costs for the second round.

A rainfall insurance contract is one that specifies a certain payoff to the farmer, if a given event, related to weather takes place. Hence, in order to specify a rainfall insurance contract that is relevant to the farmer, one must assess several things. First, one must assess the probability distribution of the weather related uncertain event, so as to be able to specify the undesirable event. In addition, one has to be able to specify the likely loss from the uncertain event, in a way that is appropriate for the farmer. Finally, one must specify the expected value of the loss, so as to utilize it for specifying the actuarially fair price of the rainfall insurance contract. The sequel describes all the above steps.

The first issue concerns the probability distribution of rainfall. We have obtained data for monthly total rainfall in ten weather stations in Kilimanjaro and five weather stations in Ruvuma, for 33 years. The first thing that is done for each weather station is to aggregate the monthly rainfall data to yearly total rainfall figures, using the appropriate agricultural or marketing year for each region. Subsequently we pool all the yearly data from all stations into one group, and order them from lowest to highest. Apart from eight occurrences of zero rainfall in Kilimanjaro, all other yearly totals are positive. The data is ordered, the cumulative distribution is specified, and the mean as well as the median is computed.[1] Basically the way we treat the rainfall data, is as if the yearly rainfall of each rainfall station is an independent draw from the Kilimanjaro average annual weather distribution. It might have been more accurate to use for each village the weather data from the weather station closest to the village. But this turned out to be difficult, as the distances from a given village to the various weather stations are not well defined, and a village may be close in that sense to more than one weather station.

The second issue concerns objective and subjective estimations of the probabilities of below normal weather events. From the village questionnaires of each survey we have data on the frequency of occurrence of a "drought" for the village, in the last ten years. From these answers (which were provided by a group of village officials, and hence reflect consensus views), we estimate the average number of years out of ten in which villages think they had a drought. For Kilimanjaro this turned out to be 3.35 years out of ten, or almost exactly a 30 percent annual chance of a drought.

In the household questionnaires we asked households about the occurrence on their plots of five types of rain, namely much above normal, somewhat above normal, around normal, somewhat below normal and much below normal. We need to specify what is meant by

[1] For Kilimanjaro the average annual rainfall was equal to 1,234 mm and the median was 1,160 mm.

rainfall somewhat below normal and much below normal, as these variables are utilized in production function estimates to estimate losses from adverse weather.

We assumed that "drought" as defined at the village level was equivalent to the households' subjective estimates of rain "much below normal". The next issue is to define in terms of rainfall what is meant by a drought. By reference to the annual rainfall distribution we compute the annual rainfall that corresponds to a cumulative distribution point equal to 0.335. In other words we estimate the annual rainfall below which occurrences in the past have been observed with frequency equal to 0.335. For Kilimanjaro this was equal to a level of 884 mm, or about 24 percent below the median of the rainfall distribution. This cut-off point we regard as the borderline of what may be considered much below normal.

The next issue is to specify what is meant by rainfall "somewhat below normal". This was arbitrarily defined as the rainfall point in the cumulative rainfall distribution that corresponds to a probability mass equal to one half of the mass between the median (namely 50 percent of the mass) and the drought point (which as seen above corresponds to 33.5 percent of the mass). Hence, the arbitrary definition of the rainfall which will be considered somewhat below normal is the level that corresponds to a total probability mass of 0.335+(0.5-0.335)/2 =0.335+0.082=0.417. This rainfall from the rainfall probability distribution is equal to 1011 mm, or 13 percent below the median. Thus the probability of weather being below normal, an event that includes both the "somewhat below normal" and the "much below normal" possibilities, is 41.7 percent.

In the first round questionnaire we ask farmers to specify for each of their cultivated plots whether rain on that plot for the year before the survey was one of five possibilities, namely much above normal, somewhat above normal, around normal, somewhat below normal and much below normal. We assign sequentially the values of 1,2,3,4,5 to each one of the above possibilities, and then compute for each household a household specific rainfall index by weighting each plot specific subjective rainfall number by the plot size, and dividing by the total area of all plots. This procedure gives a non-integer number between 1 and 5. We take the nearest integer of this number and hence assign to each household an integer number, corresponding to one of the above five possibilities, which reflects the type of rainfall each household experienced in its farm in the year prior to the survey. From these integers we create five separate dummy variables, each corresponding to one of the five possibilities above. In other words the dummy indicating rain much below normal will be equal to 1 if the rainfall index for this household is equal to 5, and zero otherwise. These five dummy variables are the household specific weather variables that are utilized in the production function estimates to estimate the likely losses from weather below normal.

In the next step we estimate the average value of output that is normal without weather influences and the value of agricultural income losses due to weather. This is done by estimating an agricultural production function for all the households in the sample. The dependent variable is the (natural logarithm of) gross value of agricultural production per acre. This gross value is computed by multiplying the quantities produced of all products, by the prices that are specific to each household. In case the household sold some of the particular product, the price at which the total production of that product is valued is the average price for all sales. For products which are not sold on the market, the price is the average price of the same product sold by other households in the same village. For products for which no household in the village sold any quantity, the price is taken from an average of sales prices in the villages in the same district.

The production function includes four of the five weather dummy variables discussed above (the sum of all five is equal to the constant, and hence one must be omitted). In particular we omitted the dummy for weather equal to normal, and left all other dummies for weather above or below normal. As expected, the dummies for weather somewhat or much below normal were negative and significant. The dummies for weather above normal were positive but not significant. The production function included variables such as land cultivated, the value of capital utilized per hectare, the amount of labour per hectare, the value of purchased inputs per hectare, the number of permanent trees per hectare, and household and farm specific variables such as the education of the head, the altitude of the farm, etc.

Given the production function estimate, the "predicted" value of total output for each household is computed by omitting all the weather variables. In other words for each household we predict the value of output in the absence of weather induced variations. This value is the basis from which we estimated losses due to weather. As there is considerable size variation among farmers, we separate the predicted values of agricultural output in three terciles. For each tercile we compute the average value of "predicted" agricultural output, and the amount lost if the weather is somewhat below normal and much below normal, by multiplying this average by the corresponding coefficients of the respective dummies from the production function estimates. These numbers give us the average total losses if weather is somewhat below normal and the average total loss if weather is much below normal, for each of the three groups of households. We then compute the average loss if weather is below normal, by the weighted average of these losses (weights are the respective probabilities, namely 0.335 and 0.082). The actuarially fair price for a weather insurance contract that will pay this average loss if weather is below normal is the sum of the products of the probabilities of each of the two above events, multiplied by their respective estimated losses.

As an illustration, for the first tercile in Kilimanjaro, the average value of agricultural production without the weather effects is estimated to be Tsh 116 180. The regression coefficients of the weather_4 and weather_5 dummies in the production regression are -0.126 and -0.206 respectively[1]. Hence the estimated average losses in each respective case are Tsh 0.126*116180=Tsh 14 639, and 0.206*116180=Tsh 23 933. Since the first event occurs with probability equal to 0.082 and the second with probability equal to 0.335, the weighted average loss is equal to (0.082*14639+0.206*23933)/(0.082+0.335)=22105. The actuarially fair premium for an insurance contract that will pay this value (in the actual questionnaire this value is rounded to 22000) when the annual rainfall is less than 13 percent below normal (and normal in this case is understood as the median of the annual rainfall distribution) is equal to Tsh 0.082*14639+0.206*23933=9218. This is then the value around which we specify different premium values and ask the farmer whether he would be willing to pay them in order to obtain the payoff of 22000 (in the actual questionnaire the actuarially fair premium is rounded to Tsh 9 000).

The same procedure is applied to the other two terciles.

[1]These regression coefficients have been superseded by later more detailed analysis (Sarris, Savastano and Christiaensen, 2006), which indicated that the values of the negative coeffficients of the weather variables in the production functions losses were higher than those indicated above. This implies that the actual income losses which are incurred by farmers are larger under the weather scenarios indicated in the questionnaires than those on the basis of which the contracts were designed. Hence, this would tend to make the prices for the offered contracts less than what would be justified under the "true" loss assessment. Hence it is expected that farmers would be more willing to pay for them. This, however, should not bias the overall estimates of WTP.

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Table 6.1: Interest in minimum price coffee insurance among coffee producing households. (Number of households)

1a. Kilimanjaro

		Round 2		
		No	**Yes**	**Total**
Round 1	No	22,454	22,772	45,226
	Yes	19,976	38,843	58,819
	Total	42,430	61,615	104,045

1b. Ruvuma

		Round 2		
		No	**Yes**	**Total**
Round 1	No	3,959	3,198	7,157
	Yes	12,962	31,183	44,145
	Total	16,921	34,381	51,302

Source. Authors' calculations

Table 6.2: Interest in minimum price cashew nut insurance among cashew nut producing households in Ruvuma. (Number of households)

		Round 2		
		No	**Yes**	**Total**
Round 1	No	2,779	5,530	8,309
	Yes	8,916	19,470	28,386
	Total	11,695	25,000	36,694

Source. Authors' calculations

Table 6.3 : Probit selection regressions concerning interest in minimum price insurance by coffee producers in Kilimanjaro. (Dependent variable is dummy equal to one if the answer is "yes" to the interest question. The results indicate the marginal effects)

	Round (1)	Round (2)
Per capita income (Tsh)	0.0000001	0.0000003
	(0.77)	(1.80)
Share of cash to total gros income	-0.0018067	-0.0016812
	(1.55)	(1.32)
Share of coffee income to total hh income	0.0033801	0.0000968
	(1.05)	(0.04)
Per capita wealth (Tsh)	-0.0000000	-0.0000000
	(0.63)	(0.33)
Total no of coffee trees	0.0000248	0.0001517
	(0.62)	(2.38)*
Education level of the head (years)	0.0061214	0.0041409
	(0.68)	(0.38)
Coffee price received this year (Tsh/kg)	0.0002323	0.0004835
	(0.72)	(1.80)
Price control dummy for coffee price	-0.1935966	-0.2583106
	(2.82)**	(3.80)**
Price variability index	0.0007142	0.0011255
	(1.17)	(1.88)
Price variability control dummy	-0.1611438	-0.0188923
	(3.03)**	(0.38)
Number of yrs out of the past 10, when cash income from coffee was 50% below normal	-0.0230457	0.0065519
	(1.71)	(0.50)
Dummy: 1=cash income from sales of coffee is important	-0.0268230	0.0513168
	(0.44)	(0.57)
Have access to seasonal credit	0.0886969	0.1104928
	(1.30)	(1.50)
Dum=1 if in shock use savings	0.0453281	-0.0383499
	(0.78)	(0.67)
Dum=1 if in shock i use family assistance	0.0292113	0.1535873
	(0.47)	(2.32)*
Dum=1 if in shock i use other assistance	0.0911020	0.0639030
	(1.13)	(0.50)
Dum=1 if in shock i use new ways to earn income	-0.0354391	-0.0530817
	(0.54)	(0.82)
Number of yrs out of the past 10, when total hh income declined a lot below average	-0.0160176	-0.0116474
	(0.96)	(0.75)
Banana production dummy	-0.0651070	0.0425610
	(0.66)	(0.41)
Herfindhal index (cash income)	0.0002490	-0.0024394
	(0.23)	(1.96)*
Share of coffee input costs to coffee production value	0.0008214	0.0008427
	(1.16)	(0.95)
Observations	529	522
Pseudo R-squared	0.13	0.15

Robust z statistics in parentheses
* significant at 5%; ** significant at 1%

Proportion of correct predictions round 1	67.84
Proportion of correct predictions round 2	72.16

Source: Authors' calculations

Table 6.4: Probit selection regressions concerning interest in minimum price insurance by coffee producers in Ruvuma. (Dependent variable is dummy equal to one if the answer is "yes" to the interest question. The results indicate the marginal effects)

	Round (1)	Round (2)
Per capita income (Tsh)	-0.0000000	-0.0000001
	(0.08)	(0.47)
Share of cash to total gros income	-0.0002495	0.0028970
	(0.48)	(1.31)
Share of coffee income to total hh income	0.0011640	-0.0009364
	(1.33)	(0.35)
Per capita wealth (Tsh)	0.0000000	-0.0000002
	(1.64)	(0.81)
Total no of coffee trees	0.0000132	0.0001113
	(0.95)	(1.80)
Education level in years	-0.0124381	-0.0307801
	(2.54)*	(1.64)
Coffee price this year (Tsh/kg)	-0.0001836	0.0001288
	(1.80)	(0.67)
Price control dummy	0.0063056	0.0106148
	(0.18)	(0.08)
Price variability index	0.0000890	-0.0004022
	(0.79)	(1.21)
Price variability control dummy	-0.0000369	0.0717628
	(0.00)	(0.78)
Dum=1 cash income from coffee is most unreliable	0.0976008	0.2139364
	(5.12)**	(2.45)*
Dummy: 1=cash income from sales of coffee is important	0.0693971	0.2078365
	(2.79)**	(2.34)*
Dummy: 1=quite easy access to short term credit	-0.0056297	
	(0.22)	
Dum=1 if in shock i use savings	-0.0505688	-0.0322265
	(2.13)*	(0.31)
Dum=1 if in shock i use family assistance	0.0060861	-0.0433698
	(0.25)	(0.31)
Dum=1 if in shock i use other assistance	0.0358786	-0.0367579
	(1.27)	(0.17)
Dum=1 if in shock i use new ways to earn income	-0.0607318	0.2896774
	(1.30)	(2.17)*
Dum=1 hh income declined considerably previous years	-0.0199411	0.0712828
	(0.78)	(0.65)
Banana production dummy	-0.0026819	0.0852363
	(0.11)	(0.86)
Herfindhal index (cash income)	-0.0008508	0.0003951
	(1.68)	(0.21)
Share of coffee input costs to coffee production value	0.0000287	0.0065512
	(0.55)	(3.08)**
Observations	262	228
Pseudo R-squared	0.32	0.21

Robust z statistics in parentheses
* significant at 5%; ** significant at 1%
Proportion of correct predictions round 1 90.46
Proportion of correct predictions round 2 73.69
Source: Authors' calculations

Table: 6.5 Probit selection regressions concerning interest in minimum price insurance by cashew nut producers in Ruvuma. (Dependent variable is dummy equal to one if the answer is "yes" to the interest question. The results indicate the marginal effects)

	Round (1)	Round (2)
Per capita income (Tsh)	0.0000001	0.0000013
	(0.31)	(3.86)**
Share of cash to total gros income	-0.0000405	0.0005233
	(0.03)	(0.28)
Share of cashew nuts income to total hh income	0.0011764	0.0000703
	(0.94)	(0.03)
Per capita wealth (Tsh)	-0.0000001	-0.0000008
	(0.23)	(2.68)**
Total number of cashew nut trees	0.0000738	0.0000148
	(1.39)	(0.35)
Education level in years	0.0140423	-0.0231461
	(1.48)	(1.40)
Cashew nut price this year (Tsh/kg)	-0.0003795	-0.0003031
	(1.34)	(0.48)
Prive variability index	-0.0004630	-0.0013624
	(0.75)	(1.39)
Price variability control dummy	-0.0820426	-0.0490198
	(1.53)	(0.69)
Dum=1 cash income from cashew is least reliab	0.0544935	-0.1813993
	(1.03)	(2.35)*
Dummy: 1=cash income from sales of cashew nuts is important	0.1888393	0.0851402
	(3.37)**	(1.18)
Dummy: 1=quite easy access to short term credit	0.0952541	0.2084152
	(1.30)	(2.17)*
Dum=1 if in shock use savings	0.0006240	-0.3960840
	(0.01)	(3.82)**
Dum=1 if in shock use family assistance	-0.0227167	0.2115453
	(0.36)	(1.94)
Dum=1 if in shock use other assistance	0.0551890	-0.1282833
	(0.76)	(0.59)
Dum=1 if in shock use new ways	-0.0714488	0.2767859
	(0.95)	(3.91)**
Dum=1 hh income declined considerably in previous years	-0.0215371	0.0508458
	(0.32)	(0.63)
Banana production dummy	-0.1461249	-0.0433319
	(1.56)	(0.48)
Herfindhal index (cash income)	-0.0016534	-0.0016928
	(1.65)	(1.14)
Share of cashew nut input costs to cashew nuts production value	-0.0000845	0.0040732
	(0.21)	(2.96)**
Observations	280	285
Pseudo R-squared	0.15	0.26

Robust z statistics in parentheses
* significant at 5%; ** significant at 1%
Proportion of correct predictions round 1 81.4
Proportion of correct predictions round 2 76.31
Source: Authors' calculations

Table 6.6: WTP regressions for coffee producers in Kilimanjaro from round 1 (all coefficients shown are the marginal effects)

	Tsh 400 minimum price	Tsh 600 minimum price	Tsh 800 minimum price
Bid value for Tsh 400 contract	-0.0033366	-0.0028467	-0.0016604
	(3.67)**	(4.78)**	(6.57)**
This year's coffee price over 400	-0.0000257		
	(0.02)		
This year's coffee price over 600		0.0016143	
		(0.89)	
This year's coffee price over 800			-0.0000818
			(0.03)
Per capita income (Tsh)	-0.0000001	-0.0000003	0.0000000
	(1.33)	(2.17)*	(0.09)
Share of cash to total income	-0.0007700	0.0017628	0.0006019
	(0.57)	(1.28)	(0.47)
Share of coffee income to total hh income	-0.0031350	-0.0054050	-0.0030090
	(0.60)	(1.12)	(0.71)
Per capita wealth (Tsh)	0.0000001	0.0000001	0.0000000
	(1.81)	(1.98)*	(1.01)
Total no of coffee trees	-0.0000873	-0.0000620	-0.0001235
	(2.19)*	(1.55)	(3.27)**
Education level in years	0.0064465	0.0286317	0.0014548
	(0.56)	(2.55)*	(0.15)
No yrs out of the past 10, when coffee cash income was 50% or more below normal	0.0601228	0.0553138	0.0476327
	(2.83)**	(2.56)*	(2.66)**
Dummy: 1=cash income from sales of coffee is important	0.2377579	0.1828496	0.1339451
	(3.25)**	(2.62)**	(2.22)*
Easy access to seasonal credit	-0.0578120	0.0468831	-0.2419023
	(0.73)	(0.62)	(3.08)**
Dum=1 if in shock use savings	-0.1049879	-0.1492184	-0.0898400
	(1.43)	(2.17)*	(1.54)
Dum=1 if in shock use family assistance	-0.0568690	0.0355042	0.1067232
	(0.73)	(0.44)	(1.70)
Dum=1 if in shock use other assistance	-0.0906162	-0.1162114	-0.2958855
	(0.96)	(1.23)	(2.98)**
Dum=1 if in shock use new income earning ways	-0.1826361	-0.0228133	-0.0513829
	(2.19)*	(0.31)	(0.74)
Number of yrs out of the past 10, when total hh income declined a lot below average	0.0005537	-0.0267924	-0.0683653
	(0.02)	(1.06)	(3.27)**
Banana production dummy	0.3005355	0.5522005	0.2695673
	(2.48)*	(4.27)**	(2.37)*
Herfindhal Index (cash income)	0.0018468	0.0038701	0.0007722
	(1.35)	(2.89)**	(0.63)
Share of coffee input costs to coffee production value	-0.0022499	-0.0020619	-0.0001474
	(2.85)**	(2.66)**	(0.23)
Observations	313	284	290
Pseudo R-squared	0.23	0.28	0.32

Robust z statistics in parentheses
* significant at 5%; ** significant at 1%

Proportion of correct predictions Tsh 400 contract	72.28
Proportion of correct predictions Tsh 600 contract	77.06
Proportion of correct predictions Tsh 800 contract	79.66

Table 6.7: WTP regressions for coffee producers in Ruvuma from round 1 (all coefficients shown are the marginal effects)

	Tsh 400 minimum price	Tsh 600 minimum price	Tsh 800 minimum price
Bid value	-0.0090261	-0.0039038	-0.0012629
	(4.30)**	(4.81)**	(5.16)**
Past year's coffee price over 400	0.0006527		
	(0.46)		
Past year's coffee price over 600		-0.0026790	
		(1.71)	
Past year's coffee price over 800			-0.0006620
			(0.57)
Per capita income (Tsh)	0.0000012	0.0000003	0.0000003
	(2.42)*	(1.11)	(1.55)
Share of cash to total income	-0.0057706	-0.0023305	-0.0003189
	(2.59)**	(1.57)	(0.42)
Share of coffee income to total hh income	0.0003355	0.0004097	0.0006375
	(0.14)	(0.23)	(0.69)
Per capita wealth (Tsh)	-0.0000002	-0.0000000	-0.0000001
	(1.45)	(0.37)	(1.58)
Total no of coffee trees	-0.0001807	-0.0000646	-0.0000451
	(3.35)**	(1.94)	(2.31)*
Education level in years	0.0083298	-0.0108838	0.0090695
	(0.51)	(0.87)	(1.33)
Price variability index	-0.0008361	-0.0007092	-0.0001800
	(1.98)*	(2.18)*	(1.46)
Price variability dummy	0.0631541	-0.0429331	-0.0307178
	(0.71)	(0.62)	(0.76)
Dum=1 income from coffee is unreliable	-0.0337031	-0.0043483	0.0164874
	(0.38)	(0.07)	(0.47)
Dum=1 cash income from coffee is important	0.3216173	0.1201364	-0.0088543
	(3.70)**	(1.83)	(0.29)
Dum=1=easy access to short term credit	0.0636030	-0.0385618	0.0703546
	(0.74)	(0.53)	(2.23)*
Dum=1 if in shock use savings	0.0965305	0.1321136	0.0241094
	(0.97)	(1.80)	(0.55)
Dum=1 if in shock use family assistance	0.1687670	0.0237026	0.0541970
	(1.53)	(0.28)	(1.35)
Dum=1 if in shock use other assistance	-0.0721058	0.0673944	0.0251723
	(0.50)	(0.80)	(0.49)
Dum=1 if in shock use new ways	-0.3302539	-0.1517489	-0.3812963
	(2.21)*	(1.36)	(3.76)**
Dum=1 hh income declined considerably previous years	0.1043057	0.0039699	0.0938717
	(1.01)	(0.06)	(1.61)
Banana production dummy	-0.0222660	-0.0447769	0.0263547
	(0.28)	(0.77)	(0.71)
Herfindhal index (cash income)	-0.0001741	0.0002906	-0.0003379
	(0.09)	(0.20)	(0.43)
Share of coffee input costs to coffee production value	-0.0019161	-0.0003314	0.0000865
	(2.35)*	(2.28)*	(1.50)
Observations	222	219	220
Pseudo R-squared	0.42	0.35	0.41

Robust z statistics in parentheses
* significant at 5%; ** significant at 1%

Proportion of correct predictions Tsh 400 contract	82.68
Proportion of correct predictions Tsh 600 contract	82.5
Proportion of correct predictions Tsh 800 contract	90.26

Table 6.8: WTP regressions for cashew nut producers in Ruvuma from round 1 (all coefficients shown are the marginal effects)

	Tsh 300 min price	Tsh 450 min price	Tsh 600 min price
Bid values	-0.0090467	-0.0076630	-0.0010566
	(4.38)**	(5.49)**	(5.29)**
Past year's price over 300	-0.0011836		
	(0.74)		
Past year's price over 450		0.0001488	
		(0.07)	
Past year's price over 600			-0.0000784
			(0.17)
Per capita income (Tsh)	0.0000008	0.0000005	0.0000001
	(1.40)	(0.93)	(2.24)*
Share of cash to total income	-0.0017829	-0.0014658	-0.0003859
	(0.90)	(0.75)	(1.05)
Share of cashew income in hh income	0.0003915	-0.0012232	0.0000373
	(0.19)	(0.63)	(0.14)
Per capita wealth (Tsh)	-0.0000009	-0.0000007	-0.0000000
	(1.75)	(1.46)	(0.00)
No of cashew nut trees	-0.0001245	-0.0000084	0.0000582
	(1.52)	(0.10)	(2.40)*
Education level in years	0.0041433	0.0087631	-0.0027313
	(0.25)	(0.54)	(0.87)
Price variability index	-0.0002580	-0.0008179	0.0000719
	(0.23)	(0.77)	(0.53)
Price variability control dummy	0.0117027	0.0991875	0.0107670
	(0.12)	(1.15)	(0.89)
Dum=1 cash income from cashew least reliable	-0.0848829	-0.0589842	-0.0297028
	(0.84)	(0.61)	(1.47)
Dum=1 cash income from cashew nuts is important	0.3081411	0.2497730	0.0407519
	(3.30)**	(2.76)**	(2.14)*
Dum=1 easy access to sort term credit	-0.0926290	-0.1847276	-0.0690627
	(0.75)	(1.62)	(2.36)*
Dum=1 if in shock use savings	0.0717601	0.0767879	-0.0234855
	(0.78)	(0.90)	(1.40)
Dum=1 if in shock use family assistance	-0.1549754	-0.0371895	-0.0161111
	(1.53)	(0.39)	(0.91)
Dum=1 if in shock use other assistance	0.0512585	0.1031238	0.0126341
	(0.38)	(0.76)	(1.04)
Dum=1 if in shock use new ways	-0.2694285	-0.2601832	0.0066565
	(2.25)*	(2.25)*	(0.51)
Dum=1 hh income declined considerably previous years	0.2634780	-0.0255109	0.0280563
	(2.31)*	(0.25)	(1.48)
Banana production dummy	0.0701050	0.0795912	
	(0.41)	(0.49)	
Herfindhal index (cash income)	-0.0001822	0.0010713	-0.0004128
	(0.10)	(0.65)	(1.94)
Share of cashew nut input costs to cashew nuts production value	-0.0001374	0.0002152	-0.0000506
	(0.22)	(0.39)	(0.54)
Observations	222	222	196
Pseudo R-squared	0.26	0.24	0.50

Robust z statistics in parentheses
* significant at 5%; ** significant at 1%

Proportion of correct predictions Tsh 300 contract	76.00
Proportion of correct predictions Tsh 450 contract	74.05
Proportion of correct predictions Tsh 600 contract	89.65

Source: Authors' computations

Table.6.9: Summary statistics of the predicted value of WTP for coffee minimum price insurance in Kilimanjaro from Round 1

Tsh 400 Minimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	63,803	92.06	77.82
WTP (Share of Tsh 400 min. price)	63,803	23.01	19.46
Tsh 600 minimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	58,619	140.96	100.94
WTP (Share of Tsh 600 min. price)	58,619	23.49	16.82
Tsh 800 minimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	60,116	233.67	85.46
WTP (Share of Tsh 800 min. price)	60,116	29.21	10.68

Source: Authors'computations

Table 6.10: Summary statistics of the predicted value of WTP for coffee minimum price insurance in Ruvuma from Round 1

Tsh 400 inimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	46,002	52.79	47.30
WTP (Share of Tsh 400 min. price)	46,002	13.20	11.82
Tsh 600 minimum price contract			
	No of hh's	**Average WTP**	**St.Dev.**
WTP (Tsh)	45,759	110.68	66.96
WTP (Share of Tsh 600 min. price)	45,759	18.44	11.16
Tsh 800 minimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	45,563	243.88	102.77
WTP (Share of Tsh 800 min. price)	45,563	30.48	12.84

Source: Authors'computations

Table 6.11: Summary statistics of the predicted value of WTP for cashew nut minimum price Insurance in Ruvuma from Round 1

Tsh 300 minimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	30,348	37.12	30.02
WTP (Share of Tsh 300 min. price)	30,348	12.37	10.01
Tsh 450 minimum price contract			
	No of hh's	**Average WTP**	**St.Dev.**
WTP (Tsh)	30,348	59.68	31.45
WTP (Share of Tsh 450 min. price)	30,348	13.26	6.99
Tsh 600 minimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	26,794	121.57	42.56
WTP (Share oTsh 600 min. price)	26,794	20.26	7.09

Source: Authors' computations

Table 6.12: Summary statistics of the predicted value of WTP for coffee and cashew nut minimum price Insurance in Kilimanjaro and Ruvuma from Round 2

	No of hh's	Average WTP	St. Dev.
WTP (Tsh)	58,211	338.06	183.43
WTP (Share of Tsh 800 min. price)	58,211	42.26	22.92
Ruvuma coffee Tsh 600 minimum price contract			
	No of hh's	**Average**	**St.Dev.**
WTP (Tsh)	49,597	27.67	70.93
WTP (Share of Tsh 600 min. price)	49,597	4.613	11.82
Ruvuma coffeeTsh 800 minimum price contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	52,236	132.01	96.39
WTP (Share of Tsh 800 min. price)	52,236	16.50	12.04
Ruvuma cashew Tsh 450 minimum price contract			
	No of hh's	**Average**	**St.Dev.**
WTP (Tsh)	39,507	36.56	26.17
WTP (Share of Tsh 450 min. price)	39,507	8.12	5.81
Ruvuma cashew Tsh 600 minimum price contract			
	No of hh's	**Average**	**St. Dev.**
WTP (Tsh)	38,691	83.04	67.64
WTP (Share of Tsh 600 min. price)	38,691	13.84	11.27

