

The Sixth Annual Life in Kyrgyzstan Conference (online) | 27-30 October 2020



1

Outline

- Problem background
- Research questions
- Conceptual framework
- Study regions and data description
- Estimation method
- Results
- Conclusions and policy implications









Problem background



www.iamo.de/en

Main research questions



How are behavioral factors, social norms and institutional settings related with farmers' decision to adopt SAPs?



Which factors prevent or facilitate farmers' adoption of SAPs?



6

www.iamo.de/en

5

Conceptual framework



Literature: Feder, 1985; Foster and Rosenzweig, 2010; Kallas et al., 2010; Liu, 2013; Mariana et al., 2012; Manda et al., 2016; Ward et al., 2018; Dessart et al., 2019; Zeweld et al., 2019.

www.iamo.de/en



Further information about study regions



	Kazakhstan (Turkistan)	Uzbekistan (Samarkand)
Land tenure	Long-term leases, private land ownership possible,	Long-term leases, allocations to strategic crops
Farm restructuring	Dissolution of state farms in early 1990s , av. cotton farm has 6 ha of land, no farm specialization	Land distribution after 1998 , reconsolidation after 2008 & 2019, average cotton farm has about 90 ha of land. Since 2018, cotton cultivation transferred to private textile companies called 'clusters'
Land distribution process	Farm property was distributed to directors of former state farms for 5-20 years, about 80% was given to farm members	Land distribution to individual applicants via tender considering certain criteria
Strategic role of agriculture	No strategic crops, direct subsidies	Cotton & wheat are strategic crops , Delivery quotas & procurement prices
Access to capital & inputs	Private banks and input suppliers, input supply via contract farming	State agri bank, centralized input supply and machinery services
Extension service	KazAgro Innovation, processors through contract farming	Public universities and research institutes



9

Descriptive summary of selected variables



	Kazakhstan		Uzbekistan		ines .	
Variable	Adopt (N=160)	Non adopt (N=336)	Mean diff	Adopt (N=213)	Non adopt (N=247)	Mean diff
Age of farm manager (years)	47.625 (13.309)	46.810 (13.170)	0.815	43.272 (9.854)	44.162 (10.206)	-0.890
Farm manager experience (year)	20.769 (10.622)	19.479 (9.601)	1.290	13.376 (8.490)	12.166 (7.699)	1.210
Education in agriculture (1/0)	0.388 (0.489)	0.259 (0.439)	0.129***	0.408 (0.493)	0.316 (0.466)	0.092**
Farm size (ha)	12.397 (20.565)	13.389 (25.073)	-0.991	37.384 (24.306)	40.290 (28.297)	-2.906
Risk-taker (1/0)	0.843 (0.364)	0.783 (0.413)	0.061	0.610 (0.489)	0.692 (0.462)	-0.082*
Cooperation in production (1/0)	0.181 (0.386)	0.080 (0.272)	0.101***	0.268 (0.444)	0.312 (0.464)	-0.044
Land tenure security (1/ 0)	0.925 (0.264)	0.851 (0.356)	0.074**	0.648 (0.479)	0.437 (0.497)	0.211***
Free decision on crop cultivation, crop rotation (1 to 5, categorical)	4.875 (0.350)	4.711 (0.685)	0.164***	1.554 (0.963)	1.595 (1.062)	-0.041
Number of cultivated crops (number)	1.706 (0.829)	1.759 (0.939)	-0.053	2.869 (1.056)	2.474 (0.923)	0.395***
Number of taken training courses (number)	0.400 (0.636)	0.083 (0.377)	0.317***	1.408 (1.017)	1.219 (0.946)	0.190**
Soil fertility index (0-1)	0.426 (0.469)	0.485 (0.462)	-0.058	0.605 (0.360)	0.682 (0.423)	-0.077**
Note: Standard deviation in the parenthesis. Statistical significance at the 99% (***), 95% (**) and 90% (*), t-test www.iamo.de/en Source: AGRICHANGE II farm survey data, 2019 10						

