

Supplementary Data A

Table 1. List of countries listed as “NA” in ISIMIP data.

Name	wheat	Name	rice	Name	maize
Antigua and Barbuda	NA	Anguilla	NA	Aruba	NA
Australian Indian Ocean Territories	NA	Aruba	NA	Australian Indian Ocean Territories	NA
Australian Indian Ocean Territories	NA	Australian Indian Ocean Territories	NA	Bahrain	NA
Bahrain	NA	Australian Indian Ocean Territories	NA	Barbados	NA
Benin	NA	Barbados	NA	British Virgin Islands	NA
British Indian Ocean Territory	NA	Belgium	NA	Cape Verde	NA
British Virgin Islands	NA	Bermuda	NA	Cayman Islands	NA
Cambodia	NA	British Indian Ocean Territory	NA	Cook Islands	NA
Cape Verde	NA	Canada	NA	Cyprus	NA
Chad	NA	Clipperton Island	NA	Dominica	NA
Clipperton Island	NA	Comoros	NA	Equatorial Guinea	NA
Comoros	NA	Cook Islands	NA	Falkland Islands	NA
Djibouti	NA	Djibouti	NA	Greenland	NA
Dominica	NA	Dominica	NA	Grenada	NA
Dominican Republic	NA	Equatorial Guinea	NA	Guam	NA
El Salvador	NA	Estonia	NA	Heard Island and McDonald Islands	NA
eSwatini	NA	Falkland Islands	NA	Iceland	NA
Falkland Islands	NA	Faroe Islands	NA	Ireland	NA
Federated States of Micronesia	NA	Fiji	NA	Israel	NA
Fiji	NA	Finland	NA	Jersey	NA
French Polynesia	NA	French Polynesia	NA	Kiribati	NA
French Southern and Antarctic Lands	NA	French Southern and Antarctic Lands	NA	Kuwait	NA
Ghana	NA	Germany	NA	Maldives	NA
Greenland	NA	Greenland	NA	Marshall Islands	NA
Grenada	NA	Grenada	NA	Mauritius	NA
Guam	NA	Guam	NA	Montserrat	NA
Honduras	NA	Jamaica	NA	Norfolk Island	NA
Hong Kong	NA	Jersey	NA	Northern Mariana Islands	NA
Iceland	NA	Jordan	NA	Norway	NA
Indonesia	NA	Kiribati	NA	Oman	NA
Jamaica	NA	Lebanon	NA	Pitcairn Islands	NA
Jersey	NA	Lesotho	NA	Puerto Rico	NA
Macau	NA	Lithuania	NA	Saint Kitts and Nevis	NA
Malaysia	NA	Maldives	NA	Saint Martin	NA
Maldives	NA	Malta	NA	Saint Pierre and Miquelon	NA
Malta	NA	Marshall Islands	NA	Saint Vincent and the Grenadines	NA
Marshall Islands	NA	Mauritius	NA	Saint-Barthélemy	NA
Montserrat	NA	Mongolia	NA	Saudi Arabia	NA
Mozambique	NA	Montenegro	NA	Seychelles	NA
Namibia	NA	Montserrat	NA	Sint Maarten	NA

Nicaragua	NA	Netherlands	NA	Tunisia	NA
Niue	NA	New Caledonia	NA	Turks and Caicos Islands	NA
Northern Mariana Islands	NA	New Zealand	NA	United Arab Emirates	NA
Panama	NA	Norfolk Island	NA	United States Minor Outlying Islands	NA
Papua New Guinea	NA	Northern Mariana Islands	NA		
Philippines	NA	Norway	NA		
Pitcairn Islands	NA	Oman	NA		
Puerto Rico	NA	Palau	NA		
Qatar	NA	Palestine	NA		
Republic of the Congo	NA	Papua New Guinea	NA		
Saint Helena	NA	Pitcairn Islands	NA		
Saint Lucia	NA	Puerto Rico	NA		
Saint Pierre and Miquelon	NA	Saint Helena	NA		
São Tomé and Príncipe	NA	Saint Pierre and Miquelon	NA		
Sierra Leone	NA	Samoa	NA		
Singapore	NA	São Tomé and Príncipe	NA		
Solomon Islands	NA	Serbia	NA		
The Bahamas	NA	Slovakia	NA		
United States Minor Outlying Islands	NA	The Bahamas	NA		
United States Minor Outlying Islands	NA	United Arab Emirates	NA		
Venezuela	NA	United States Minor Outlying Islands	NA		
Wallis and Futuna	NA				

Supplementary Data B

Table 1 shows the quality of the process of identifying trade communities (Modularity) and the similarity between the structure of present-day and climate-projected trade communities (the Adjusted Rand Index). The Adjusted Rand Index shows small changes, but we assert that the network trade community structure for rice differs the most between present-day and climate-projected trade across the three commodities studied.