Source: Authors' computations

Table 6.13: Kilimanjaro coffee: welfare benefit and cost for minimum price insurance

Premium rule	Premium value (Tsh/kg)	Quantity insured (tonnes)	Number of households	Total premium (Tsh million)	Premium as share of coffee sales (percent)	Consumer surplus (Tsh million)	Consumer surplus as share of coffee sales (percent)
Tsh 400 minimum price							
Mean WTP	92.1	1202.6	30,700	110.7	23.2	77.7	16.3
Mean WTP + 1 SD	169.9	408.0	9,322	69.3	49.3	19.9	14.1
Mean WTP - 1 SD	14.2	2511.7	48,937	35.8	3.1	219.0	19.3
Tsh 600 minimum price							
Mean WTP	141.0	1407.3	28,705	198.4	33.0	127.8	21.3
Mean WTP + 1 SD	241.9	485.4	10,492	117.4	62.5	34.5	18.4
Mean WTP - 1 SD	40.0	2566.7	48,064	102.7	9.2	307.0	27.5
Tsh 800 minimum price							
Mean WTP	233.7	1692.2	36,305	395.4	53.1	183.5	24.7
Mean WTP + 1 SD	319.1	898.9	21,270	286.9	79.9	78.2	21.8
Mean WTP - 1 SD	148.2	2439.3	46,617	361.5	34.3	371.6	35.2
Mean WTP - 2 SD	62.8	2963.2	54,551	185.9	14.3	653.0	50.3

Source. Authors' calculations

Table 6.14: Ruvuma coffee: Welfare benefit and cost for minimum price insurance

Premium rule	Premium value (Tsh/kg)	Quantity insured (tonnes)	Number of households	Total premium (Tsh million)	Premium as share of coffee sales (percent)	Consumer surplus (Tsh million)	Consumer surplus as share of coffee sales (percent)
Tsh 400 minimum price							
Mean WTP	52	7001.0	20,235	364.1	6.2	320.5	5.4
Mean WTP + 1 SD	99	2324.7	7,966	230.2	3.9	94.1	1.6
Mean WTP - 1 SD	5	11200.0	36,315	56.0	0.9	713.9	12.1
Tsh 600 minimum price							
Mean WTP	110	6691.5	20,552	736.1	12.5	492.0	8.3
Mean WTP + 1 SD	176	3608.9	9,988	635.2	10.7	118.8	2.0
Mean WTP - 1 SD	44	12400.0	38,425	545.6	9.2	1048.3	17.7
Tsh 800 minimum price							
Mean WTP	243	7514.8	21,870	1826.1	30.9	696.6	11.8
Mean WTP + 1 SD	345	2447.1	6,397	844.2	14.3	209.8	3.5
Mean WTP - 1 SD	141	11500.0	38,696	1621.5	27.4	1592.6	26.9
Mean WTP - 2 SD	39	13600.0	45,135	530.4	9.0	2926.4	49.5

Source. Authors' calculations

Table 6.15: Ruvuma cashew nuts: Welfare benefit and cost for minimum price insurance

Premium rule	Premium value (Tsh/kg)	Quantity insured (tonnes)	Number of households	Total premium (Tsh million)	Premium as share of cashew nut sales (percent)	Consumer surplus (Tsh million	Consumer surplus as share of cashew nut sales (percent)
300 Tsh minimum price							
Mean WTP	37	4132.1	14,903	152.9	3.9	114.5	3.0
Mean WTP + 1 SD	67	1767.0	5,312	118.4	3.1	29.0	0.7
Mean WTP - 1 SD	7	6469.0	23,789	45.3	1.2	276.4	7.1
450 Tsh minimum price							
Mean WTP	59	4332.9	15,720	255.6	6.6	106.1	2.7
Mean WTP + 1 SD	90	1461.9	4,473	131.6	3.4	22.3	0.6
Mean WTP - 1 SD	28	6537.7	25,026	183.1	4.7	289.2	7.5
600 Tsh minimum price							
Mean WTP	121	3470.9	12,903	420.0	10.8	147.1	3.8
Mean WTP + 1 SD	163	1001.4	3,552	163.2	4.2	55.6	1.4
Mean WTP - 1 SD	79	6073.0	22,773	479.8	12.4	380.1	9.8
Mean WTP - 2 SD	37	6740.5	26,641	249.4	6.4	612.4	15.8

Source: Authors' calculations

Table 6.16: Percentage of households who report a given number of years out of the last ten, when rainfall was in the indicated subjective range

Kilimanjaro					
Number of years	**Much below**	**Somewhat below**	**Normal**	**Somewhat above**	**Much above**
0	3.6	12.6	1.8	32.0	11.8
1	22.6	20.6	5.9	37.9	81.1
2	32.0	32.9	21.0	25.7	6.4
3	20.0	24.4	27.5	4.0	0.6
4	13.4	7.5	21.2	0.3	0.1
5	5.2	1.2	9.8	0.1	0.0
6	2.0	0.7	6.3	0.0	0.0
7	0.6	0.1	3.1	0.0	0.0
8	0.4	0.0	2.0	0.0	0.0
9	0.1	0.0	0.6	0.0	0.0
10	0.0	0.0	0.8	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0
Ruvuma					
Number of years	**Much below**	**Somewhat below**	**Normal**	**Somewhat above**	**Much above**
0	60.7	25.5	0.3	30.9	31.2
1	23.2	27.1	3.1	32.3	55.9
2	10.9	28.7	4.1	24.5	10.4
3	4.3	11.3	7.1	8.6	2.1
4	0.5	6.1	14.1	2.8	0.1
5	0.2	1.0	14.5	0.3	0.1
6	0.2	0.3	18.8	0.1	0.0
7	0.0	0.0	14.7	0.4	0.1
8	0.0	0.0	10.9	0.1	0.0
9	0.0	0.0	8.2	0.0	0.0
10	0.0	0.0	4.2	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations

Table 6.17: Average number of years in past 10 that households and village officials report rainfall as being in different ranges

Rainfall incidence past decade (number of years)				
	Household responses		Chairman responses	
	Mean	StDev	Mean	StDev
Kilimanjaro				
Much below	2.47	1.42	2.38	1.12
Somewhat below	2.01	1.23	2.68	1.68
Normal	3.53	1.77	3.19	2.05
Somewhat above	1.03	0.88	0.74	0.87
Much above	0.96	0.47	1.02	0.60
Ruvuma				
Much below	0.63	0.94	0.64	0.95
Somewhat below	1.50	1.24	0.87	1.41
Normal	5.78	2.21	7.05	1.96
Somewhat above	1.24	1.15	0.43	0.93
Much above	0.85	0.74	1.01	0.69

Source: Authors' calculations

Table 6.18: Similarity between farmers' perceptions concerning rainfall (Index 1)

Similarity index of rainfall incidence assessment between households from village average (number of years) (1)						
Kilimanjaro	**Rombo**	**Mwanga**	**Same**	**Moshi**	**Hai**	**Overall**
Much below	0.23	0.23	0.25	0.21	0.20	0.22
Somewhat below	0.23	0.26	0.27	0.24	0.22	0.24
Normal	0.18	0.22	0.23	0.18	0.16	0.18
Somewhat above	0.37	0.35	0.35	0.37	0.29	0.35
Much above	0.15	0.20	0.12	0.14	0.11	0.14
Ruvuma	**Songea**	**Tunduru**	**Mbinga**	**Namtumbo**		**Overall**
Much below	0.51	0.52	0.74	0.47		0.61
Somewhat below	0.26	0.27	0.40	0.36		0.34
Normal	0.18	0.16	0.14	0.14		0.15
Somewhat above	0.36	0.39	0.34	0.36		0.36
Much above	0.21	0.35	0.35	0.31		0.32

Source: Authors' calculations

(1) The similarity index is estimated from the proportions p=x/10 and q=1/N*Σ(p), where p are the number of years out of the previous 10 a household declares that rainfall was in one of the ranges above, and N is the total number of households reporting in a village. The index is calculated as D= Σ(|p-q|) / (2Σp). D ranges from perfect similarity (0) to perfect dissimilarity (1).

Table 6.19: Similarity between farmers' perceptions concerning rainfall (Index 2)

Similarity index of rainfall incidence assessment between households from village average (number of years) (1)						
Kilimanjaro	**Rombo**	**Mwanga**	**Same**	**Moshi**	**Hai**	**Overall**
Much below	0.77	0.77	0.75	0.79	0.80	0.78
Somewhat below	0.77	0.74	0.73	0.76	0.78	0.76
Normal	0.82	0.78	0.77	0.82	0.84	0.82
Somewhat above	0.63	0.65	0.65	0.63	0.71	0.65
Much above	0.85	0.80	0.88	0.86	0.89	0.86
Ruvuma	**Songea**	**Tunduru**	**Mbinga**	**Namtumbo**		**Overall**
Much below	0.49	0.48	0.26	0.53		0.39
Somewhat below	0.74	0.73	0.60	0.64		0.66
Normal	0.82	0.84	0.86	0.86		0.85
Somewhat above	0.64	0.61	0.66	0.64		0.64
Much above	0.79	0.65	0.65	0.69		0.68

Source: Authors' calculations

(1) The similarity index is estimated from the proportions p=x/10 and q=1/N*Σ(p), where p are the number of years out of the previous 10 a household declares that rainfall was in one of the ranges above, and N is the total number of households reporting in a village. The index is calculated as D= D= 2 Σ min(p ,q) / (Σp + Σq). It ranges from perfect similarity (1) to perfect dissimilarity (0).

Table: 6.20 Perceptions of households concerning rainfall

If rainfall was 1/10, ¼, ⅓ or ½ below normal you would say that it was (% of household responses):					
	Normal	**Somewhat below**	**A lot below**	**NA**	**Total**
Kilimanjaro					
1/10 below normal	19.9	52.34	25.85	1.91	100
1/4 below normal	1.69	32.41	63.99	1.91	100
1/3 below normal	2.63	8.49	86.86	2.02	100
1/2 below normal	0.21	1.46	96.42	1.91	100
Number of households	**182,775**				
Ruvuma					
1/10 below normal	28.28	53.55	15.71	2.46	100
1/4 below normal	2.55	37.17	57.96	2.32	100
1/3 below normal	0.87	12.22	84.6	2.32	100
1/2 below normal	0.08	1.59	96.01	2.32	100
Number of households	**161,619**				

Source: Authors' calculations

Table 6.21: Reasons for which households indicated they were not interested in rainfall (or drought) insurance

Why not interested in drought insurance? (% out of total households in the region)	
Kilimanjaro	
I cannot pay any amount for rainfall	29.28
I am short of funds in the period before planting	1.98
I have other pressing cash needs in the period before planting	1.15
Declines in rainfall do not hurt me too much	4.70
I have other means of covering losses due to bad rainfall	0.82
Major declines in rainfall do not occur too often	0.94
Other	14.32
% of households not interested	53.19
Total number of households	**182,775**
Ruvuma	
I cannot afford to pay any amount	20.71
I am short of funds in the period before planting	0.78
I have other pressing cash needs in the period before planting	0.46
Declines in rainfall do not hurt me too much	17.32
I have other means of recovering losses due to bad rainfall	0.21
Major droughts do not occur too often	20.20
Other	3.48
NA	2.44
% of households not interested	65.60
Total number of households	**161,619**

Source: Authors' calculations

Table 6.22: Determinants of interest in drought insurance

Interest in drought insurance participation	Kilimanjaro (1)	Ruvuma (2)
	Interested in rainfall insurance	Interested in rainfall insurance
Education of head of hhlds (years)	0.0078351	0.0199430
	(0.92)	(2.26)*
Education control dummy	-0.1233392	-0.1007000
	(1.89)	(1.54)
Household size (number of adult equivalents)	0.0123204	-0.0043820
	(1.27)	(0.40)
Per capita hh income (Tsh 000)	0.0005553	0.0001916
	(4.26)**	(1.10)
Share of cash to total gros income	0.0014562	0.0001747
	(1.51)	(0.17)
Per capita wealth (Tsh)	-0.0000000	-0.0000001
	(1.06)	(1.05)
Number of all kinds of trees	0.0000306	0.0000145
	(1.02)	(0.51)
Land cultivated (acres)	-0.0067593	0.0031886
	(0.65)	(1.07)
Number of animals (cattle equivalent)	0.0027093	-0.0014309
	(0.63)	(0.11)
Herfindhal Index of total gross income diversification	-0.0018540	0.0005755
	(1.66)	(0.44)
Proportion of irrigated land	0.0010499	0.0005606
	(1.27)	(0.17)
Dummy: 1=drought since 1998 affected living conditions	0.0198140	
	(0.41)	
Number of yrs in past 10, when total hhld income declined a lot below average	-0.0109973	
	(0.86)	
Number of yrs in past 10, when cash income from coffee production and sales was much average	0.0041335	
	(0.35)	
Dummy: 1=easy access to short term credit	-0.0192579	0.1436749
	(0.29)	(2.26)*
Dum=1 if when shock occurred used own savings	0.1673770	-0.0281507
	(3.72)**	(0.54)
Dum=1 if when shock occurred used family assistance	-0.0926325	0.0477785
	(1.77)	(0.65)
Dum=1 if when shock occurred used other assistance	0.0287514	-0.1953010
	(0.30)	(2.12)*
Dum=1 if when shock occurred used new ways of generating income	0.0231376	0.1837596
	(0.43)	(2.47)*
Coffee production dummy	0.0596198	-0.0970719
	(0.96)	(1.00)
Banana production dummy	0.0154995	0.0835044
	(0.24)	(1.79)
Rainfall on farm last year below average		0.0418547
		(0.71)
Number of years in past 10 when revenue per acre was less than half of nornal		0.0062711
		(0.45)
Dum=1 hh income declined considerably in previous years		-0.0822377
		(1.60)
Dum=1 cash income from cash crop production and sales is most or second most unreliable		-0.0252610
		(0.54)
Cashew production dummy		0.1976408
		(2.29)*
Tobacco production dummy		-0.0222234
		(0.14)
Observations	914	833
Pseudo R-squared	0.14	0.10
Wald chi2	164.03	95.67
Proportion of correct predictions	68.4	69.7

Source. Authors' calculations

Robust z statistics in parentheses:* significant at 5%; ** significant at 1%.

Table 6.23: WTP for weather insurance in Kilimanjaro under a hypothetical 10 % decline in rainfall below normal

	(1) Indemnity Tsh 22,000/acre	(2) Indemnity Tsh 38,000/acre	(3) Indemnity Tsh 61,000/acre
Bid for type A contracts	-0.0000315		
	(5.08)**		
Bid for type B contracts		-0.0000172	
		(5.32)**	
Bid for type C contracts			-0.0000107
			(5.61)**
Education of head (years)	0.0031947	-0.0036556	0.0029070
	(0.38)	(0.48)	(0.39)
Education control dummy	-0.1561989	-0.0904394	-0.1428214
	(2.48)*	(1.61)	(2.72)**
Househodl size (number of adult equivalent)	0.0143268	0.0187827	0.0137327
	(1.51)	(2.22)*	(1.65)
Per capita hhld income (Tsh)	0.0000003	0.0000004	0.0000005
	(2.55)*	(3.22)**	(4.02)**
Share of cash to total gros income	0.0027130	0.0034428	0.0027574
	(2.79)**	(3.70)**	(3.09)**
Per capita hhld wealth	-0.0000000	0.0000000	0.0000000
	(0.10)	(0.56)	(0.49)
Number of all kinds of trees	0.0000380	0.0000187	-0.0000037
	(1.28)	(0.70)	(0.14)
Cultivated land (acres)	-0.0086896	-0.0093607	-0.0050140
	(0.85)	(1.03)	(0.57)
Number of animals (cattle equivalent)	0.0048587	0.0047200	0.0050213
	(1.14)	(1.35)	(1.38)
Herfindhal Index of total gross income diversification	-0.0023396	-0.0014617	-0.0004046
	(2.17)*	(1.48)	(0.42)
Proportion of irrigated land	0.0001179	0.0003894	-0.0005272
	(0.15)	(0.52)	(0.74)
Dummy: 1=drought since 1998 affected living conditions	0.0279978	0.0583691	0.0724507
	(0.59)	(1.35)	(1.71)
Number of years in past 10, when total hhld income declined a lot below normal	-0.0101021	-0.0099038	-0.0081291
	(0.83)	(0.87)	(0.73)
Number of yrs in past 10, when cash income from cash crop production and sales declined a lot below normal	0.0023509	0.0050296	0.0051951
	(0.21)	(0.49)	(0.51)
Dummy: 1= easy access to short term credit	0.0348105	0.0859783	0.0782608
	(0.54)	(1.39)	(1.30)
Dum=1 if when shock occurred used own savings	0.2026496	0.2794222	0.2419975
	(4.58)**	(6.62)**	(5.91)**
Dum=1 if when shock occurred used family assistance	-0.1211117	-0.1351296	-0.0845148
	(2.41)*	(3.14)**	(1.98)*
Dum=1 if when shock occurred used other assistance	0.0414985	0.0841996	0.1905354
	(0.45)	(0.98)	(2.14)*
Dum=1 if when shock occurred used new ways to earn income	-0.0178091	-0.0619279	-0.0573487
	(0.34)	(1.33)	(1.24)
Coffee production dummy	0.0407135	0.0891714	0.0984441
	(0.68)	(1.64)	(1.85)
Banana production dummy	-0.0027592	-0.0229183	-0.0190289
	(0.04)	(0.39)	(0.33)
Observations	914	914	914
Pseudo R-squared	0.15	0.18	0.18
Proportion of correct predictions	70.72	74.29	75.95

Source: Authors' calculations

Robust z statistics in parentheses.* significant at 5%; ** significant at 1%

Table 6.24: WTP for weather Insurance in Ruvuma under a hypothetical 10 % decline in rainfall below normal

Ruvuma WTP for –10% drought insurance			
	(1)	(2)	(3)
	Insured for Tsh 2,000/acre	Insured for Tsh 21,000/acre	Insured for Tsh 35,000/acre
Bid for type A contracts	-0.0000201		
	(1.42)		
Bid for type B contracts		-0.0000131	
		(1.81)	
Bid for type C contracts			-0.0000108
			(2.39)*
Education of head (years)	0.0199428	0.0222907	0.0231836
	(2.61)**	(3.62)**	(4.06)**
Education control dummy	-0.0797984	-0.0366186	-0.0275677
	(1.42)	(0.86)	(0.78)
Household size (number of adult equivalent)	-0.0102901	0.0013952	0.0084963
	(1.05)	(0.18)	(1.34)
Per capita hhld income (Tsh)	0.0000001	0.0000001	0.0000002
	(0.67)	(1.24)	(2.42)*
Share of cash to total gros income	0.0006158	0.0002535	-0.0004480
	(0.65)	(0.35)	(0.72)
Per capita hhld wealth	-0.0000001	-0.0000000	-0.0000000
	(1.18)	(0.05)	(0.50)
Number of all kinds of trees	0.0000023	0.0000268	0.0000020
	(0.09)	(1.36)	(0.13)
Cultivated land (acres)	0.0044995	0.0027647	0.0010803
	(1.61)	(1.28)	(0.59)
Number of animals (cattle equivalent)	-0.0020542	0.0004405	0.0040489
	(0.18)	(0.05)	(0.57)
Herfindhal Index of total gross income diversification	0.0015841	0.0001133	0.0003609
	(1.39)	(0.13)	(0.49)
Proportion of irrigated land	0.0024497	-0.0010135	-0.0006673
	(0.86)	(0.51)	(0.42)
Rainfall last year was below normal	-0.0025291	0.0373883	0.0230414
	(0.05)	(0.89)	(0.67)
Number of years in past 10 when revenue per acre was less than half of nornal	-0.0006033	-0.0087851	0.0028336
	(0.05)	(0.94)	(0.36)
Dum=1 hh income declined considerably in previous years	-0.0046807	-0.0020361	-0.0078805
	(0.10)	(0.06)	(0.26)
Dum=1 cash income from cash crop production and sales is most or second most unreliable	-0.0335038	-0.0006277	0.0322233
	(0.80)	(0.02)	(1.11)
Dummy: 1=easy access to short term credit	0.0672123	-0.0735353	-0.0509876
	(1.21)	(1.93)	(1.64)
Dum=1 if when shock occurred used own savings	0.0629001	0.1291919	0.1265810
	(1.30)	(3.14)**	(3.52)**
Dum=1 if when shock occurred used family assistance	-0.0735346	-0.0958323	-0.0590380
	(1.19)	(2.41)*	(1.76)
Dum=1 if when shock occurred used other assistance	-0.0876488	-0.0369287	-0.0440579
	(1.03)	(0.53)	(0.81)
Dum=1 if when shock occurred used new ways to earn income	0.1987073	0.1166692	0.1605734
	(2.92)**	(2.17)*	(3.13)**
Coffee production dummy	-0.1043865	-0.0171953	-0.0662357
	(1.19)	(0.24)	(1.39)
Cashew production dummy	0.1117819	-0.0261707	0.0065172
	(1.41)	(0.45)	(0.13)
Tobacco production dummy	0.0374690	0.2270147	0.2607588
	(0.25)	(1.57)	(2.07)*
Banana production dummy	0.0567938	-0.0012286	-0.0078831
	(1.36)	(0.04)	(0.31)
Observations	833	810	812
Pseudo R-squared	0.10	0.15	0.18
Proportion of correct predictions	75.6	82.39	85.82

Source: Authors' calculations

Robust z statistics in parentheses. * significant at 5%; ** significant at 1%

Table 6.25: WTP for weather insurance in Kilimanjaro under a hypothetical ⅓ decline in rainfall below normal

Kilimanjaro WTP for –30% drought insurance			
	(1)	(2)	(3)
	Indemnity Tsh 24,000/acre	Indemnity Tsh 4,1000/acre insurance	Indemnity Tsh 66000/acre
Bid for type A contracts	-0.0000300		
	(5.00)**		
Bid for type B contracts		-0.0000177	
		(5.04)**	
Bid for type C contracts			-0.0000110
			(5.02)**
Education of head (years)	0.0091647	0.0060331	0.0072183
	(1.15)	(0.79)	(0.97)
Education control dummy	-0.0985363	-0.1041472	-0.1001461
	(1.60)	(1.86)	(1.86)
Household size (number of adult equivalent)	0.0170123	0.0229299	0.0272600
	(1.87)	(2.67)**	(3.26)**
Per capita hhld income (Tsh)	0.0000004	0.0000004	0.0000005
	(3.57)**	(3.69)**	(4.24)**
Share of cash to total gross income	0.0035510	0.0037464	0.0036529
	(3.45)**	(3.90)**	(3.83)**
Per capita hhld wealth	0.0000000	0.0000000	0.0000000
	(0.55)	(0.93)	(1.22)
Number of all kinds of trees	0.0000263	0.0000212	0.0000202
	(0.96)	(0.81)	(0.80)
Cultivated land (acres)	-0.0135037	-0.0098023	-0.0090659
	(1.34)	(1.03)	(0.98)
Number of animals (cattle equivalent)	0.0079945	0.0054865	0.0036573
	(1.86)	(1.47)	(1.08)
Herfindhal Index of total gross income diversification	-0.0003668	-0.0006151	-0.0003552
	(0.34)	(0.61)	(0.36)
Proportion of irrigated land	0.0003012	0.0002210	-0.0000090
	(0.38)	(0.29)	(0.01)
Dummy: 1=drought since 1998 affected living conditions	0.0841162	0.0627385	0.0622337
	(1.85)	(1.44)	(1.48)
Number of years in past 10, when total hhld income declined a lot below normal	-0.0006705	-0.0048672	-0.0082863
	(0.06)	(0.43)	(0.75)
Number of yrs in past 10, when cash income from cash crop production and sales declined a lot below normal	0.0023762	0.0049419	0.0017756
	(0.22)	(0.48)	(0.17)
Dummy: 1= easy access to short term credit	0.0312531	0.0215146	0.0359027
	(0.49)	(0.35)	(0.59)
Dum=1 if when shock occurred used own savings	0.2214839	0.2256798	0.2092927
	(5.13)**	(5.38)**	(5.08)**
Dum=1 if when shock occurred used family assistance	-0.1099834	-0.0715529	-0.0648006
	(2.34)*	(1.58)	(1.45)
Dum=1 if when shock occurred used other assistance	0.0804023	0.0953053	0.1028760
	(0.88)	(1.11)	(1.24)
Dum=1 if when shock occurred used new ways to earn income	-0.0644691	-0.0617310	-0.0632049
	(1.31)	(1.31)	(1.37)
Coffee production dummy	0.1073478	0.1124155	0.1139989
	(1.89)	(2.05)*	(2.14)*
Banana production dummy	-0.0024261	-0.0200338	-0.0052259
	(0.04)	(0.34)	(0.09)
Observations	914	914	914
Pseudo R-squared	0.18	0.17	0.17
Proportion of correct predictions	71.69	73.21	73.79

Source: Authors' calculations

Robust z statistics in parentheses * significant at 5%; ** significant at 1%

Table 6.26: WTP for weather insurance in Ruvuma under a hypothetical ⅓ decline in rainfall below normal

Ruvuma WTP for –30% drought insurance			
	(1)	(2)	(3)
	Insured for Tsh 20,000Tsh/acre	Minimum price Tsh 35,000/acre insurance	Insured for Tsh 58,000/acre
Bid for type A contracts	-0.0000195		
	(1.57)		
Bid for type B contracts		-0.0000112	
		(1.29)	
Bid for type C contracts			-0.0000082
			(1.48)
Education of head (years)	0.0156553	0.0180050	0.0125218
	(2.28)*	(3.15)**	(2.41)*
Education control dummy	-0.0636741	-0.0849125	-0.0666985
	(1.32)	(2.62)**	(2.14)*
Household size (number of adult equivalent)	-0.0124502	-0.0055754	-0.0116430
	(1.46)	(0.75)	(1.78)
Per capita hhld income (Tsh)	0.0000002	0.0000002	0.0000002
	(1.61)	(2.16)*	(2.28)*
Share of cash to total gros income	-0.0011136	0.0000158	0.0001109
	(1.35)	(0.02)	(0.17)
Per capita hhld wealth	-0.0000000	-0.0000000	-0.0000000
	(0.82)	(0.69)	(0.80)
Number of all kinds of trees	0.0000292	0.0000523	0.0000305
	(1.34)	(2.93)**	(1.91)
Cultivated land (acres)	0.0033710	-0.0005541	0.0000757
	(1.46)	(0.28)	(0.04)
Number of animals (cattle equivalent)	-0.0018995	0.0020131	0.0011521
	(0.18)	(0.24)	(0.14)
Herfindhal Index of total gross income diversification	-0.0004036	-0.0007188	-0.0010151
	(0.38)	(0.81)	(1.25)
Proportion of irrigated land	0.0002726	0.0012906	0.0003175
	(0.13)	(0.78)	(0.21)
Rainfall last year was below normal	0.0540662	0.0689318	0.0838694
	(1.16)	(1.75)	(2.23)*
Number of years in past 10 when revenue per acre was less than half of normal	0.0058144	-0.0013220	0.0040106
	(0.59)	(0.16)	(0.51)
Dum=1 hh income declined considerably in previous years	-0.0453940	-0.0456861	0.0139311
	(1.10)	(1.31)	(0.46)
Dum=1 cash income from cash crop production and sales is most or second most unreliable	-0.0226970	-0.0132588	0.0113432
	(0.64)	(0.43)	(0.38)
Dummy: 1=easy access to short term credit	0.0688008	0.0053823	-0.0087103
	(1.35)	(0.14)	(0.25)
Dum=1 if when shock occurred used own savings	-0.0226302	0.0417450	0.0897612
	(0.54)	(1.11)	(2.54)*
Dum=1 if when shock occurred used family assistance	0.0298734	-0.0191174	-0.0206631
	(0.52)	(0.43)	(0.54)
Dum=1 if when shock occurred used other assistance	-0.0405295	0.0367069	0.0284975
	(0.55)	(0.52)	(0.45)
Dum=1 if when shock occurred used new ways to earn income	0.1121665	0.0877135	0.0528945
	(1.98)*	(1.79)	(1.23)
Coffee production dummy	-0.0452696	-0.0807284	-0.0790873
	(0.55)	(1.25)	(1.30)
Cashew production dummy	0.0123894	0.0478020	-0.0282782
	(0.20)	(0.84)	(0.57)
Tobacco production dummy	0.0912742	0.0874516	0.1329693
	(0.78)	(0.77)	(1.26)
Banana production dummy	0.0478922	0.0331855	0.0568675
	(1.29)	(1.12)	(2.14)*
Observations	833	806	833
Pseudo R-squared	0.11	0.16	0.14
Proportion of correct predictions	80.25	83.97	86.14