Selected model



PROBIT model

$$\begin{split} Y_{i} &= \begin{cases} 1 \ if \ a \ farmer \ adopts \ at \ least \ one \ of \ SAPs \\ 0 \ otherwise \end{cases} \\ \\ \hline Y_{i} &= \begin{cases} 1 \ if \ a \ farmer \ adopts \ crop \ rotation \\ 0 \ otherwise \end{cases} \\ \\ \hline Y_{i} &= \begin{cases} 1 \ if \ a \ farmer \ adopts \ conservation \ tillage \\ 0 \ otherwise \end{cases} \\ \\ \hline Y_{i} &= \begin{cases} 1 \ if \ a \ farmer \ adopts \ conservation \ tillage \\ 0 \ otherwise \end{cases} \\ \\ \hline Y_{i} &= \begin{cases} 1 \ if \ a \ farmer \ adopts \ conservation \ tillage \\ 0 \ otherwise \end{cases} \\ \\ \hline Y_{i} &= \begin{cases} 1 \ if \ a \ farmer \ adopts \ biological \ pest \ control \ methods \\ 0 \ otherwise \end{cases} \\ \\ \hline Y_{i}^{*} &= \delta X_{i} + \ \varepsilon_{i}, \quad Y_{i} = 1[Y_{i}^{*} > 0] \end{cases}$$

Literature: Abdulai, (2016); Asfaw et al. (2012); Khonje et al. (2015)

www.iamo.de/en

11

colleagues (categorical 1 to 5) Cooperation in production (1/0)

www.iamo.de/en

Determinants of farmer's SAPs adoption decision (marginal effect)

-0.006



tion

ion

0.102***

11

Kazakhstan, N=496				
Variables	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conserva tillage
Education in agriculture (1/0)	0.066	-0.097**	0.040	0.114***
Cultivated crops (number)	-0.006	0.026	-0.020	-0.020
Risk-taking farmer (1/0)	0.098*	0.043	0.053*	0.042
Caring opinion of farmers and colleagues (categorical 1 to 5)	0.049**	0.036*	0.037***	0.016
Cooperation in production (1/0)	0.163***	-0.023	0.092**	0.060**
Uzbekistan, N=460				
Variables	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conservat tillage
Education in agriculture (1/0)	0.084*	0.007	0.127***	0.045
Cultivated crops (number)	0.068***	0.057***	0.029	-0.002
Risk-taking farmer (1/0)	-0.072	0.088*	-0.070	0.007
Caring opinion of farmers and	0.098***	0.011	0.058**	-0.051***

-0.033

Note: * p<0.1, ** p<0.05, *** p<0.01

0.016

Determinants of farmer's SAPs

adoption decision (marginal effect)

Kazakiistaii, 11-450				
Variables	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conservation tillage
Participation in farm trainings (number)	0.199***	0.145***	0.023	0.045***
Land tenure security (1/0)	0.113*	0.135**	0.065	0.013
Farmers trust courts to assist (categorical 1 to 5)	-0.015	-0.022	-0.002	0.019*
Free decision on crop to cultivate, crop rotation to use (categorical 1 to 5)	0.116***	0.079**	0.034*	0.031
Information source about new technologies and agronomy (1/0)	-0.148***	-0.118***	-0.043*	-0.039*
Uzbekistan, N=460				
Variables	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conservation tillage
Participation in farm trainings (number)	0.024	0.010	0.025	0.029**
Land tenure security (1/0)	0.178***	0.209***	0.057	0.015
Farmers trust courts to assist (categorical 1 to 5)	-0.078***	-0.016	-0.075***	-0.044***
Free decision on crop to cultivate, crop rotation to use (categorical 1 to 5)	-0.018	-0.034	0.013	0.031*
Information source about new technologies and agronomy (1/0)	-0.121***	0.040	-0.174***	-0.134***
/ww.iamo.de/en	Note: *	p<0.1, ** p<0.05, ***	° p<0.01	

13

Conclusions



- · Farmers who care about opinion of other farmers and relatives are more likely to adopt SAPs;
- In Uzbekistan, farmers with higher education are more likely to adopt SAP, while it is an opposite among Kazakh farmers;
- Farmers, who receive information on technology and agronomy from their networks, are less likely to adopt SAP;
- Risk-taking farmers are more likely to adopt crop rotation in Uzbekistan and biological methods in Kazakhstan;
- In Uzbekistan, farmers who trust courts in assisting in disputes with local administration are less likely to adopt SAP;
- SAPs adoption in both regions is related with farmers' feeling about land tenure security;
- In Kazakhstan, farmers' opinion about freedom in what crop to cultivate and rotation to use is positively associated with SAP adoption;
- Kazakh farmers who cooperate in agricultural production are more likely to adopt SAP.

