

How Do Informational & Social Capital Influence Nepali Farmer Climate Adaptation?



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Motivation: Limited Effectiveness of Climate Information Services

Literature on Farmer Climate Perceptions

- Farmers accurately perceive general long-term climate trends¹⁻³
- However, perceived climate risks do not necessarily translate to adaptive actions³⁻⁵
- Government interventions to promote climate information services have limited success
 - Negative forecasts may be particularly discounted⁶⁻⁷
 - Access to climate information may favor technological solutions, rather than larger-scale livelihood changes⁸

Literature Gaps

- How does climate shape risk perceptions not just of farming, but also livelihood alternatives, including migration?
- How do information sources and social networks mediate (i) climate risk perceptions and (ii) likelihood of taking adaptive action?

1. Manandhar et al. (2011); *Reg. Env. Change*. [Nepal]

3. Bro (2020); *Sustainability*. [Nicaragua]

5. Mulwa et al. (2018); *Climate Risk Management*. [Malawi]

7. Grothmann and Patt (2005). *Global Env. Change* [Zimbabwe]

2. Truelove et al. (2015); *Global Env. Change*. [Sri Lanka]

4. Singh et al. (2014); *Land Use Policy*. [India]

6. Ziervogel (2004); *Geographic Journal*. [Lesotho]

8. Tessema et al. (2018). *Env. Development* [Ethiopia]

Motivation: Research Questions

- How **salient is climate** to overall perceptions of livelihood risks?
- How is heterogeneity in access to **information sources** correlated with farmers' perceptions of climate risks?
- How do perceptions of climate risk and livelihood alternatives shape **income diversification strategies**, including through migration?



Motivation: Nepal Agriculture as a Case Study

- High overall vulnerability to climate risks including: floods, droughts, landslides (World Bank; ND-GAIN)
- Highly dependent on agricultural sector
 - 24% of GDP (China: 7%; EU: 2%, US: 1%)
 - 71% of employment (China: 16% , EU: 4%, US: 2%)
- One of 10 fastest-urbanizing countries; remittances account for 27% of GDP
- Government efforts to better understand farmers' perceptions of climate risk and adaptation strategies, including national climate and agriculture survey (ongoing)



Agriculture census to record impact of climate change

Experts say warming temperatures are cause for concern for Nepal's food security, as droughts, flooding and erratic rainfall, among others, are causing damage to produce.



Methods: Survey Design



S.N	Livelihood Strategy	National Events		Local Level Election		COVID-19					
		Local Events		2017	2018	2019	2020	2021	2022		
		English Year	Animal Year	Bd	Dg	Dr	Rt	Cw	Tg		
		Nepali Year		2074	2075	2076	2077	2078	2079		
	A. Plantation & Production										
1	1. Rice and Paddy (1.Yes, 0. No)										
	1a. Land area (Bigha/Katha/Dhur)										
	1b. Production (in Quintal or KG)										
2	2. Maize (1.Yes, 0. No)										
	2a. Land area (Bigha/Katha/Dhur)										
	2b. Production (in Quintal or KG)										
3	3. Wheat (1.Yes, 0. No)										
	3a. Land area (Bigha/Katha/Dhur)										
	3b. Production (in Quintal or KG)										
4	4. Non-Cereal Crops (Mustard/Lentil) (1.Yes, 0. No)										