Source: Authors' calculations

Robust z statistics in parentheses. * significant at 5%; ** significant at 1%

Table 6.27: Summary statistics of the WTP for rainfall insurance in Kilimanjaro

Drought WTP Kilimanjaro –10% rainfall decline below normal			
	Tsh 22,000 Contract		
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	182539	4997.7	5491.4
WTP (Share on Tsh 22,000)	182539	22.7	25.0
	Tsh 38,000 Contract		
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	182539	5082.3	7747.4
WTP (Share of Tsh 38,000)	182539	13.4	20.4
	Tsh 61,000 Contract		
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	182539	7591.3	12536.7
WTP (Share of Tsh 61,000)	182539	12.4	20.6
Drought WTP Kilimanjaro –1/3 rainfall decline below normal			
	Tsh 24,000 Contract		
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	182539	3417.7	4995.7
WTP (Share Tsh 24,000)	182539	14.2	20.8
	Tsh 41,000 Contract		
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	182539	4404.4	7141.7
WTP (Share Tsh 41,000)	182539	10.7	17.4
	Tsh 66,000 Contract		
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	182539	6408.0	10884.8
WTP (Share Tsh 66,000)	182539	9.7	16.5

Source: Authors' calculations

Table 6.28: Summary statistics of the WTP for rainfall insurance in Ruvuma

Drought WTP Ruvuma –10% Rainfall decline below normal			
Tsh 12,000 Contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	161530	741.3	2393.8
WTP (Share on Tsh 12000)	161530	6.2	19.9
Tsh 21,000 Contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	159736	620.0	2423.4
WTP (Share on Tsh 21000)	159736	3.0	11.5
Tsh 35,000 Contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	158317	990.2	3246.8
WTP (Share onTsh 35000)	158317	2.8	9.3
Drought WTP Ruvuma –⅓ rainfall decline below normal			
Tsh 20,000 Contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	161530	219.3	1142.1
WTP (Share on Tsh 20000)	161530	1.1	5.7
Tsh 35,000 Contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	156346	407.7	1978.4
WTP (Share of Tsh 35000)	156346	1.2	5.7
Tsh 58,000 Contract			
	No of hh's	**Average WTP**	**St. Dev.**
WTP (Tsh)	161530	413.0	2248.4
WTP (Share of Tsh 58000)	161530	0.7	3.9

Source: Authors' calculations

Table 6.29: Kilimanjaro welfare benefits and cost of rainfall insurance

Kilimanjaro surplus estimation from insurance against 10% rainfall reduction								
	Premium value (Tsh000/ acre)	**Acres insured**	**Number of households**	**Total premium (Tsh million)**	**Premium as share of crop sales**	**Consumer surplus (Tsh million)**	**Consumer surplus as share of crop sales**	**Acres cultivated**
				Tsh 22,000 Contact				
At mean WTP	5.0	118,434.6	77,061.4	591.9	3.3	829.8	4.7	241,611
At +1 Sdev WTP	10.5	66,715.2	32,504.1	699.8	7.6	320.5	3.5	117,800
				Tsh 38,000 Contract				
At mean WTP	5.1	86,208.6	61,570.6	438.1	2.8	1,017.8	6.5	204,385
At +1 Sdev WTP	12.8	45,581.9	27,589.5	584.8	6.8	481.2	5.6	108,665
				Tsh 61,000 Contract				
At mean WTP	7.6	86,180.1	61,098.4	654.2	4.1	1,633.0	10.1	202,950
At +1 Sdev WTP	20.1	47,389.1	27,018.2	953.8	10.9	765.9	8.7	100,551
Total number of households/acres			182,834					504,152
Kilimanjaro surplus estimation from insurance against ⅓ rainfall reduction								
	Premium value (Tsh000/ acre)	**Acres insured**	**Number of households**	**Total premium (Tsh million)**	**Premium as share of crop sales**	**Consumer surplus (Tsh million)**	**Consumer surplus as share of crop sales**	**Acres cultivated**
				Tsh 24,000 Contact				
At mean WTP	3.4	109,298.2	64,430.4	373.5	2.3	794.2	4.9	211,256
At +1 Sdev WTP	8.4	61,629.1	28,708.7	518.5	6.3	340.6	4.2	102,873
				Tsh 41,000 Contract				
At mean WTP	4.4	94,289.6	59,689.5	415.3	2.6	1,033.2	6.5	208,050
At +1 Sdev WTP	11.5	50,843.9	28,165.2	587.0	6.6	492.0	5.5	106,507
				Tsh 66,000 Contract				
At mean WTP	6.4	88,234.4	57,586.1	565.4	3.6	1,477.6	9.3	197,650
At +1 Sdev WTP	17.3	51,161.1	27,323.6	884.7	8.9	723.4	7.3	105,086
Total number of households			182,834					504,152

Source.: Authors' calculations

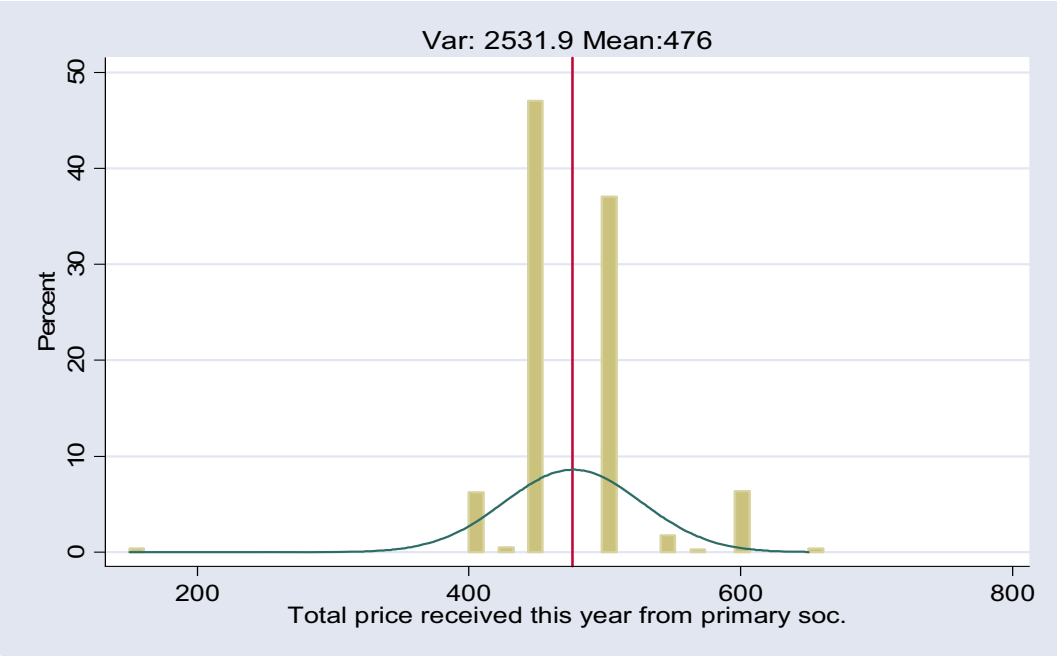
Table 6.30: Ruvuma welfare benefits and cost of rainfall insurance

Ruvuma surplus estimation from insurance against 10 percent rainfall reduction								
	Premium value (Tsh000/ acre)	**Acres insured**	**Number of households**	**Total premium (Tsh million)**	**Premium as share of crop sales**	**Consumer surplus (Tsh million)**	**Consumer surplus as share of crop sales**	**Acres cultivated**
				Tsh 12,000 Contact				
At mean WTP	0.7	51,380.0	21,671.6	38.1	0.4	336.4	3.9	194,069
At +1 Sdev WTP	3.1	37,567.7	13,979.2	117.8	1.9	224.1	3.7	130,920
				Tsh 21,000 Contract				
At mean WTP	0.6	38,848.3	16,219.2	24.1	0.3	271.4	3.6	164,927
At +1 Sdev WTP	3.0	32,408.6	11,608.0	98.6	1.7	186.9	3.3	115,648
				Tsh 35,000 Contract				
At mean WTP	1.0	39,085.6	21,761.9	38.7	0.4	285.4	3.0	211,464
At +1 Sdev WTP	4.2	20,199.1	13,295.0	85.6	1.3	188.8	2.8	138,996
Total number of households			162,722					1,216,465
Ruvuma surplus estimation from insurance against ⅓ rainfall reduction								
	Premium value (000Tsh/ acre)	**Acres insured**	**Number of households**	**Total premium (Tsh million)**	**Premium as shareof crop sales**	**Consumer surplus (Tsh million)**	**Consumer surplus as share of crop sales**	**Acres cultivated**
				Tsh 20,000 Contact				
At mean WTP	0.2	22,599.0	9,845.8	5.0	0.1	85.0	1.8	99,095
At +1 Sdev WTP	1.4	16,967.0	7,013.9	23.1	0.6	65.8	1.6	65,343
				Tsh 35,000 Contract				
At mean WTP	0.4	23,506.3	9,934.5	9.6	0.2	133.0	2.5	80,088
At +1 Sdev WTP	2.4	15,461.9	7,772.3	36.9	0.9	101.0	2.4	53,928
				Tsh 58,000 Contract				
At mean WTP	0.4	24,918.8	9,571.2	10.3	0.2	168.1	3.6	77,978
At +1 Sdev WTP	2.7	14,421.9	6,277.4	38.4	1.0	130.2	3.5	44,749
Total number of households			162,722					1,216,465

Source: Authors' calculations

Figure 6.1: Frequency distribution of prices received for coffee by coffee producers selling to primary societies or private buyers in Kilimanjaro in 2003

1A: Selling only to Primary Societies



1B: Selling only to Private

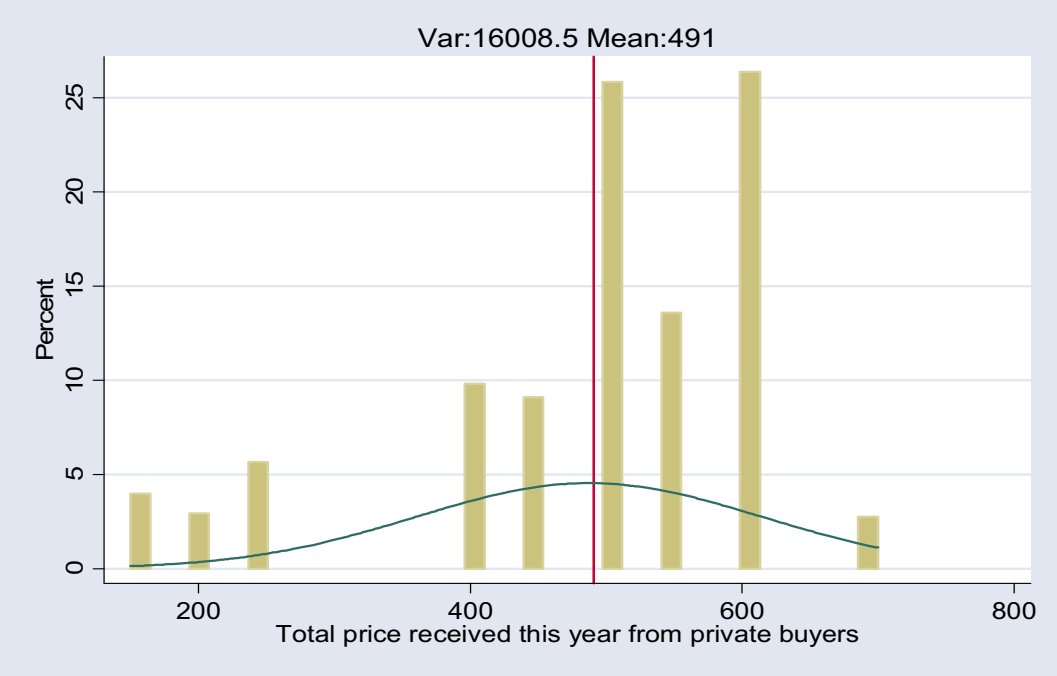
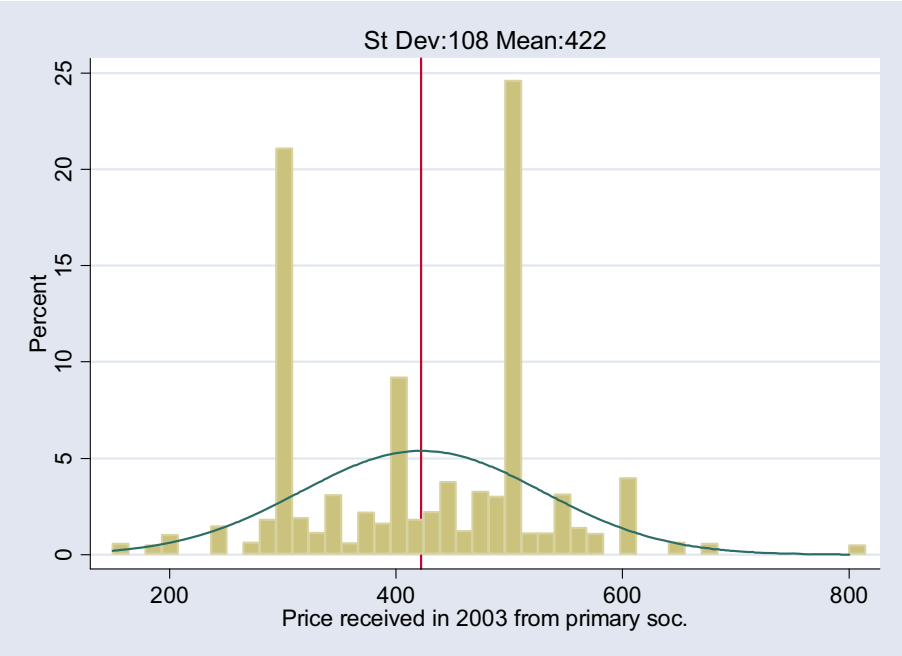


Figure 6.2: Frequency distribution of prices received for coffee by coffee producers selling to primary societies or private buyers in Ruvuma in 2003

2A: Selling only to Primary Societies



2B: Selling only to Private Buyers

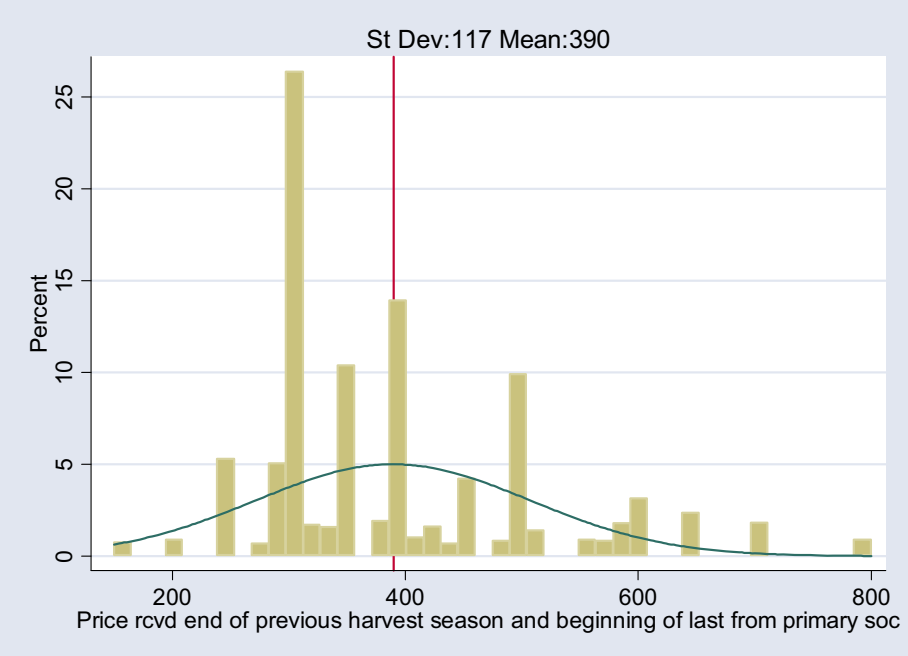
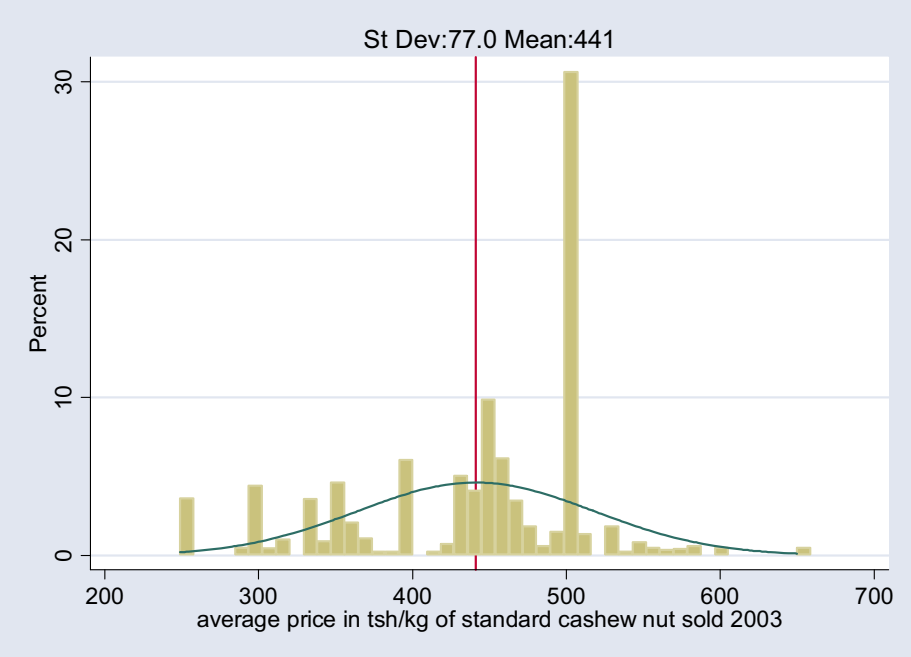


Figure 6.3: Average price received by cashew nut producers in Ruvuma for standard grade cashews

3A: Received in 2003



3B: Received in 2004

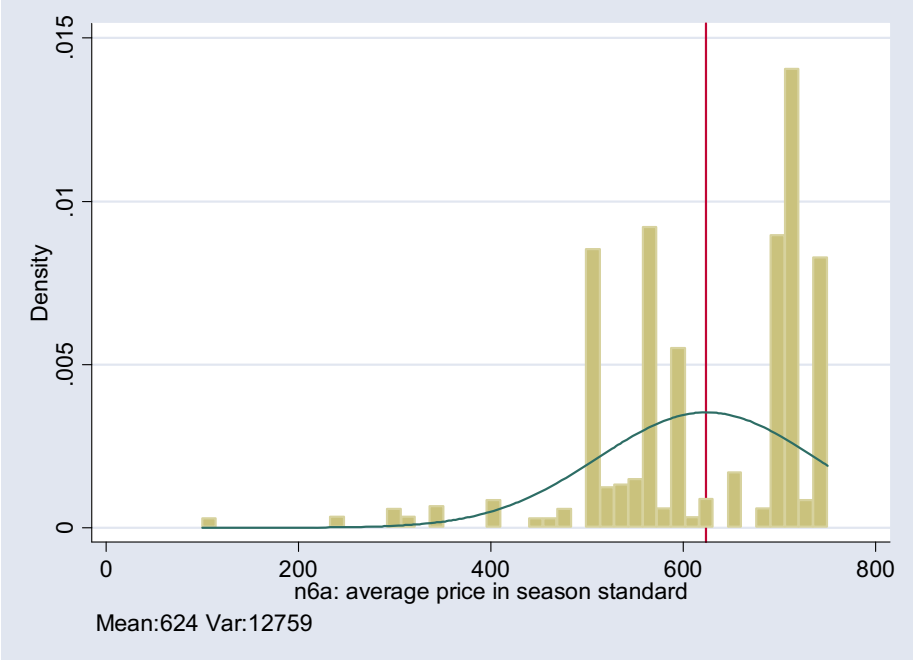
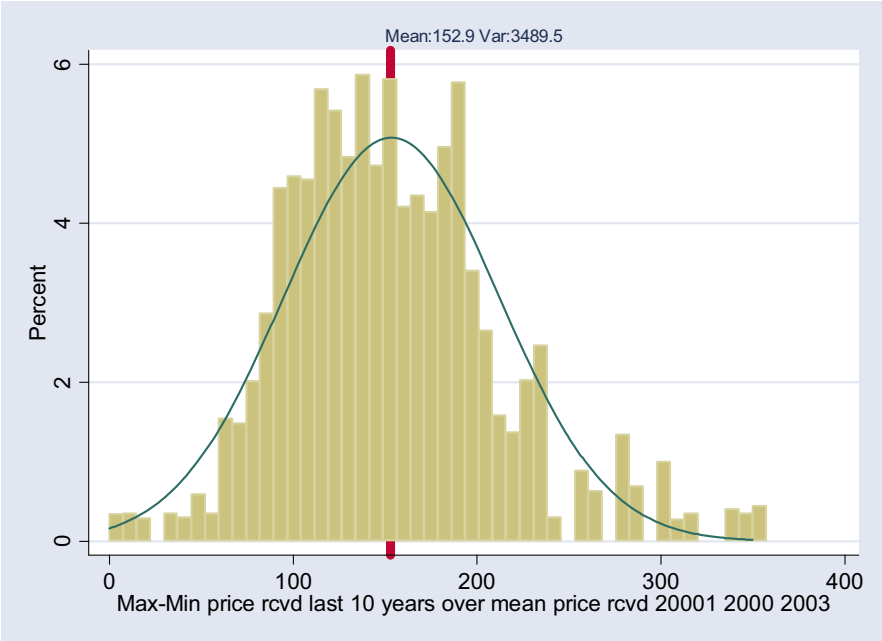


Figure 6.4: Variabilitiy of nominal prices received for coffee in Kilimanjaro and Ruvuma over the previous 10 years

4A: Kilimanjaro



4B: Ruvuma

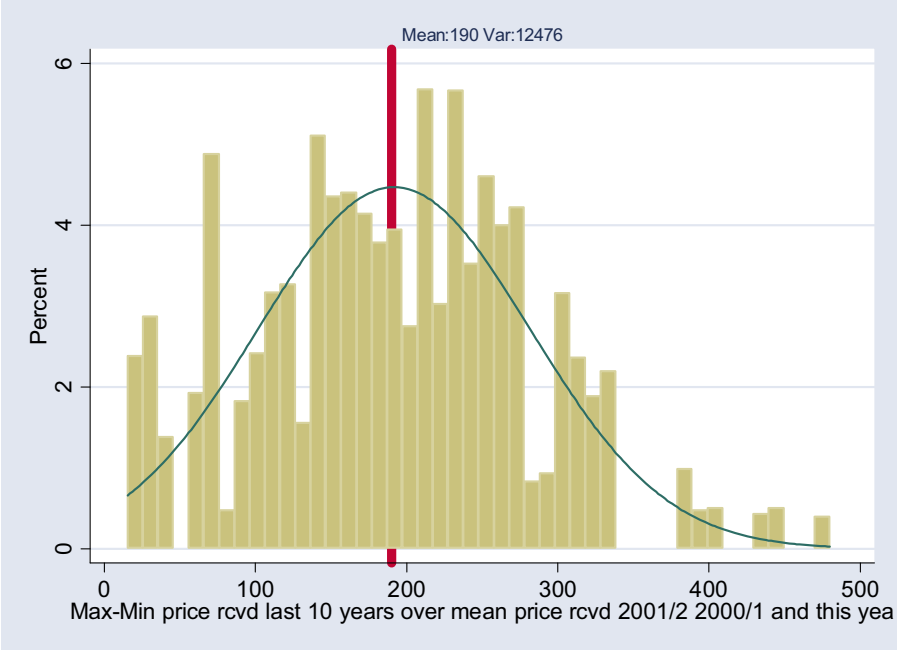


Figure 6.5: Variability of nominal prices received for cashew nuts in Ruvuma over the previous 10 years

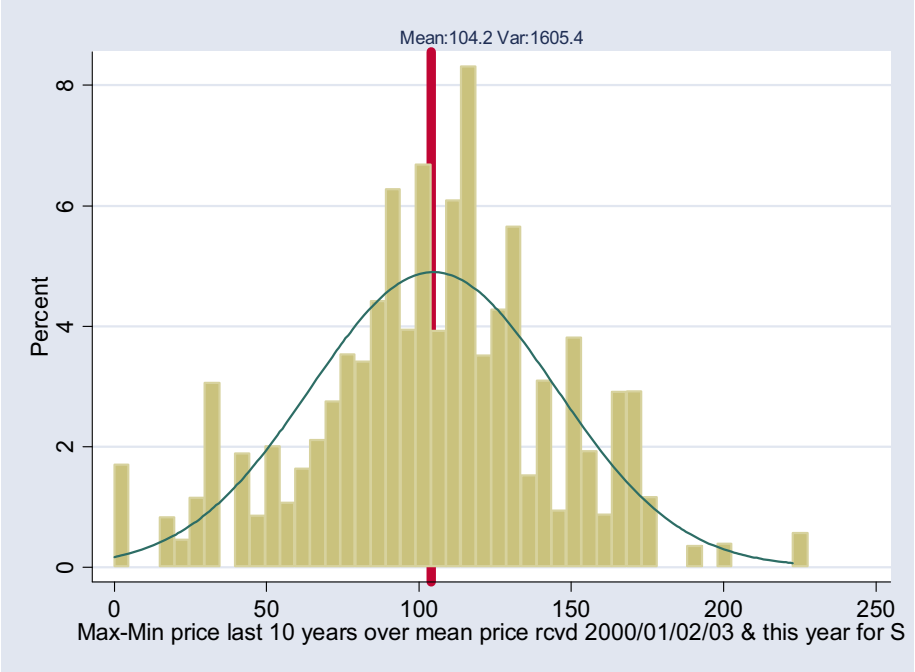


Figure 6.6: Demand for Tsh 400 minimum price insurance in Kilimanjaro by coffee producers

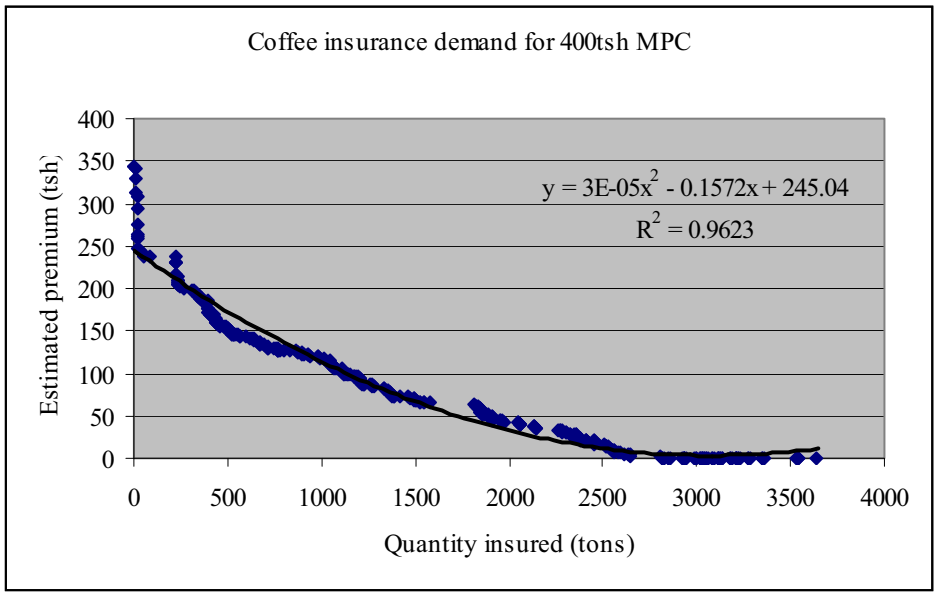


Figure 6.7: Demand for Tsh 600 minimum price insurance in Kilimanjaro by coffee producers

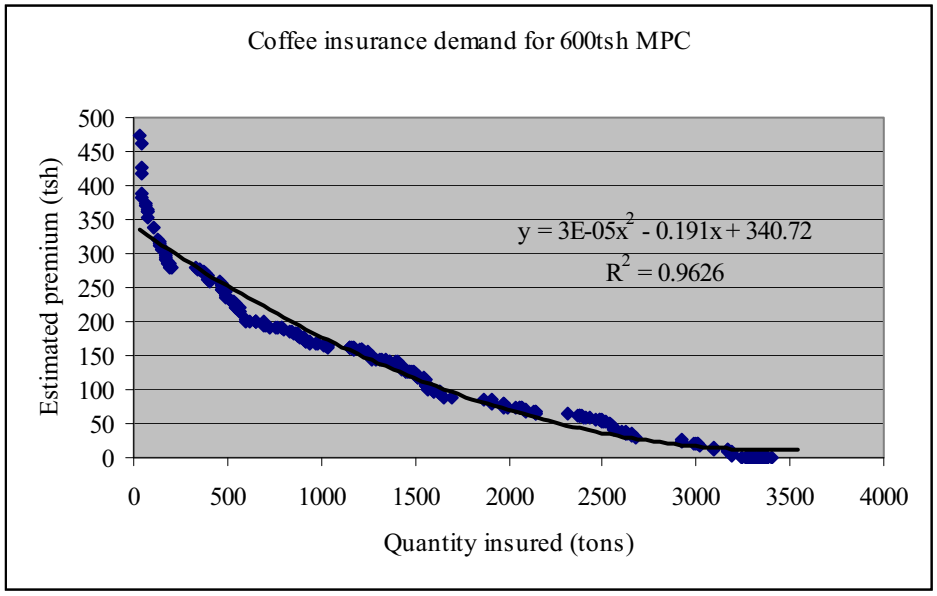


Figure 6.8: Demand for Tsh 800 minimum price insurance in Kilimanjaro by coffee producers

