Climate shocks and risk attitudes among female and male maize farmers in Kenya

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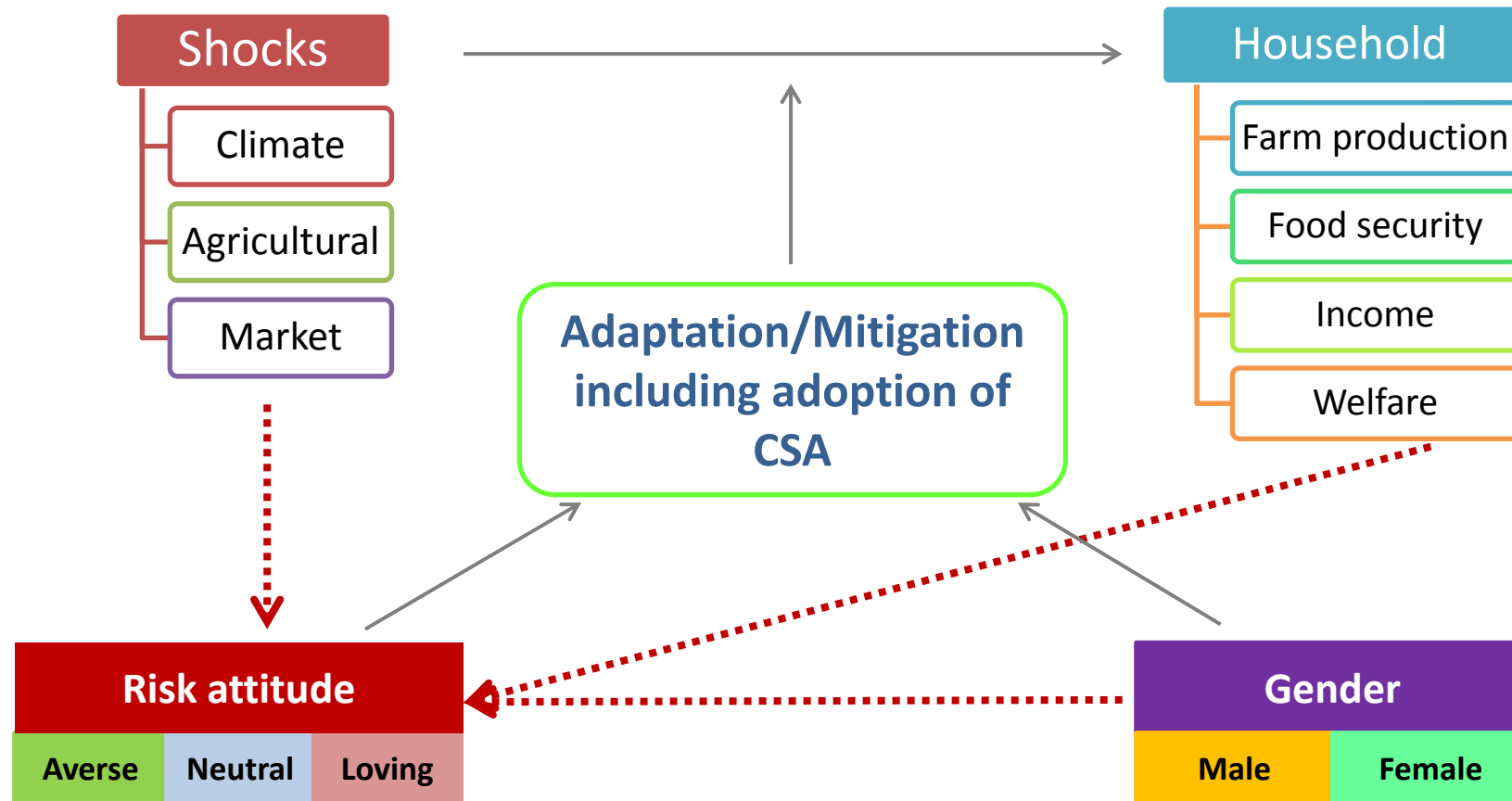
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Introduction