14

Policy implications



- Agricultural sustainability policies will benefit from integrating information for improving local image and status of farmers who adopt SAPs;
- The governments should pay more attention in improving information about SAP among farmers;
- The regulatory environment which promotes land tenure security and farmers' autonomous decision making, particularly farmer's own adoption decision, can facilitate SAP adoption;
- While dealing with sustainable agricultural programme, the governments should also promote cooperation among farmers.



15

Thank you for attention!

For questions: Tadjiev@iamo.de

References



- In Transition Economies
 In Tra
- Abdulai, A. N. (2016). Impact of conservation agriculture technology on household welfare in Zambia. Agricultural economics. 47(6), 729-741. Asfaw, S., Kassie, M., Simtowe, F., & Lipper, L. (2012). Poverty reduction effects of agricultural technology adoption: a micro-evidence from rural Tanzania. Journal of Development Studies, 48(9), 1288-1305.
- Boyabatli, O., Nasiry, J., & Zhou, Y. (2019). Crop planning in sustainable agriculture: Dynamic farmland allocation in the presence of crop rotation benefits. Management Science, 65(5). 2060-2076.
- ools). 200-207.0. Desard, F. J., Barreiro-Hurlé, J., & van Bavel, R. (2019). Behavioural factors affecting the adoption of sustainable farming practices: a policy-oriented review. European Review of Agricultural Economics, 46(3), 417-471. Djanibekov, N., Van Assche, K., Bobojonov, I. & Lamers, J.P.A. (2012). Farm restructuring and land consolidation in Uzbekistan: New farms with old barriers. Europe-Asia Studies: 64(6), 110:1-1126.
- Feder, G., Just, R. E., & Zilberman, D. (1985). Adoption of agricultural innovations in developing countries: A survey. Economic Development and Cultural Change 33(2): 255-298.
- Facet, A. J., Boschweig, M. (2010). Microeconomics of technology adoption. Annual Review of Economics 2(1): 395-424.
 Kallas, Z., Serra, T., & Gil, J. M. (2010). Microeconomics of technology adoption. Annual Review of Economics 2(1): 395-424.
 Kallas, Z., Serra, T., & Gil, J. M. (2010). Farmers' objectives as determinants of organic farming adoption: The case of Catalonian vineyard production. Agricultural technology. 409-423.
- Kienzler, K. M., Lamers, J. P. A., McDonald, A., Mirzabaev, A., Ibragimov, N., Egamberdiev, O. & Akramkhanov, A. (2012). Conservation agriculture in Central Asia—What do we know and where do we go from here?. Field Crops Research, 132, 95-105.
- Know and where up one go not interest, neurol copo research, 152, 35-105.
 Knowler, D., & Bradshaw, B. (2007). Farmers' adoption of conservation agriculture: A review and synthesis of recent research. Food Policy 32(1): 25-48.
 Manda, J., Alene, A. D., Gardebroek, C., Kassie, M., & Tembo, G. (2016). Adoption and impacts of sustainable agricultural practices on maize yields and incomes: Evidence from rural Zambia. Journal of Agricultural Economics, 67(1), 130-153.
 Mariano, M. J., Villano, R., & Fleming, E. (2012). Factors influencing farmers' adoption of modern rice technologies and good management practices in the Philippines. Agricultural Systems, 110, 41-53.
- Systems, 110, 41-53. Mirzabaev, A. (2016). Land Degradation and Sustainable Land Management Innovations in Central Asia. In Technological and Institutional Innovations for Marginalized Smallholders in Agricultural Development (pp. 213-224). Springer, Cham. Nurbekov, A., Akramkhanov, A., Kassam, A., Sydyk, D., Ziyadaullaev, Z., & Lamers, J. P. A. (2016). Conservation Agriculture for combating land degradation in Central Asia: a synthesis. AlMS Agriculture and Food, 1(2), 144-156.
- Pender, L., Mirzahaev, A., & Kato, F. (2009). Fronomic analysis of sustainable land management ontions in Central Asia. Final report for the ADB. IFPRI/ICARDA. 168
- Perfore: _____, Mirzdaev, A., & Kato, E. (2009). Economic anarysis of sustainable and management opuons in Certica shar, initial report for the Abos. Intra/LCARDA, 106: Schoengold, K., Studning, D. L. (2014). The impact of water price uncertainty on the adoption of precision irrigation systems. Agricultural Economics, 45(6), T29-743. Shrestha, R. &, & Gopalakrishnan, C. (1993). Adoption and diffusion of drip irrigation technology: an econometric analysis. Economic Development and Cultural Change, 41(2), 407-48.
- Teklewold, H., Kassie, M., & Shiferaw, B. (2013). Adoption of multiple sustainable agricultural practices in rural Ethiopia. Journal of Agricultural Economics, 64(3): 597-623
- Ward, P. S., Bell, A. R., Droppelmann, K., & Benton, T. G. (2018). Early adoption of conservation agriculture practices: Understanding partial compliance in programs with multiple adoption decisions. Land Use Policy 70: 27-37. Zeweld, W., Van Huylenbrocck, G., Tesfay, G., Azadi, H., & Speelman, S. (2020). Sustainable agricultural practices, environmental risk mitigation and livelihood improvements: Empirical evidence from Northern Ethiopia. Land use policy, 95, 103799.