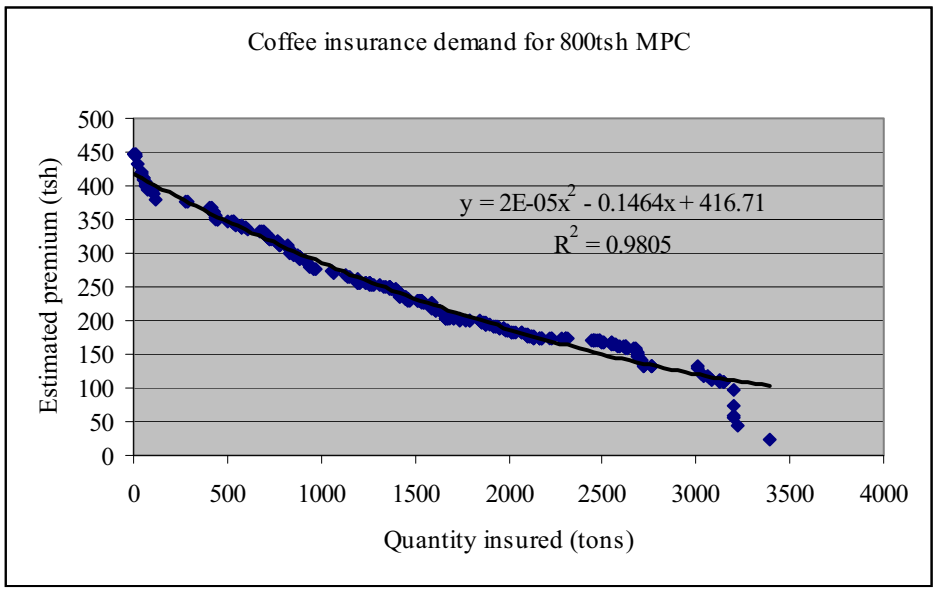


Figure 6.9: Demand for Tsh 400 minimum price insurance in Ruvuma by coffee producers

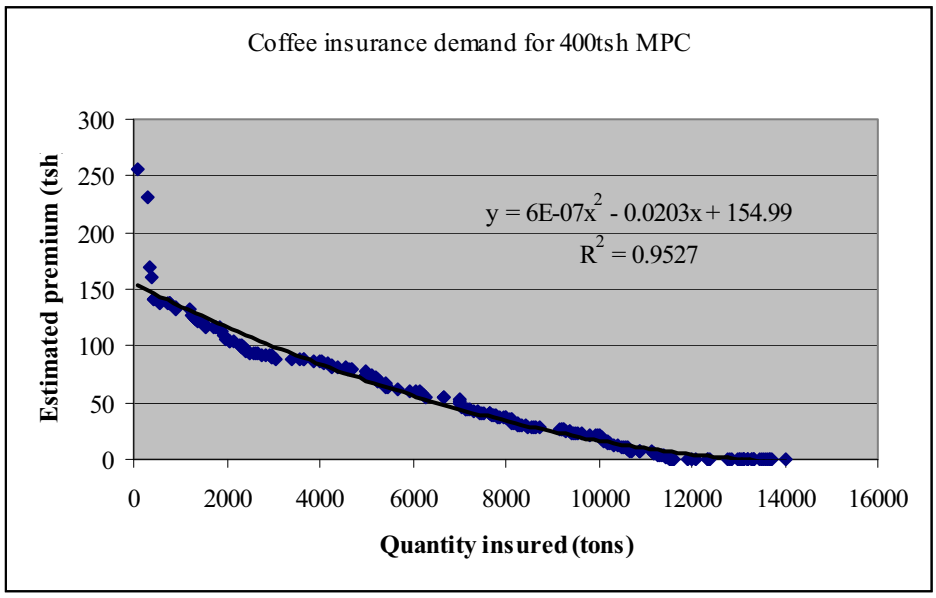


Figure 6.10: Demand for Tsh 600 minimum price insurance in Ruvuma by coffee producers

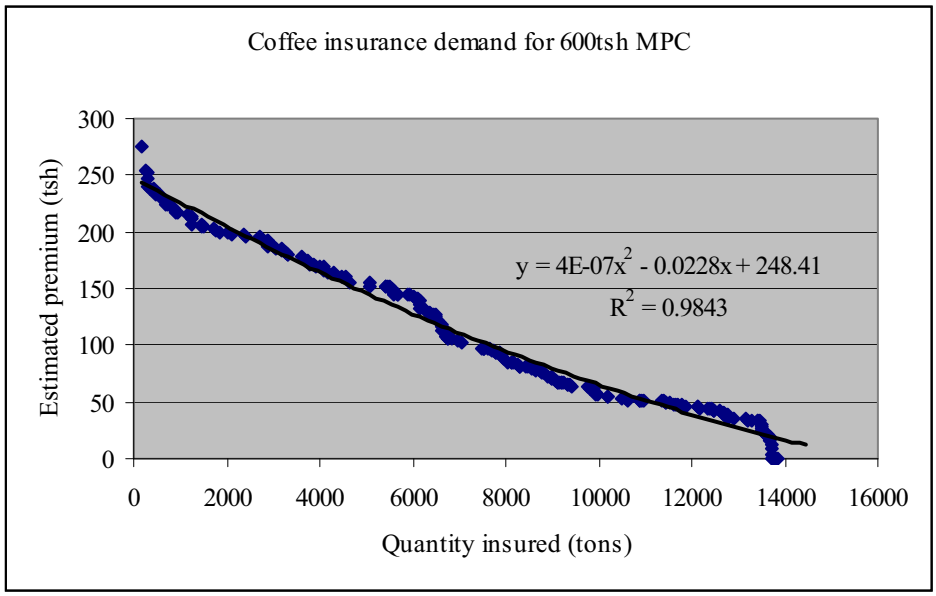


Figure 6.11: Demand for Tsh 800 minimum price insurance in Ruvuma by coffee producers

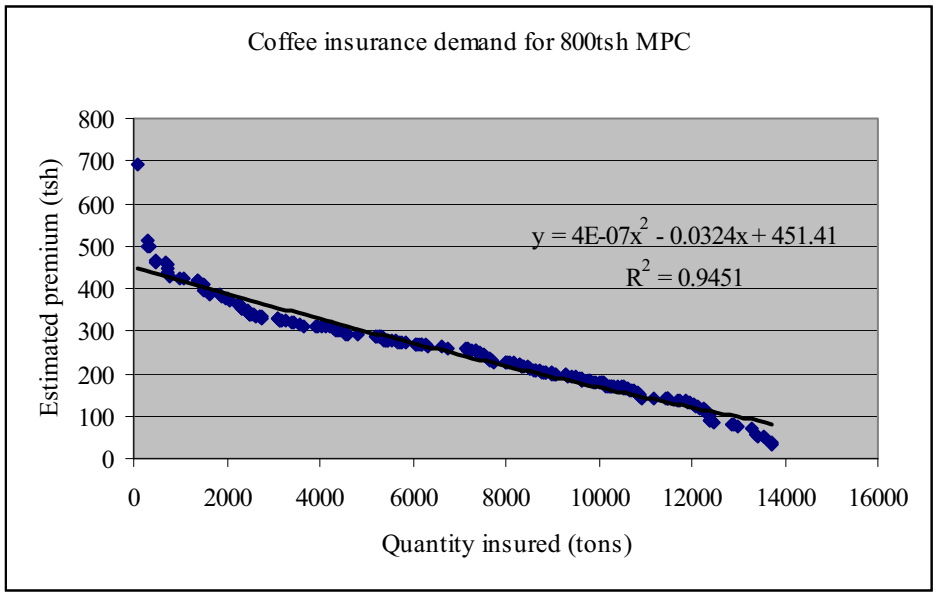


Figure 6.12: Demand for Tsh 300 minimum price insurance in Ruvuma by cashew nut producers

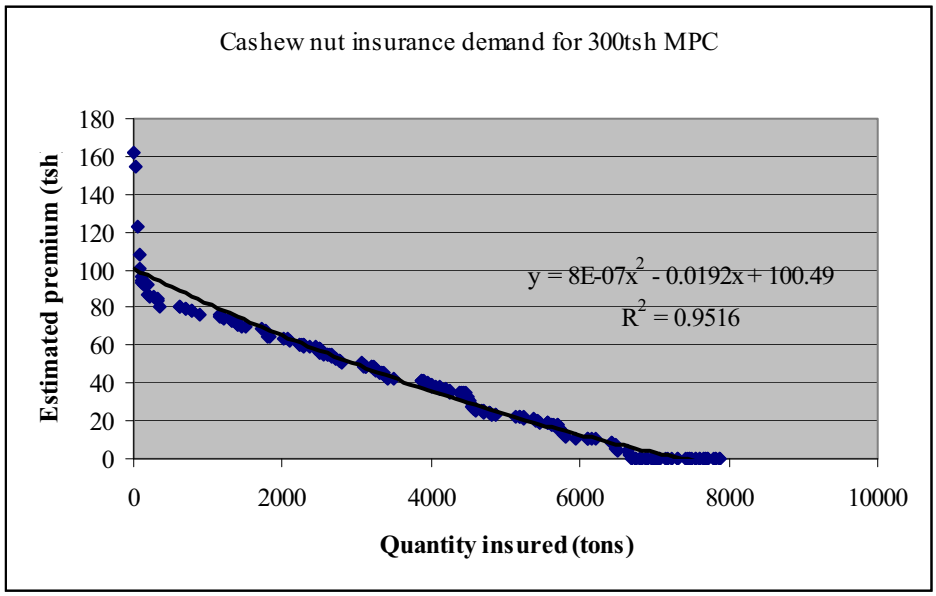


Figure 6.13: Demand for Tsh 450 minimum price insurance in Ruvuma by cashew nut producers

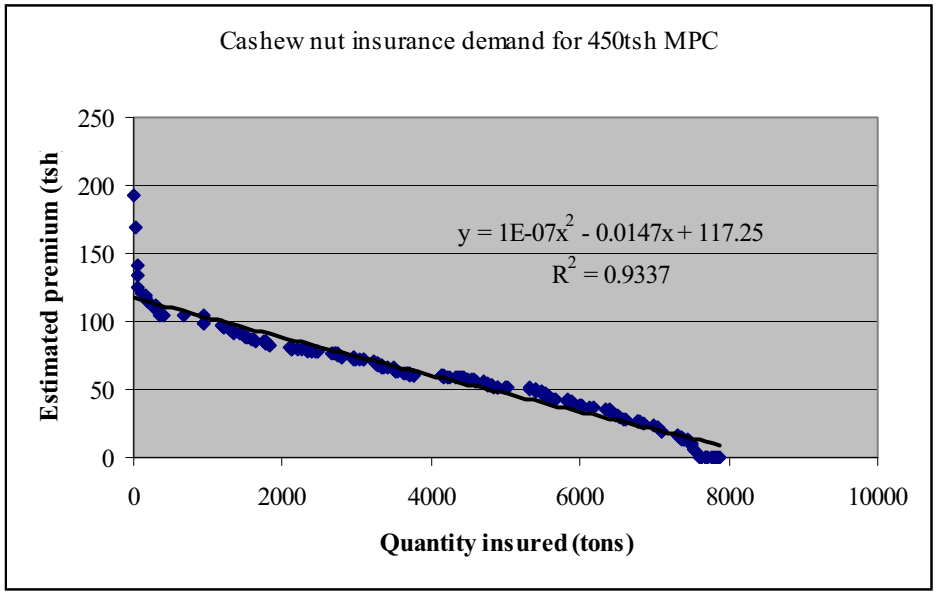


Figure 6.14: Demand for Tsh 600 minimum price insurance in Ruvuma by cashew nut producers

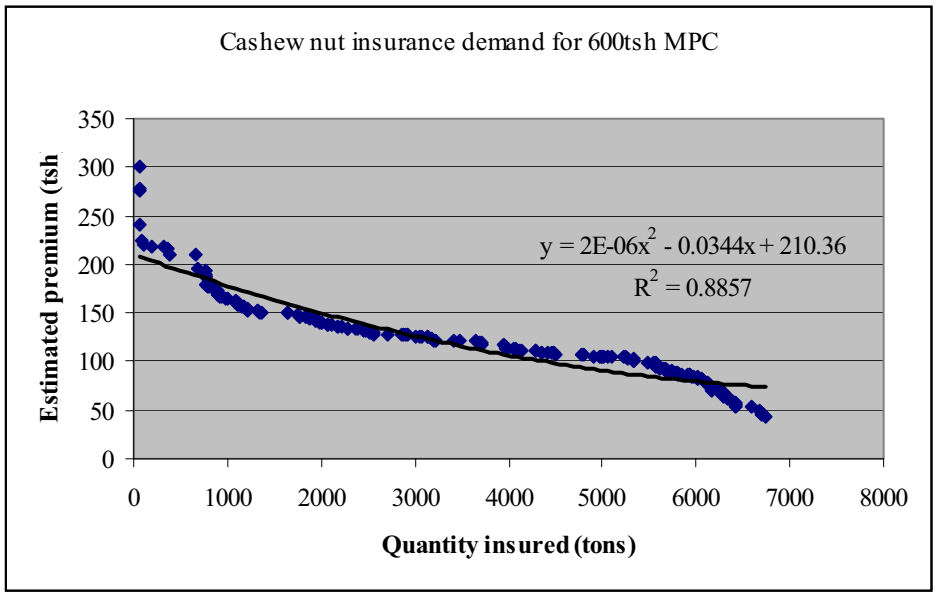
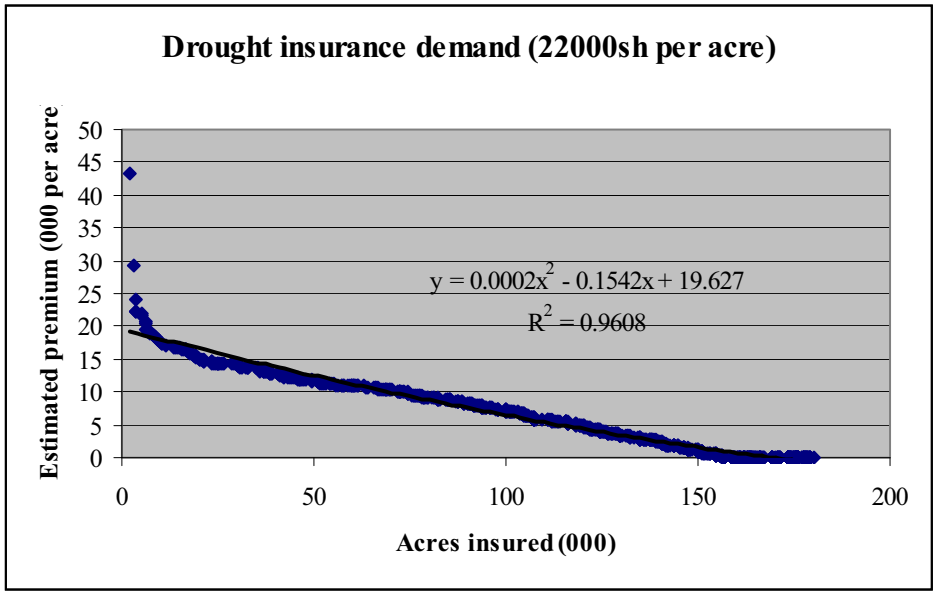
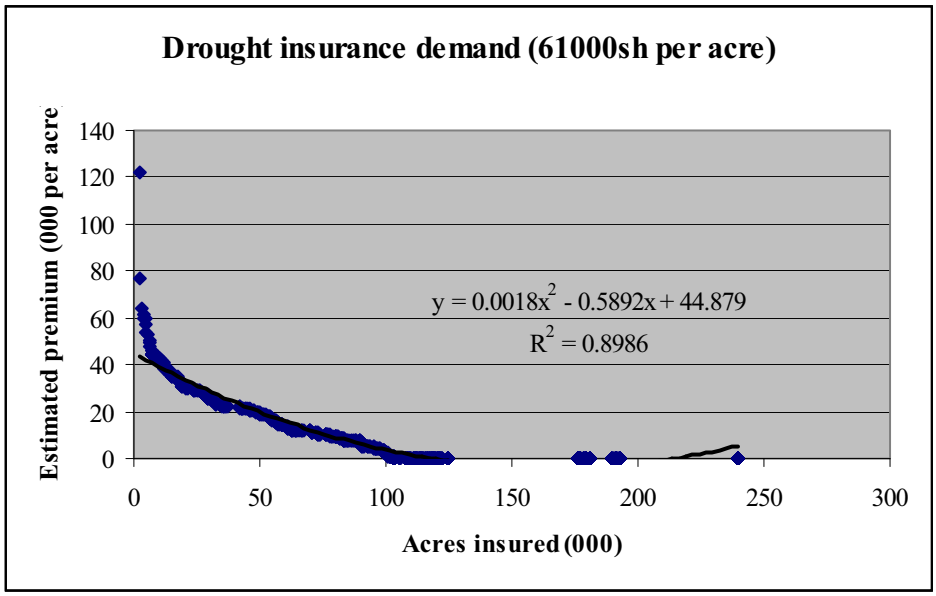


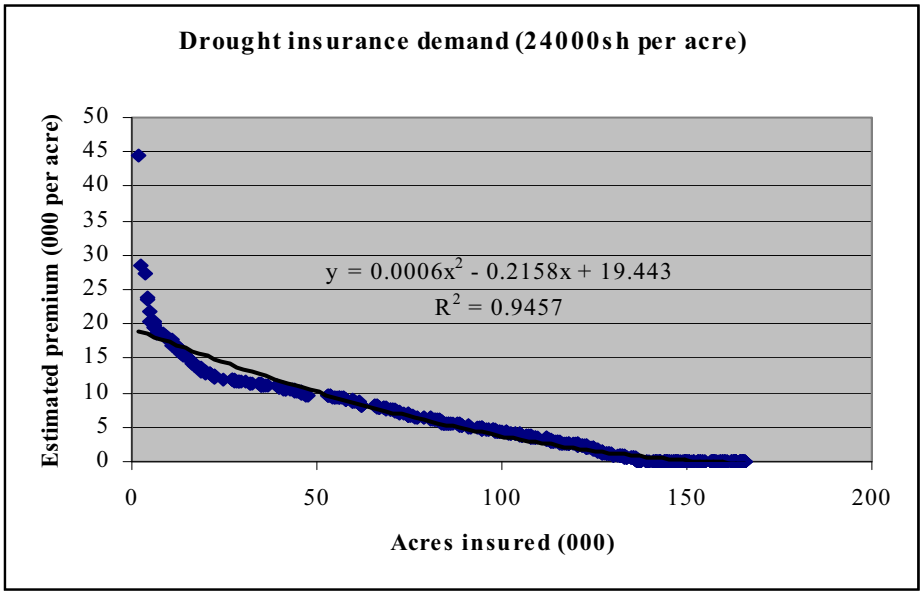
Figure 6.15: Kilimanjaro. Demand for insurance against a 10% rainfall decline