Objectives

- To assess whether there is significant difference between male and female maize farmers in their attitudes towards risk

- To evaluate consistency of risk attitude measured by *self-assessment and 2 experimental elicitations*

- To identify factors, in particular the climate, agricultural and market shock experience, that influence risk attitudes elicited from 3 different methods
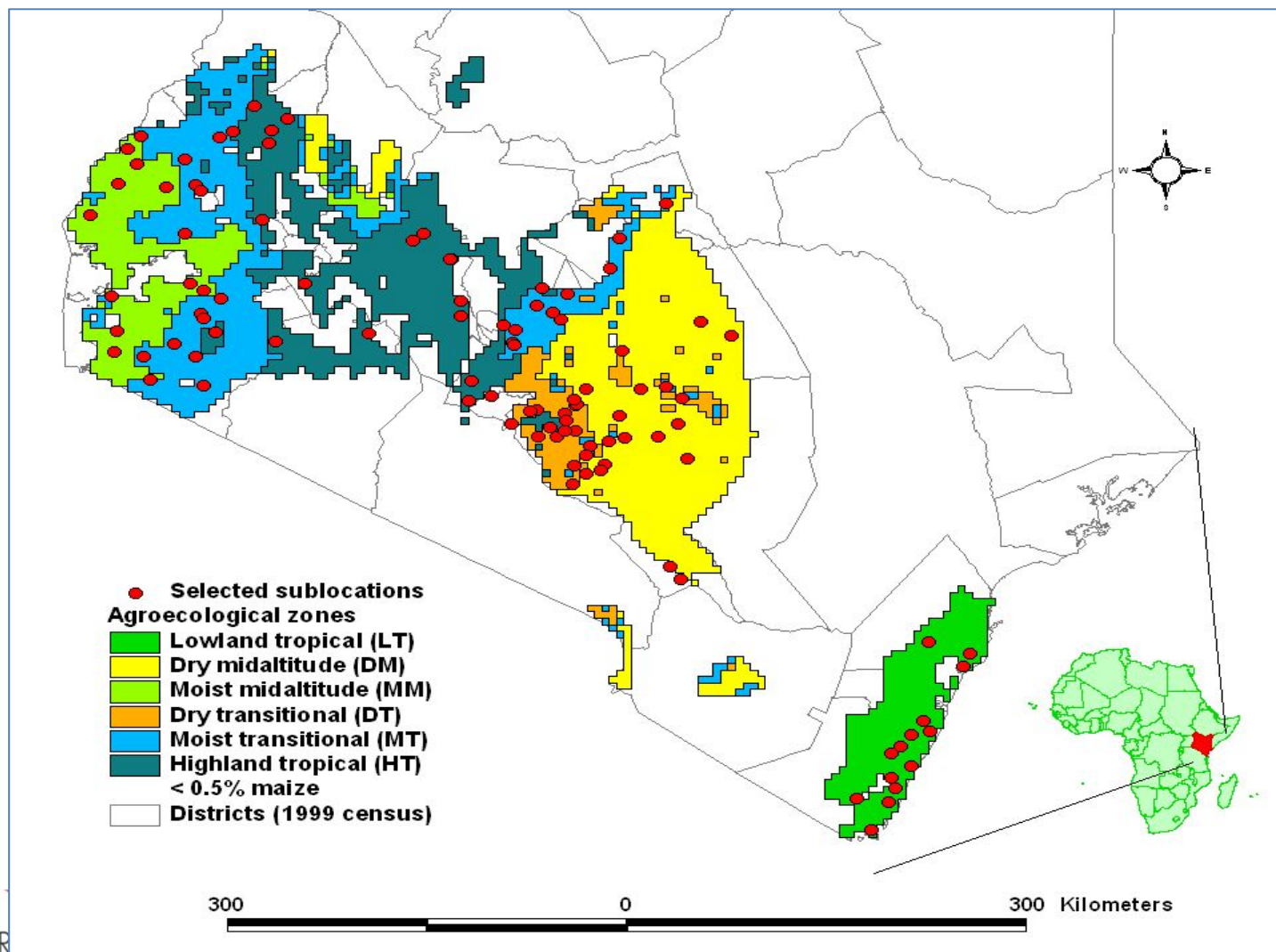
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Data and study site