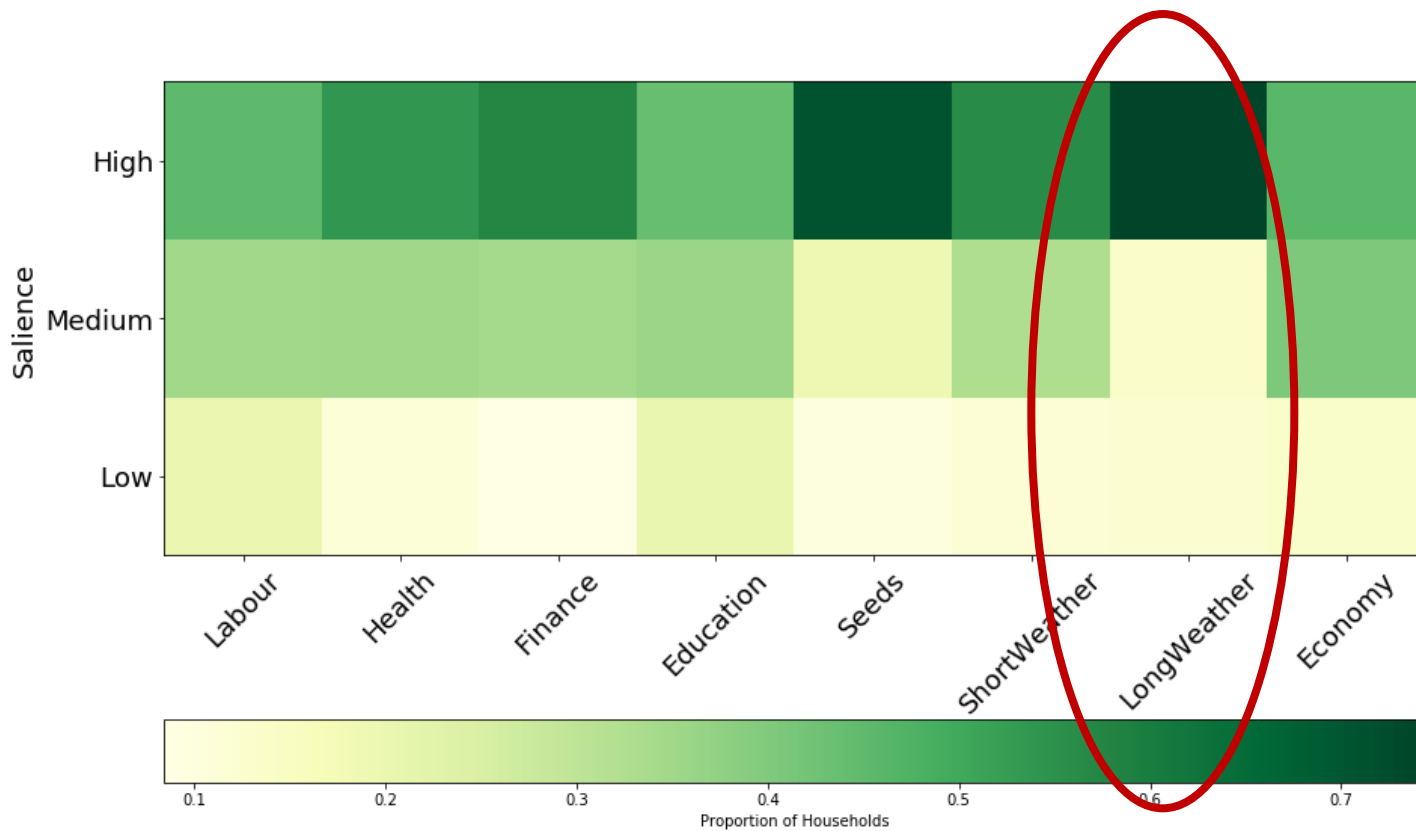
Survey Logistics

- Face-to-face surveys lasting ~1 hour
- 500 households in Chitwan District (major ag. region)
 - 400 households < 1 km from riverbank
 - 100 households > 3 km from riverbank

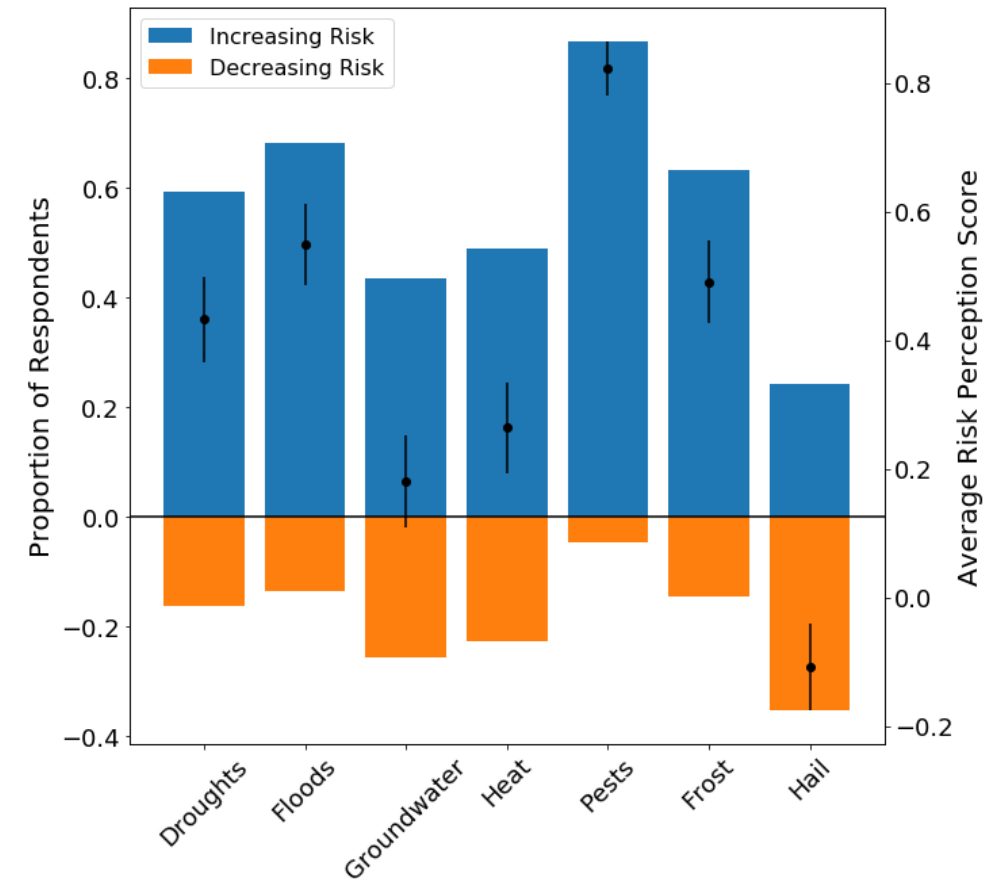
Descriptive Stats: Salience of Climate Risks

