Leibniz Institute of Agricultural Development in Transition Economies

Agricultural insurance markets: From index design to farmers‘ adoption

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in cooperation with:

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Leibniz-Gemeinschaft

Content

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- Climate change in transition economies
- Motivation
- Index design
- Demand analysis
- Scientific transfer: Piloting activities
- Summary and conclusion

Temperature trends in selected countries

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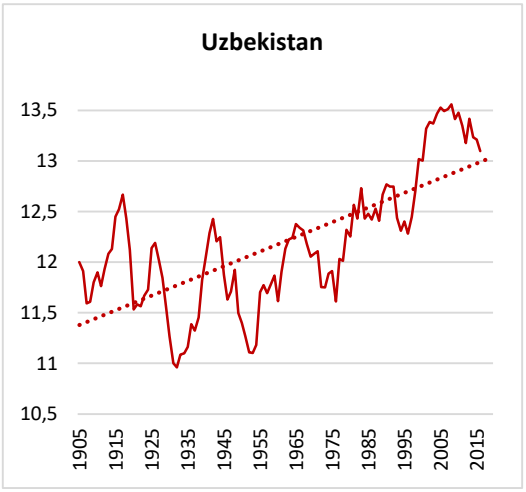
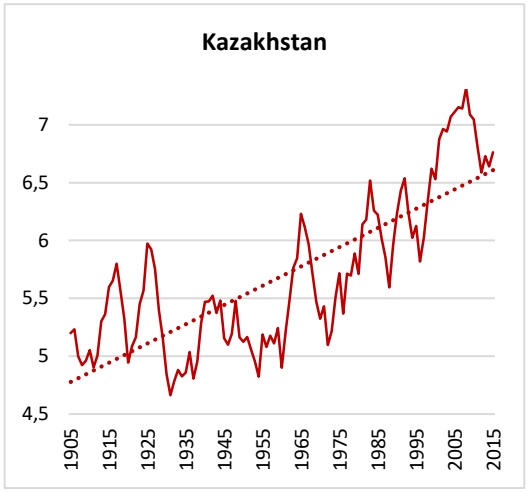
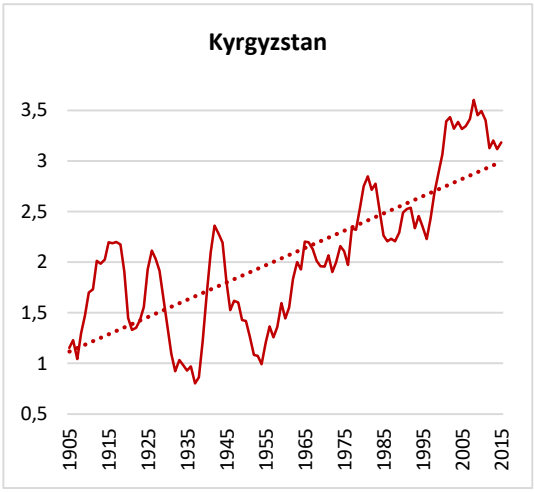


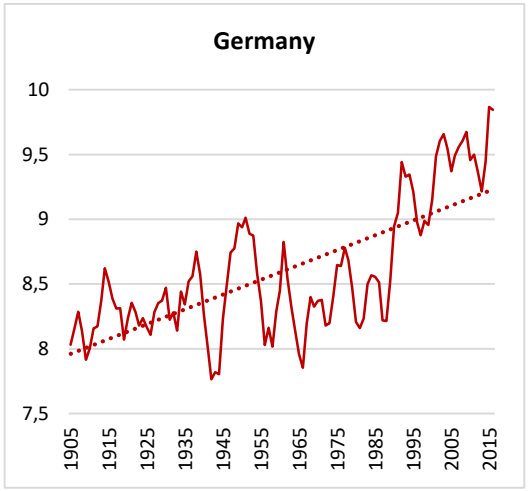


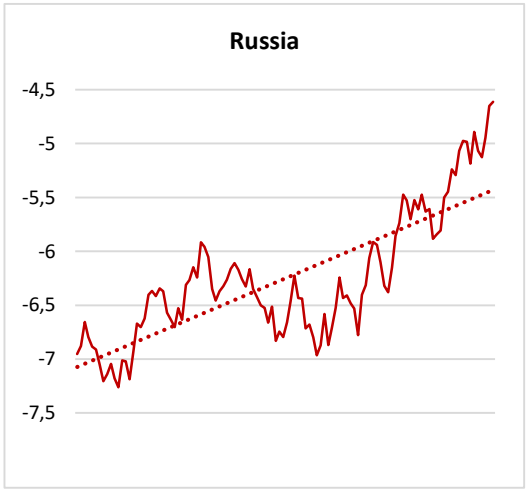


Temperature (°C)
1905-2015

Trend
Five year moving average

Source: Data calculated and visualized from World Bank – Climate Change Knowledge Portal