17

www.iamo.de/en

17

Study regions

Country	District	Number of respondents	Main distric characteristics
	Jomboy	150	Non-cotton producers, diversified
Uzbekistan	Pastdargam	154	Mainly state crop cotton and wheat
(Samarkand)	Payarik	156	Mainly state crop cotton and wheat
	Total	460	
	Maktaaral	171	Specializes in cotton cultivation
Kazakhstan	Sariagash	166	Diversified in high-value crops
(Turkistan)	Shardara	166	Specializes in cotton cultivation
	Total	503	

Source: AGRICHANGE II farm survey data, 2019

The number of adopted SAPs by individual farms



Number of	Kazakhstan	Uzbekistan	
SAPs			
0	315 (62.6 %)	227 (49.4 %)	
1	152 (30.8 %)	172 (37.4 %)	
2	30 (6.0 %)	41 (8.9 %)	
3	3 (0.6 %)	19 (4.1 %)	
4	0	1 (0.2%)	

www.iamo.de/en

19

Determinants of farmer's SAPs adoption decision (marginal effect)



Razakiistani, N=450				
Variables	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conservation tillage
Farm manager experience (year)	0.001	0.001	0.001	-0.000
Farm size (ha)	-0.001	-0.001	0.001	0.0003
Impatient farmer (1/0)	0.079	-0.014	0.065**	0.038
Credit rationed farm (1/0)	-0.069	-0.092**	0.016	-0.002
Farmer has a relative who manages own farm (1/0)	0.089*	0.041	0.013	0.119***
Good soil fertility (index 01)	-0.075*	-0.033	-0.053*	-0.033
Distance to the district center (km)	-0.001	0.001	0.0001	-0.002**
Uzbekistan. N=460				
Variables	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conservation tillage
Farm manager experience (year)	0.004	0.001	0.003	0.003
Farm size (ha)	-0.001	0.0002	0.001	-0.001
Impatient farmer (1/0)	-0.019	0.080	-0.012	0.035
Credit rationed farm (1/0)	0.042	0.045	-0.025	0.086***
Farmer has a relative who manages own farm (1/0)	-0.079*	-0.044	-0.093**	-0.022
	0 4 50***	-0.022	-0.043	-0.059*
Good soil fertility (index 01)	-0.159***	-0.032	01010	0.000

Determinants of farmer's SAPs

adoption decision (marginal effect)



Kazakhstan, N=496

Variables (district effect)	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conservation tillage
Shardara	0.030	-0.030	-0.023	0.056
Sariagash	-0.009	-0.026	-0.116***	0.046*
Pseudo R2	0.162	0.123	0.266	0.275
Prob > chi2	0.000	0.0000	0.0000	0.0000

Uzbekistan, N=460

Variables (district effect)	SAPs adoption (including intercropping)	Crop rotation	Biological methods for pest control	Conservation tillage
Payarik	-0.102*	-0.006	-0.104*	-0.108**
Pastdargam	-0.181***	-0.045	-0.184***	-0.155***
Pseudo R2	0.181	0.221	0.186	0.312
Prob > chi2	0.000	0.000	0.000	0.000

www.iamo.de/en

Note: * p<0.1, ** p<0.05, *** p<0.01

21

sustainable agriculture



21

22

 sustainable agriculture can be defined as efficiently using available resources, on the aim of improving productivity, as well as management and maintenance of resources in a way that accommodate individuals' requirements for today and for future generations. (Acharya 2006; Zeweld, Van Huylenbroeck et al. 2017)