How important is X to your economic success?

Over next 5 years, how will impact of X change?

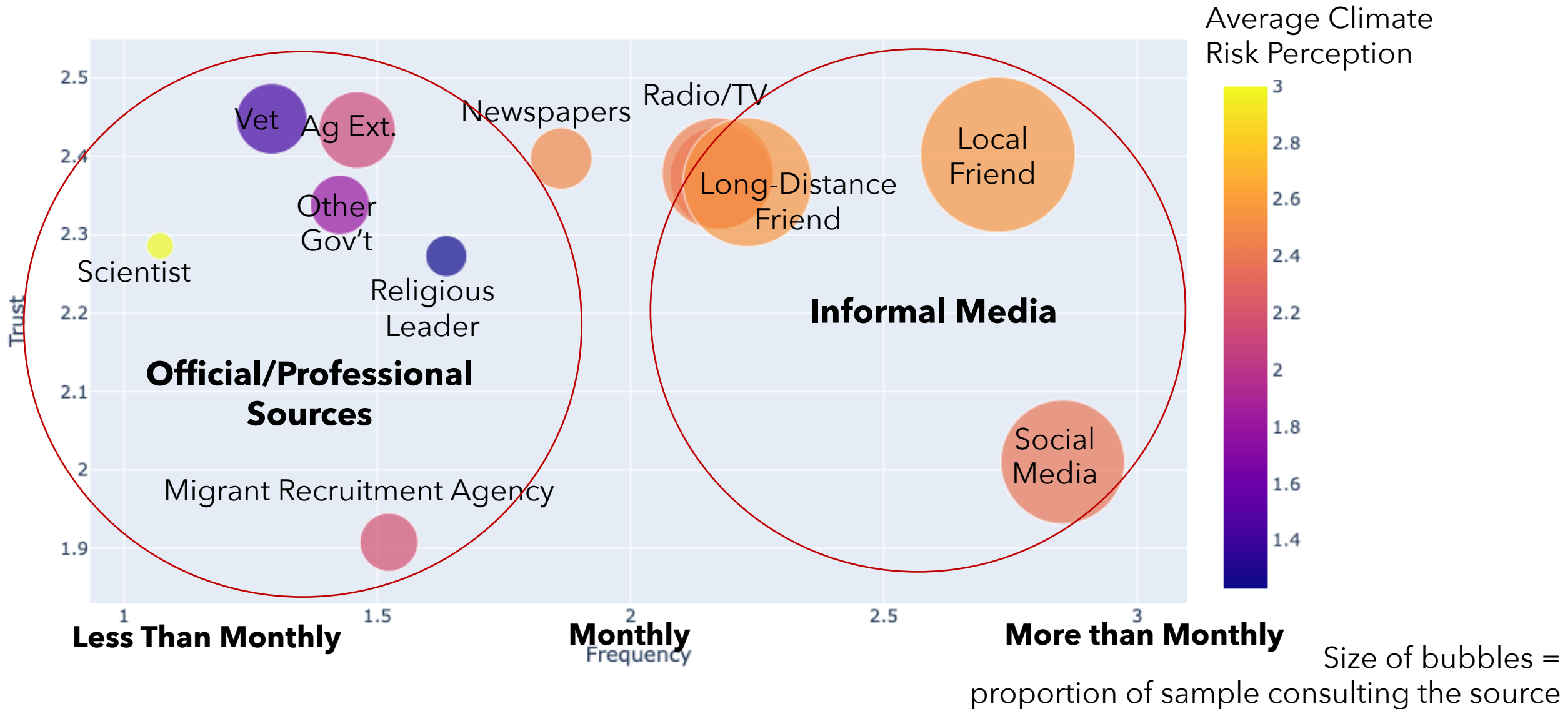


Long-term weather risks **highly salient** to farming success..