Precipitation trends in selected countries

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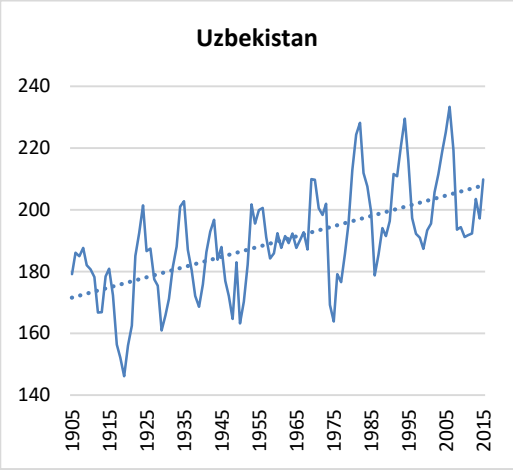
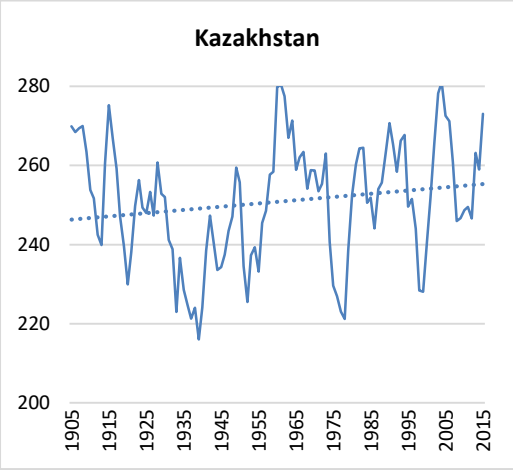
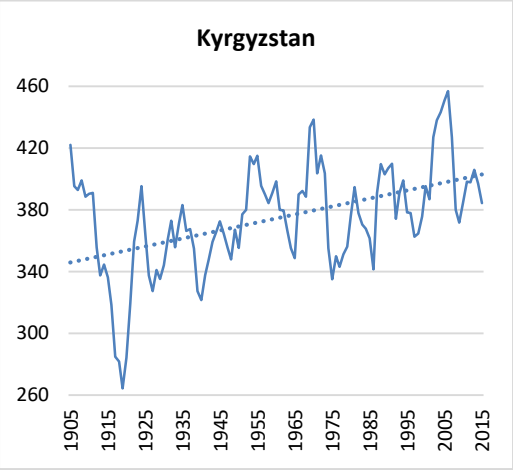


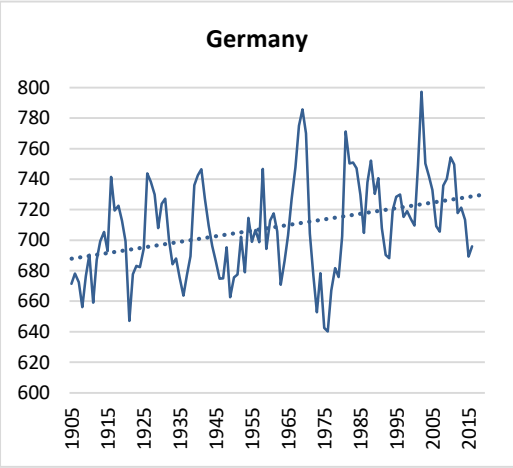


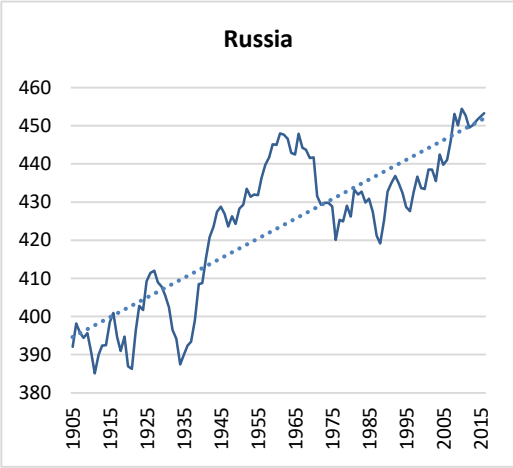


Precipitation (mm)
1905-2015

Trend
Five year moving average

Source: Data calculated and visualized from World Bank – Climate Change Knowledge Portal