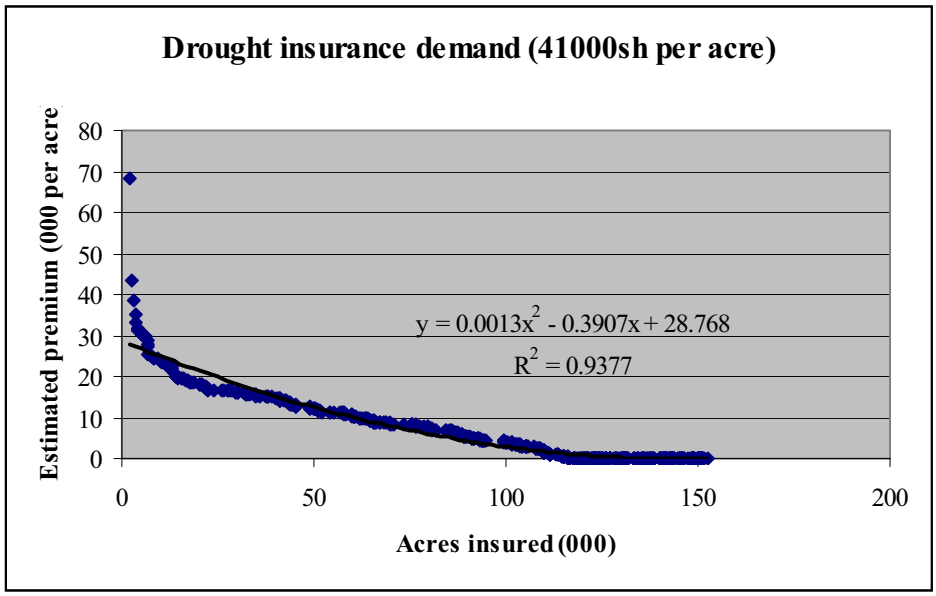


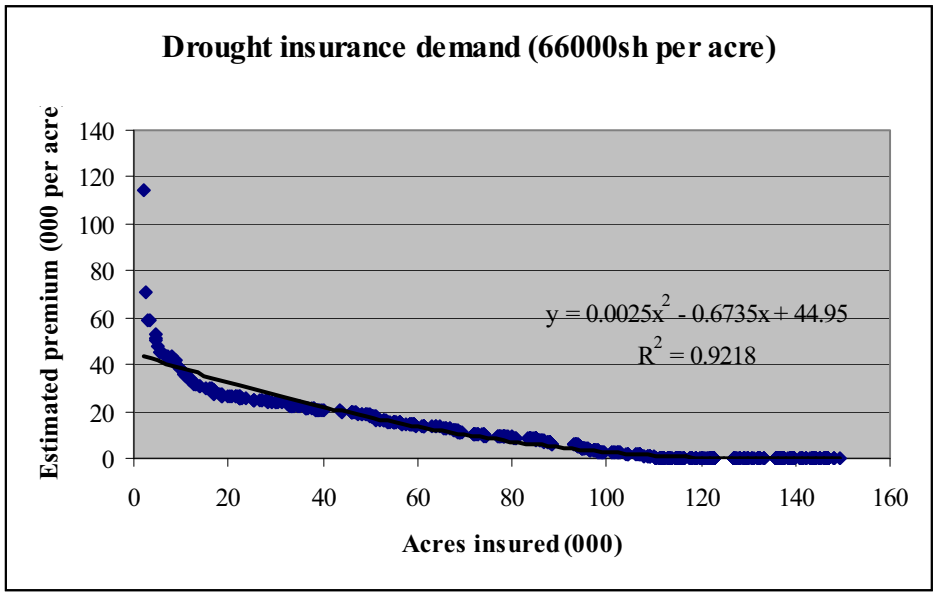


Source: Authors' calculations

Figure 6.16: Kilimanjaro. Demand for insurance against a 30% rainfall decline

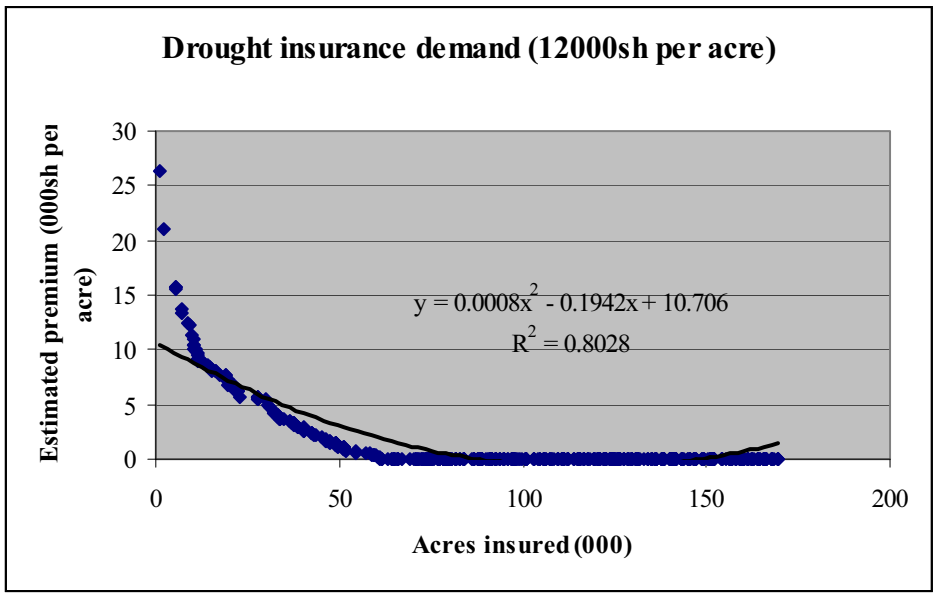


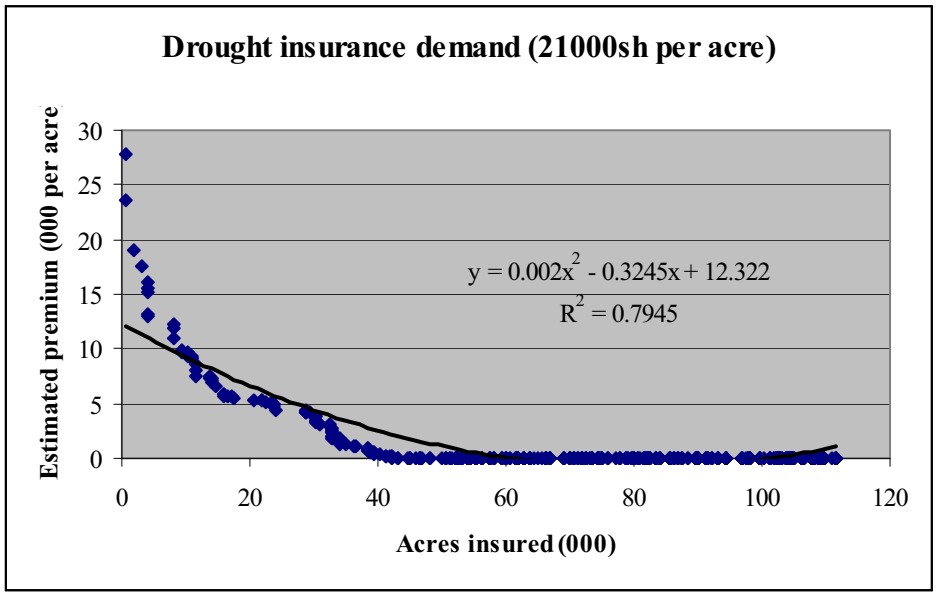


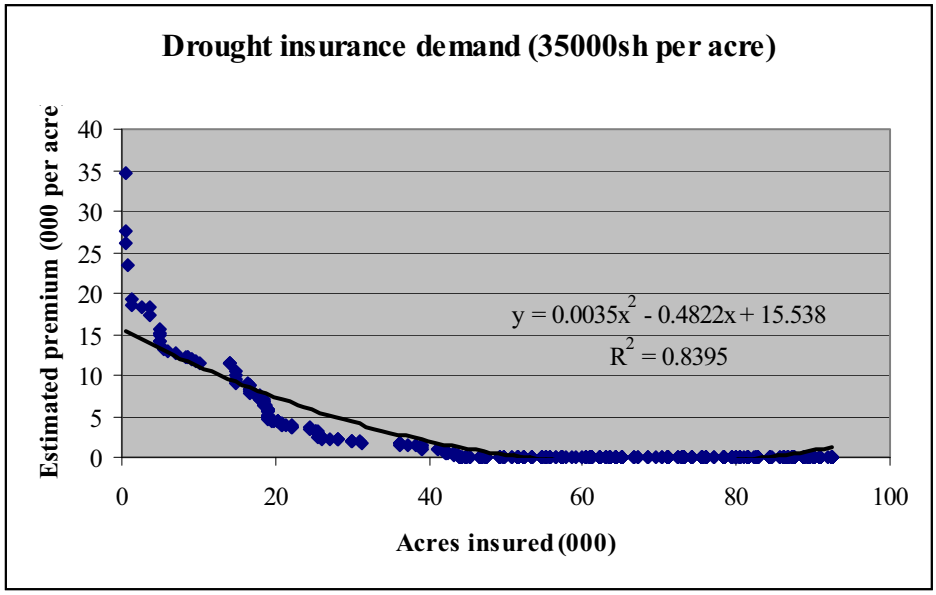


Source: Authors' calculations

Figure 6.17: Ruvuma. Demand for insurance against a 10% rainfall decline

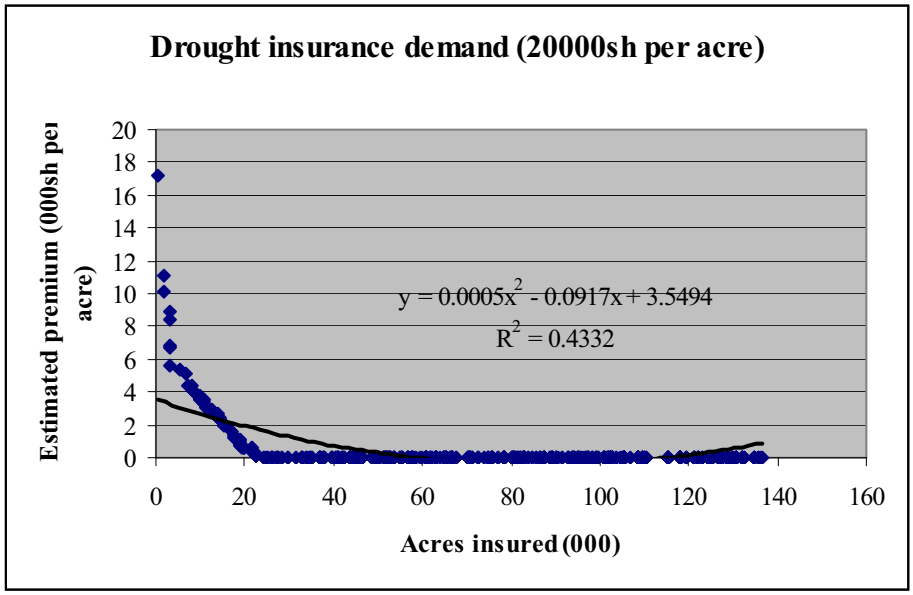




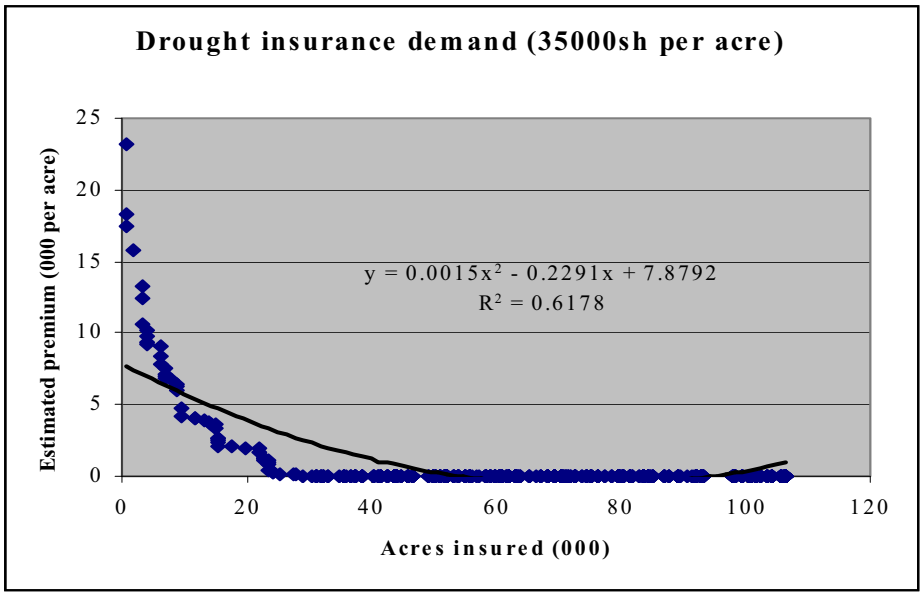


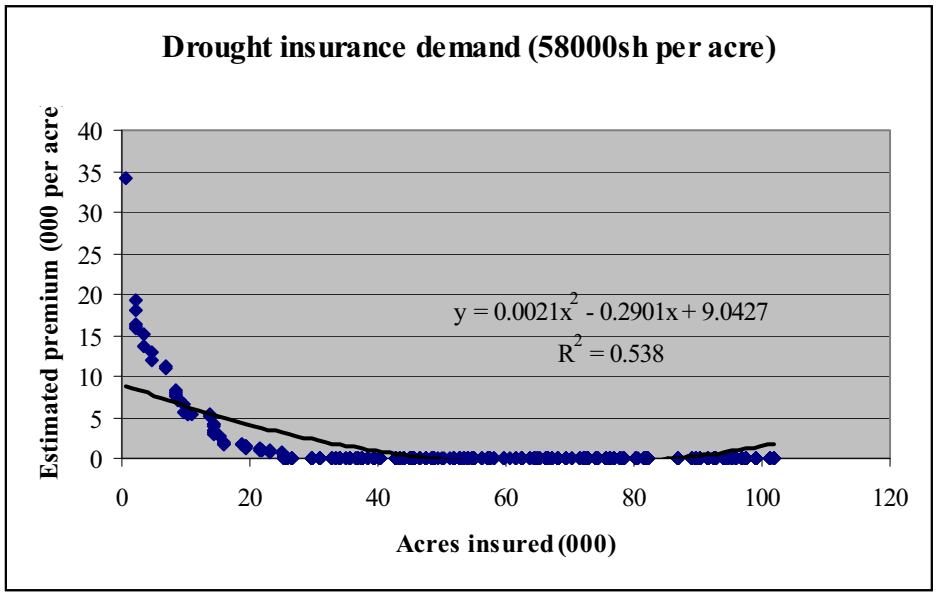
Source: Authors' calculations

Figure 6.18: Ruvuma. Demand for insurance against a 30% rainfall decline



Rainfall decline





Source: Authors' calculations

Appendix 1: Survey and sampling design[1]

The purpose of this note is to describe the procedure for the selection of a sample of villages and rural agricultural households that can be utilised for the survey of both coffee producing and non-coffee producing agricultural households.

The list of villages must be such that it can be utilised to draw a random sample of agricultural households, in the sense that it will be representative of all agricultural households in the Kilimanjaro Region. The sampling frame for the analysis is a list of the number of households and population in all villages in Kilimanjaro,[2] provided by the National Bureau of Statistics (NBS), and based on the most recent population census of 2002. The villages are grouped by wards and districts. There are six districts in Kilimanjaro, of which one (Moshi urban) is the capital of the region, and is an urban district.

The first step in the methodology is to define the frame more precisely. We are interested in agricultural households (equivalently we shall refer to these as farm households) as well as coffee producing households among them. The most recent District Integrated Agricultural Survey (DIAS) for Kilimanjaro, namely the one for the 1998/99 year, defines an agricultural household as one in which one or more members are holders. A holder in turn is a person that exercises management control over an agricultural household operation and who takes major decisions regarding resource utilization and disbursement. An agricultural household is defined as an economic unit of agricultural production under single management. It consists of all livestock and all land used for agricultural production without regard to title. In the 1998/99 DIAS the agricultural households were restricted to those that met the following conditions:

- Having or operating at least 25 m^2 of arable land
- Own or keep at least one head of cattle or five goats/sheep/pigs or fifty chicken/ducks/turkeys during the relevant (for the survey) October to September agricultural year.

For the current survey this definition will also be followed to distinguish farm households from non-agricultural households.

The list of wards and villages that is available from the National Bureau of Statistics (NBS) classifies wards as rural, urban and mixed urban/rural. We shall consider as the frame for the survey as the one consisting of villages in wards classified as rural. This is not strictly speaking a frame of agricultural households, as will be seen below, but is the best we can have with the available information

To explore the frame issue deeper, the following calculations were done. First in the 2002 census, the various villages were classified according to whether the ward in which they belong is rural. This classification is available from the NBS website. The number of all such households in the Kilimanjaro Region was thus estimated for 2002 to be equal to 199391. By utilizing the 1988 to 2002 rate of growth of population in Kilimanjaro (estimated to be equal

[1] A similar procedure has been followed for selecting households in Ruvuma. Details available upon request from the authors.

[2] In the frame provided by the NBS the smallest enumeration area (EA) or primary sampling unit (PSU) is either a village or a street when the location is a city or town. For the remainder of this note we shall refer to these PSUs as "villages", although they may actually be streets in small towns.

to 1.608 percent annually) the 2002 rural population and number of households was projected back to 1998. The estimated number of rural households thus estimated for 1998 is 187064.

In the 1998/99 DIAS the number of agricultural households in Kilimanjaro was estimated to be equal to 223930, which appears to be much larger than the above projected number of 187064. However, there is a serious problem with the 1998/99 numbers of agricultural households. This concerns the reported number of agricultural households in the Same district. In the 1998/99 DIAS this is reported to be equal to 114295 or more than half of the total number of agricultural households in Kilimanjaro, according to the 1998/99 DIAS. This number, however, must be grossly overstated. The reason is that the number of total (not just rural) households reported in the 2002 census for Same is only 44272, and the number of households in 2002 living in rural wards in Same in 2002, is reported to be only 23429. When this last number is projected back to 1998 it results in a number of rural households in Same in 1998 equal to 21980. This is less than 20 percent of what is reported in the DIAS, and raises serious issues about the method utilised to compute these aggregates in Same. The problem does not appear to be the same in the other districts.

To deal with this problem the following method was used. By comparing the 1998/99 DIAS reported numbers of agricultural households in all other districts except Same, and comparing them with the 1998 backward projections of rural households resulting from the 2002 census, it appears that the number of agricultural households in the 1998/99 DIAS is on average 66.4 percent of the number of rural households in 1998 as projected back from the 2002 census. This percentage was then used to estimate the number of agricultural households in Same in 1998, from the backward projection of the 1998 estimated number of all rural households there. The estimated number of agricultural households in Same with this method is 14598. Thus the adjusted total number of agricultural households in the Kilimanjaro Region in the 1998 DIAS is equal to 124233, which is much lower than the originally reported figure of 223930. This number is still smaller than the number of rural based households projected back to 1998, which is, as reported above, 187064 households. This implies that even if we consider the frame to consist of all rural based households, based on the 2002 census, it will overstate the number of agricultural households. In fact we expect that only about 66.4 percent of the selected households from this frame will be agricultural ones. Hence if we wish to sample M agricultural households from this frame, we should select a sample equal to M/0.664, and reject the households that in the actual visit are found not to be agricultural by the above definition of an agricultural household, in order to make sure we get an expected number of M agricultural households.

The 1998/99 DIAS also reports the number of coffee producing households among the agricultural households. As will be seen below the share of coffee producing households in all farm households is utilised in the sample selection method. For Same, given the adjustment above, it was assumed that the share of coffee producing households in the new number of rural households is the same as the share of coffee producing households reported in the 1998/99 DIAS. The resulting total number of coffee producing farm households in Kilimanjaro in 1998 is equal to 79598 or 64.1 percent of all reported agricultural households in the adjusted 1998/99 DIAS.

From now on then the frame that will be considered is the list of all villages in Kilimanjaro that are in wards which are classified as rural by the NBS according to the 2002 census. The total number of such villages is 369, located in 82 rural wards. The corresponding number of households in this set as reported in the 2002 census is equal to 199391 and the corresponding population is 941262.

Consider now the problem of selecting among these villages and households a set of 900 farm households at random for sampling. Ideally we would like to have about 600 of these households to be coffee producers, and the rest non-coffee producers. This presents a problem for the sampling design because according to the 1998/99 DIAS only 64.1 percent of all agricultural households in the Kilimanjaro Region are coffee producers. This implies that if we select 900 households at random (namely with equal selection probabilities) from the population, we expect that only 900x0.641=577 will be coffee producing. This is smaller than the number we actually want. The problem, however, can be solved by adjusting the district-wide selection probabilities as will be shown below.

In the problem at hand, the following list or frame is available. There is a complete list of the numbers (in other words there is no need for the names of farmers or household heads) of all rural households in each village, ward and district. In Kilimanjaro there are five rural districts (Rombo, Mwanga, Same, Moshi rural, and Hai), within each district there are between nine (in Hai) and 29 (in Moshi rural) rural wards. Within each ward there are several villages, with a minimum of two villages and a maximum of ten villages per ward. The typical number of villages per ward is three-five. From preliminary discussions in the field during a visit in some of the relevant areas in May 2003, it appears that there is considerable household homogeneity within each village and, possibly ward, but considerable heterogeneity between wards. This implies that we should sample fewer households in each village or ward and larger numbers of villages or wards, to obtain better precision in the survey variables. However, this must be balanced against the cost of travelling from village to village. Nevertheless, the number of households per village, as seen in the available frame, is considerable, hence we need to select a significant number of households per village to capture the village population characteristics. This involves compromises between the number of households per village and the number of villages to visit.

Given the structure of the frame, there will be three levels of stratification. At the first level all districts will be chosen, so that the whole region will be represented. At the second level a certain number of wards will be chosen and within each ward a certain number of villages will be chosen. Finally, within each village a given number of households will be chosen. Given that all villages in a given ward are geographically close together and hence will necessitate small travel cost among them and given that villages in a given ward are most likely more homogeneous than villages from different wards possibly situated far apart, the idea is to select a small number of villages per ward, but as large a number of wards as possible, within the overall budget.

Assume that the total number of rural households in the frame is N. This is the total number of households in the rural or rural/mixed wards in Kilimanjaro. As the selection of the villages must be done so as to eventually provide the basis for the larger survey, it will be assumed that a survey will involve a sample of m farm households. This notation is utilised as illustrative to indicate the way the villages are selected. In the actual choice of households for the study m is set equal to 900/0.664=1355. This is done in order to make sure that there will be an expected number of farm households, namely households with some minimum farm output, equal to 900. Since some non-response is expected, the actual number of households selected will be larger than 1355 so as to have readily available substitutes, in case of non-response. It will be assumed that the non-response rate is equal to 30 percent. Hence the actual number of households selected will be about 1355X1.25=1762. This basically means that the selected number of households in each village will be 30 percent larger than what would have been selected in the absence of non-response. Otherwise, the number of wards and villages selected will be the same, as if non-response is zero. The

choice of wards, villages and number of households per village will be made on the basis of m=1350 (the slight adjustment from the above number of 1355 is done to preserve the integer number of villages selected as will be seen below), while in each village visited the actual number of households selected will be 1.30*(number of households to sample per village).

The following description concerns the selection of wards and villages to visit. The selection of rural households is mentioned as well. The sampling design will consist of a multistage stratified design. In other words the population of farms will be divided into strata, and a sample will be drawn from each stratum. In the case of the Kilimanjaro Region in Tanzania the strata are already defined, namely the rural districts (Moshi urban will be excluded, as by definition it is not a rural area). Hence, the sample for the survey will be drawn from each district, and from selected rural wards and villages in each district. The whole idea of sample design in a survey is how to select the number of households to sample from each stratum (district), and then how to allocate this number within each district to the individual ward and villages.

Given that we know the number of households for all strata (districts) and substrata (wards, and villages), the next step in the design of any sample is to apportion the desired sample among the first level strata (districts), and then the subsequent substrata (namely wards, and villages). In the sequel the size of the sample, namely the number of desired farm households to sample will be denoted by m, while the desired number of coffee producing households to sample will be denoted by c.

Assume that S denotes the number of strata, which in Kilimanjaro is equal to the number of districts (The number of districts in Kilimanjaro that will be sampled is 5). The next step is to partition or apportion the total number of the desired sample m to the S different strata. At this point the only number that is needed, is the total number of households in each district. Denote the total number of households in stratum s as N_s (s=1, … S, where S is the total number of districts to be sampled, namely 5), and the total number of households in all districts in which there will be a survey as N. Then by definition

$$N = \sum_{s=1}^{S} N_s \qquad (1)$$

For the survey at hand, N will be equal to the total number of rural households estimated for 2002, namely 199391. For some of the calculations below N_s and N are projected back to 1998, in order to compute relevant factors. Since all these backward projections are done with the same growth rate, the allocation of rural households in 1998 among districts is the same as in 2002.

Furthermore, denote the total number of coffee producing households in the region by C and the number of coffee producing households in each district by C_s . Clearly a relationship such as (1) also holds between C and the C_s . While we know reasonably well the total number of rural households in each district, ward, etc., as they were derived from a recent census, we do not know exactly the number of farm households and coffee producing households, as their number was inferred by the 1998/99 DIAS, which is a sample survey and not a census. Nevertheless, this is the best source for the number of coffee producers. Given that 1998/99 is a year not too far in the past, that coffee production is based on coffee trees that are perennial and hence stay on farm for a long time and that the rate of population growth is small, it can be taken with reasonable degree of confidence that the distribution of coffee producers in Kilimanjaro is as indicated in DIAS. It is difficult to speculate whether the total number of

coffee producers in 2002 should be equal to the total absolute number of coffee producers in 1998, or it should be correspond to the same share of all rural households as in 1998. It is probably safer to assume that their share in all rural households and their geographical distribution in 2002 is the same as in 1998 and this will be assumed here.

Since we are interested in coffee producing households and their comparison with non-coffee producing ones, we need a good (namely one with small sampling variance) representation of coffee producing households. This could be ensured by a proportional sampling design[1]. In other words the desired allocation of our required sample of coffee producing households among the districts should be according to their shares in total coffee producers in the 1998 DIAS. Hence if c is the desired total number of coffee producing households in our survey and c_s is the number of coffee producing households in the survey that will be sampled from district s, the desired allocation of c among districts could be done as follows.

$$c_s = c \cdot \frac{C_s}{C} \tag{2}$$

Since, however, the share of coffee producers in each district is different, as indicated in the DIAS of 1998/99, we need to sample a different number of households at random from each district, in order to be sure that our expected sample number of coffee producers is equal to c_s in each district s. If the 1998/99 share of coffee producers in all rural households in district s is denoted as α_s ($=C_s / N_s$), and we assume that this share is unchanged in 2002, and if the number of rural households sampled in each district is equal to m_s, where the sum of m_s is equal to the total number of sampled households m, then the expected number of coffee producing households in the sample for the district will be equal to.

$$c_s = \alpha_s \cdot m_s \tag{3}$$

If we equate (2) and (3) we find that under this design the desired number of sampled households in each district to ensure (2) is equal to.

$$m_s = c \cdot \frac{N_s}{C} \tag{4}$$

While this allocation of the sample among district is proportional to the number of all rural households in the district, it nevertheless, implies a total number of sampled households (namely the sum of the district samples in (4)), that is equal to c(N/C) which is larger than m (=1350), which is what we desire. This is because the ratio of C/N in the population (=0.426) is smaller than the desired ratio of c/m (=600/1350=0.444). Hence the above design albeit producing the minimum variance estimated statistics among coffee producing farm households is uneconomical from our perspective. While the discrepancy is not large, and one could in fact utilize this design and the expected number of coffee producing households would be 577, this is only because by chance the share of coffee producers in all households happens to be close to our desired share of coffee producers in the sample. In fact, we must adjust the allocation of the desired sample in (4) among the districts if we wish to have a sample of coffee producing households as originally desired.

Clearly if we want the farm households to be chosen at random, while at the same time ensuring that the expected number of coffee households among those sampled will be 600,

[1] See for instance G. Kalton. Introduction to Survey Sampling. Sage Publications, University Paper Series Number 07-035, Newbury Park London, 1983, or L. Kish. Survey Sampling. New York, John Wiley, 1965.

we must oversample the districts with higher share of coffee producers and undersample the districts where coffee producers constitute a smaller share of farm households. A natural number to utilise in adjusting the number of households to sample is the share of coffee producing households in all rural households in the district, relative to the similar share in the whole region, namely the following unitless number.

$$\beta_s = \frac{C_s / N_s}{C / N} \tag{5}$$

Clearly the above parameter is larger than 1 in districts where the share of coffee producers in the population is larger than the same share for the whole region, and smaller than 1 otherwise. The allocation of the sample then will be done in a way similar to a formula like (4), which allocates samples in proportion to the district population, but with the following nonlinear adjustment.

$$m_s = \lambda \left(c \cdot \frac{N_s}{C} \right) \cdot (\beta_s)^{\alpha} \tag{6}$$

where α and λ are parameters to ensure that the two adding up conditions are satisfied. These two conditions are first that the sum of m_s over all districts should be equal to m, and second that the sum of the expected coffee producers among those sampled will be equal to c. These two conditions can be written as follows (Exp(.) denotes the expected value of a statistic).

$$m = \sum_s m_s = \lambda \cdot \sum_s \left(c \cdot \frac{N_s}{C} \right) \cdot \beta_s^{\alpha} \tag{7}$$

$$c = \sum_s Exp(c_s) = \sum_s m_s \cdot \frac{C_s}{N_s} \tag{8}$$

From (7), and for any value of α, the parameter λ can be derived directly by simple division. By adjusting the parameter α then one can make sure that (8) is satisfied as well. 2

In the case in hand, it was found that for a value of α equal to 0.35, and a consequent value of λ equal to 0.972, the two adding up conditions are satisfied exactly (after rounding up to the nearest integer). The following table shows the population figures in 2002 and 1998 (projected backwards from 2002), and the allocation of our sample of 1350 rural households among the five districts in the Kilimanjaro Region, as well as the expected number of farm and coffee producing households in each district. It can be seen that while the sample that will be chosen will be equal to 1350, the actual expected number of interviews and questionnaires to be filled is 891, as this is the expected number of farm households among the rural ones. The expected number of agricultural households in the actual sample is not exactly equal to 900 but instead 891 because of rounding errors. The error, however, is less than one percent.

Table 1. Allocation of the sample for the 2003 vulnerability survey among districts in the Kilimanjaro Region

District	No rural hhlds 2002 (census)	No rural hhlds 1998 (projected from 2002 census)	No farm hhlds 1998 (DIAS adjusted for Same)	No coffee hhlds 1998 (DIAS adjusted for Same)	No of hhlds to sample. Vuln. survey 2003	Expected no of farm hhlds. Vuln. survey 2003	Expected number of coffee producing hhlds. Vuln. survey 2003	No of wards to visit in each district	Final adjusted number of hhlds to sample in each village in given district	Final no of hhlds that will be sampled. Vuln. Survey 2003 =(9)*(8)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Rombo	44608	41850	29111	24394	343	238	200	11	31	341
Mwanga	14268	13386	10628	3323	81	65	20	3	27	81
Same	23429	21980	14598	3609	115	77	19	4	29	116
Moshi rural	82154	77075	45186	37984	595	349	293	20	30	600
Hai	34932	32772	24710	10288	216	163	68	7	31	217
Total	199391	187064	124233	79598	1350	891	600	45		1355

Source: Computed by author

Once the m_s are chosen for all s (s=1,…, S), the next step is to decide which wards within each district to visit. The way this can be done is the following. First, given that the heterogeneity among rural households in Kilimanjaro is presumably among wards, the choice is made to visit only one village per ward. This implies that the number of wards to visit will be the same as the number of villages.

Second, the initial number of households to sample in each village will be set at 30. This implies a number of wards and villages to visit will equal to R=1350/30=45. Table 1, column (8) indicates what this implies about the number of wards to visit in each district, given the sample that is to be selected from each district. Since the number of wards to visit must be integer, and the number obtained by dividing the desired sample in each district by the number of households to sample (30) is normally a fraction, the nearest integer of wards is chosen and this is the number indicated in column (8) for wards to visit. However, once this is done, and we maintain the number 30 for the number of households to sample in each ward, the selection probabilities of each household sampled in a given district and ward will be slightly different. To keep the selection probabilities as equal as possible, the desired number of sampled households in each district (indicated in column 5) is divided by the integer number of wards, and the nearest integer of this division is chosen. This is indicated in column (9) in Table 1, and is the number of households to sample in each village visited in a given district. By multiplying these numbers by the number of wards in column 9, one obtains the number of households to sample in each district in the actual survey, and this is indicated in column (10) in Table 1. It can be seen that these numbers are very close but not exactly equal to the theoretically desired sample numbers in column (5), but this is the best that can be done, and the error is quite small.

Clearly not all 30 (or the corresponding close number in column 9 of the table above) of the selected households will be interviewed in each village visited, as the idea is that only the farm households among them will be interviewed. In other words, once a household is chosen the first questions will have to do with whether they have some minimum agricultural production. If the household passes this test, then it will be interviewed. If not, then the enumerator should move to the next household chosen in the village. If the survey is further restricted to coffee producing households, the relevant first question should be whether the household cultivates any coffee. If the answer is yes, then the enumerator should proceed with the interview. If not, then the next household in the list should be visited. The exact

questions to ask at the beginning of an encounter with a household, in order to decide whether to interview a household, are indicated in Appendix 2.

Given the number of wards to visit, the next issue is how to select the wards to visit in each district, from the list of all rural wards in the district. The way this should be done is by a method known in statistics as Probability Proportional to Size (PPS). Size in this survey will refer to the total number of rural households in a ward. The PPS method ensures that a ward with many rural households is more likely to be selected than a small one (always on the basis of the number of rural households). This is different than a Simple Random Sampling (SRS) design, where each ward would have exactly the same probability of being selected for a visit. The PPS procedure is fairly standard in sample surveys, and is explained in detail in Appendix 1 to this note.

Once the wards have been selected, the next step concerns the selection of the village to visit within each ward that is indexed by sr (namely in district s, ward r). The way to do this is to first specify the number of samples (namely rural households) per village for this ward. The number of rural households (called primary sampling units in sampling theory) per village, is denoted by H. As indicated above this may be different than 30 depending on the district where the relevant ward is located.

The number of villages to visit in a ward indexed by s and r, denoted as nv_{sr} , was already specified to be equal to 1. This was done on the basis of *a-priori* information concerning the homogeneity pattern of villages in the districts. Once the numbers H and nv_{sr} are chosen, the actual village to visit in each ward must be chosen. The procedure again will be to utilise PPS to choose the village to visit in each ward indexed by sr. In other words a large village will be more likely to be selected than a small one (on the basis of the number of farms) according to this method. This is different than a Simple Random Sampling (SRS) design, where each village would have exactly the same probability of being selected for a visit. The PPS procedure is explained in detail in Appendix 1.

Consider a village among the ones selected to be visited (we will use the index v to denote the v'th village in ward r in district s). Denote the number of individual rural households in this village by N_{srv} =M (we use the symbol M instead of the more complicated symbol N_{srv}). Then, if the PPS method of choosing villages is followed, the probability of choosing a particular village v among all the villages in any given ward sr, will be proportional to M (exactly as the name denotes).

Once the exact location of the village to visit in each ward sr is chosen by PPS, then for each village, one could obtain the detailed list of individual households from the village record of the chairman, or other similar list in the village. From that list one will select a random number of H*1.25 households to visit. As discussed earlier, the reason for the multiplication of the number of intended households to visit by 1.25 is to account for non-response. In other words the random list of households selected will be 38 (or even 40 if this is more convenient). The enumerator will start visiting these households. If they cannot be interviewed because of absence of the head, or unwillingness or inability to talk to the enumerators (this is considered a non-response), then the next household in the list will be visited. Once the household agrees to talk, the first question that will be asked is whether they have agricultural production. If not then this household will not be sampled, and so on down the list. The actual number of households that is expected to be interviewed if this procedure is followed, is 891, as indicated earlier, of which 600 will be expected to be coffee producers.

A further problem that will arise in the actual survey, is that despite the fact that the available census is recent (namely from 2002), there may be differences between the number of households indicated as residing in a given village, and the actual number residing there

when the enumerators visit the village sometime in 2003. In this case, in order to keep the selection probabilities equal and the same for all households in the district, the survey team will need to adjust the actual number of households selected for interview by the fraction (M_{2003} /M_{2002}) where M_n is the number of households[1] in year n. In other words if there has been a growth of the actual number of households of the order of four percent, as revealed by the new village household listing, then the actual number of households to select to visit should be not H, as indicated above, but an integer number closest to H_1= H*(1.04). Of course the adjustment for non-response will now apply to the new number H_1 . Given that the census on the basis of which this survey is designed is quite recent, the adjustments expected from this correction should not be too large.

For each village the selection of households will be done by a Simple Random Sampling (SRS) method. A simple way to operationalize this method in the field is indicated in annex C. If the wards and villages are chosen in the way outlined above, and H farm households within each selected village are chosen randomly, then the selection probabilities of all the chosen rural households can be found as follows:

The selection probability of a rural household can be written by the fundamental law of conditional probabilities as follows:

Prob(Selection of a household in a district in the region)=Prob(Selection of a household/Given selection of a village, and ward in a given district) Prob(Selection of village/Given selection of a ward in a given district) Prob(Selection of ward/Given selection of a given district) Prob(Selection of a district) (9)

The probabilities in equation (9) can be written as follows using the notation utilised earlier:

Prob(Selection of a household/Given selection of a village, and ward, in a given district)= $H \big/ N_{srv}$ (10)

Prob(Selection of village/Given selection of a ward in a given district)

$= n_{srv} \cdot \frac{N_{srv}}{N_{sr}}$ (here of course the number of villages n_{srv} is equal to 1) (11)

Prob (Selection of a ward/Selection of a given district) =

Number of wards chosen times $\frac{N_{sr}}{N_s} = \frac{m_s}{H} \cdot \frac{N_{sr}}{N_s}$ (12)

Prob(Selection of a given district)= 1 (since all district are to be included) (13)

If we use the formulas (10)-(13) in equation (9) we obtain that.