... and most hazards expected to get **worse**

Descriptive Stats: Information Sources and Risk Perceptions



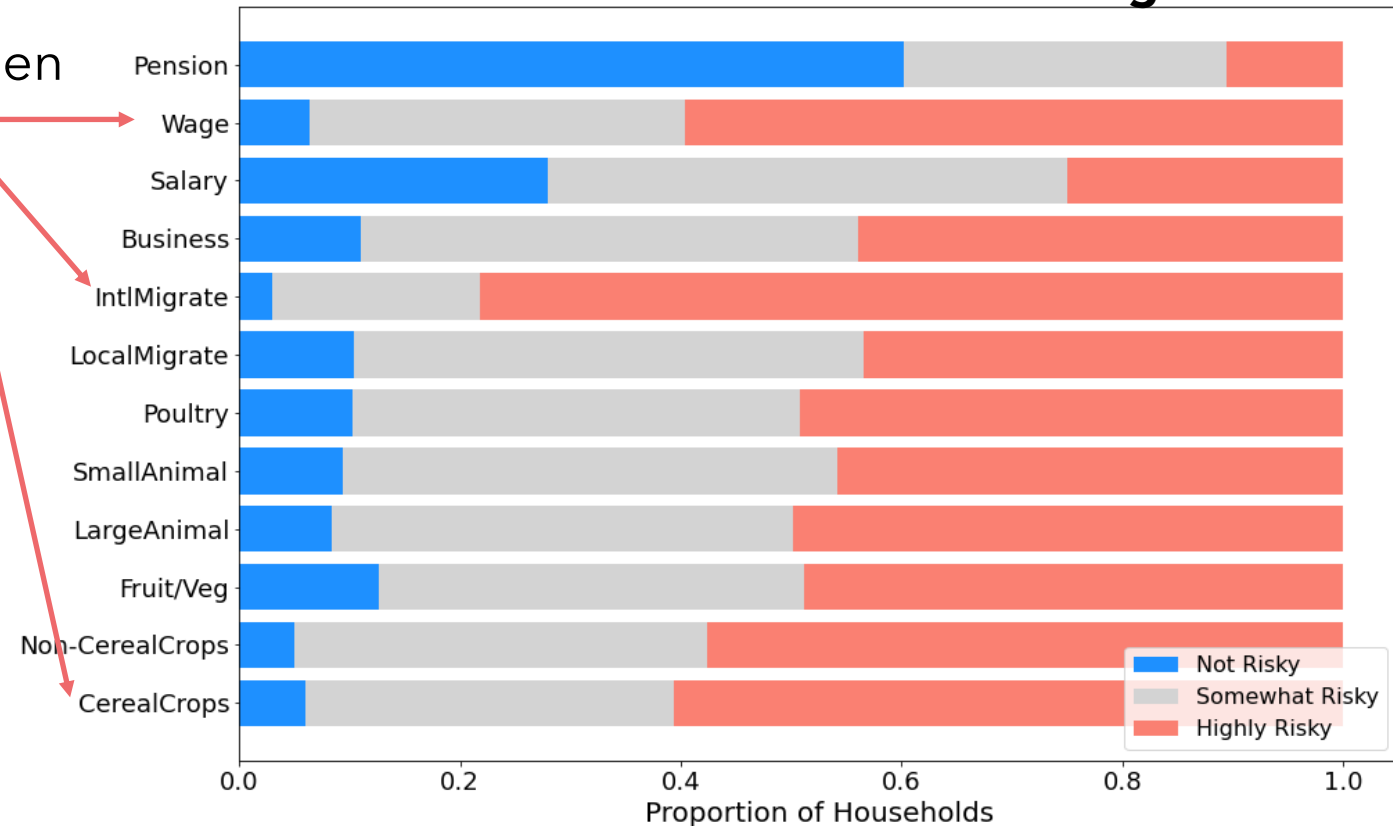
Results: How Does Climate Affect Perceptions of Livelihood Risk?

- Wage Labor and International Migration seen as even riskier than farming cereal crops

Variable	Cereal Crops	Intl Migration	Wage Labor	Pension Income
Gender	-0.047 (0.218)	-0.388 (0.272)	0.193 (0.215)	0.344 (0.0214)
Age	0.0007 (0.009)	-0.0052 (0.011)	-0.0084 (0.009)	-0.003 (0.009)
Secondary School	0.398* (0.220)	0.280 (0.269)	-0.137 (0.222)	-0.025 (0.216)
Composite Climate Risk	0.160*** (0.037)	0.227*** (0.045)	0.177*** (0.037)	0.0411 (0.035)
Information Sources	-0.104 (0.095)	-0.108 (0.111)	-0.278** (0.093)	-0.188* (0.097)
Social Networks	-0.162* (0.094)	-0.190* (0.114)	0.062 (0.096)	0.019 (0.095)

