Supporting Information for

Improving farmer livelihood resilience to climate change in rural areas of Inner Mongolia, China

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Table S1. The scoring system we provided to experts when comparing each pair of dimensions.

Score	Explanation
1	A is the same as B.
3	A is sightly important than B.
5	A is more strongly important than B.
7	A is very strongly important than B.
9	A is extremely important than B.

Table S2. The standard for classification of farmers' livelihood types.

Different livelihood type	Explanation
Sole agriculture	The proportion of household agricultural income≥90%, agricultural income includes income from farming, forestry, husbandry, and fishery.
Agriculture as a major job	50%≤Proportion of household agricultural income<90%, agricultural income is the main source of income, and business, labor, and wage income are supplemented.
Agriculture as a side job	The proportion of household agricultural income<50%, business, labor, and wage income are the main source of income, and agricultural income is supplemented.

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Table S3. The definitions of factors influencing the farmers' livelihood resilience.

Influencing factors	Definition
Non-agricultural level (V_1)	Non-agricultural income as a share of annual household income (%)
Highest education (V_2)	The highest education level among family members (1=uneducated, 2=elementary school, 3=junior high school, 4=senior high school, 5= technical secondary school, 6= college graduate or higher)
Age of household head (V_3)	Age of household head in the family
Family size (V_4)	Total family members
Arable area (V_5)	Total household arable area (Mu [1])
Agricultural technology training (V_6)	Number of times of participating in agricultural technology training per year
Convenience of transportation (V_7)	Does convenient transportation surround your home? (1=very inconvenient, 2=inconvenient, 3=general, 4=convenient, 5=very convenient)
Accessibility of information (V_8)	Do you have easy access to the information? (1=difficult, 2=general, 3=easy)
Change of livelihood strategies (V_9)	Number of changing livelihood strategies
Awareness of climate change (V_{10})	Whether know about climate change (1=not at all, 2=not very well, 3=generally, 4=somewhat, 5=very well)
Climate change perception (V_{11})	Whether worry about climate change (1=not at all, 2=not very well, 3=generally, 4=somewhat, 5=very well)

[1] 1 Mu = 0.0667 ha.

Table S4. Experts' insights on the weight of farmers' livelihood resilience dimension.

Dimension	Weight (priority order)
Buffer capacity	0.3335 (2)
Self-organization capacity	0.3263 (3)
Learning capacity	0.3402 (1)
Consistency Index (CI)	0.0002

Table S5. Sociodemographic characteristics of surveyed farmers with valid data.

	N	Minimum	Maximum	Mean	Std. Deviation
Gender [1]	596	0	1	0.53	0.500
Age	596	18	82	49.44	10.193
Marital status [2]	596	1	5	2.02	0.292
Education level [3]	596	1	5	2.07	0.750
Household agricultural income [4]	596	1	5	2.97	1.361

[1] Male = 1, Female = 0; [2] Single = 1, Married = 2, Divorced = 3, Widowed = 4, Live-in = 5; [3] Primary school or below = 1, Junior high school = 2, High school or technical secondary school = 3, Junior college = 4, University or above = 5; [4] Below 20000 RMB/year = 1, 20000–39999 RMB/year = 2, 40000–59999 RMB/year = 3, 60000–79999 RMB/year = 4, 80000 RMB/year or above = 5.

189 **Table S6. The classification of farmers' livelihoods and the percentage of responders in**
190 **the farmers survey.**

Different livelihood type	Number of farmer households	Proportion (%)
Sole agriculture	201	33.72
Agriculture as a major job	203	34.06
Agriculture as a side job	192	32.22

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Table S7. The survey results of farmers' livelihood resilience indicators from all farmers.