Improving resilience in agriculture

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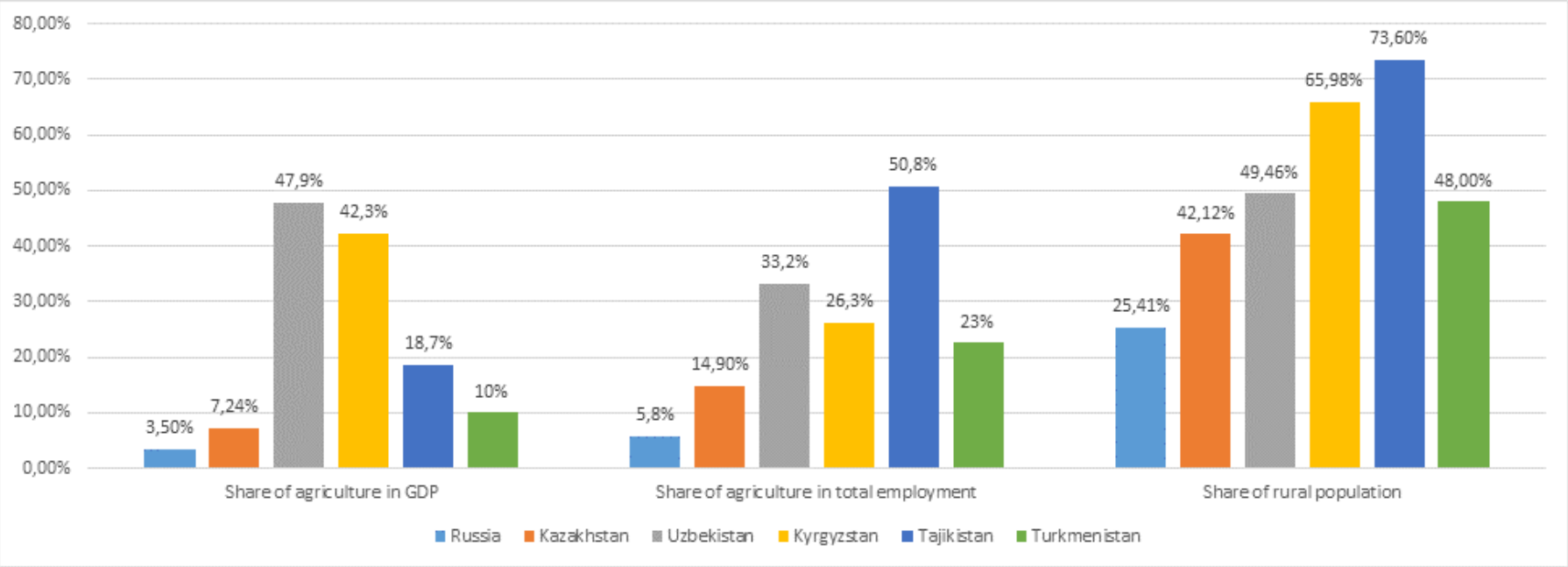
- Importance of agriculture (GDP share, rural population, employment)
- Increasing climate risks
- Production and income volatility
- Limited investment in agriculture
- Agricultural credit can boost investment
- Index insurance has a high potential in transition economies



Relevance of agriculture in Central Asia and Russia
Source: World Bank, 2019

Motivation

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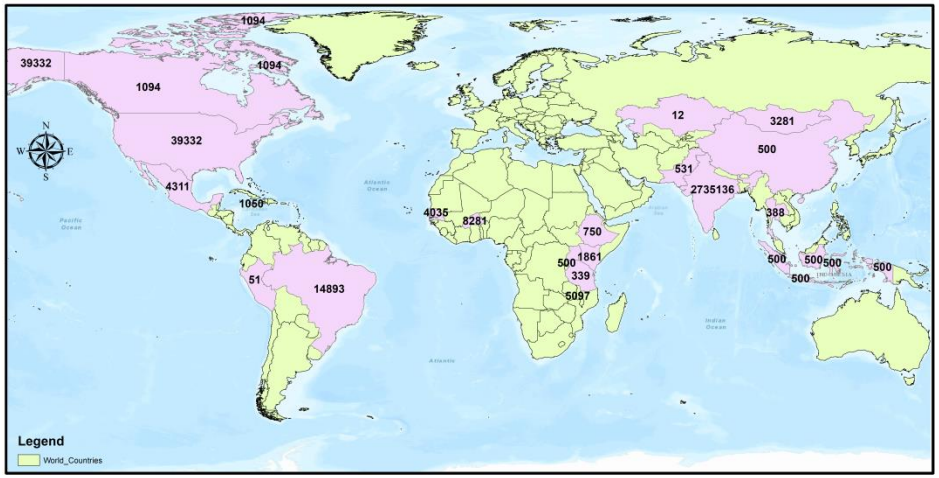
- Large number of scientific analyses in product development
- Weather and yield data scarcity (Odening and Shen, 2014)
- Prices still remain high (Jin et al., 2016)
- Slow dissemination of index insurance programs
- Lack of studies on transfer of scientific results to stakeholders
- Identification of sustainable market model remains (Sarries 2013)