Kenya Rural Maize Household Survey (2013)

AEZ	Number of sub-locations	Number of households	Number of respondents		
			Male	Female	Total
Coastal Lowland	15	90	72	79	151
Dry Mid-Altitude	18	216	151	200	351
Dry Transitional	17	204	152	185	337
Moist Transitional	33	354	272	321	593
Highland Tropics	20	240	179	216	395
Moist Mid-Altitude	18	240	185	209	394
Total	121	1344	1011	1210	2221

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Data and study site

Maize agro-ecological zones and surveyed sub-locations in Kenya
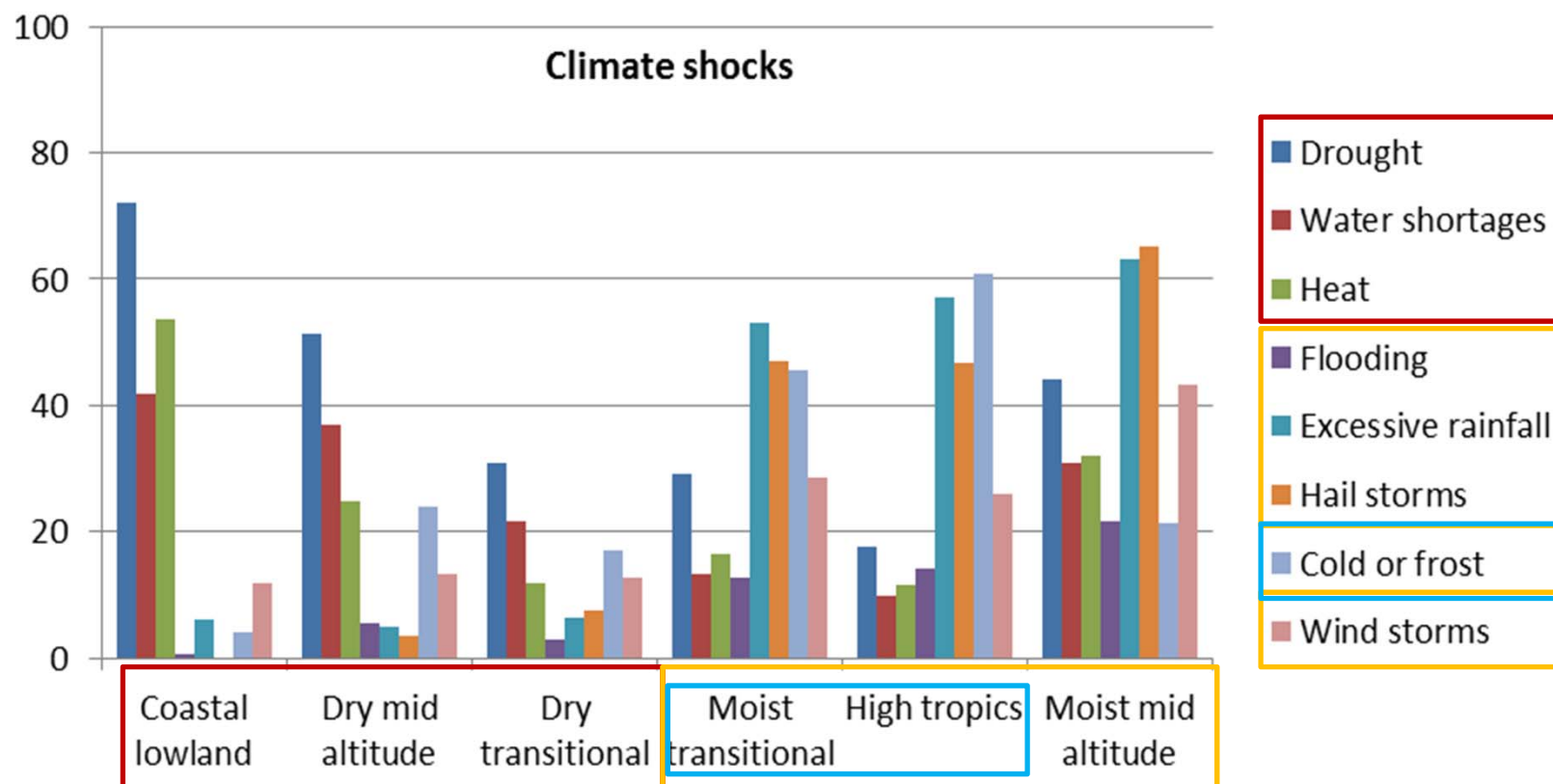
Selected sublocations
Agroecological zones
- Lowland tropical (LT)
- Dry midaltitude (DM)
- Moist midaltitude (MM)
- Dry transitional (DT)
- Moist transitional (MT)
- Highland tropical (HT)
- < 0.5% maize
- Districts (1999 census)