Table 6: General Drivers of Livelihood Risk Perceptions. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

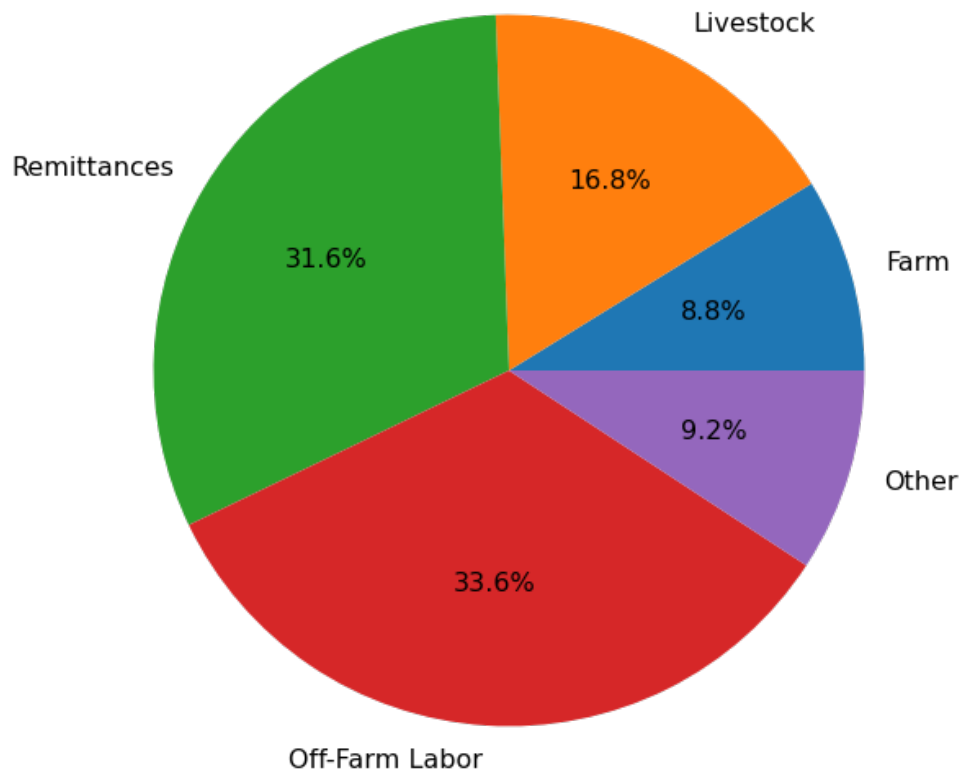
Perceived Risk of Livelihood Strategies



- High climate risk perceptions also associated with higher perceptions of migration and wage labor risks
- Suggests climate may also be driving increased perceived risk of common livelihood diversification strategies

Results: What Factors Lead to Income Diversification?

Average Household Income by Source across all Years



Drivers of Annual Income Proportion

Variable	Farming Prop.	Remittance Prop.	Off-Farm Labor Prop.
Constant	0.649** (0.057)	1.00*** (0.096)	0.044 (0.094)
Gender	-0.021** (0.003)	0.083*** (0.006)	-0.108*** (0.006)
Age	-0.0001 (0.000)	-0.0009*** (0.000)	-0.0059*** (0.000)
Secondary School	0.010*** (0.004)	0.033*** (0.006)	-0.140*** (0.006)
Composite Climate Risk	-0.016*** (0.006)	0.070*** (0.010)	-0.073*** (0.010)
Social Networks (\tilde{G})	0.022*** (0.002)	-0.008*** (0.003)	-0.029*** (0.003)
Information Sources (\tilde{I})	0.0080** (0.002)	0.030*** (0.003)	-0.036*** (0.003)
DV Livelihood Risk	0.015*** (0.003)	-0.071*** (0.006)	-0.010** (0.005)
Flood Exposure	-0.044*** (0.015)	0.016 (0.034)	-0.095*** (0.027)
Livelihood Risk*Flood Exposure	0.036*** (0.006)	-0.018 (0.012)	0.030*** (0.010)
Year	-0.007*** (0.001)	-0.008*** (0.001)	0.010*** (0.001)