Dimension	Indicator	Description	Mean	Standard Deviation	Weight
Buffer capacity (B)	Household laborers (B_1)	The number of household laborers × 1 + The number of household semi-labor × 0.5	2.114	0.627	0.011
	Health and environmental issues (B_2)	Use a sanitary toilet (1=yes, 0=no)	0.139	0.346	0.512
	Arable area per capita (B_3)	The ratio of household arable area to the household total population (Mu)	10.748	10.573	0.100
	Soil capability index (B_4)	Soil quality (1=low, 2=medium, 3=high)	1.888	0.396	0.043
	Housing quality (B_5)	Housing type × 0.5 + Housing area class × 0.5 (Housing type: 1=dilapidated house, 2=earthen house, 3=brick house, 4=apartment; Housing area class: level 1=<100 m^2, level 2=100~200 m^2, level 3=201~300 m^2, level 4=>300 m^2)	2.194	0.301	0.028
	Savings (B_6)	1=<20,000 (RMB; the official currency of China, 1 RMB ≈ 0.16 US Dollar), 2=20,000~40,000 (RMB), 3=40,001~60,000 (RMB), 4=>60,000 (RMB)	2.282	1.248	0.157
	Assets (B_7)	Livestock quantity + Production equipment quantity	19.438	22.937	0.149
Self-organization capacity (S)	Social network (S_1)	Whether get cooperation from other village people (1=yes, 0=no)	0.977	0.151	0.003
	Neighborhood trust (S_2)	Trust degree of neighbors (1=very low, 2=low, 3=average, 4=high, 5=very high)	4.324	0.869	0.006
	Access to market (S_3)	Distance of residence to the nearest agricultural products market (km)	5.788	8.017	0.072
	Leadership (S_4)	Whether there is a civil servant or village cadre in the family members (1=yes, 0=no)	0.153	0.360	0.250
	Specialized cooperative (S_5)	Whether family members are a member of a cooperative society	0.211	0.408	0.207

		(1=yes, 0=no)			
	Grain self-sufficiency (S6)	Whether can grain self-sufficiency (1=yes, 0=no)	0.032	0.176	0.459
	Access to credit (S7)	Whether can borrow money from a bank or credit union (1=yes, 0=no)	0.985	0.122	0.002
Learning capacity (L)	Education of household head (L1)	Household head education level (1=uneducated, 2=elementary school, 3=junior high school, 4=senior high school, 5= technical secondary school, 6= college graduate or higher)	3.077	0.756	0.034
	Previous work experience (L2)	Years of involvement in forestry or agriculture (1=<5 years, 2=6~10 years, 3=11~15 years, 4=16~20 years, 5=>20 years)	4.151	1.203	0.050
	Information accessing capacity (L3)	The number of channels that family access to information	4.087	1.773	0.096
	Purchase of insurance (L4)	Whether buy agriculture or forestry insurance for annual (1=yes, 0=no)	0.886	0.318	0.062
	Education investment (L5)	Education cost per year (1=<2,000 RMB, 2=2,000~4,000 RMB, 3=4,001~6,000 RMB, 4=6,001~8,000 RMB, 5=>8,000 RMB)	2.529	1.713	0.385
	Technical training (L6)	Whether participate in training organized by the government (1=yes, 0=no)	0.601	0.490	0.260
	Knowledge transfer capability (L7)	Whether learn new ideas/practices from other farmers or professionals (1=yes, 0=no)	0.800	0.400	0.113

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Table S8. The livelihood resilience value of farmers with different livelihood types.

Different livelihood type	Dimensions	Buffer capacity	Self-organization capacity	Learning capacity	Livelihood resilience
Sole agriculture		0.066	0.028	0.170	0.264
Agriculture as a major job		0.070	0.042	0.193	0.306
Agriculture as a side job		0.061	0.037	0.193	0.290
Test of homogeneity of variances	Levene statistic	4.990	7.506	1.719	0.550
	Significance	0.007***	0.001***	0.180	0.577
ANOVA	F statistics	1.006	4.847	5.629	5.168
	Significance	0.366	0.008***	0.004***	0.006***

Note: *** indicates significant at the level of 1%.

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Table S9. The scores of livelihood resilience indicators of farmers with different livelihood types.