300   0   300   Kilometers
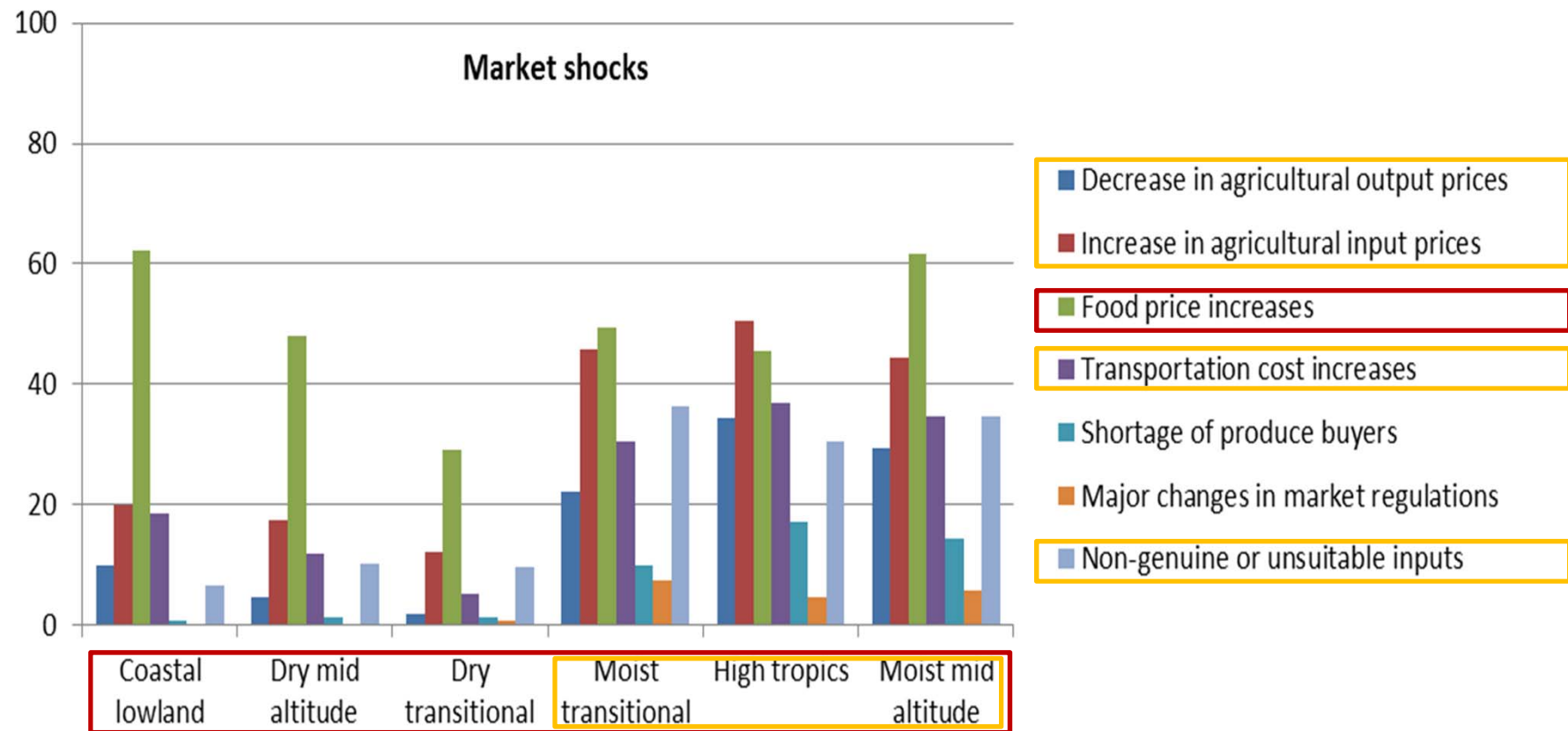
% of households who had experienced shocks in last 2 years (2011-2012)