Prob(Selection of a household/Given the choice of district s in the region)= $\frac{m_s}{N_s}$ (14)

With the method outlined above, then, all household living in rural wards within a given district will have the same probability of being selected. However, because of the way the sample was allocated among the districts (re. equation (6)), these selection probabilities will not be the same in the different districts. This implies that, to compute any statistic for the whole region, the data from any given household must be weighted with weights that are equal to the inverse of the selection probabilities.

[1] See Kalton, op. cit. p. 42-43.

The statistics that will be computed from a sample of this form will weigh each farm household's data equally in each district but unequally between districts. For instance, if the value for an agricultural household h in district s for a given variable (say area planted in coffee) is x_{hs} then the average value for the whole sample will be equal to

$$\bar{x} = \sum_{s=1}^{S} \left(\frac{1}{\sum_{h=1}^{m_s} w_{hs}} \sum_{h=1}^{m_s} w_{hs} x_{hs} \right) \tag{15}$$

In the above equation the weights w_{hs} will be the following.

$$w_{hs} = \frac{N_s}{m_s} \tag{16}$$

Notice that these weights, which equal the inverse of the overall selection probability in the district, depend only on s, namely the 0district where the household is located, and will be different for different values of s. Table 2 gives these weights, along with the numbers that are used to estimate them.

Table 2. Selection probabilities and weights by district

District	No rural hhlds 2002 (census)	No of actual households to sample in survey	Selection probabilities based on 2002 figures	Weights (inverse of select. Probs)
Rombo	44608	341	0.007644	130.815
Mwanga	14268	81	0.005677	176.148
Same	23429	116	0.004951	201.974
Moshi rural	82154	600	0.007303	136.923
Hai	34932	217	0.006212	160.977
Total	199391	1355		

Based on the methodology outlined above, a selection of wards and villages was done to satisfy all the above criteria. The list of selected wards and villages, as well as their population statistics and the number of households to sample in each village, are indicated in Table 3. This is then the actual places that the survey teams should visit. As discussed above, in each identified village the number of households to select by SRS will not be what is indicated in the 9th column of Table 1 in Appendix 1, but in fact 30 percent larger. In Rombo, for instance, in all villages the number of households selected from the village lists (assuming that the updating fraction discussed above due to the change in population is equal to 1) will be equal to 31*1.3=40. This, in order to account for non-response. Once the desired number of households are interviewed (namely 31), the ones remaining in the list of 40 selected households will be omitted.

Table 3: Wards and villages to visit in the Kilimanjaro vulnerability survey.

Ward sequential number	District name	Ward name	Village or Street name	Total Pop. Census 2002	Number of households in 2002	Number of agric. households to sample per village	Weights[1] for computing survey statistics
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Rombo	Mamsera	Mamsera Juu	2131	498	31	130.815
2	Rombo	Mengwe/Manda	Mengwe Chini	2555	565	31	130.815
3	Rombo	Keni/Aleni	Aleni - Chini	6031	1226	31	130.815
4	Rombo	Shimbi	Shimbi Mashami	2648	590	31	130.815
5	Rombo	Mrao/Keryo	Mrao	2793	567	31	130.815
6	Rombo	Katangara/Mrere	Mrere	6202	1194	31	130.815
7	Rombo	Olele	Kiooti	3174	658	31	130.815
8	Rombo	Kirongo/Samanga	Samanga	5368	995	31	130.815
9	Rombo	Kitirima/Kingachi	Leto	4679	912	31	130.815
10	Rombo	Nanjala/Reha	Nayeme	5788	1111	31	130.815
11	Rombo	Motamburu kitendeni	Nalemuru	2800	611	31	130.815
12	Mwanga	Msangeni	Mamba	1033	228	27	176.148
13	Mwanga	Jipe	Jipe	963	208	27	176.148
14	Mwanga	Kilomeni	Sofe	1808	347	27	176.148
15	Same	Ruvu	Ruvu Jiungeni	3183	761	29	201.974
16	Same	Mhezi	Mtunguja	2574	495	29	201.974
17	Same	Mtii	Lugulu	1847	382	29	201.974
18	Same	Bwambo	Vugwama	2334	458	29	201.974
19	Moshi Rural	Mwika Kusini	Kimangaro	4462	920	30	136.923
20	Moshi Rural	Mwika kaskazini	Mrimbo Uuwo	4445	967	30	136.923
21	Moshi Rural	Mamba kusini	Kimbogho	1529	368	30	136.923
22	Moshi Rural	Marangu Mashariki	Rauya	4080	652	30	136.923
23	Moshi Rural	Marangu Magharibi	Nduweni	1641	377	30	136.923
24	Moshi Rural	Kilema Kusini	Kilema chini	2858	476	30	136.923
25	Moshi Rural	Kirua Vunjo Mashariki	Mero	2546	552	30	136.923
26	Moshi Rural	Kahe	Ngasinyi	2433	563	30	136.923
27	Moshi Rural	Old Moshi East	Tsuduni	1922	326	30	136.923
28	Moshi Rural	Mbokomu	Korini Juu	2143	483	30	136.923
29	Moshi Rural	Uru Mashariki	Mnini	2334	483	30	136.923
30	Moshi Rural	Uru South (Mawela)	Kariwa	3135	700	30	136.923
31	Moshi Rural	Mabogini	Mtakuja	4486	1124	30	136.923
32	Moshi Rural	Arusha Chini	Uhuru	1858	448	30	136.923
33	Moshi Rural	Kibosho Mashariki	Sungu	2141	435	30	136.923
34	Moshi Rural	Kibosho Magharibi	Manushi Ndoo	3330	664	30	136.923
35	Moshi Rural	Kindi	Kindi kati 1	7026	1474	30	136.923
36	Moshi Rural	Kirua Vunjo Kusini	Uchira	5603	1201	30	136.923
37	Moshi Rural	Okaoni Kibosho	Omarini	2141	511	30	136.923
38	Moshi Rural	Kimochi	Sango	3815	834	30	136.923
39	Hai	Machame Mashariki	Nkuu - Ndoo	2659	628	31	160.977
40	Hai	Machame Kusini	Kikavu Chini	3752	920	31	160.977
41	Hai	Machame Kaskazini	Nshara "A"	2329	488	31	160.977
42	Hai	Masama Mashariki	Mbweera	4166	996	31	160.977
43	Hai	Masama Magharibi	Mbosho	1966	479	31	160.977
44	Hai	Siha Mashariki	Kishisha	1283	282	31	160.977
45	Hai	Siha Kaskazini	Nrao Kisangara	1888	458	31	160.977

[1] Final weights have been adapted to reflect actual response rate.

Appendix 2: Household and community questionnaires[1]

TANZANIA VULNERABILITY SURVEY 2005
Research on Poverty Alleviation, FAO and World Bank
SET 1: PRICE CONTRACT: 10/20/50
WTP RAINFALL CONTRACT: 2000/4000/7500/1000/3000/5000
Ruvuma Household Questionnaire Round 2 (February 2005)
(To be answered by household head or most knowledgeable household member)

Date of interview: _____day _____ month_____ year

	Region	District	Ward	Village	Name of household head	Name of respondent if different from household head
Name						
Code						

Region Code
1=Kilimanjaro
2= Ruvuma

District Code
1=Songea rural
2=Tunduru
3=Mbingao
4=Nambumbo
5=Songea urban

Village code
1=Mlete
2=Muhukuru_Barabarani
3=Morogoro
4=Madaba
5=Sisi kwa sisi
6=Namiungo
7=Namakambale
8=Tuwemacho
9=Chiungo
10=Angalia1
11=Mchesi
12=Wenje
13=Mchoteka
14=Mbesa
15=Kitanda
16=Nampungu
17=Namakungwa
18=Litorongi
19=Lipumba
20=Mkwaya
21=Ndondo
22=Chiulu/Chiula
23=Kingerikiti
24=Kibandai 'A'
25=Mango
26=Langiro Asili
27=Mahenge
28=Tukuzi
29=Ululela
30=Kipololo
31=Mpepai
32=Kitura
33=Ligera
34=Mlilayoyo
35=Naikesi
36=Likuyu/ Seka manga

Note: To identify the household name use the name of the respondent (household head or most knowledgeable person in the household), and for the household code use the corresponding code from the household list.

	Name	Code/id number
Respondent		
Is respondent different from last time? (1=yes, 2=no). _____		
If yes, then who was the respondent last time? Use code from household roster (99 if respondent does not remember		
Enumerator		
Supervisor		
Data enterer		

Note to Enumerator – please use following codes throughout the questionnaire

- **99 if the respondent does not know, does not remember or refuses to answer (in other words answer is not necessarily zero)**
- **88=Not Applicable (question irrelevant for the respondent)**
- **In all other cases blanks or empty spaces will be interpreted as zeros**

LOCAL UNIT CONVERSION CHART

Whenever during the interview the respondent refers to local units (bags, tins, debe, pishi, etc., make sure to return to this page and record or estimate in kilograms the weight, or in litres the content of the local units used by this particular respondent for this particular product. Remember **1Ha=2.47 acres**

Product	Local unit	Weight in kgs	Content in litres

[1] Questionnaires for the other rounds are similar. All questionnaires are also available in Swahili and are available upon request from the authors

A. Household roster –demographic characteristics, education and health

Please enumerate all household members of the household, i.e. members who usually live and eat in the household, including those who were members of the household last year. Please start with the household head, his/her spouse, other adults and then children (ranked from oldest to youngest). First list all the persons who are household members now, and then add those who were members last year but have left at the bottom.

(A1) **ID**	(A2) Name	(A3) Gender 1=Male 2=Female	(A4) Enter Age (yrs) at last birth day.	(A5) Relationship to head of the household 1=Head 2=Spouse 3=Child of both parents 4=child of head only 5=child of spouse only 6=grandchild 7= Niece, nephew 8=Parent or parent in law 9= brother/sister or brother/sister in law 10=daughter or son in law 11=adopted child 12=Other	(A6) Marital status (if ≥ 15 years old) 1=unmarried 2=married 3=separated/ divorced 4=widowed 5=other 88=N/A	(A7) Highest grade completed 0=pre-school 1=Standard 1 2=Standard 2 … 8=Standard 8 9=course after primary educ. 10=Form I 11=Form II 12=Form III 13=Form IV 14=course after second. educ. 15=Form V 16=Form VI 17=Course after Form VI 18=Diploma course 19=Other certificate 20=Some but not finished university 21=Completed University Degree 22=Adult education only 23=No education	(A8) Was [NAME] a member of the household 1 year ago (1=yes, 2=no)	(A9) Is [NAME] still a member of the household (1=yes, 2=no) If A9= 1 go to A11, if A9=2, go to A10	(A10) If [NAME] is no longer a member of the household, what has happened 1=died 2=married and moved within the village 3=married and left the village 4=moved to live on his own in the village or with another family 5=left the village to live on his/her own or with another family 6=other (explain)_____ _____	(A11) For how many months has [NAME] been absent during the past year? (Zero if less than 1 month)	(A12) If absent, what was the main reason for his absence? 1=looking for work; 2=business 3=medical treatment 4=education 5=social event 6=started own household 7=others	(A13) Did [NAME] fall sick or get injured during the past 4 weeks? 1=yes 2=no (if A13=2 go to A15)	(A14) If yes, what sort of illness/injury did [NAME] suffer from? 1.Malaria 2. Respiratory 3.Measles 4.Diarrhoea 5.Cholera 6.TB 7.AIDS 8.Pregnancy related 9.Malnutrition 10.Accident 11.Intestinal infections 12.Skin infections 13.Mental illness 14. Others	(A15) Does [NAME] usually sleep under a mosquito net? 1=yes 2=no
1														
2														
3														
…														
12														

B. Activities of household members aged 5 years or above

ID (from A1)	Household member Name [repeat all names from Section A except children 5 or below] be sure that ID numbers correspond with those in section A.	Main activity (time spent)	If codes 1-5 in col (B3)		Last year, [NAME's] spent second most of his/her time while a member of the household as? Activity code	If codes 1-5 in col (B6)		If none of the two main activities mentioned in the previous two questions involved work on own farm, then how many months last year did {NAME} spend on the family farm last year (Answer only if main or secondary activity is NOT self employment in agriculture or livestock)	Did household member have any other jobs last year? 1=yes 2=no	If yes, state the number of jobs	Is household member 1= village chairman, 2=Kitongoji chair 3=10 cell leader 4=member of village council 5=village execution officer 6=relative to one of the above 7=none of the above
		In the past year (since last survey) or during the time he/she was a member of this household if not member for the whole year, [NAME] spent most of his/her time as (see code below)?	What is sector of employment? (see code below)	How many months were spent in the past year (since the last survey) doing this activity? (Use months if needed)		What is sector of employment?	How many months were spent **last year (since the last survey)** doing this activity? (Use fraction of months if needed))				
(B1)	(B2)	(B3)	(B4)	(B5)	(B6)	(B7)	(B8)	(B9)	(B10)	(B11)	(B12)

Activity code
1=regular wage earner in private sector
2=regular wage earner in public sector
3=irregular wage earner
4=self employed
5=unpaid family worker
6=student
7=looking for work
8=not working and not looking for work
9=household work
10=retired, pensioner
11=too old, too young
12=disabled
13=other

Sector of employment
Primary sector
1=agriculture
2=fishing
3=livestock
4=mining and quarrying
5=other primary

Industrial sector
6=manufacturing/production/crafts
7=construction
8=other industry

Service sector and government
9=wholesale/retail/shop
10=restaurant/food preparation
11=repair work
12=transport, storage and communication
13=banking, finance, real estate and business
14=public service, army, education, health
15=other service and government

C. Cash Income

What were the main sources of the total cash income of all household members over the past year (since the last survey)? Please indicate the five most important sources (1=most important, 2=second most important, … Up to 5th most important). Note to enumerators: please read each response.

Sources of income	Degree of Importance	Sources of income	Degree of Importance
C1. cash income from sale of food crops		C10. cash income from own non-agricultural enterprise	
C2. cash income from sale of coffee		C11. cash from pensions	
C3. cash income from sale of other cash crops		C12. cash from land rents	
C4. cash income from sale of vegetables		C13. cash from dividends, interest on bank deposits etc.	
C5. cash income from sale of livestock		C14. cash income from state and NGO assistance	
C6. cash income from sale of livestock products (milk, eggs, meat…….)		C15. cash gifts from friends, neighbours & relatives,	
C7. cash income from regular wage jobs		C16. cash from remittances from household members living elsewhere	
C8. cash income from irregular agricultural wage jobs		C.17. Other cash (explain)…..	
C9. cash income from irregular non-agricultural wage jobs			

C18. What share of the total cash income of the household (i.e. of all household members) last year was obtained?
(Code 88=0%, 1=1-25%, 2=26-50%, 3=51-75%, 4≥75%)

From regular wages _____
From all irregular wages_____
From pensions_____
From remittances_____

D. Non-farm income

How much *income (cash and in kind)* have the different household members (≥ 5 years old) received from non-farm activities over the past year (since last survey)? If the individual was not a member of the household for the full year, list only their income during the time they were a member.

D1. Household member ID (from A1)	D2. Household member Name [repeat all names of household members listed in Section B]	D3. Total wages (in cash and in kind) received in all regular wage jobs (Tsh000)		D4. Total wages received (in cash and in kind) in occasional wage jobs (Tsh000)		D5. Total net income from non-farm business (Tsh000)	D6. Total amount of pensions received (Tsh000)	D7. Total amount received from all kinds of State and other institutional assistance (e.g.NGO), except pensions (Tsh000)		D8. Total amount received as gifts from neighbours, relatives, family, etc (Tsh000)		D9. Total amount received or brought back as remittances (Tsh000)	
		In cash	Value in kind	In cash	Value in kind			In cash	Value in kind	In cash	Value in kind	In cash	Value in kind
(D1)	(D2)	(A)	(B)	(A)	(B)	(D5)	(D6)	(A)	(B)	(A)	(B)	(A)	(B)

E. Total and food consumption expenditures

E1. Is your current household income adequate to meet your needs? _____ 1= not enough even for food; 2=enough for food but nothing left for other necessities; 3=enough for food and necessities, but not much left for other expenses; 4=enough to meet most of our needs) Note to enumerators – read the different possible answers.

For the questions below ask the respondent to fill in the answers for **all** the following periods	A. one day	B. one week	C. one month
E2. What is the total amount in cash your household spent for **all** expenditures in the last (Tsh000):			
E3. What is the amount in cash your household spent for food in the last (Tsh000):			

E4. What is the **average** cash amount spent **per month** for all **consumption** expenditures **during last year**? (Tsh000)	
E5. What is the **average** cash amount spent **per month** for all **food** expenditures **during last year?** (000 Tsh)	

How do you judge the stability of your total household...	1=very unstable 2=somewhat unstable 3=stable	How do you judge the stability of your total household ...	1=very unstable 2=somewhat unstable 3=stable
E6. **Total cash** expenditures from year to year?		E8. Cash **non-food** expenditures from year to year?	
E7. Household **non-cash** consumption from year to year?		E9. Cash **food** expenditures from year to year?	

Was your household income adequate to meet your needs … year(s) ago?	(1= not enough even for food; 2=enough for food but nothing left for other necessities; 3=enough for food and necessities, but not much left for other expenses; 4=enough to meet most of our needs)
E10. 1 year ago	
E11. 2 years ago	
E12. 3 years ago	
E13. 4 years ago	
E14. 5 years ago	
E15. 6 years ago	

F. Household assets

Housing condition

Do you live in the same house as last year? (1=yes, 2=no) _____
If yes, skip to question F8

F1. What is the type of house you live in? _____
(1=detached house; 2=semi-detached house; 3=flat; 4=hut in compound; 5=others)

F2. Is the house you live in _____
(1=owner occupied; 2=free public; 3=free private; 4=subsidized public; 5=subsidized private; 6=rented; 7=others)

F3. When was the house built? _____

F4. Does the house you live in have baked _____
brick or concrete/stone walls (1=yes, 2=no) ?

F5. How large is the compound of the house _____
(in acres)?

F6. Number of rooms used for living & sleeping ____
(exclude kitchen, bathroom, toilet)

F7. Does the house you live in have a metal, stone or concrete roof? (1=yes, 2=no) _____

F8. If you rent the house you live in, what is monthly rent paid (Tsh000)? _____

F9.A. Did you make any renovations to the house over the past year? (1=yes, 2=no) _____
F9.B. If yes, how much did you spend (Tsh000)
_____

F13. Do you boil the water before drinking it?
_____
(1=yes; 2=no)

F15. If you were to sell house and compound today, how much do you think you would make (Tsh000)_____

F16.A. Does the household own another house than the one discussed (1=yes; 2=no) _____
B. Did you acquire this during the past year?
(1=yes; 2=no) _____

F17. If yes in F16A, how much do you think you would make if you were to sell the house and compound today (Tsh000)? _____

	A. Did your household buy/receive or sell/give away any of the following items over the past year? (1=yes, 2=No)	**B. If it bought or received any of these items**		**C. If it sold or gave away any of these items**	
		B1 How many?	**B2. What was the total value (Tsh000)?**	**C1 How many**	**C2 What was the total value (Tsh000)?**
Consumer durables					
F18. Radio/cassette player/stereo equipment					
F19. TV set/video					
F20. Dish antenna/decoder					
F21. Telephone fixed					
F22. Cell phone					
F23. Computer/printer					
F24. Refrigerator/freezer					
F25. Sewing machine					
F26. Chairs					
F27. Sofas					
F28. Tables					
F29. Beds					
F30. Cupboards, chest of drawers, boxers, wardrobes, bookcases					

	A. Did your household buy/receive or sell/give away any of the following items over the past year? (1=yes, 2=No)	B. If it bought or received any of these items		C. If it sold or gave away any of these items	
		B1.How many?	B2. What was the total value (Tsh 000)?	C1.How many?	C2. What was the total value (Tsh 000)?
F31. Electric gas/stove					
F32. Other stove					
F33. Water heater					
F34 Books (not school books)					
F35. Watch					
F36. Motor vehicle					
F37. Motor cycle					
F38. Bicycle					
F39. Boat/canoe					
F40. Mosquito net					
Production tools					
F41. Wheel barrow					
F42. Plough for animal traction					
F43. Tractor					
F44. Trailer for tractor, harvester/reaper, plough for tractor, harrow					
F45. Sprayer and/or fogger					
F46. Water pumping set					
F47. Milking machine					
F48. Milling machine					
F49. Coffee pulping machine					
F50. Tobacco curing machine					
F51. Cashew machines					
F52. Incubator					
F53. Fishing net and other fishing equipment					
F54. Beehives					
F55. Sugar cane processing machine					
F56. Irrigation pump*[1]					
Buildings					
F57. Storage building for agric. products					
F58. Tobacco curing hut					
F59. Animal shed					

F60 Did you buy or obtain as a gift/inheritance any non-farm enterprise assets (not your house, land, consumer durables or farm equipment)? (1=yes, 2=no) (A)_____ If yes, how? (1=bought; 2=obtained by gift/inheritance) (B)_____ What was the total value (price if bought)? (Tsh000) (C) _____

F61 Did you sell or give away any non-farm enterprise assets (not your house, land, consumer durables or farm equipment)? (1=yes, 2=no) (A) _____ If yes, how? (1=sold; 2=gave away) (B)_____ What was the total value (price if sold)? (Tsh000) (C) _____

[1] * indicates that the item was not included in the first round.

G. Agricultural land ownership and use (crop production)

	A. Amount	B. Unit (1=ha; 2=acre)
G1. What is the total amount of land your household **owns now**? (in acres)		
G2. What is the total amount of land your household **cultivated** (both owned & rented) (in acres) this **year?**		

During the past year (since the last survey):			A. Amount	B. Unit (1=ha; 2=acre)	C. Value (Tsh000)
G3. Did you buy/receive any agricultural land? 1=yes, bought 2=yes received; 3=not bought or received		G4. If bought or received, state amount and value			
G5. Did you sell/give away any agricultural land? 1=yes, bought 2=yes received; 3=not bought or received		G6. If sold/given away, state amount and value			
			A. Amount	B. Unit (1=ha; 2=acre)	C. Rent (Tsh000)
G7. Did you rent in any land for agriculture? 1=yes, 2=no		G8. If rented, state amount and rent			
G9. Did you rent out any land for agriculture? 1=yes, 2=no		G10. If rented, state amount and rent			

I would now like to ask you some questions about your tree crops.

	Do you currently own any of the following tree crops?		Did you change the number of trees you own during the past year?		
	A 1=yes 2=no	B If yes, how many?	C 1=yes 2=no	D If yes, how many did you plant?	E If yes, how many did you uproot?
G11. Coffee, arabica					
G12. Banana					
G13. Cashew nut trees					
G14. Other fruit trees					
G15. Trees for timber or firewood					
G16. Other trees					

G17. How many parcels of land did you operate (includes rented land) this past year?	

For each land parcel answer the following questions starting with the largest parcel. Start with the largest and continue to the smallest.

Parcel number	G18. Size		G19.Distance from household compound (km) (0 if next to compound)	G20.Altitude compared to village centre 1=much above 2=somewhat above 3=about the same 4=somewhat below 5=much below	G21.What is the general slope of the parcel 1=very steep 2=gentle slope 3=mostly flat	G22. Irrigated? 1=yes; 2=no	G23. If yes, state type of irrigation 1=flooding 2=sprinkler 3=drip irrigation	G24. Is land parcel: 1=fully owned by household 2=partly owned by household 3=under long term leasehold 4=Rented 5= other	G25. Soil quality 1=Good 2=Medium 3=Poor	G26. Distance from nearest all weather road	G27. What kind of improvements does this plot have such as bunding, terracing, or mulching 1=rock bunds 2=soil bunds 3=mulching 4=terraces 5=grass lines 6=other 7=none		G28. How was the land cultivated last year 1=by hand 2=by animal traction 3=by tractor 4=was not cultivated (fallow) 5=other
	(A) Amount	(B) Unit 1=ha 2=acres									(1)	(2)	
P1													
P2													
P3													
P4													
P5													
P6													
P7													
P8													
P9													
P10													

For each of the largest 5 parcels (fewer if household does not operate 5 or more) answer the following questions regarding the crops cultivated this year in each parcel (follow sequence of plots indicated above).

G29. Parcel No	G30. Type of cultivation 1=mono-crop 2=mixed crop	G31. Crop code (if mixed, repeat parcel number and list different crops	G32. Number of trees if applicable	G33. Production last year		G34. Rainfall received in parcel last year compared to normal in past (code below)	G35. Onset of rainfall last year compared to normal 1=normal; 2=little bit late 3=much too late 4=early	G36. crop damage due to pest/insect attacks? 1=none 2=little 3=somewhat 4=a lot
				A. Units (use same units along the same rows)	B. Amount			

Crop code
1=maize
2=beans
3=coffee
4=banana
5=millet
6=sorghum
7=wheat
8=rice
9=cassava
10=yams
11=sweet potato
12=Irish potato
13=groundnuts
14=onions
15=tomatoes
16=pumpkin
17=carrots
18=sweet pepper
19=cabbage
20=other vegetables
21=simsim (sesame)
22=peas
23=castor oil
24=sugar cane
25=papaya
26=other fruit
27=others, specify
28=tobacco
29=cashew
30=sunflower
31=avocado

Units
1=kg
2=litre
3=100kg bags
4=20kg tins/debe
5=5kg tins
6=bunch (specify weight in front)
7=root bag (specify weight in front)
8=cups (specify weight in front)
9=pieces

Normality code
1=much above normal
2=somewhat above normal
3=around normal/average
4= somewhat below normal
5=much below normal

G37. What was the production and sales of main annual crops in the past year? (state units and conversion rates to kg in the local unit conversion table). If some products haven't been completely harvested, give estimated total production.

	A. Produced this year? 1=yes 2=no	D. Total production	E. Units for production and sales (apply to all cols)	F. Amount sold	G. Total value of sales (Tsh. 000)	H. Amount used for household consumption	I. Amount still stored	J. Chemical Fertiliser used? 1=Yes 2=no	K. Organic fertilizer used? 1=yes 2=no	L. Chemicals/ pesticides used 1=Yes 2=no	M. Improved seeds used? 1=yes 2=no
Maize											
Beans											
Coffee Arabica											
Banana											
Millet											
Sorghum											
Wheat											
Rice											
Cassava											
Yams											
sweet potatoes											
Irish potatoes											
Groundnuts											
Onions											
Tomatoes											
other Vegetables											
Sunflower											
Peas											
Castor oil											
Sugar cane											
trees for timber or firewood											
Papaya											
Other fruit											
Tobacco											
Cashew											
Simsim											

	A. Produced this year? 1=yes 2=no	D. Total production	E. Units for production and sales (apply to all cols)	F. Amount sold	G. Total value of sales (Tsh. 000)	H. Amount used for household consumption	I. Amount still stored	J. Chemical Fertiliser used? 1=Yes 2=no	K. Organic fertilizer used? 1=yes 2=no	L. Chemicals/ pesticides used 1=Yes 2=no	M. Improved seeds used? 1=yes 2=no
Other product (code from prev. page) G38_____											
Other product (code from prev. page) G39_____											
Other product (code from prev. page) G40_____											

Unit code

1=kg
2=litre
3=100kg bags
4=20kg tins
5=5kg tins
6=bunch (specify weight in front)
7=root bag (specify weight in front)
8=cups (specify weight in front)
9=pieces
10-other (explain)_____

A. In how many years out of the last ten have you grown this crop?		In how many years out of the last ten, has production per acre of these two crops been in the following categories: (total number of years should be equal to number in column A)				
		B1. Normal or above normal	B2. Less than normal and at least 9/10 of normal	B3. Less than 9/10 of normal and at least ¾ of normal	B4. Less than three quarters of normal and at least ½ of normal	B5. Less than half the normal production
G41. Maize						
G42. Cassava						

H. Livestock production and sales

H1. Did your household have any livestock during any period last year?	1= yes	2=no

If NO, go to animal product section. IF YES, how many animals does your household own now and last year?

	A. Number 1 year ago (i.e. at the time of last survey)	B. Acquisitions since February last year				C. Diminishments since February last year					D. Number now
		(1) # bought	(2) Total spent (Tsh000)	(3) # born	(4) # obtained as gift or by exchange of labour or other goods or services	(1) # sold.	(2) Total payment received (Tsh000)	(3) # killed for cons.	(4) # given as gift or in exchange of labour or other goods or services	(5) # died /stolen	
H2. Draft bullocks or oxen											
H3. Cows and male cattle											
H4. Goats/sheep											
H5. Pigs											
H6. Horses mules donkeys											
H7. Poultry (chicken, ducks, turkeys, guinea fowl)											

Animal products last year (<u>i.e. since last survey</u>):

H9. Did your household produce any animal or bee products last year? _____ (1=yes, 2=no). If NO, go to the FARM INPUT section. If YES, we would like to ask you some questions about the type of products produced and the amount sold.