Different livelihood type \ Indicator	Sole agriculture		Agriculture as a major job		Agriculture as a side job		Total farmers		ANOVA
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	F statistics
Household laborers (B_1)	1.985	0.598	2.148	0.610	2.214	0.656	2.114	0.627	7.096***
Health and environmental issues (B_2)	0.179	0.384	0.108	0.312	0.130	0.337	0.139	0.347	2.210
Arable area per capita (B_3)	10.888	8.742	12.392	12.544	8.862	9.794	10.748	10.582	5.603***
Soil capability index (B_4)	1.950	0.421	1.897	0.351	1.813	0.404	1.888	0.396	6.113***
Housing quality (B_5)	2.157	0.307	2.214	0.294	2.211	0.300	2.194	0.301	2.319*
Savings (B_6)	1.945	1.192	2.685	1.262	2.208	1.179	2.282	1.249	19.301***
Assets (B_7)	16.662	23.561	25.887	23.385	15.526	20.356	19.438	22.957	12.751***
Social network (S_1)	0.975	0.156	0.956	0.206	1.000	0.000	0.977	0.152	4.280**
Neighborhood trust (S_2)	4.328	0.708	4.384	0.944	4.255	0.939	4.324	0.870	1.089
Access to market (S_3)	6.436	8.712	4.610	7.990	3.536	2.745	4.880	7.144	8.525***
Leadership (S_4)	0.080	0.271	0.177	0.383	0.203	0.403	0.153	0.360	6.626***
Specialized cooperative (S_5)	0.149	0.357	0.241	0.429	0.245	0.431	0.211	0.409	3.542**
Grain self-sufficiency (S_6)	0.045	0.207	0.049	0.217	0.000	0.000	0.032	0.176	4.748***
Access to credit (S_7)	0.985	0.122	0.985	0.121	0.984	0.124	0.985	0.122	0.003
Education of household head (L_1)	2.905	0.711	3.089	0.739	3.245	0.784	3.077	0.756	10.223***

Previous work experience (L$_2$)	4.274	1.127	4.286	1.070	3.880	1.366	4.151	1.204	7.323***
Information accessing capacity (L$_3$)	4.075	1.664	4.202	1.881	3.979	1.772	4.087	1.774	0.785
Purchase of insurance (L$_4$)	0.791	0.408	0.926	0.262	0.943	0.233	0.886	0.318	14.217***
Education investment (L$_5$)	2.408	1.718	2.576	1.700	2.604	1.727	2.529	1.714	0.762
Technical training (L$_6$)	0.507	0.501	0.655	0.476	0.641	0.481	0.601	0.490	5.612***
Knowledge transfer capability (L$_7$)	0.766	0.424	0.798	0.402	0.839	0.369	0.800	0.400	1.615

Note: ***, **, * indicate significant at the level of 1%, 5%, and 10%, respectively.

Table S10. The livelihood resilience of farmers in different towns.

Different town	Dimensions	Buffer capacity	Self-organization capacity	Learning capacity	Livelihood resilience
Saliba		0.053	0.022	0.184	0.259
Sijiazi		0.076	0.043	0.231	0.350
Xiawa		0.054	0.043	0.159	0.256
Changsheng		0.046	0.012	0.138	0.195
Fengshou		0.086	0.049	0.189	0.323
Test of homogeneity of variances	Levene statistic	53.052	31.110	9.037	8.919
	Significance	0.000***	0.000***	0.000***	0.000***
ANOVA	F statistics	8.861	12.637	24.174	26.700
	Significance	0.000***	0.000***	0.000***	0.000***

Note: *** indicates significant at the level of 1%.

Table S11. The scores of livelihood resilience indicators of farmers in different towns.