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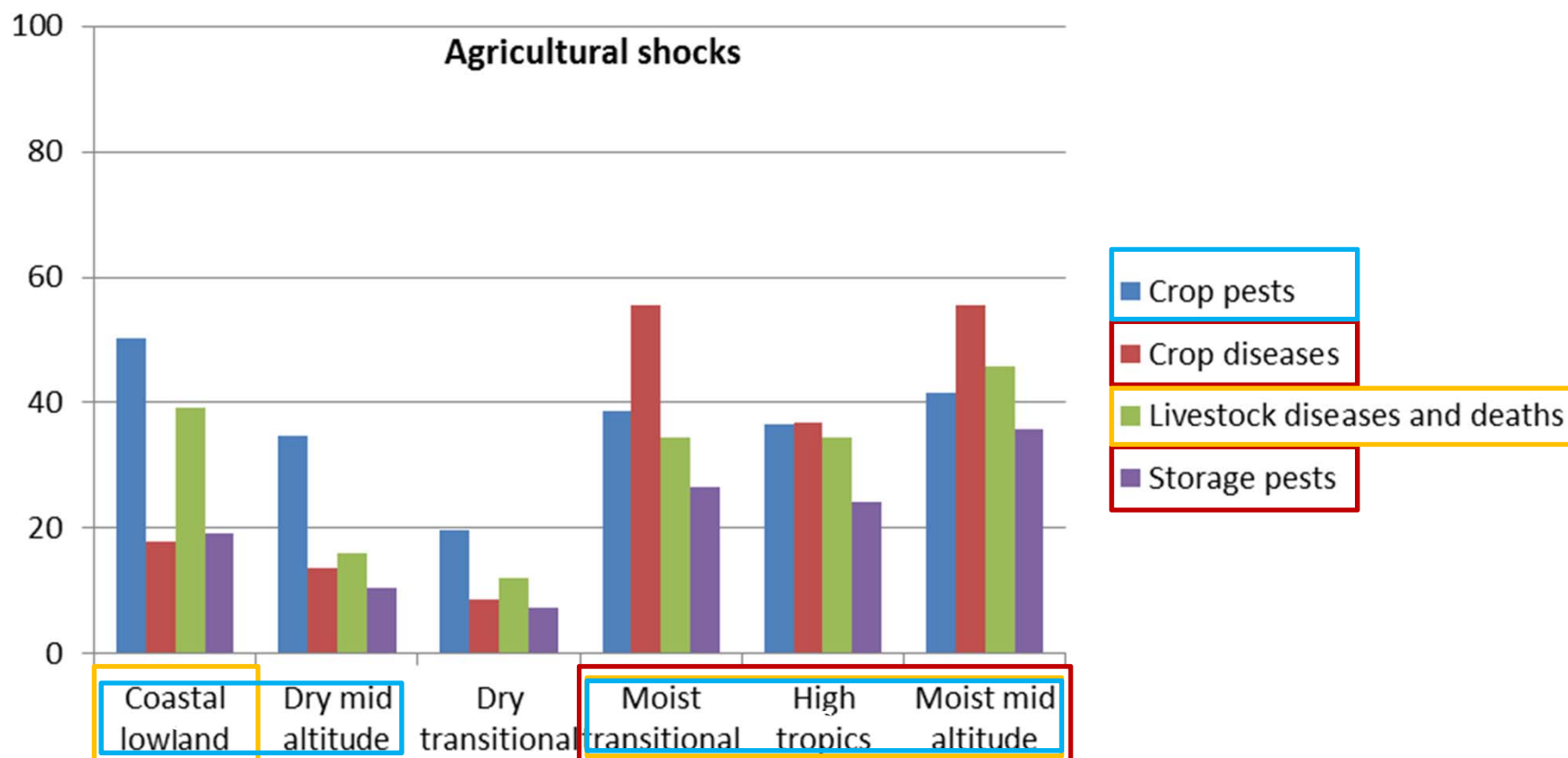
% of households who had experienced shocks in last 2 years (2011-2012)