Index insured farms worldwide
Source: Own presentation based on Kuhn and Bobojonov, 2019

Objective

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- To explore suitable index products for the conditions of Central Asia and Mongolia
- Investigate insurance demand in transition economies
- To analyse the process of scientific transfer to real life conditions

KlimALEZ: Increasing climate resilience via agricultural insurance

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KlimALEZ

Work packages

- Development of an index-based drought insurance
- 2 waves of insurance pilots
- Impact assessment

Funding: BMBF

Duration: 2018-2021

Consortium:

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UCA UNIVERSITY OF CENTRAL ASIA

Index design

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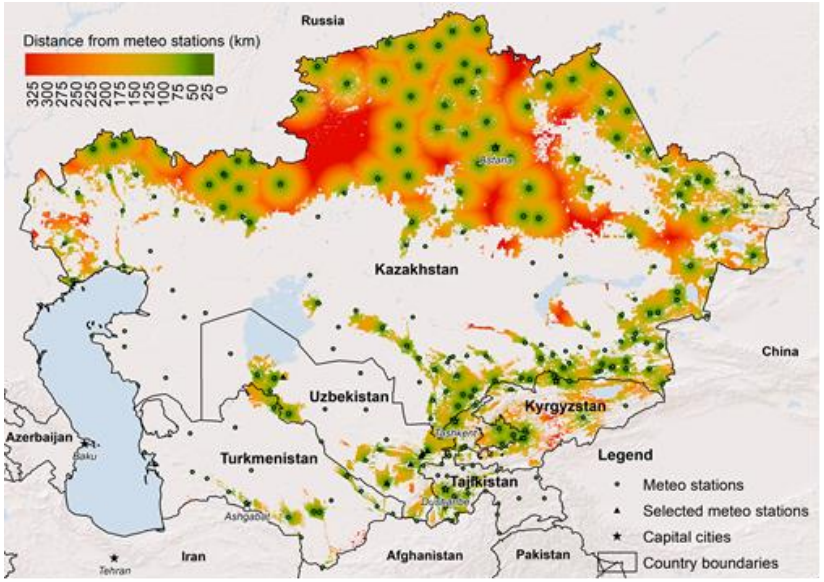
- Need for index insurance to participate in global risk sharing
- Climate data could be used for crop loss estimation
- Location of climate stations are sparse
- More than 96% of cropland is beyond a radius of 20 km from the next weather station
- Satellite data provide the best coverage and easy data access