Different Town / Indicator	Saliba		Sijiazi		Xiawa		Changsheng		Fengshou		Total farmers		ANOVA
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	F statistics
Household laborers (B_1)	1.946	0.604	2.118	0.548	2.228	0.671	2.038	0.335	2.205	0.765	2.114	0.627	4.217***
Health and environmental issues (B_2)	0.092	0.290	0.143	0.351	0.036	0.186	0.000	0.000	0.333	0.473	0.139	0.347	19.819***
Arable area per capita (B_3)	8.120	5.441	10.549	12.167	11.060	9.082	24.469	10.571	5.264	5.489	10.748	10.582	64.452***
Soil capability index (B_4)	1.942	0.395	1.721	0.450	1.723	0.449	2.000	0.000	2.069	0.281	1.888	0.396	23.903***
Housing quality (B_5)	1.975	0.193	2.154	0.274	2.228	0.299	2.319	0.242	2.319	0.322	2.194	0.301	32.132***
Savings (B_6)	2.108	1.262	2.771	1.266	2.661	1.227	2.200	0.960	1.701	1.104	2.282	1.249	18.291***
Assets (B_7)	19.342	31.354	30.986	21.880	20.580	20.921	15.688	9.158	9.486	16.855	19.438	22.957	18.089***
Social network (S_1)	0.892	0.312	1.000	0.000	1.000	0.000	1.000	0.000	0.993	0.083	0.977	0.152	12.755***
Neighborhood trust (S_2)	4.425	0.876	4.136	1.236	4.063	0.634	5.000	0.000	4.250	0.597	4.324	0.870	18.942***
Access to market (S_3)	4.614	2.975	4.067	3.496	3.178	2.170	5.656	5.198	6.784	12.944	4.880	7.144	5.010***
Leadership (S_4)	0.075	0.264	0.171	0.378	0.071	0.259	0.050	0.219	0.319	0.468	0.153	0.360	13.285***
Specialized cooperative (S_5)	0.008	0.091	0.364	0.483	0.313	0.466	0.038	0.191	0.250	0.435	0.211	0.409	20.293***
Grain self-sufficiency	0.075	0.264	0.000	0.000	0.080	0.273	0.000	0.000	0.007	0.083	0.032	0.176	6.713***

(S$_6$)												
Access to credit (S$_7$)	0.992	0.091	0.979	0.145	1.000	0.000	0.988	0.112	0.972	0.165	0.985	0.122	1.012
Education of household head (L$_1$)	2.783	0.624	3.393	0.736	3.063	0.751	2.825	0.742	3.167	0.757	3.077	0.756	14.580***
Previous work experience (L$_2$)	4.250	1.218	4.207	1.083	4.259	1.153	4.163	1.195	3.924	1.328	4.151	1.204	1.800
Information accessing capacity (L$_3$)	5.108	1.549	3.536	2.100	3.625	1.202	4.200	0.753	4.069	2.009	4.087	1.774	16.939***
Purchase of insurance (L$_4$)	0.825	0.382	1.000	0.000	0.732	0.445	0.988	0.112	0.889	0.315	0.886	0.318	15.569***
Education investment (L$_5$)	2.042	1.606	2.707	1.856	2.777	1.702	1.763	1.082	2.993	1.736	2.529	1.714	10.676***
Technical training (L$_6$)	0.667	0.473	0.957	0.203	0.375	0.486	0.438	0.499	0.465	0.501	0.601	0.490	37.252***
Knowledge transfer capability (L$_7$)	0.942	0.235	0.986	0.119	0.563	0.498	0.538	0.502	0.833	0.374	0.800	0.400	37.372***

Note: *** indicates significant at the level of 1%.

Table S12. Factors influencing farmers' livelihood resilience to climate change and survey results from all farmers.

Influencing factors	Definition	Mean	Standard Deviation
Non-agricultural level (V_1)	Non-agricultural income as a share of annual household income (%)	0.427	0.374
Highest education (V_2)	The highest education level among family members (1=uneducated, 2=elementary school, 3=junior high school, 4=senior high school, 5= technical secondary school, 6= college graduate or higher)	3.711	1.183
Age of household head (V_3)	Age of household head in the family	49.441	10.193
Family size (V_4)	Total family members	2.982	1.031
Arable area (V_5)	Total household arable area (Mu)	30.047	29.981
Agricultural technology training (V_6)	Number of times of participating in agricultural technology training per year	1.696	1.438
Convenience of transportation (V_7)	Does convenient transportation surround your home? (1=very inconvenient, 2=inconvenient, 3=general, 4=convenient, 5=very convenient)	3.693	1.385
Accessibility of information (V_8)	Do you have easy access to the information? (1=difficult, 2=general, 3=easy)	1.923	0.523
Change of livelihood strategies (V_9)	Number of changing livelihood strategies	1.082	1.285
Awareness of climate change (V_{10})	Whether know about climate change (1=not at all, 2=not very well, 3=generally, 4=somewhat, 5=very well)	3.128	0.898
Climate change perception (V_{11})	Whether worry about climate change (1=not at all, 2=not very well, 3=generally, 4=somewhat, 5=very well)	2.691	1.046