	A. Did your household produce any of the following animal products 1=yes; 0=no	B. Total production last year	C. Unit	D. Quantity sold last year	E. Value of sales (Tsh000)
H10. milk					
H11. Cheese, butter, yoghurt					
H12. Honey					
H13. Meat (Beef, goat/sheep, pork) (from animals slaughtered)					
H14. Eggs					

Unit code

1=kg
2=litre
3=100kg bags
4=20kg tins
5=5kg tins
6=bunch (specify weight in front)
7=root bag (specify weight in front)
8=cups (specify weight in front)
9=piece

I. Farm inputs

How much of various inputs did you use and buy this past year (including inputs for coffee, tobacco and cashew production)?

	A. Used this year 1=yes 2=no; if no, go to F for non blocked items.	B. Total used		C. Quantity purchased	D. Value spent Tsh000 for quantity purchased	E. What was the main source of your input last year? 1=Private market/shop 2=Cooperative 3=Government project 4=Other	F. Was it easy to get assuming you had financing (1=yes, 2=no)	G. Was it available when you needed it? 1=yes 2=no
		B1. Amount	B2. Unit 1=kg 2=litre					
I1. Traditional seeds								
I2. Improved seeds								
I3. Organic fertiliser								
I4. Inorganic fertiliser								
I5. Chemicals (insecticides herbicides)								
I6. Veterinary services								
I7. Other livestock related services and inputs (feed, transport, etc. except labour)								
I8. Animal or machinery hire for ploughing etc.								
I9. Transport of farm products								
I10. Other production expenses								

I11. Did you obtain any inputs on credit (1=yes; 2=no)? _____

I12.A If yes, whom did you get credit from? _____
(1=food crop buyer; 2=primary society; 3=private cash crop trader; 4=cash crop company;
5=relatives/friends; 6=bank; 7=sacco or other credit association; 8=rosca; 9=private input trader; 10=other (explain)_____

I13. How did you eventually pay back?_____
(1=In cash after sale of product; 2=By deduction from sale price when lender bought my products; 3=In kind with other products; 4=through working for the person who lent me; 5=I have not repaid yet ; 6=other way (specify)…….....)

J. Hired farm labour

J1. Did you hire workers for the farm last year (inclusive for coffee, tobacco, and cashew production)?	1=yes	2=no

J2. How many days of hired labour did you use last year for all your crops (i.e. since last November)	J3. Total amount spent for this type of labour last year in cash and estimated value of non-cash payments	
	A. Cash (Tsh000)	B. Value in kind (Tsh 000)

K. Processing of farm products

K1. Have you processed any farm products from crops/other plants **during the past year (i.e., since the last survey)** (beer, butter, vegetable oil, …(1=yes; 2=no)? _____
If no, go to next section.

	A0. During the past twelve months list all products made from crops and other plants by household members (beer, shea butter , vegetable oil, etc) (see codes in last column)	A. Total production last year		B. Total amount sold	C. Total sales last year Tsh000	D. Total cash production expenses during last year (tools, containers, labour, etc.) Tsh000
		A1. unit	A2. amount			
K2.						
K3.						
K4.						
K5.						
K6.						
K7.						

Production unit code
1=kg
2=litre
3=100kg bags
4=20kg tins
5=5kg tins
6=bunch (specify weight in front)
7=other (specify weight in front)

Product codes
1=beer/wine/strong drink
2=maize or rice flour
3=yam or cassava flour
4=oil
5=prepared/cooked food
6=other, specify

L. Marketing of crops

L1. Did you sell any of the products you produced last year ? (1=yes, 2=no) _____ If no, go to the next section. If yes, could tell us during which period of the year you sold your harvest. For the **main** marketed products **except coffee and cashew nuts** (not more than 4 products). **Note to enumerator: if any crops were sold, this section should be filled out (cross-check with G37F)**

	A0. Use crop codes from page 11	What percentage of your sales of the major products did you sell in each of the following periods (% of total sold; columns should add to 100%)				
		A. Right after harvest	B. 1-4 months after harvest	C. 5-8 months after harvest	D. 9-12 months after harvest	E. More than 12 months after harvest
L2.						
L3.						
L4.						
L5.						

L6.Did you encounter any problems in selling farm products last year (except coffee, tobacco, cashew))? (1=yes,2=no)_____
If answer to above was yes, then what were the most important problems you encountered (list up to three)? (Do not read responses).
If a problem is identified, ask how often it occurs (column B).

Type of problem	A. 1=most important 2=second most important 3=third most important 88=all others	B. Frequency of problem 1=always 2=sometimes 3=rarely a problem 88=not mentioned in A
L7. I could not find buyers when I wanted to sell		
L8. I could not sell in the village and had to transport to nearest market		
L9. Transport to market was not available when I wanted to sell		
L10. It took too long to sell, and product deteriorated in quality		
L11. I had to wait too long for payment		
L12. Prices were low		
L13. Other problems (explain)		

M. Coffee production and sales

M1. Do you have coffee trees? (1=yes, 2=no) _____. If no, go to the next section.

Arabica coffee marketing and sales last year and this year (all units in kg of parchment equivalent). If available and the farmer is willing to share them, please use the receipts. Cross check with coffee production in section G.

	How much coffee did you sell?			
	A. to the primary society	B. Directly to the auction (through farmers' groups)	C. private buyers or others?	D. to Akscg or other NGOs under special contracts
M2. Amount sold since the beginning of the harvest season this year (2004)				
M3. Initial price in Tsh per kg				
M4. Additional payment in Tsh per kg				
M5. Amount sold from the end of last harvest season (2003) till the beginning of this year's harvest season (2004)				
M6. Initial price in Tsh per kg				
M7. Additional payment in Tsh per kg				

Coffee production costs

Last year	A.Cultivation	B.Pruning	C.Weeding	D.Harvesting	E. Washing and processing	F. Transport to collection centre	G. Other	H. Total Days	L. Total amount spent (Tsh) (note: total should be ≤ J3A & J3B	
M8. How many days did you and other household members spend over the past year (2004) on									L1. Cash	L2. In kind
M9. How many days from hired labour (permanent and seasonal) did you utilise over the past year (2004) on										

M10. What was the total cash cost (Tsh 000) of other variable inputs applied to coffee trees:
Fertilizer (A) _____ Spraying chemicals (B) _____ Various services (e.g. rental equipment, …) (C) _____
Credit (interest paid) (D) _____ Other inputs (E) _____

In all cases below it concerns the price for coffee in parchment form.

M11. (A) Do you know what is the price of coffee today offered at your village? _____ (1=Yes , 2=no).
(B) If yes, how much is it (Arabica Parchment) _____Tsh/kg

M12. Do current coffee prices cover total cash production costs (namely excluding your household labour and other in kind household inputs) 1=yes, 2=no	
M13. At current prices, is it worth the time of your household members to produce coffee? 1=yes, 2=no	
M14. What is the current or most recent Moshi auction price for arabica coffee? (in Tsh/kg)	

1=highly likely, 2= somewhat likely, 3= somewhat unlikely, 4=highly unlikely, 99=cannot tell or do not know	A. Below 400 Tsh/kg	B. At least 400 and less than 600 Tsh/kg	C. At least 600 and 800 and less than Tsh/kg	D. At least 800 and less than1000 Tsh/kg	E. Above 1000 Tsh/kg
M15. How likely do you think it is that next year's coffee prices (in the village for parchment) will be the in the indicated range					

	(A). January -March	(B). April-June	(C). July-September	(D). October-December	TOTAL
M16. What proportion (percentage) of your total coffee production do you normally harvest in each of the following periods (note answers must add to 100)					
M17. What proportion (percentage) of your total coffee production last year did you harvest in each of the following periods (note answers must add to 100)					

Willingness to pay for coffee price insurance

Suppose it would be possible to buy a contract NOW to ensure yourself a certain minimum coffee price in the future after the next harvest. If the market price is higher than this minimum price at the time your contract expires, you will get the market price. If it is lower than this minimum price, you will get the minimum price stipulated in your contract. While it is not possible to offer such contracts at this time, it may be possible to do so in the future. Obviously, such a contract does not come for free. A premium must be paid NOW, and we would like to know if you would be interested in such contracts and how much you would be willing to pay for such a contract. The coffee you would deliver would be of the same quality as you delivered last year and it would be collected at the same place it is collected now.

M18 Would you be interested in such a contract if it were offered to you? (1=yes; 2=no) _____

While you may not be interested in such a contract, you may become more interested if we make it a bit more concrete, so please bear with us for a moment.

While we fully realize that this is not an easy exercise, we would like to emphasize that it is important that you give us as honest and precise an answer as possible. By overstating the premium you would be willing to pay, you would suggest that the interest in such an insurance scheme is higher than it actually

is and vice versa, if you understate the premium, you suggest that you are less interested than you actually are. Note once again that the contract guarantees you a certain minimum price and that if the actual market price in a year turns out to be higher, you get that higher market price.

M19. (A) Would you be willing to pay Tsh10 for a contract which permits you to sell 1 kg of coffee in May-August of 2005 (i.e. 3 to 6 months from now for at least Tsh 400 (1=yes, 2=no) _____
(note you can buy as many of these 1 kg contracts as you wish)

(B). If your answer is YES, then how many contracts would you be willing to buy at this price? _____

(C). If your answer is no, what is the maximum price you would be willing to pay for such a contract? _____Tsh

M20. (A) Would you be willing to pay Tsh20 for a contract which permits you to sell 1 kg of coffee in May-August 2005 (i.e. 3 to 6 months from now for at least Tsh 600. (1=yes, 2=no) _____ (note you can buy as many of these 1 kg contracts as you wish)

(B). If your answer is YES, then how many contracts would you be willing to buy at this price?_____

(C). If your answer is no, what is the maximum price you would be willing to pay for such a contract? _____Tsh

M21. (A) Would you be willing to pay Tsh 50 for a contract which permits you to sell 1 kg of coffee in May-August 2005 (i.e. 3-6 months from now) for at least Tsh 800. (1=yes, 2=no) _____
(Note you can buy as many of these 1 kg contracts as you wish)

(B) If your answer is YES, then how many contracts would you be willing to buy at this price?_____

(C). If your answer is no, what is the maximum price you would be willing to pay for such a contract? _____Tsh

M22. Would you be able to pay for the premium now? (1=yes, 2=no) _____

N. Cashew nut production and sales

N1. Do you have cashew nut trees? (1=yes, 2=no) _____ *If no, go to the next section.*

N2. Who was the main buyer for your cashew nuts this past year? (1=Primary society, 2=trader, 3=cashew nut private company; 4=other)_____
N3. Did you make a contract for producing and selling cashew nut last year? (1=Yes, 2=No)_____
N4. If yes with whom? (1=primary society, 2= trader, 3=private cashew nut company, 4=other)_____

Cashew nut marketing and sales last year and this year (all units in kg of raw nuts). If available and the farmer is willing to share them, please use the receipts.

	How much cashew nut did you sell	
	A. Standard	B. Under grade
N5. Amount sold since the beginning of the harvest season this year (2004)		
N6. Average price in Tsh per kg		
N7. Amount sold from the end of last harvest season (2003) till the beginning of this year's harvest season (2003)		
N8. Average price in Tsh per kg		

Last year	A. Land preparation	B. Pruning	C. Weeding	D. Harvesting	E. Processing	F. Transport to collection centre	G. Other	H. Total Days	I. Total amount spent (Tsh) note: should be ≤ to J3 A and B	
N9. How many days did you and other household members spent last year on									L1. Cash	L2. In kind (value)
N10. How many days from hired labour (permanent and seasonal) did you utilise last year on										

N11. What was the total cash cost (Tsh) of other variable inputs applied to cashew nut trees:
Fertilizer (A)……..…….. Spraying chemicals (B) …..…….. Various services (e.g. rental equipment, …) (C)……..Cash Credit (interest paid) (D) ……..

N12. (A) Did you receive any of these inputs on credit or as a loan? (1=yes, 2=no)_____
(B) If yes, from whom?(1=primary society, 2=from buyer of product, 3=from seller of inputs, 4=other)_____
Cashew nut prices (in all cases below the cashew nut for which price is asked is per kg, for standard grade nuts)

N13. Do current cashew prices cover total cash production costs (namely excluding your household labour and other in kind household inputs)	1=yes,	2=no
N14. At current prices, is it worth the time of your household members to produce cashew? 1=yes, 2=no		

1=highly likely, 2= somewhat likely, 3= somewhat unlikely, 4=highly unlikely, 99=cannot tell or do not know	A. Below 300 Tsh/kg	B. At least 300 and below 400 Tsh/kg	C. At least 400 and below 500 Tsh/kg	D. At least 500 and up to 600 Tsh/kg	E. Above 600Tsh/kg
N15. How likely do you think it is that next year's cashew nut prices (in the village) will be the in the indicated range					

Willingness to pay for cashew nut price insurance

Suppose it would be possible to buy a contract NOW to ensure yourself a certain minimum cashew nut price in the future after the next harvest. If the market price is higher than this minimum price at the time your contract expires, you will get the market price. If it is lower than this minimum price, you will get the minimum price stipulated in your contract. While it is not possible to offer such contracts at this time, it may be possible to do so in the future. Obviously, such a contract does not come for free. A premium must be paid NOW, and we would like to know if you would be interested in such contracts and how much you would be willing to pay for such a contract. The cashew you would deliver would be of the same quality as you delivered last year and it would be collected at the same place it is collected now.

N16. Would you be interested in such a contract if it were offered to you? (1=yes; 2=no) _____
While you may not be interested in such a contract, you may become more interested if we make it a bit more concrete, so please bear with us for a moment..

While we fully realize that this is not an easy exercise, we would like to emphasize that it is important that you give us as honest and precise an answer as possible. By overstating the premium you would be willing to pay, you would suggest that the interest in such an insurance scheme is higher than it actually is and vice versa, if you understate the premium, you suggest that you are less interested than you actually are. Note once again that the contract guarantees you a certain minimum price and that if the actual market price in a year turns out to be higher, you get that higher market price.

N17. (A) Would you be willing to pay Tsh10 for a contract which permits you to sell 1 kg of standard grade cashew nut in August-December 2005 (i.e. 6-10 months from now) for at least Tsh300. (1=yes, 2=no)_____
(note you can buy as many of these 1 kg contracts as you wish)

(B) If your answer is YES, then how many contracts would you be willing to buy at this price? _____

(C) If no, what is the maximum price you would be willing to pay (in Tsh)? _____

N18 (A) Would you be willing to pay Tsh20 for a contract which permits you to sell 1 kg of standard grade cashew nut in August-December 2005 (i.e. 6-10 months from now) for at least Tsh450. (1=yes, 2=no)_____
(note you can buy as many of these 1 kg contracts as you wish)

(B) If your answer is YES, then how many contracts would you be willing to buy at this price? _____

(C) If no, what is the maximum price you would be willing to pay (in Tsh)? _____

N19.(A) Would you be willing to pay Tsh 30 for a contract which permits you to sell 1 kg of standard grade cashew nut in August-December 2005 (i.e. 6-10 months from now) for at least Tsh 600. (1=yes, 2=no)_____
(note you can buy as many of these 1 kg contracts as you wish)

(B) If your answer is YES, then how many contracts would you be willing to buy at this price? _____

(C) If no, what is the maximum price you would be willing to pay (in Tsh)? _____

N20. Would you be able to pay for the premium now? (1=yes, 2=no) _____

N21. Are you still sure of your responses? _____(1=very sure; 2=sure ; 3=have some doubt; 4=still have a lot of doubt;99=really don't know)

O. Willingness to pay for rainfall based insurance

We would like to ask you some questions relating to how weather affects your farm production, and then some questions about whether you would be interested in a particular kind of insurance for losses due to bad weather.

First I would like to ask you some questions concerning rainfall in the location of your farm.

O1 How many years out of the last ten was the rainfall in your farm …. (The sum of all answers must be 10)

A. Much below normal	B. Somewhat below normal	C. Around normal or average	D. Somewhat above normal	E. Much above normal

We would like to ask you if rainfall falls a certain percentage below normal, if you would consider it:

1= normal, 2= somewhat below normal; 3= a lot below normal. (Note to enumerator, as soon as the respondent has indicated that he considers a certain drop in rainfall below normal as 3=a lot below normal, you enter 3 for the subsequent questions till W.6)

O2 In particular, if rainfall in a particular year is around 1/10 below normal, would you say that rainfall is: _____

O3 If rainfall in a particular year is around a quarter (1/4) below normal, would you say that rainfall is: _____

O4 If rainfall in a particular year is around a third (1/3) below normal, would you say that rainfall is: _____

O5 If rainfall in a particular year is half (1/2) or more below normal, would you say that rainfall is: _____

O6 When you consider a period of 10 years, how often (i.e. how many years out of ten) did you obtain:

A. A normal revenue per acre or more (as low as 10% below average is considered normal)	B. Between 10 percent and one quarter below the average revenue per acre	C. More than one quarter, but not less than half the average revenue per acre	D. Less than half of the average revenue per acre

Explanation for the respondent

Some organizations are currently exploring the introduction of a rainfall based insurance contract. The spirit of the contract is that if the amount of rain is below a certain minimum, you would receive a certain payout. The contract will be written per acre and you can buy as many contracts as you want. In other words, if the rainfall falls below a certain level (defined as a fraction below normal rainfall), you would receive a certain amount at the time of harvest. If the rainfall was above that then you would receive nothing. If you had bought two contracts, you would receive two times that amount. If you had bought three contracts, you would receive three times that amount, etc. and you would receive a multiple of that amount depending on the number of contracts you have bought per acre. Obviously, such a contract would not come for free and you would be asked to pay a certain premium for such a contract. The premium would have to be paid at the time of the purchase of the contract, i.e. before the planting season. We would like to know if you would be interested in such contracts and how much you would be willing to pay for such a contract. While we fully realize that this is not an easy exercise, we would like to emphasize that it is important that you give us as honest and precise an answer as possible.

O7 Would you be interested in such a type of contract? (1=yes, 2=no) _____

(To the enumerator) If the answer of the respondent to the previous question is "Yes", then go to Question O9 below. Otherwise continue

O8 If your answer to W7 is No, then why is it so? (Do not read responses; select only one answer from below) _____

1. I cannot afford to pay any amount for rainfall insurance
2. I am short of funds in the period before planning
3. I have other more pressing cash needs in the period before planting
4. Declines in rainfall do not hurt me too much
5. I have other means of covering my losses due to inadequate rainfall
6. Major declines in rainfall do not occur too often
7. Other
   (explain)_____

Even if you answered that you are not interested in such a contract we would like to ask you some relevant questions to see whether you would be interested when you heard the options.

O9. Consider the following contract. When rainfall in the following year is 1/10 OR MORE below normal, then you will be paid an amount equal to Tsh12000 per acre. Are you willing to pay 2000 Tsh/acre for such a contract (you could buy as many "per acre contracts as you want"? (1=yes, 2=no)?_____

O10. How many acres (one contract per acre) would you insure at that price?

Number of acres	

O11. Consider the following contract. When rainfall in the following year is 1/10 OR MORE below normal, then you will be paid an amount equal to Tsh21000 per acre. Are you willing to pay 4000 Tsh/acre for such a contract (you could buy as many "per acre contracts as you want"? (1=yes, 2=no)?_____

O12. How many acres (one contract per acre) would you insure at that price?

Number of acres	

O13. Consider the following contract. When rainfall in the following year is 1/10 OR MORE below normal or more, then you will be paid an amount equal to Tsh 35000 per acre. Are you willing to pay 7500 Tsh/acre for such a contract (you could buy as many "per acre contracts as you want"? (1=yes, 2=no)?

O14 How many acres (one contract per acre) would you insure at that price?

Number of acres	

O15A. How much chemical fertilizer do you normally use on your farm? _____ (in kgs)

O15B. If you were to buy one of the insurance contracts offered above, how much chemical fertilizer would you use?_____ (in kgs)

O16. Consider the following contract. When rainfall in the following year is 1/3 OR MORE below normal, then you will be paid an amount equal to Tsh 20000 per acre. Are you willing to pay 1000 Tsh/acre for such a contract (you could buy as many "per acre contracts as you want"? (1=yes, 2=no)? _____

O17 If you answered yes to any of the above questions, then how many acres (one contract per acre) would you insure at that price?

Number of acres	

O18. Consider the following contract. When rainfall in the following year is 1/3 OR MORE below normal, then you will be paid an amount equal to Tsh 35000 per acre. Are you willing to pay 3000 Tsh/acre for such a contract (you could buy as many "per acre contracts as you want"? (1=yes, 2=no)? _____

O19. If you answered yes to any of the above questions, then how many acres (one contract per acre) would you insure at that price?

Number of acres	

O20. Consider the following contract. When rainfall in the following year is 1/3 OR MORE below normal, then you will be paid an amount equal to Tsh 58000 per acre. Are you willing to pay 5000 Tsh/acre for such a contract (you could buy as many "per acre contracts as you want"? (1=yes, 2=no)? _____

O21. If you answered yes to any of the above questions, then how many acres (one contract per acre) would you insure at that price?

Number of acres	

O22. If you were to buy one of the insurance contracts offered above, how much inorganic fertilizer would you use?_____ (in kgs)

Note for external readers of the questionnaire, the * on the premiums indicates an actuarially fair contract.

P. Access to credit	
P1. Does any member of your household belong to a sacco (1=yes, 2=no)	
P2. Does any member of your household belong to a rosca (1=yes, 2=no)	
P3. Does any member of your household have an individual bank account (1=yes, 2=no)	
P4A. During the last year, have you needed money quickly for an emergency, that you could not cover from your own resources? (1=yes, 2=no) If yes, go to next question; if no, go to P6A.	
P4B. Were you able to obtain money to deal with this emergency? (1=yes, 2=no)_ If yes, go to next question; if no, go to P6A.	
P5. If answer to above is yes how did you cover your needs? (1=gifts from relatives or friends, 2= borrowed from relatives or friends, 3=borrowed from sacco, or other formal credit association; 4=borrowed from rosca; 5=borrowed from cooperative or other primary society; 6=borrowed from local trader, shopkeeper or other person not related to household; 7=borrowed from local or other bank; 8=other (explain)_____)	
P6A. Did you need seasonal credit to buy inputs for the farm this year? (1=yes, 2=no) *If yes, go to next question, if no, go to P8A*	
P6B. Were you able to obtain credit for seasonal inputs? (1=yes, 2=no) *If yes, go to P7; if no, go to P8A.*	
P7. If answer to previous question is yes, then whom did you obtain this credit from? (1=borrowed from relatives or friends, 2=borrowed from sacco or other formal credit association; 3= borrowed from rosca; 4=borrowed from cooperative or other primary society; 5=borrowed from local trader, shopkeeper or other person not related to household; 6=borrowed from local or other bank; 7=other (explain)_____)	
P8A. Did you need credit to buy any of the capital items (farm or non-farm) that you bought this year? (1=yes, 2=no) *If yes, go to P8B, if no, go to P10*	
P8B. Were you able to obtain credit for capital items?	
P9. If answer to previous question is yes, then whom did you obtain this credit from? (1=borrowed from relatives or friends, 2=borrowed from sacco or other formal credit association; 3= borrowed from rosca; 4=borrowed from cooperative or other primary society; 5=borrowed from local trader, shopkeeper or other person not related to household; 6=borrowed from local or other bank; 7=other (explain)_____)	

P10. How many loans do various members of your household have now? (number)	
P11. What is the total amount of loans your household owes now? (Tsh000)	
P12. A. How much (average) interest do you pay per month on these loans (Tsh000)	
P13. Have you given out any loans to other people? (1=yes, 2=no)	
P14. What is the total amount of loans you have given out to other people now? (Tsh000)	
P15. How much (average) interest do you collect on these loans per month? (Tsh000)	
P16. Do you normally in a year spend for consumption less than your income? (1=yes,2=no) Note: income includes all cash and in kind income, as well as home production; consumption includes purchased and non-purchased items	
P17. If the answer to question above is yes, then what portion of your income do you save in a normal year? (1=less than 5%, 2=at least 5 and less than 10%), 3= at least 10 and less than 20%;4= at least 20 and as much as 30%;5=more than 30%	
P18. Do you keep some of your savings in cash? (1=yes, 2=no)	
P19. What proportion of your total savings do you normally keep in cash? (1=up to 10%, 2=more than 10%, but less than a quarter), 3= at least a quarter, but less than half;4=half or more	
P20. Do you keep some cash outside the household? (1=yes, 2=no)	
P21. If you keep cash outside the household, where do you keep it? 1=bank;,2=sacco;3=rosca; 4=other (explain)_____	

Q. Real income evolution and instability

Compared with 6 years ago (1999), is income from each of the following sources now a larger share of total income, about the same, or a smaller share of total income?
1=larger share of total now than 6 years ago;
2=about the same share as 6 years ago;
3=smaller share of total now than 6years ago.
88=do not receive any income from this source now and also did not 6 years ago.

Q1. Cash income from own farm staple food crops (cereals/banana /root crops/ etc)		Q6. Wages (cash or goods exchanged) of all types	
Q2. Cash income from sale of own livestock		Q7. Income (cash or goods exchanged) from food and other agricultural processing activities (not coffee)	
Q3. Cash income from coffee production and sales		Q8. Income (cash or goods exchanged) from other non-farm family enterprises	
Q4. Cash income from other cash crops		Q9. Income from pensions	
Q5. Cash income from sale of vegetables / fruits		Q10. Income (cash or goods) from gifts and remittances	

Q11. Has food produced by the household become a larger or smaller share of total food consumption over the past six years? _____
1=larger share of total now than 6 years ago;
2=about the same share as 6 years ago;
3=smaller share of total now than years ago.
88=do not receive any income from this source now and also did not 6 years ago.

R. Constraints to expanding income opportunities

R1. Is your household interested in increasing its agricultural production activities? _____ (1=yes; 2=no)
If yes, go to R2; if no, go to R3.

R2. IF YES, what are the three most important problems/constraints that prevent you to increase your household's agricultural activities?
1=most important, 2=second most important, 3=third most important (DO NOT READ RESPONSES) If no constraints mark 1 for responses option 17 and 88 elsewhere

	1.Cannot obtain more land		7. Prices of products too low		13. Difficulties of dealing with state
	2. Cannot obtain loans, credit for capital purchases		8. Delayed payments from buyers		14. Difficulty in dealing with primary society or cooperative
	3. Cannot obtain credit/loans for seasonal capital needs		9. Not enough family labour		
	4. Cannot find labour to hire		10. Prices of inputs too high		15. Agricultural production less profitable than other activities of household
	5. Cannot sell products		11. Cannot find suppliers of inputs		16. Other (explain)….
	6. Do not have enough own capital		12. High cost of marketing because of bad roads		17. No constraints (if no constraints mark 1 here and 88 elsewhere.)

R3. IF NO, what are the two most important reasons why you are not interested?
→ 1=most important, 2=second most important (DO NOT READ RESPONSES)

	1. Farming is not profitable		3. We can make more money doing other things		5. We cannot sell what we want to sell now
	2. We are too old		4. We do not need the money		6. Other (explain)….

R4. Are some of your household members interested in working more for wages? _____ (1=yes; 2=no)
If no, go to section S; if yes, continue.

R5. IF YES, what are the two most important problems in finding additional work?
1=most important, 2=second most important (DO NOT READ RESPONSES)

	1. There is no or little work available where we live
	2. There is work available but wages are too low
	3. We do not have any spare time to work more
	4. We make better income in our current activities
	5. Other (explain) ……..

S. Portfolio and growth preferences

S1. Suppose you earned some extra money from your income activities (equal to about half your annual income), what would you use it for?
State the 3 most important purposes (DO NOT READ RESPONSES) (1=most important, 2=second most important, 3= third most important).

1. Increase agricultural food crop production	5. Increase farm processing activity	9. Buy bicycle, motorcycle, truck, car, etc.	13. Put in savings account in bank
2. Increase coffee production	6. Increase storage capacity or other farm buildings	10. Buy food or other consumer goods	14. Other.....
3. Increase production of non-food cash crops besides coffee	7. Invest in non-farm enterprise	11. Pay for children's education	
4. Increase livestock production	8. Improve house	12. Buy household appliances	

T. Major shocks and other temporary events that negatively affected household's living conditions in the past year

SHOCKS ARE EVENTS THAT OCCUR SUDDENLY. OFTEN THEY HAVE A CLEAR BEGINNING AND A CLEAR END. THEY GENERALLY DO NOT LAST FOR MORE THAN A FEW DAYS OR WEEKS. SOME MAY EVEN BE VERY BRIEF (E.G. A HAILSTORM). THE CONSEQUENCES OF SHOCKS (E.G. LOSS OF ASSETS, OR LACK OF FOOD) MAY BE FELT FOR A LONG PERIOD OF TIME

In the past year have the living conditions in your household been negatively affected by any of the following [SHOCKS]?