Location of climate stations in Central Asia

Using satellite data for index design

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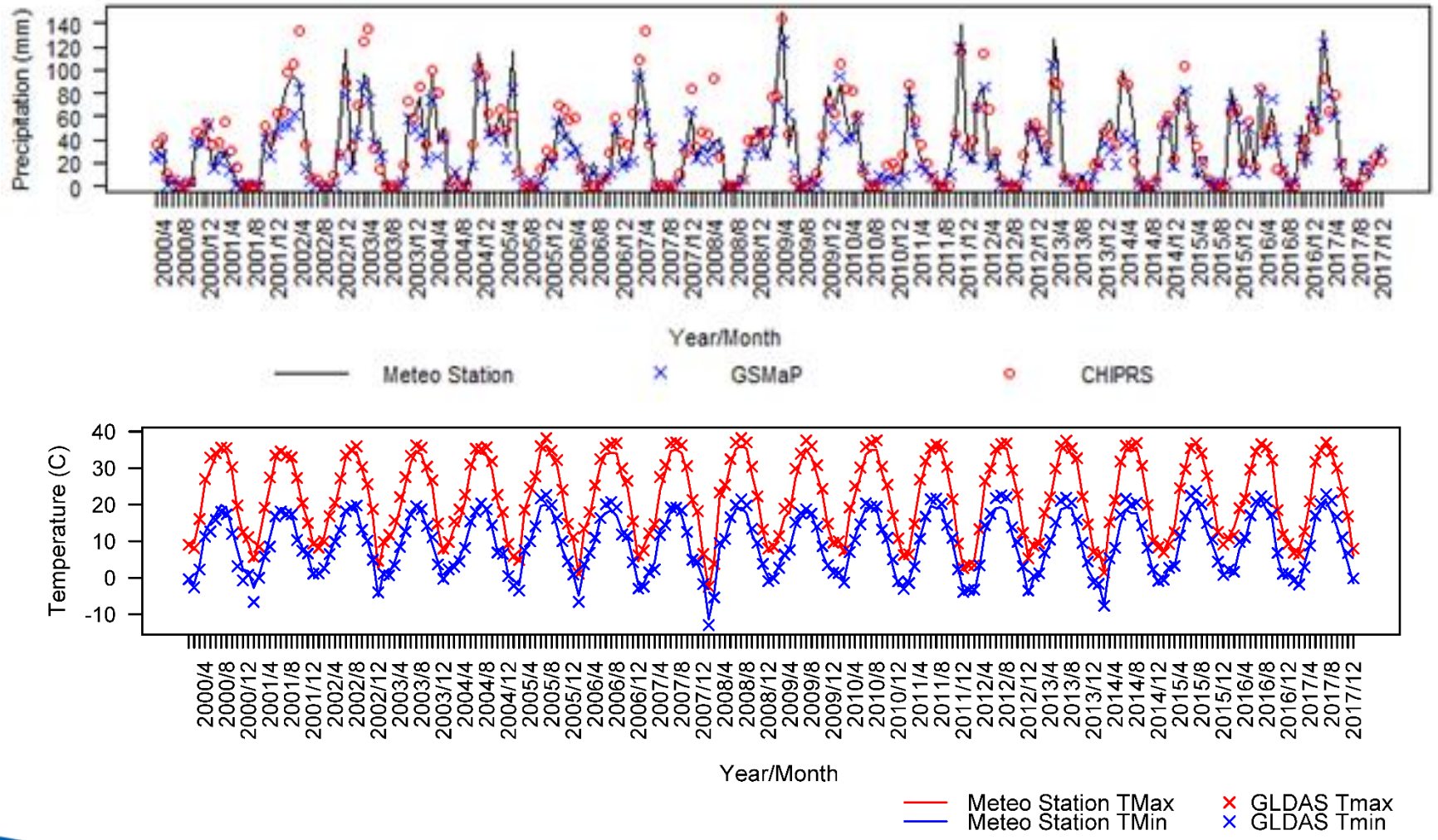

Quanatile regression of GSMaP and CHIRPS

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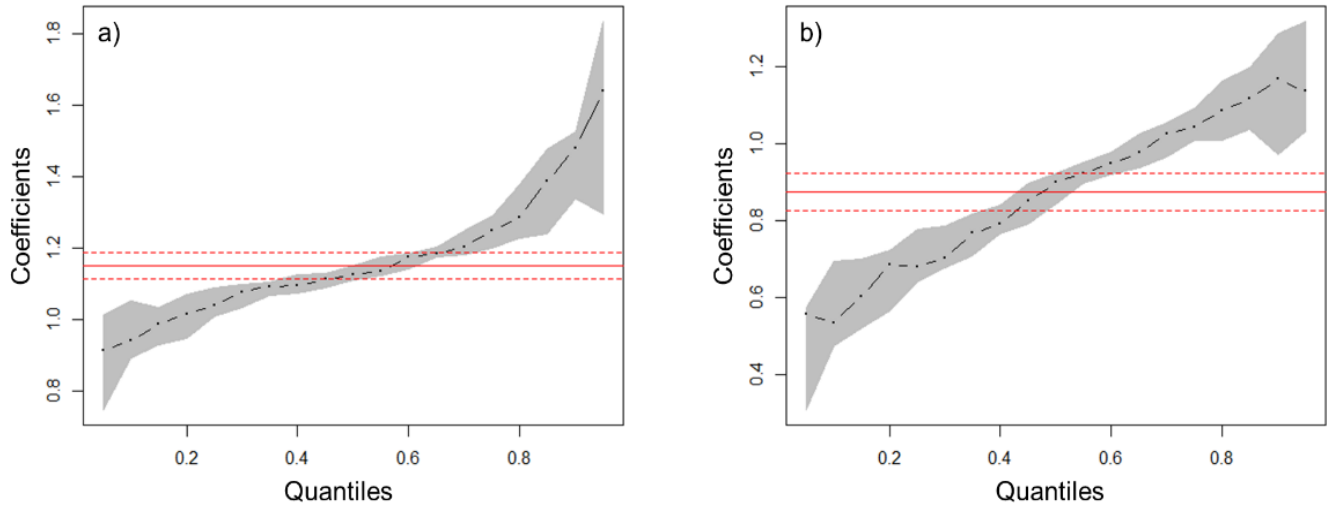