340   **Table S13. Regression analysis results of factors influencing the livelihood resilience of**
341   **farmers with different livelihood types.**

Influencing factors	Coefficients in regression analysis results by livelihood type				Variance inflation factor
	Sole agriculture	Agriculture as a major job	Agriculture as a side job	All farmers	
Non-agricultural level (V1)	0.267***	-0.301***	0.072	0.052	1.074
Highest education (V2)	0.431***	0.353***	0.404***	0.398***	1.383
Age of household head (V3)	-0.227***	-0.278***	-0.050	-0.204***	1.259
Family size (V4)	0.398***	0.516***	0.407***	0.456***	1.589
Arable area (V5)	0.218***	0.048	-0.091	0.061*	1.078
Agricultural technology training (V6)	0.521***	0.454***	0.495***	0.496***	1.258
Convenience of transportation (V7)	0.237***	0.015	0.090	0.132***	1.071
Accessibility of information (V8)	0.017	0.152**	0.098*	0.091**	1.144
Change of livelihood strategies (V9)	0.065	0.123**	0.154**	0.117***	1.191
Awareness of climate change (V10)	0.483***	0.320***	0.268***	0.362***	1.333
Climate change perception (V11)	0.252***	0.140**	0.063	0.147***	1.369
Constant	-1.336	1.307	-2.348**	-1.892*	
Number of	201	203	192	596	

samples

Adjust R2	0.524	0.538	0.458	0.483
F statistics	20.985***	22.379***	15.670***	51.501***

Note: ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

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Table S14. Regression analysis results of factors influencing the livelihood resilience of
farmers in different towns.

Influencing factors	Coefficients in regression analysis results by town						Variance inflation factor
	Saliba	Sijiazi	Xiawa	Changsheng	Fengshou	All farmers	
Non-agricultural level (V1)	0.087	0.082	-0.097	-0.085	-0.122*	0.052	1.074
Highest education (V2)	0.143*	0.379***	0.493***	0.574***	0.345***	0.398***	1.383
Age of household head (V3)	-0.259***	-0.316***	-0.289***	-0.502***	-0.044	-0.204***	1.259
Family size (V4)	0.381***	0.502***	0.503***	0.760***	0.335***	0.456***	1.589
Arable area (V5)	0.200**	0.081	0.164**	0.600***	0.362***	0.061*	1.078
Agricultural technology training (V6)	0.536***	0.060	0.614***	0.843***	0.504***	0.496***	1.258
Convenience of transportation (V7)	0.191**	-0.039	-0.076	-0.105	0.297***	0.132***	1.071
Accessibility of information (V8)	-0.332***	0.227***	0.192**	0.000***	0.342***	0.091**	1.144
Change of livelihood strategies (V9)	0.331***	0.233***	-0.038	0.634***	-0.005	0.117***	1.191
Awareness of climate change (V10)	0.108	0.092	0.346***	0.588***	0.449***	0.362***	1.333
Climate change perception	0.380***	0.027	0.253***	0.325***	0.142**	0.147***	1.369

(V11)

Constant	0.987	-0.055	2.131**	-1.039	-2.348**	-1.892*
Number of samples	120	140	112	80	144	596
Adjust R2	0.441	0.345	0.639	0.885	0.458	0.483
F statistics	9.522***	7.642***	18.843***	61.990***	15.670***	51.501***

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Note: ***, **, * indicate significance at the 1%, 5%, and 10% levels, respectively.

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