Risk elicitation method

1. General risk self-assessment scale *Dohmen et al. (2011) and Hardeweg et al. (2011)*

In general, to what extent do you take risk?
Please choose on a scale below

Risk elicitation method

2. Lottery Choice Experiment (MPL) *Holt and Laury (2002) & Eckel and Grossman (2008)*

Lottery choice with increasing expected payoffs and standard deviation

**Candy test-run
50 Ksh endowment**

Choice	Event A Blue stone Probability 50%	Event B Yellow stone Probability 50%	Respondent's selection	Give reason
1	50	50		
2	80	30		
3	100	20		
4	120	10		
5	150	-20		
6	none of the above choice			

Expected payoff	Standard deviation	Implied risk attitude
50	0	High risk averse
55	25	Moderate risk averse
60	40	Low risk averse
65	55	Risk neutral
65	85	Risk loving
		Extreme risk averse

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Risk elicitation method

3. Lottery Purchase Experiment (BDM auction)

Candy test-run
100 Ksh endowment
Random price draw

Maximum willingness to pay for a lottery

Lottery price (KSH)	Respondent's willingness to pay	Lottery payoff (KSH)		Give reason	Implied interval for the coefficient of relative risk aversion			Implied risk attitude
		Event A Blue stone probability 50%	Event B Yellow stone probability 50%		lower bound		upper bound	
0		100	0		0.699	to	inf	Risk averse
10		100	0		0.569	to	0.699	Risk averse
20		100	0		0.424	to	0.569	Risk averse
30		100	0		0.244	to	0.424	Risk averse
40		100	0		0	to	0.244	Risk averse
50		100	0		-0.357	to	0	Risk neutral
60		100	0		-0.943	to	-0.357	Risk loving
70		100	0		-2.106	to	-0.943	Risk loving
80		100	0		-5.579	to	-2.106	Risk loving
90		100	0		-inf	to	-5.579	Risk loving
100		100	0		irrational		irrational	Irrational