Table 1. Statistical comparison of present-day and climate-projected network community structure. Modularity Q represents the quality of communities (i.e. how accurately the network can be described as being built up by separable communities, 0 = no quality, 1 = perfect quality). The Adjusted Rand Index represents the pair-wise (country-country) similarity between present-day and climate-projected trade communities (0 = no similarity, 1 = perfect similarity), indicating highest similarity for the global wheat network structure.

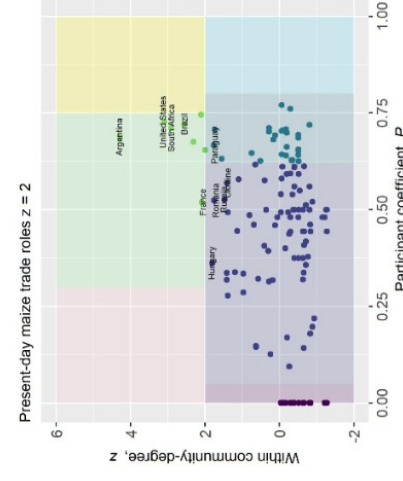
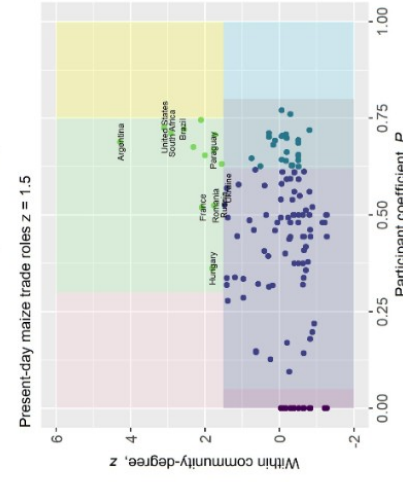
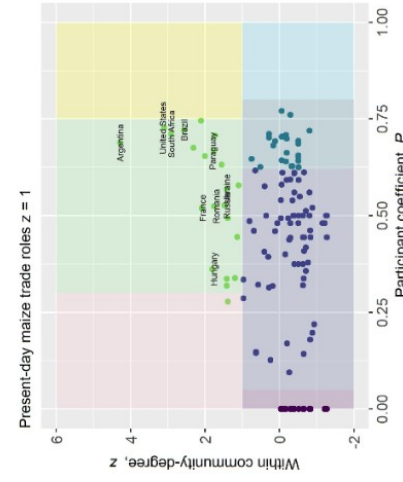
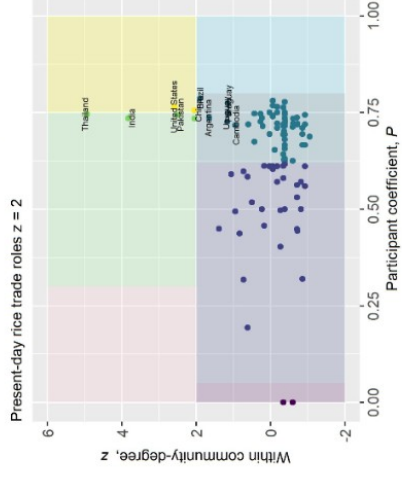
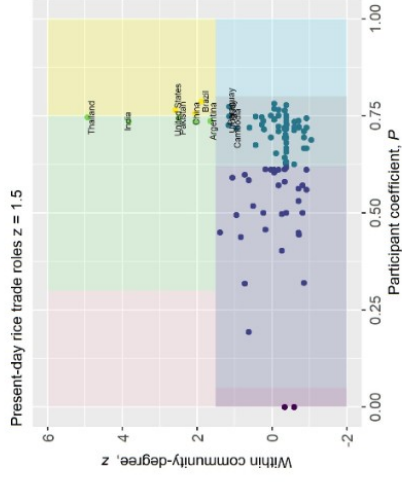
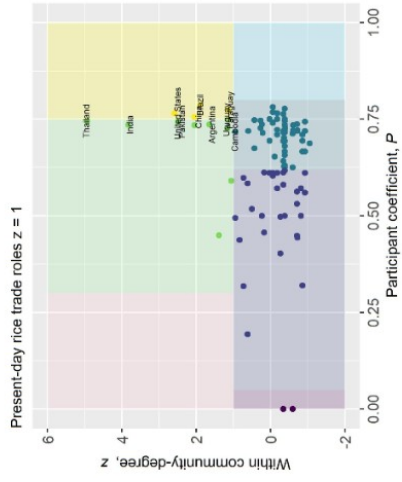
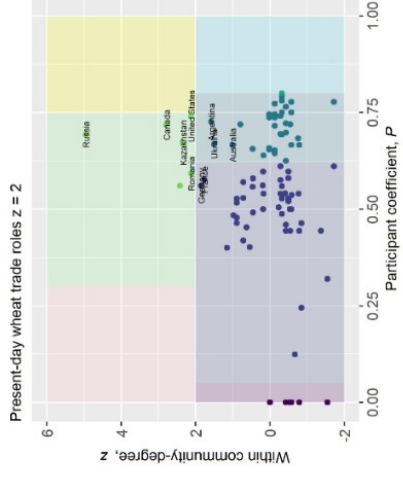
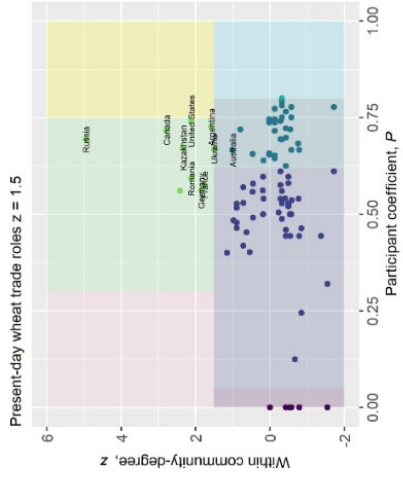
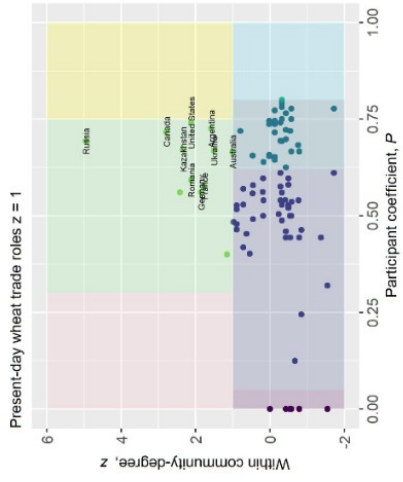
	Wheat		Rice		Maize	
Nr countries (without isolates)	108		108		143	
Nr links	1091		1010		1418	
	Present-day trade	Climate-projected trade	Present-day trade	Climate-projected trade	Present-day trade	Climate-projected trade
Modularity	0,471	0,472	0,447	0,445	0,483	0,487
Nr of communities	6	6	5	5	6	6
Isolates	Bhutan, Lao, Niger, South Sudan				Chad	Chad
Adjusted Rand Index	1		0.89		0.86	