Estimated results of quantile regressions for (a) GSMaP and (b) CHIRPS in Djizzakh

SPE quantile regression results for Djizzakh MS (n = 214)

		OLS	QR0.5	QR 0.1	QR 0.25	QR 0.5	QR 0.75	QR 0.9	QR 0.95
Djizzakh-GSMaP	Coef.	1.150***	0.914***	0.940***	1.039***	1.126***	1.249***	1.480***	1.640**
	SE	0.022	0.054	0.022	0.022	0.013	0.029	0.066	0.159
	pR2	0.925	0.605	0.6708	0.7529	0.8046	0.7897	0.7531	0.711
Djizzakh-CHIRPS	Coef.	0.876***	0.558***	0.535***	0.681***	0.900***	1.044***	1.168***	1.137**
	SE	0.029	0.048	0.033	0.034	0.026	0.034	0.077	0.106
	R2/pR2	0.807	0.3273	0.4044	0.5469	0.6408	0.6534	0.6123	0.5873

Quantile regression of GLDAS

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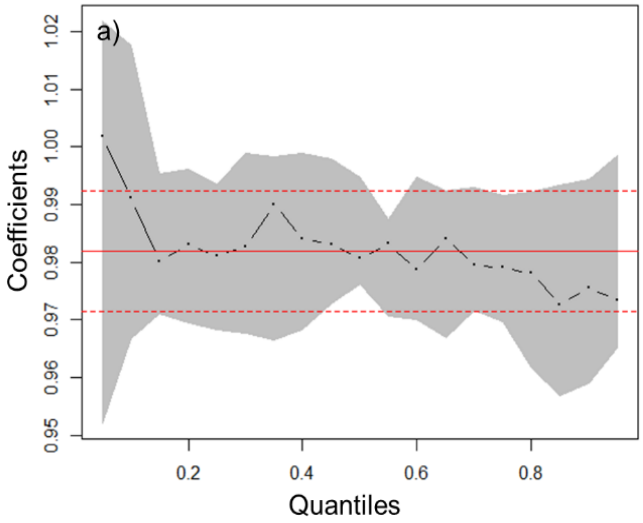

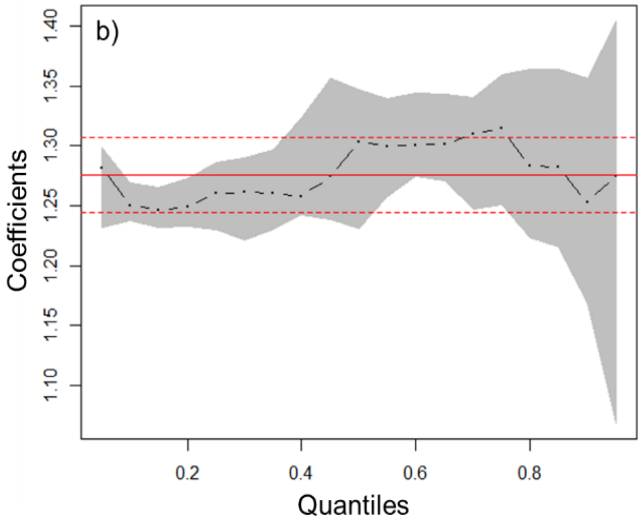

	Djizzakh		Gallaral		Lalmikor		Samarkand		Karshi		Takhtakupir	
	GLDAS Tmax	GLDAS Tmin	GLDAS Tmax	GLDAS Tmin	GLDAS Tmax	GLDAS Tmin	GLDAS Tmax	GLDAS Tmin	GLDAS Tmax	GLDAS Tmin	GLDAS Tmax	GLDAS Tmin
Coef.	0.947***	1.255***	0.982***	1.276***	0.979***	1.253***	0.934***	1.188***	0.945***	1.155***	1.016***	1.249***
SE	0.006	0.014	0.006	0.019	0.007	0.019	0.009	0.015	0.006	0.017	0.005	0.015
R-sq	0.991	0.973	0.991	0.953	0.989	0.954	0.981	0.967	0.992	0.954	0.995	0.972

Coef. = Coefficient; SE = standard error; R-square; * p<0.05, ** p<0.01, *** p<0.001