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Results: Consistency

Response comparison of three risk measurements
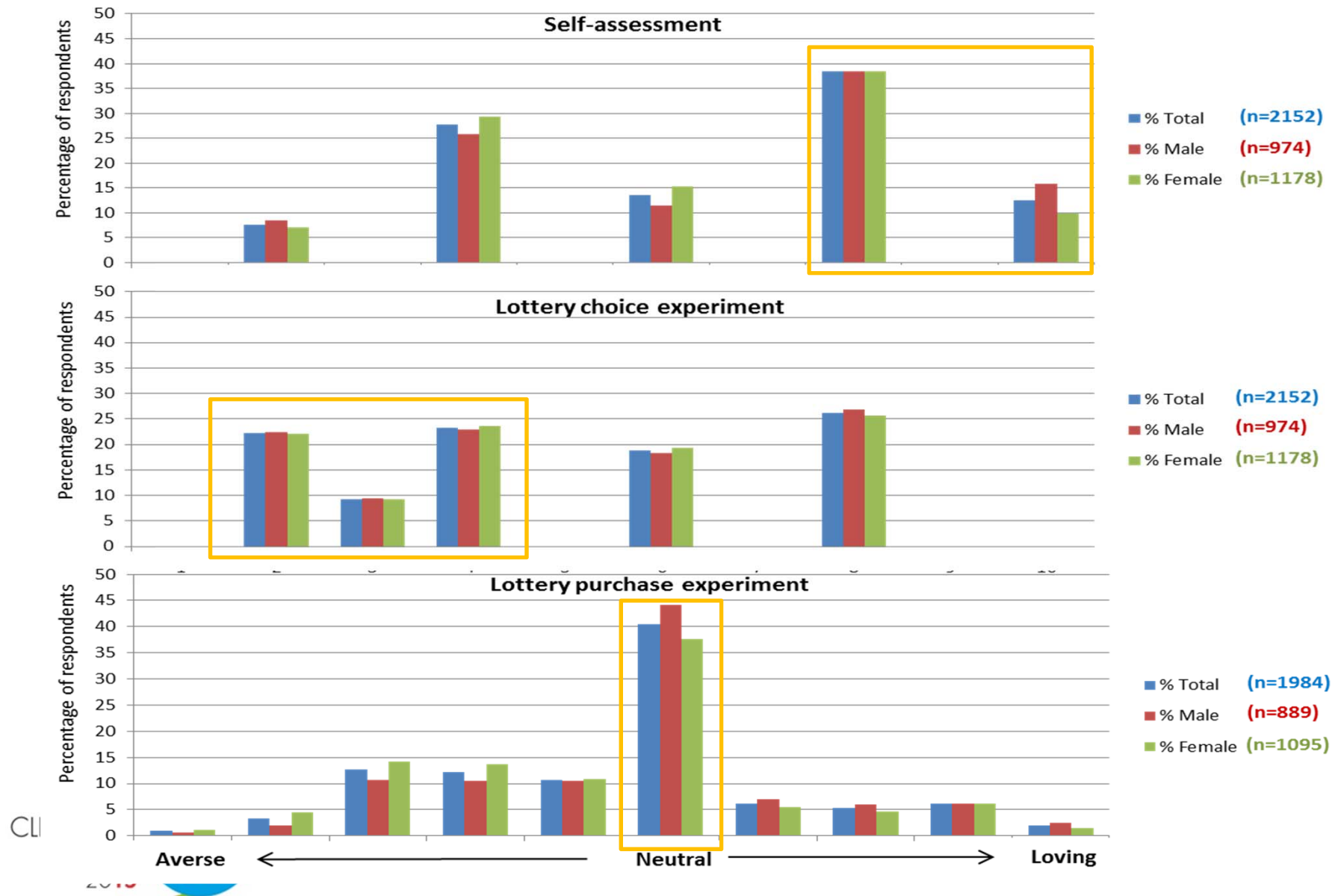
Results: Consistency

- Overall, the three risk measures are significantly positively though weakly correlated.