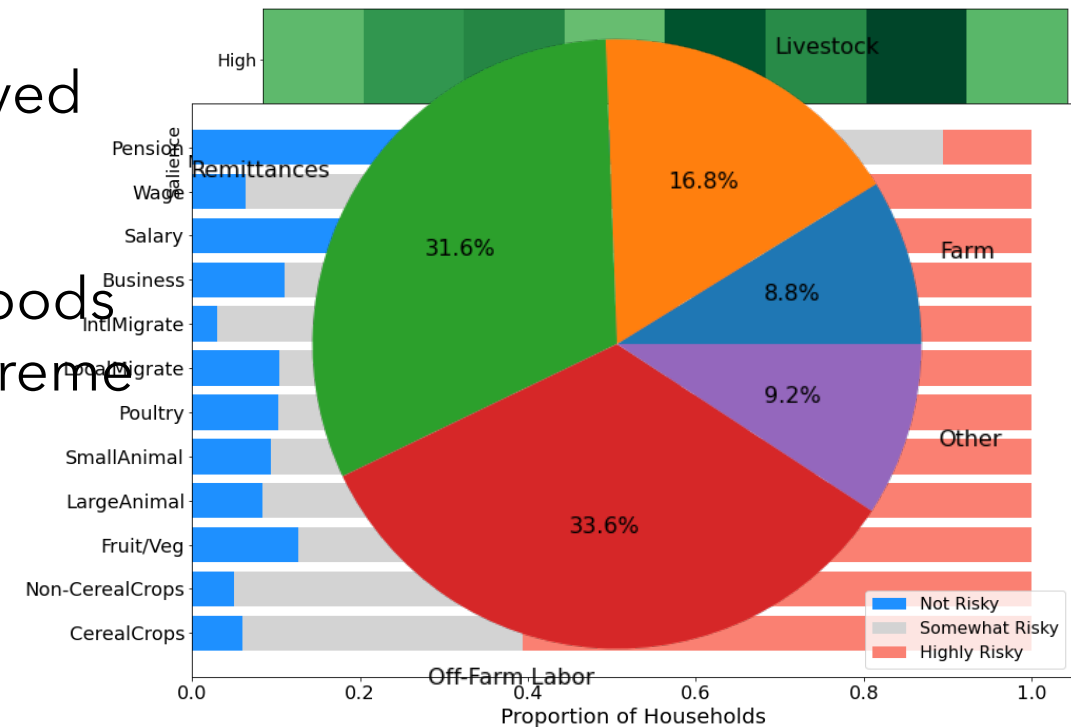
- Households generally rely less on remittances and wage labor if they perceive these as risky, except in flood years.
- Suggests “doubling down” strategy when faced with income shock

Discussion: Key Insights and Next Steps

- Climate is highly salient to perceptions of livelihood risk
- Climate may be contributing to increased perceived risk of income diversification strategies
- Farmers are generally reluctant to invest in livelihoods they find risky, but may “double down” during extreme events

Future Work

- Dis-aggregate effects of specific groups/info sources
- Evaluate effect of hypothetical policy interventions (cash transfer vs. insurance)
- Focus group discussions to understand drivers of livelihood diversification risk perceptions



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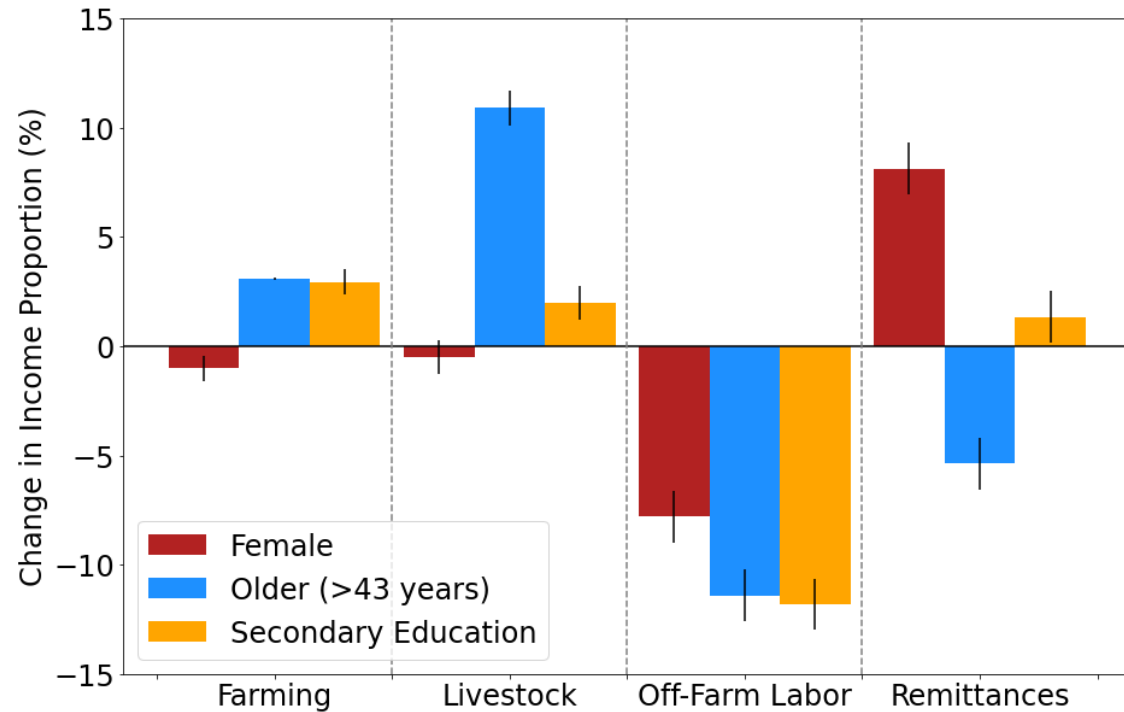
High Meadows
Environmental
Institute