ID		Over the past year, have the living conditions of household members been affected by [SHOCK]? 1= yes 2= no If 2 go to next item		How did [SHOCK] affect the food consumption of the household 1=Very negatively 2=somewhat Negatively 3=not much 4=not at all	How did [shock] affect the total consumption of the household? 1=Very negatively 2=somewhat Negatively 3=not much	How long did it take to get back to the total consumption level attained before the shock? 1. Less 1 month 2. 1-3 months 3. 3-6 months 4. 6 –12 months 5. Have not recovered yet	Who else in the community experienced this [SHOCK]? 1. Only this household was affected 2. Few households 3. Many households 4. Almost everybody
T0		T1		T2	T3	T4	T5
1	Drought						
2	Heavy rainfall, flooding, untimely rains, hailstorm						
3	Unexpected decline in cereal price compared to the previous year						
4	Unexpected decline in cash crop price compared to the previous year						
5	Major harvest losses due to wild animals, birds, livestock, insects, pests						
6	Fire/house burnt down						
7	Theft of household assets						
8	Unemployment from paid job						
9	Loss of livestock (death, theft, illness; NOT SALE)						
10	Eviction, loss of land (NOT SALE)						
11	Substantial post harvest maize loss						
12	Other (specify) _____						

			Age	Sex 1=M, 2=F				
13	Major illness not resulting in death # 1							
14	Major illness not resulting in death # 2							
15	Major illness not resulting in death # 3							
16	Death # 1							
17	Death # 2							
18	Death of person outside of household who provided important financial support							

As a direct consequence of this [SHOCK] …

			If yes in T7		If yes (code 1 in T9)		If yes (code 1) in column T11					If yes to T16		
	Of the shocks identified on the previous page, which three shocks were the most serious ones? **Provide shock ID from T0**	As a result of [SHOCK] did you lose (part of) your harvest 1=Yes 2=no → T9	How much did you lose 1=90-100% 2=1/2-90% 3=1/2 to ¼ 4=less 25%	As a result of [SHOCK] did you incur major expenses (e.g. funeral, medical bills) 1=yes 2=no → T11	How much did you spend in '000 Tsh	Did you lose any livestock? (NOT BY SALE) 1=yes 2=no → T16	How many oxen did you lose?	How many other cattle did you lose?	How many goats, pigs or sheep did you lose?	How many poultry did you lose?	Did [SHOCK] have any non-material consequences? 1=Yes 2=no → T19	What kind of consequences? **Consequence code**		**Consequence code** 1. Social disruption *e.g. immorality, drug, alcohol abuse* 2. Family breakdown *e.g. orphan hood, early marriage, inheritance* 3. Emotional breakdown *e.g. depression, mental illness* 4. Educational breakdown *e.g. interrupted school, lack of concentration* **5.** Other ____(specify)
	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	
Most Serious														
Second Shock														
Third Shock														

To reduce the consequences of this [SHOCK] (e.g. for the household's food consumption) or to recover from the [SHOCK] (e.g. to rebuild a house) **…**

			If yes to T20			If yes to T23	**If 1-4 in T24**		**If yes to T26**			**If yes to T29**	
	Shock ID **From P6**	Did you use cash savings? Or did you sell, barter or exchange land, animals or other assets? 1=Yes 2=no → T23	What assets did you sell or exchange? **Codes at bottom in column 1**		Did you receive assistance from family or others (friends, NGO, gov't)? 1=Yes 2=no → T26	From whom **Codes at bottom in col 2**	Is the person from whom you received aid:1=better-off than you, 2=about the same, or 3=poorer than you?	Did you engage in new ways of generating income? *e.g. sell food / crafts, work off farm…* 1=Yes 2=no → T29	What did you do? **Codes at bottom in column 3**		Did you take any other actions to deal with [SHOCK] *e.g. Borrow, eat less expensive food…*? 1. Yes 2. No	What did you do? *e.g. borrow money,, migration* **Codes at bottom in column 4**	
	T19	T20	T21	T22	T23	T24	T25	T26	T27	T28	T29	T30	T31
Most Serious													
Second Shock													
Third Shock													

Column 1 Sale or exchange of assets or savings	Column 2 Reliance on assistance and aid	Column 3 Adaptations in income generation	Column 4 Other actions
1. House 2. Land 3. Oxen 4. Other cattle 5. Other livestock 6. Food stock 7. Household appliances 8. Jewellery 9. Cash Savings 10. Other (specify) _____	**from ..** 1. Relative in village 2. Relative outside village 3. Neighbours / friends in village 4. friends outside village 5. Local religious organization, NGO, or village official 6. (inter) national NGO 7. government 8. Other _____(specify)	1. Work harder, longer hours on farm 2. Engage in (more) off farm labour 3. Crafts, carpentry, beer making and other self employment 4. Join food for work program 5. Prostitution 6. Send children to work or beg 7. Other (specify)_____	1. Migrate with household to other area 2. Borrow money or food 3. Send household members away to look for work 4. Postpone purchase of clothing and other durables 5. Eat less expensive food (no meat or fish) 6. Collect and eat wild foods 7. Eat less 8. Other (specify)

U. Household consumption expenditures

A. FOOD, BEVERAGES AND TOBACCO

On average, how many people were present in the household and participated in the meals in the last 7 days? Also indicate the number of visitors who participated in the meals and the number of days they did so.

U1	Household Members		Visitors			
	(1) Adults	(2) Children	(3) Adult	(4) # days	(5) Children	(6) # days
(A) Male						
(B) Female						

How much of each of the following food items has the household (including meals prepared for visitors) consumed over the past 7 days. **Enumerators - let wife assist as she may be more familiar with food consumption than the man.**

Item Description	Code	Total amount consumed	Unit of Qty 1=kg 2=litre 3=pieces 4=gram 5=other…	Purchased (incl. food bought while temporarily away from home by household members and visitors over past 7 days.		Consumption out of home produce	Obtained as gift
				Qty.	Value (Tsh)	Qty	Qty
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Banana	101						
Maize (grains)	102						
Maize (cobs)	103						
Maize (flour)	104						
Beans (dry)	105						
Rice	106						
Millet/sorghum	107						
Bread	108						
Sweet Potatoes (Fresh)	109						
Casava(Fresh	110						
Cassava(Dry/Flour)	111						
Irish Potatoes	112						
Beef	113						
Pork	114						
Goat/sheep meat	115						
Other meat	116						
Chicken	117						
Fresh Fish	118						
Dry/Smoked fish	119						
Eggs	120						
Fresh Milk	121						
Cooking oil	122						
Margarine, Butter, etc	123						
Fruits	124						
Onions	125						
Tomatoes	126						
Cabbages	127						
Peas	128						
Other Vegetables	129						
Groundnuts	130						
Sugar	131						
Coffee	132						
Tea	133						
Salt	134						
Soda/soft drinks/ juice	135						
Beer local	136						
Beer commercial	137						
Cigarettes	138						
Other Tobacco	139						
Restaurant exp on food	140						
Restaurant exp on drinks	141						
Spices	142						

B. NON-DURABLE GOODS AND FREQUENTLY PURCHASED SERVICES (during last 30 days)

Item	Code	Unit of Quantity 1=kg 2=litre 3=pieces 4=gram 5=other	Purchases		Home Produced		Obtained as gift	
			Quantity	Value (Tsh000)	Quality	Value (Tsh000	Quality	Value (Tsh000
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Housing expenditures								
Rent of rented house	201							
Maintenance and repair expenses	202							
Water	203							
Electricity	204							
Paraffin (kerosene)	205							
Charcoal	206							
Firewood	207							
Others	208							
Personal care								
Matches	210							
Washing soap	211							
Bath soap	212							
Tooth paste	213							
Cosmetics	214							
Handbags, travel bags etc	215							
Batteries	216							
Newspapers and magazines	217							
Others	218							
Transport& communication								
Tyres, Tubes, spares, etc.	220							
Petrol, diesel etc.	221							
Taxi and/or bus fares	222							
Stamps, envelopes, etc	223							
Air time & service fee for mobile phones	224							
Expenditure on fixed phones	225							
Others	226							
Health expenditures								
Consultation Fees	230							
Medicines etc.	231							
Hospital/Clinic charges	232							
Traditional doctors fees/medicines	233							
Others	234							
Other service								
Sports, theatres etc	240							
Dry Cleaning and Laundry	241							
Houseboys/girls, Shamba boys etc.	242							
Barber and beauty shops	243							
Expenses in hotels, lodging places	244							
Milling expenses	245							

C. SEMI-DURABLE AND DURABLE GOODS AND SERVICES (during last 365 days)

Item Description	Code	Purchases Value (Tsh000)	Free (obtained as gift) Value (Tsh000)
(1)	(2)	(3)	(5)
Clothing			
Men's clothing	301		
Women's clothing	302		
Children's wear	303		
Clothing Material and tailoring	304		
Men's Footwear	305		
Women's Footwear	306		
Children's Footwear	307		
Other Footwear and Repairs	308		
Furniture, Carpet, Furnishings etc			
Furniture Items (chairs, sofas, tables, beds, cupboards, chest of drawers, wardrobes, book cases)	401		
Carpets, Mats, etc.	402		
Curtains	403		
Bedding Mattresses	404		
Blankets and bed sheets, etc.	405		
Mosquito nets	406		
Insecticide for mosquito nets or spraying the compound	407		
Other and Repairs	409		
Household Appliances and Equipment			
Electric iron/Kettles/cooking pots etc.	421		
Charcoal and Kerosene stoves	422		
Electronic Equipment (TV. dish antenna, decoder, etc.)	423		
Radio/cassette player/stereo equipment	424		
Computer/printer	425		
Bicycles	426		
Motorcar, pick-ups, etc.	427		
Motor cycles	428		
Phone Handsets (Both Fixed and Mobile)	429		
Other equipment and repairs	430		
Jewellery, Watches etc.	431		
Glass/Table Ware, Utensils & Electric goods			
Plastic Basins	441		
Plastic plates/tumblers	442		
Jerry cans and Plastic buckets	443		
Enamel and metallic utensils	444		
Switches, plugs, cables, bulbs etc	445		
Others and repairs	449		
Education			
Schools fees including PTA	601		
Boarding and Lodging	602		
School uniform	603		
Books and supplies	604		
Other educational expenses	609		
Other services			
Expenditure on household functions	801		
Insurance Premiums	802		
Other services N.E.S.	809		

D. NON-CONSUMPTION EXPENDITURE

Items Description	Code	Value during 12 months (Tsh000)
(1)	(2)	(3)
Taxes and duties paid	901	
Pension and social security contribution	902	
Remittances, gifts and other transfers including title	903	
Contributions to funerals and other functions	904	
Others (like subscriptions, interest to consumer debts, etc	909	

E. WHAT KIND OF TAXES HAVE YOU PAID THIS YEAR?
(NOTE: the sum of taxes reported below should equal the value in 901)

Type of tax / product	Code	A. Paid any of the following taxes? (1=yes,2=no)	B. If yes, what was the total amount of taxes paid this year (Tsh000)	C. Has amount of tax increased since 5 years ago? 1=yes, 2=the same 3=decreased 4=tax did not exist 5 years ago)
Produce cess				
Coffee	1001			
Maize	1002			
Other crops	1003			
Livestock	1004			
Cashew	1005			
Tobacco	1006			
Education levy				
Coffee	1007			
Maize	1008			
Other crops	1009			
Livestock	10010			
Cashew	10011			
Tobacco	10012			
Village levy				
Coffee	10013			
Cashew	10014			
Tobacco	10015			
Other products	10016			
Development levy	10017			
Other taxes (explain) ……..	10018			
Other taxes (explain) ……..	10019			
Other taxes (explain) ……..	10020			

We would like to thank you for your time and cooperation.

TANZANIA VULNERABILITY SURVEY 2004
Research on Poverty Alleviation World Bank, and FAO

Kilimanjaro Round 2. Village Questionnaire (November 2004)
(to be answered by village committee/council or focus group of knowledgeable villagers)

Date of interview :_____day _____ month

	Region	District	Ward	Village	Household Head
Name					
Code					

1= **Region Code**
Kilimanjaro
2=Ruvuma

District Code
1=Rombo
2=Mwanga
3=Same
4=Moshi Rural
5=Hai

Village code (same code can be given to the ward of that particular village)
1=Mamsera Juu
2=Mengwe Chini
3=Aleni-Chini
4=Shimbi Mashami
5=Mrao
6=Mrere
7=Kiooti
8=Samanga
9=Leto
10=Nayeme
11=Nalemuru
12=Mamba
13=Jipe
14=Sofe
15=Ruvu Jiungeni
16=Mtunguja
17=Lugulu
18=Vugwama
19=Kimangaro
20=Mrimbo Uuwo
21=Kimbogho
22=Rauya
23=Nduweni
24=Kilema Chini
25=Mero
26=Ngasinyi
27=Tsuduni
28=Korini Juu
29=Mnini
30=Kariwa
31=Mtakuja
32=Uhuru
33=Sungu
34=Manushi Ndoo
35=Kindi kati 1
36=Uchira
37=Omarini
38=Sango
39=Nkuu-Ndoo
40=Kikavu Chini
41=Nshara 'A'
42=Mbweera
43=Mbosho
44=Kishisha
45=Nrao Kisangar

Note – codes for ward and village are the same

Enumerator – please record the various readings of latitude, longitude and altitude of the community. Take the place of interview as point of reference. Readings should be between 2°25' and 4°25' South (of Equator) latitude and 36°25'3'' and 38°18'00''East of Greenwich longitudinally.

	Latitude (xx°xx'xx''S)	Longitude (xx°xx'xx''E)	Altitude (meters)
1st reading			
2nd reading			
3rd reading			

	Name	code
Enumerator		
Supervisor		
Data enterer		

Note to Enumerator – please use following codes throughout the questionnaire
99 if the respondent does not know, does not remember or refuses to answer (in other words answer is not necessarily zero)
88=Not Applicable (question irrelevant for the respondent)

A. Information about Community Respondents

May we please ask you a few questions about yourselves before we start the interview?

A.1 How many men are present at this meeting? _____

A.2 How many women are present? _____

A.3.A. Is the village chairman present? _____ (1=yes; 2=no) B. gender of chair _____ (1=male; 2=female) C. age _____ D.. years served as chair _____

A.4 Is village executive officer present? _____

A.5 Number of other elected officials present _____

A.6 How many people present have completed:

a. no formal schooling _____ b. some primary_____ c. primary_____ d. some secondary_____ e. form IV_____ f. form VI_____

A.7 Number of people present whose main activity in terms of total income is farming _____

A.8 Number of public sector employees present _____

Social and Demographic Information

A.9 How many people live in the village now? _____ (incl. those temporarily away)

A.10 How many households live in the village? _____

A.11 How many new households have **moved into** this village from outside during the past year? _____

A.12 How many households from this village **have left** the village permanently in the last year? _____

A.13 Has this village requested or received financial support from an association of former inhabitants of the village or surrounding area over the past year. (1=Y,2=No) _____

A.14 In how many households do members often migrate temporarily to work elsewhere (1=almost everyone; 2=about three quarters; 3=about half; 4=about a quarter; 5=very few; 6=none)

A.15 Do households generally receive remittances? _____ (1=almost everyone; 2=about three quarters; 3=about half; 4=about a quarter; 5=very few; 6=none)

A.16 Not including the village committee, how many economic or social organizations are there? _____

A.17 How many of these organizations are active? _____

B. Geographical and agro-ecological information about the village

B1. How many months of the year does it normally rain? _____

Which are the months of rains?	1. Jan	2. Feb	3. March	4. Apr	5. May	6. Jun	7. Jul	8. Aug	9. Sept	10. Oct	11. Nov	12. Dec
B2. In which months does it **normally** rain and how much does it rain in each of those months? (0=no rain; 1= little bit of rain; 2=moderate rain; 3= lot of rain)												
B3. How did the rains this **past year** compare to normal in **each** month (1=much above normal; 2=somewhat above normal; 3=around normal; 4=somewhat below normal; 5=much below normal)?												

B4. Indicate for the following crops during which months they are normally **planted (P), weeded (W), harvested (H) and sold (S)** in this village												
B4a.1 Maize Masika (P, W, H)												
B4a.2 Maize Vuli (P,W,H)												
B4b.1 Beans Masika (P, W, H)												
B4b.2 Beans Vuli (P, W, H)												
B4c. Coffee (P, W, H)												
B4d. Banana (P, W, H)												

B5 How much CASH expenditures do households typically have in each month? (0=almost none; 1=a little bit; 2=some; 3=a lot)												

B6 How high is the demand for hired labour during each of the following months? (0=no demand; 1=some demand; 3=high demand)												

B7. Is it difficult for anyone (including residents and non-residents) to obtain a plot of land in this village? (1=yes; 2=no)? _____

B8. If yes, why? (1=too expensive; 2=not many plots available; 3=both; 4=other - explain
B_____) A_____

B9. Share of all households in community with coffee trees. _____

B10. Share of all households in community who still grow coffee _____

B11. What is the distance to the nearest town (km)? _____

B12. How many hours does a truck take to go to the nearest town

B13. During the rainy season? Hours A_____ Minutes B _____

B14. What proportion of households lives within 1 km of centre of village? _____

B15. What proportion of households lives between 2 and 5 km of the centre of the village? ___

C. Socio-economic information about the village

Is there a _____ in the village?	A. Were the following services present last year? (1=yes, 2=no)	B. Are the following services present in the village now? 1=Yes, 2=No	C. If the answers to the previous question is no, has the distance (in km) to the nearest service 1=remained the same 2=changed compared to last year.	D. If the answer to the previous question is 2, at how many kms is the nearest service now?
C1.Elementary school				
C2. Junior secondary school				
C3. Senior secondary school				
C4. Church				
C5. Dispensary				
C6. Health centre				
C7 Hospital				
C8. Bore hole for water				
C9. Community well				
C10. Public water tap				
C11. Market				
C12. All weather road (tarmac)				
C13. All weather road (gravel)				
C14. Electricity				
C15. Public telephone				
C16 Possible to receive cell phone				
C17 Bus service to nearby town?				
C18 Village bank or other formal credit society or association				
C.19 Agricultural Extension agent				
C20. Veterinary service				
C21. Sales point for agricultural inputs (fertilizer, seeds,…)?				
C22. Primary society?				

D. Information on shocks

I would like to ask you about important shocks that have taken place in this community over the past year? Shocks are events which happen unexpectedly and which can cause substantial damage to people's livelihoods.

Event description	A. Has the following shock taken place over the past year?1=Yes; 2=No If "No", go to next event.	B. What proportion of the community has been affected by this shock (%)?
D1. Fire		
D2. Flood		
D3. Drought		
D4. Irregular rainfall pattern (too late, too early, …)		
D5 Unexpected drop in cereal prices from one year to the other		
D6 Unexpected drop in coffee prices from one year to the other		
D9 Epidemic (malaria, cholera, …)		
D11 Animal disease		
D12 Banditry/thefts		
D13 Others (Specify)		

D14 Did the Masika rains come on time this past year? _____
(1=on time; 2=somewhat late; 3= very late)

D15 Did the Vuli rains come on time this past year? _____
(1=on time; 2=somewhat late; 3= very late)

W1. In how many years out of the last ten was the rainfall in the village (Insert number of years out of last ten. The sum of all answers must be 10)

A. Much below normal	B. Somewhat below normal	C. Around normal or average	D. somewhat above normal	E. much above normal	F. Sum of the years to the left

W2. In how many years out of the last ten was the rainfall in your village (Insert number of years out of last ten. The sum of all answers must be 10)

A. Above or around normal or minimally (5% or less) below normal	B. Around 10% (1/10) below normal	C. Around a quarter (1/4) below normal	D. Around a third (1/3) below normal	E. Around half (1/2) below normal	F. Less than half (1/2) of normal	G. Sum of the years to the left

We would like to ask you if rainfall falls a certain percentage below normal, if you would consider it:
1= normal, 2= somewhat below normal; 3= a lot below normal. _____

Note to enumerator, as soon as the respondent has indicated that he considers a certain drop in rainfall below normal as 3=a lot below normal, you enter 3 for the subsequent related questions)

W.2 In particular, if rainfall in a particular year is around 1/10 below normal, would you say that rainfall is:
_____

W.3 If rainfall in a particular year is around a quarter (1/4) below normal, would you say that rainfall is:
_____

W.4 If rainfall in a particular year is around a third (1/3) below normal, would you say that rainfall is:
_____

W.5 If rainfall in a particular year is half (1/2) or more below normal, would you say that rainfall is:
_____

E. Labour market information

We would like to ask you some questions on the daily standard agricultural wage rate for adults. Note that this rate should be the sum of the remunerations received in cash as well as those received in kind, i.e. the cost of non-cash wage items such as meals, part of the harvest, etc.

Activities	(A) Land preparation	(B) Planting	(C) Weeding	(D) Harvesting
E.1 What was the agricultural daily wage rate this past year for the different activities (Tsh/day) for men?				

If daily wage rates are unknown and expressed as a lump sum for a particular task, what was on average:
(if E1 was answered, go directly to E4)

E.2 The total labour cost of preparing 1 acre of land **last year** and how long does it take on average
A_____(Tsh) B___ (days)

E.3 The total labour cost of weeding 1 acre of land **last year** and how long does it take on average
A_____(Tsh) B___(days)

E.4 During the peak season month for labour demand do some village members go to other villages or town to work? (1=yes, 2=no)_____

E.5 What is the price of 1 bag of Urea and how many kg does it contain?
A._____ price (Tsh) B. ____ kg

E.6 What was the price of 1 bag of Urea **last year** and how many kg does it contain?
A._____ price (Tsh) B. ____ kg

E.7 What is the price of 1 bag of DAP and how many kg does it contain?
A._____ price (Tsh) B. ____ kg

E.8 What was the price of 1 bag of DAP **last year** and how many kg does it contain?
A._____ price (Tsh) B. ____ kg

E.9 At the sales point for agricultural inputs mentioned in C22, is fertilizer typically physically available when needed (1=yes; 2=no)? _____

F. Information on Marketing

F1. How many different traders/companies visited the village last year to buy **maize**?_____

F2. How many different traders/companies visited the village last year to buy **coffee**?_____

G. Information on taxes

What types of taxes are collected in the village?

Type of tax	A. Collected in village? (1=yes; 2=no	B. Who collects it?	C. Amount of tax in this year		D. How does tax compare to that of last year	E. How does tax compare to that of five years ago	F. How many people in the village pay this tax
		1=village authorities 2=district authorities 3=primary societies 4=other	C1. unit on which tax is levied 1=kg of product 2=head of livestock 3=household 4=person, 5=acre of farm 6=other (explain)	C2. amount in Tsh/unit	1=increased 2=decreased 3=stayed the same 4=tax did not exist last year	1=increased 2=decreased 3=stayed the same 4=tax did not exist five years ago	1=all 2=some but not all 3=only a few 4=no-one
District produce cess of:							
10. coffee							
11. other crops							
20. education levy							
30. district trading licenses							
40. village levy							
50. tax on livestock							
60. other tax (1) (explain…)							
61. other tax (2) (explain…)							
62. other tax (3) (explain…)							

Appendix 3: Notes on the construction of the income and consumption variables

Income aggregate

The income aggregate is the sum of the individual income flows from all income generating activities of the household during the year prior to the survey. Income is composed of farm and non-farm income. Farm income is composed of income from crop production, livestock income, income from processed farm products and finally income from animal products. A detailed catalogue of more than 20 crops, six types of animals, five animal products and several processed farm products captured the variety of agricultural products produced by the sampled farm households in Kilimanjaro and Ruvuma. For each subcategory of farm activity, income was computed as the sum of the reported values of annual sales plus the value of home consumed annual farm production. The latter flows were valued at median regional unit prices, computed from all the reported sales of all farmers in the regions who sold the product. Livestock income was estimated as income from animal sales plus value of home-consumed slaughtered animals. A detailed farm input module was included in the survey, concerning ten different types of inputs. This allowed the calculation of agricultural net income. Home produced inputs were valued at median regional input prices.

Income from non-farm activities was composed of cash and in kind income from regular and irregular wages, non farm business income, pensions, amounts received from state or other institutions as assistance (e.g. NGO), as well as gifts from neighbours, relatives, family, or others and remittances. The above data were collected using a yearly recall module for each household member above five years old.

Consumption aggregate

The consumption aggregate is the sum of the value of all items consumed. This includes purchased and home produced items, as well as items received as gifts. Data on food consumption expenditures were collected using a seven-day recall module on food, drink, and tobacco; a one-month recall module on frequently purchased non-durable goods and services including cooking fuel, transport, communications, personal effects, and health care; and a one-year recall module on durables, education, and other infrequent expenditures such as expenditures on functions and taxes. A detailed description of all items is in the questionnaire in Appendix 2. The 2000/01 Tanzanian Household Budget Survey consumption aggregate excluded expenditures on health care, education, water, postage, rent, and durables. For the sake of comparability, we also exclude these items from the consumption aggregate.

For all items for which both quantity and expenditure values were collected (this includes all foods, fuel for cooking and lighting, batteries, matches, and soap), we compute unit values for both kilograms and ‘pieces’, and use regional median unit values for each item to impute the value of home-produced and gifted items. For purchased items, we use the actual reported expenditure, both to capture differences in quality among goods within the same category, and because it was thought that expenditures were more accurately reported than were quantities consumed.

Because the value of calculated expenditures using this method was much higher than that reported in the HBS, we adjust our consumption values using the following method:

(1) multiply the nominal regional mean per capita expenditure reported in the HBS final report for rural Kilimanjaro and Ruvuma by the real per capita GDP growth and CPI increase from 2000-2003.
(2) divide the mean expenditure calculated from an HBS-comparable basket (as described above) from the survey by the regional means derived in (1) to compute a "ratio of underestimation" of 1.26 for Kilimanjaro and 1.18 for Ruvuma.
(3) divide all expenditures (HBS-comparable basket) by the regional ratio of underestimation.

Poverty Lines

The poverty lines are constructed according to the cost-of-basic-needs methodology as follows. The food poverty line is taken from the 2000/01 HBS, and reflects the composition of food items consumed by the poorest 50 percent of households, adjusted by a constant to meet the minimum recommended calorie intake of 2,200 calories per adult per day. This amount was adjusted by a regional Fisher index, also taken from the HBS, and multiplied by the change in food CPI since 2000 to calculate the 2003 food poverty line used here. Households with *food* expenditures per adult equivalent below this line are considered *food poor*. Adult equivalent units reflect age and sex specific consumption requirements, and are the same as those used in the HBS, as follows:

Age	Males	Females
0-2	0.4	0.4
3-4	0.4	0.48
5-6	0.56	0.56
7-8	0.64	0.64
9-10	0.76	0.76
11-12	0.8	0.88
13-14	1	1
15-18	1.2	1
19-59	1	0.88
>59	0.88	0.72

The value of total consumption per adult equivalent (per capita) is calculated by dividing total consumption by the value of adult equivalents (number of members) from the household roster. However, for food consumption we divide by the adult equivalent value (number) of those present for meals. Household sizes in the second round were found to be much larger than in the first round. Most of this difference is attributable to children studying away from home, who were counted as household members in the second round, but not in the first. To correct for this spurious difference in household size, and thus per capita and per adult equivalent consumption values, we subtract from the second round adult equivalent value and household size the value of those members who are students and who have spent time away from home during the past year.

To calculate a regional basic needs poverty line, we take the food poverty line as derived above, and following the HBS, divide this by the food share of total consumption expenditures of the poorest 25 percent of households in that region to allow for non-food consumption. Poverty lines and regional poverty rates are reported in Chapter 2, Tables 2.19 and 2.20

Rural household vulnerability and insurance against commodity risks

Evidence from the United Republic of Tanzania

This report has two objectives. It assesses the nature and the extent of vulnerability among rural households in Tanzania with a particular focus on smallholder cash crop growers through exploring all risks, including the decline in commodity prices. It further explores the potential role for market based insurance schemes such as commodity price and weather based insurance to mitigate household vulnerability. The empirical analysis is based on two rounds of specifically designed representative surveys of farm households in Kilimanjaro and Ruvuma, two cash crop growing regions in the United Republic of Tanzania in 2003 and 2004. The contrasting experiences of a richer (Kilimanjaro) and a poorer (Ruvuma) region substantially enriches the policy guidance emerging from the report. The report applies descriptive, econometric and contingent valuation techniques to achieve its objectives. The findings identify drought, health and commodity price shocks as the key risks faced by rural households in Kilimanjaro and Ruvuma. The welfare losses associated with these shocks are substantial. Households extensively use self and mutual insurance to cope with these shocks, but nonetheless, there remains substantial uninsured risks as indicated by the considerable stated demand for coffee and weather based insurance which could have important societal benefits. The "latent" demand for insurance further suggests that current ways of coping may not be efficient and that there may be important economic opportunities which insurance could open up. Liquidity constraints emerge as important impediments in adopting such market based insurance schemes. Great care will need to go into the design and institutional delivery mechanisms of market based insurance. The establishment of interlinked markets such as input, credit and insurance packages deserves special attention in this regard. Finally, other, more traditional, public interventions such as providing public health services, fostering connectivity and access to off-farm employment, and better water management techniques were also identified as promising household vulnerability reducing interventions.

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