Vegetation indices

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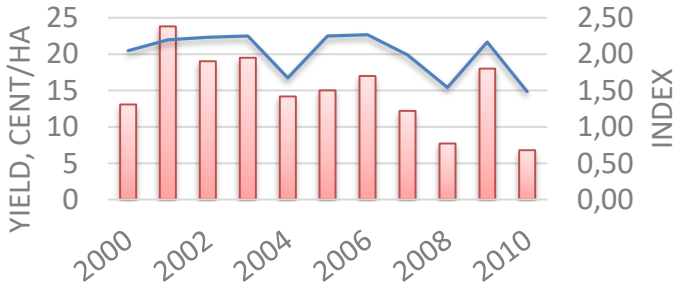
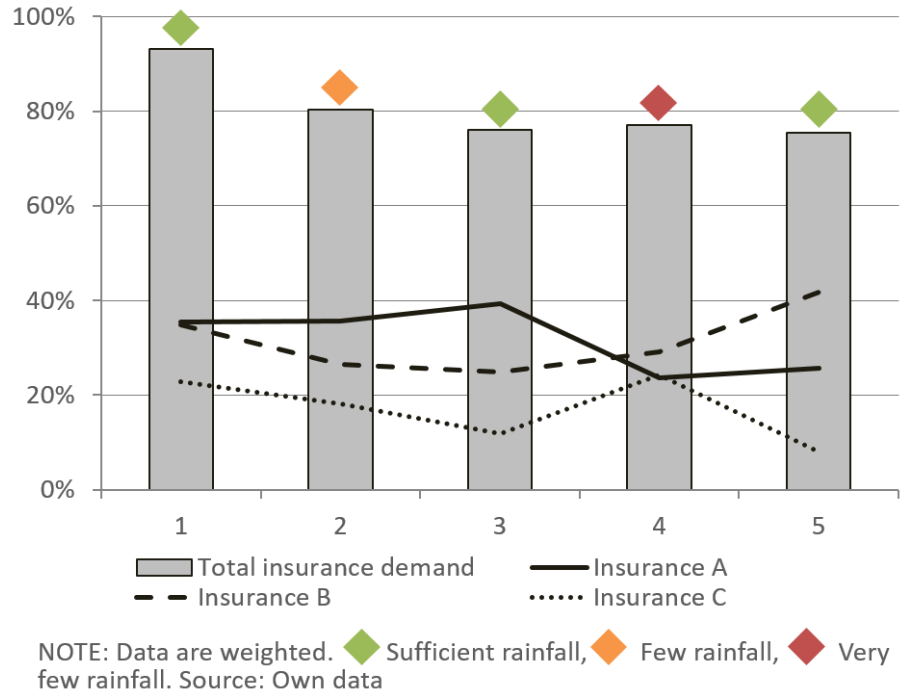
Illustrative example for vegetation index estimations



Vegetation index (blue line) and wheat yield (red bar)

Analysis



NOTE: Data are weighted. Sufficient rainfall, Few rainfall, Very few rainfall. Source: Own data

Insurance purchase over five rounds played

Average Marginal Effects Heckman 2-Step Estimation

	Insurance purchase: Pooled probit	Insurance product purchase: Pooled OLS
Group-average of insurance product bought (1-3)		1.099***
		(0.094)
Group-share of insurance purchasers (0-100)	0.007***	
	(5.77e-04)	
Presence insurer (0/1)	-0.0598**	
	(0.030)	
Level of trust in big companies (1-5)	0.0356**	-0.035
	(0.014)	(0.032)
1.understand insur.#0.insur. experience	0.003	
	(0.058)	
1.understand insur.#1.insur. experience	0.085**	0.190
	(0.036)	(0.170)
Inverse Mill's ratio (IMR)		0.241*
		(0.130)
(Pseudo) R-squared	0.655	0.433

Note: N(1)=574 (126 farmers), N(2)= 472 (125 farmers), serial correlation robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1. Data are weighted. Full model specification is given in the appendix.

Results

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- Study design that **replicates real** farm and market conditions
- Focus on **peer imitation**, **trust and understanding** in the index insurance decision
- **<u>Policy/transfer recommendations:</u>**
  - Social network effects (peer imitation) matter: farmers want to hedge index insurance but lack trust

    →**trust-building activities prior product lunch, group sessions and promotions**
  - Clear ordinal product preference: A≻B≻C
  - Does real budget allow for that? Bundled products?