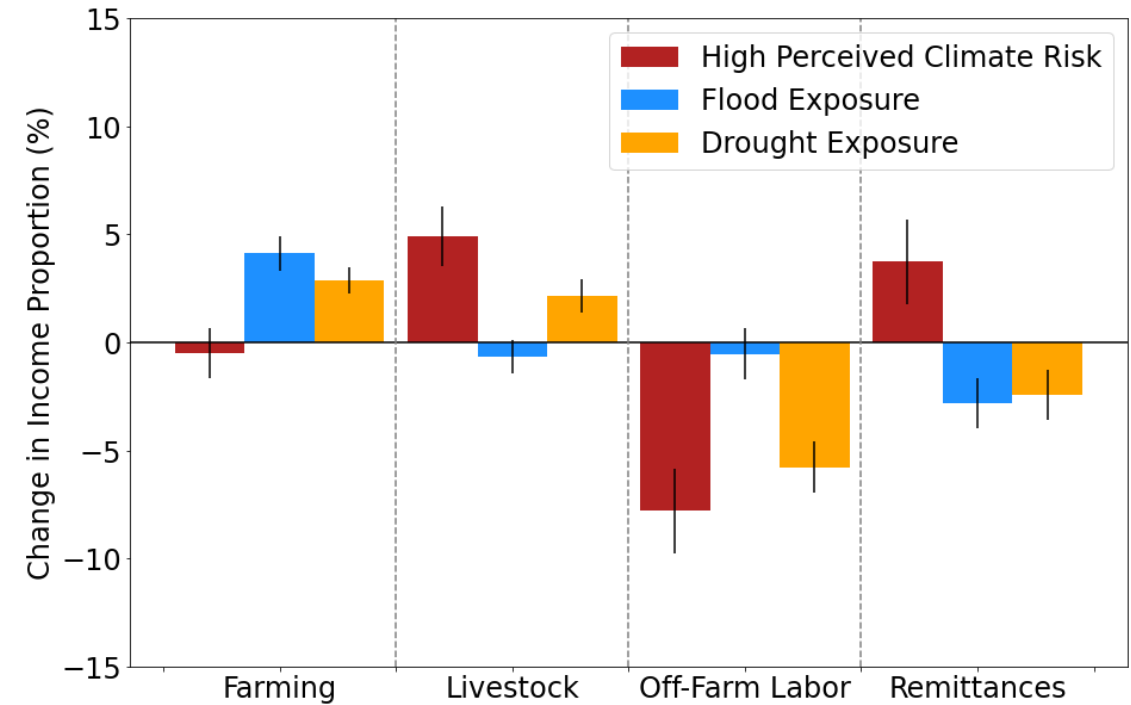
Back-up Slides

Additional Results: Income Diversification Effect Sizes

Demographic Factors



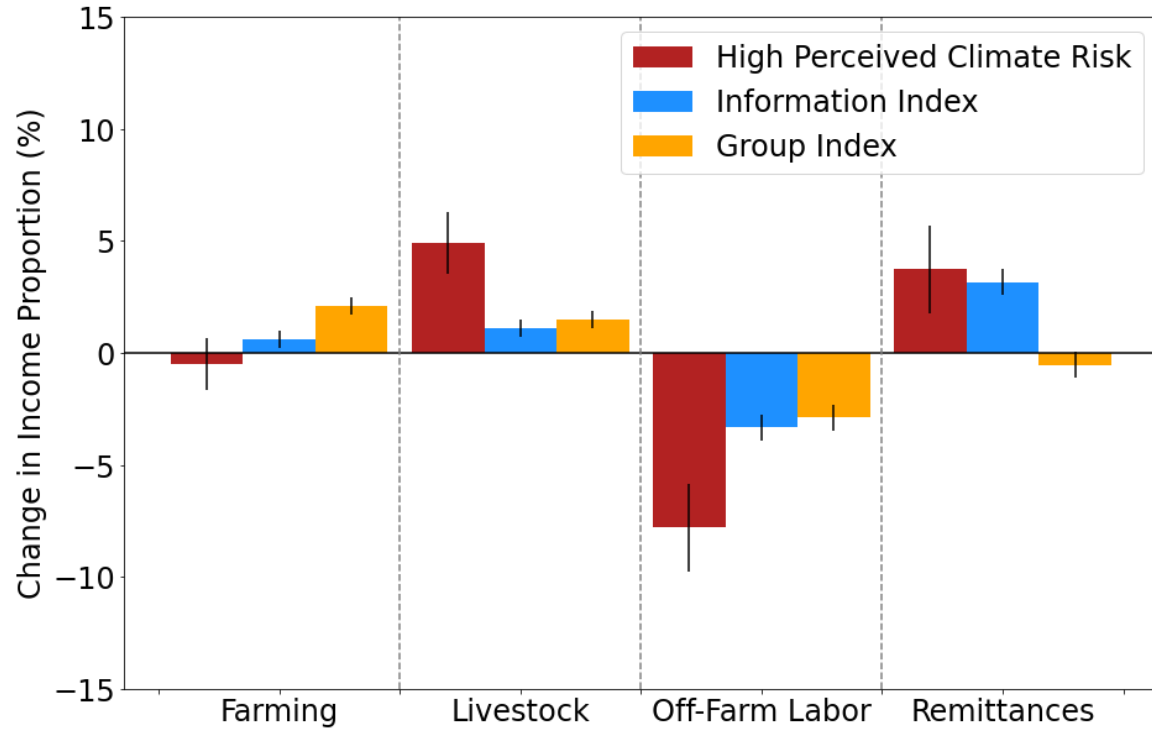
Climate Risks



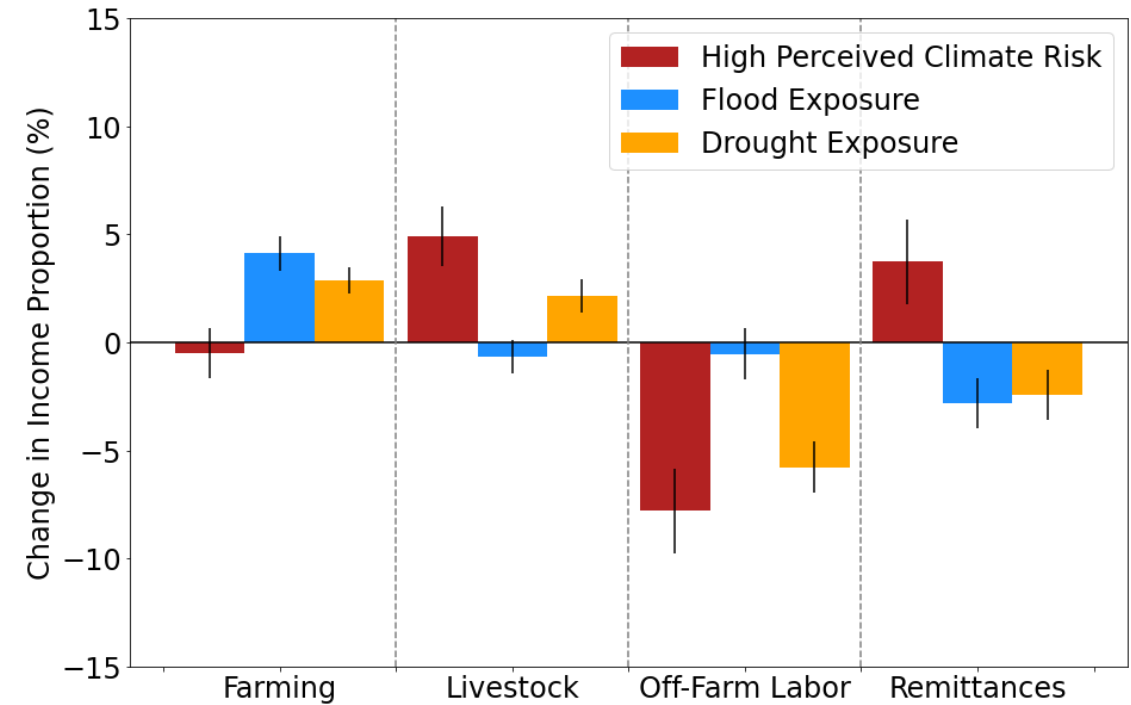
- Generally, households perceiving high climate risk diversify to livestock and migration remittances.
- Demographics are substantial drivers of how households derive income: older households especially rely more on livestock and less on off-farm labor.

Additional Results: Income Diversification Effect Sizes

Social/Informational Capital



Climate Risks



- Access to higher **informational** and **social** capital may have small but substantial effects on income diversification. Informational capital especially relevant for migration remittances.