Spearman's rank correlations among three risk measurements

		Risk self-assessment	Lottery choice experiment	Lottery purchase experiment
Total sample (n=2152)	Lottery choice experiment	**0.0997**	1	
		(0.0000)		
	Lottery purchase experiment	0.0519	0.0705	1
		(0.0169)	(0.0011)	
Male (n=974)	Lottery choice experiment	0.0903	1	
		(0.0048)		
	Lottery purchase experiment	0.0665	**0.1047**	1
		(0.038)	(0.0011)	
Female (n=1178)	Lottery choice experiment	**0.1071**	1	
		(0.0002)		
	Lottery purchase experiment	0.0334	0.042	1
		(0.2514)	(0.1493)	

p-value in parentheses

Results: Consistency

- Farmers are more risk averse (experiments) than they think they are (self-assessment), especially when they have to spend money up front (purchase experiment). This is further support by the greater agreement (concordance) between the two experiments than between self-assessment vs. experiments.
- Women seem to be especially risk averse when they have to spend money upfront (purchase experiment).

Risk elicitation measures	Number of respondents by risk level (%)						Concordance with other measures (%)			
	Averse		Neutral		Loving		Lottery choice experiment		Lottery purchase experiment	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Risk self-assessment	34.29	36.33	11.4	15.37	54.31	48.3	37.06	37.83	33.78	34.61
Lottery choice experiment	54.72	55.01	18.38	19.35	26.9	25.64			47.63	47.75
Lottery purchase experiment	71.56	76.23	6.37	5.18	13.35	11.46				

Results: Factors

- **Overall** - Different factors were associated with the different measures of risk attitudes.

- **Gender** - Men were significantly more risk-loving than women, though these effects were not large. In the purchase experiment, men were willing to pay KSH 4 more on average.

- **Education** - Significant effect only on the choice experiment: more educated people were more likely to be risk averse.

- **Household** - Having more natural capital (land) and social capital (group membership) were associated with greater acceptance of risk, while people with more dependent children were more risk averse.

- **Food security**
  - Throughout the year: Farmers from food secure households were more accepting of risk.
  - Past month: Farmers from food insecure households were more risk loving in the choice experiment and marginally so in the self-assessment, but not in the purchase experiment.

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Results: Factors

- **Region** - Risk attitudes did differ across agroecologies: Dry transitional, Dry Mid-altitude, Moist Transitional are less accepting of risk.

- **Climate shocks** - Climatic shocks largely did not affect risk attitudes.
    - Significant negative association: hail storms (choice experiment).
    - Significant positive association: wind storm (self-assessment), cold/frost (choice experiment), flooding (purchase experiment).

- **Agricultural shocks** - People who had experienced livestock diseases and deaths in the past two years assessed themselves as more risk averse. However, those who had problems with crop pests in the same period assessed themselves as more risk loving.

- **Market shocks** - People who faced shortages of produce buyers and increases in transportation costs were less accepting of risk.

- **Intra-household** - Male's and female's risk attitudes were positively correlated

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Conclusion

- **Self-assessment often does not match behavior**, indicating the importance of experimental methods that reveal risk attitude

- **Farmers are more risk averse than they think they are**, especially when they have to spend money up front.

- **Different methods of assessing risk yield different results**

- **Gender difference is confirmed** (although not large): Men were more risk loving than women, measured both through self-assessment and lottery purchase experiment.

- **Regional difference is observed**: Beyond the differences in climatic shocks, AEZ represent true differences in agroecology, capturing other unmeasured factors that may differ geographically and can influence risk attitudes (e.g. cultural and ethnic differences, unmeasured aspects of poverty)

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Conclusion

- **Policy support to reduce vulnerability to climate, agricultural and market shocks, enhance food security and building of natural and social capital can reduce risk aversion** and increase uptake of climate-smart technologies.

- Technology development, targeting, promotion activities, and extension services need to be **gender-sensitive** given the higher risk aversion among female farmers. In these efforts, we also should recognize that **regions, locations and households within a given location differ** in their risk aversion.

- Although the majority of farmers are risk averse, **there is a niche of farmers who are more accepting of risk**.

Thank you