Participating farmers, © IAMO

Micro- piloting in Uzbekistan

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Implemented in 2019

- Contracts sold in Zomin district
- Satellite based rainfall insurance
- IAMO is a settlement agent
- Including index insurance to legislation

Planned for coming year

- More advanced indices
- Negotiation with banks to accept index insurance instead of MPCI

Contract signing, © GROSS Insurance

Piloting in Mongolia

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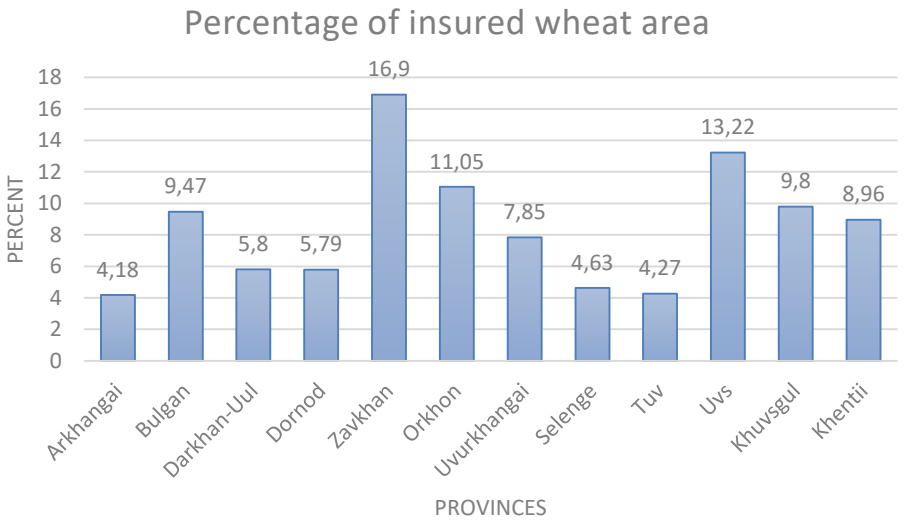
- Upon demand by Ministry of Agriculture
- To insure 30% of subsidized loans
- 30% of premium paid in advance 70% after the harvest
- 387 farmers and 22,488 ha insured in 2020
- Vegetation index developed by IAMO is used
- IAMO also serves as a settlement agent

Field inspection, © Mongolian Re



Summary of scientific results

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- Lack of access to national climate services data
- Satellite data could replace station data if carefully used
- Peer imitation and and understanding play important role in insurance purchase
- Lack of confidence to insurance companies may remain large obstacle
- Large number of negative experiences with insurance in Uzbekistan
- Combination of insurance and credit as well as procurement policies
- Piloting activities need to be implemented for product testing and demand analysis

Thank you for your attention!
Questions?

Appendix

Insurance participation in Kyrgyzstan: Heckman 2-Step Estimation results

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	(1)		(2)	
Group-average of insurance product bought (1-3)			1.099***	(0.0938)
Financial endowment (log)			-1.325	(1.145)
Group-share of insurance purchasers (0-100)	0.007***	(5.77e-04)		
Previous season few rain (0/1)	-4.11e-04	(0.0244)		
Previous season very few rain (0/1)	0.1585***	(0.039)		
Presence insurance company (0/1)	-0.0598**	(0.0298)		
Game round played (1-5)	-0.0268**	(0.0116)	-0.105*	(0.061)
Female (0/1)	-0.0268	(0.0283)	-0.0871	(0.071)
Age2	5.56e -05***	(1.25e -05)	-6.91e-05**	(3.21e-05)
Highest educational achievement	-0.005	(0.013)	-0.0412*	(0.023)
Number HH members	-4.97e-04	(0.005)	0.0416***	(0.013)
Importance remittances2 (0-5)	0.003**	(0.002)	0.017***	(0.004)
High subjective discount rate (0/1)	-0.0532	(0.040)	-0.033	(0.074)
Level of trust in big companies (1-5)	0.0356**	(0.014)	-0.035	(0.032)
1. Understand insurance#0.insurance experience	0.003	(0.058)		
1. Understand insurance#1.insurance experience	0.085**	(0.036)	0.190	(0.170)
Rainfed agriculture (0/1)	-0.051	(0.040)	0.264***	(0.074)
Land size in ha (log)	-0.018	(0.011)	0.008	(0.025)
Share average production sold (0-100)	-2.24e-04	(3.41e-04)	0.002*	(0.001)
Average yield lost#0.main farmer	-0.003***	(8.3e-04)		
Average yield lost#1.main farmer	-0.001	(6.8e-04)	0.003	(0.004)
Average danger production loss (1-4)	0.040**	(0.0156)	0.013	(0.037)
Inverse Mill's ratio (IMR)			0.241*	(0.130)
Observations	574 (126 farmers)		472 (125 farmers)	
(Pseudo) R-squared	0.6553		0.4333	

Note: Serial correlation robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Ceteris paribus effects of the elements included in the interaction terms are calculated but omitted. Data are weighted.

References

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