Supplementary Data C

Figure 1. Present-day network roles at different z values. Labelled countries are major global exporters of respective crop in 2018.

We made a qualitative calibration of the threshold values by 1) looking for a differentiated distribution of nodes across the different roles and 2) comparing identified hubs in the present-day cartographies to FAO data on the ten largest global exporters of the given crop (for 2018; FAOSTAT, 2021).

Our exploration of how well a node is connected to other nodes in its trade community (z) and how the node's links are distributed among other trade communities (P) values give differentiated distributions across the majority of roles for all three crops. It shows, however, that a value of $z = 2.5$ does not fully capture the world's largest exporters for any of the crops. We lowered the threshold until countries categorised as hubs corresponded to the majority of the ten largest global exporters, and hence assumed a lower threshold of $z = 1$. Most changes in role occur in the manner in which countries engage in communities across the entire network and not in within-community degree, meaning that current hubs largely remain central in the climate-projected network. Overall, by the countries which have shifted network role, results point towards a trend of increased distribution of trade across communities.



Supplementary Data D

Table 1. Present-day trade communities for wheat. Countries in bold represent major global producers.

Community 1	Community 2	Community 3	Community 4	Community 5	Community 6
Argentina Bolivia Brazil Chile Uruguay Paraguay	Canada China Colombia Ecuador Japan Mexico Peru Thailand United States of America Australia Myanmar Iraq Republic of Korea Kuwait New Zealand Zimbabwe Guatemala	Algeria Mali Netherlands Italy Saudi Arabia United Kingdom of Great Britain and Northern Ireland Ireland Austria Bulgaria Denmark France Germany Hungary Ireland Norway Czechia Poland Portugal Slovakia Spain Sweden Switzerland Belgium Luxembourg Lithuania Estonia Finland Zambia Bosnia and Herzegovina Croatia Greece Republic of Moldova Slovenia	Bangladesh Botswana Kenya Lesotho Nigeria South Africa Uganda Viet Nam Egypt Jordan United Republic of Tanzania Oman Yemen Sudan Israel North Macedonia Romania Ethiopia Albania Cyprus Lebanon Somalia Turkey Serbia Burundi Malawi Rwanda Belarus Russian Federation Eritrea Latvia Georgia Armenia Iran (Islamic Republic of) Azerbaijan Mongolia Syrian Arab Republic Pakistan Montenegro Democratic People's Republic of Korea Palestine	Morocco Tunisia Libya Ukraine	India Afghanistan Nepal Kazakhstan Kyrgyzstan Tajikistan Turkmenistan Uzbekistan

Rice

Table 3. Present-day trade communities for rice. Countries in bold represent major global producers.

Community 1	Community 2	Community 3	Community 4	Community 5
Colombia El Salvador Guatemala Haiti Honduras Japan Mexico United States of America Belize Dominican	Argentina Bolivia Brazil Chile Costa Rica Cuba Gambia Nicaragua Panama Peru Sierra Leone	Iraq Mali Senegal Bangladesh Iran (Islamic Republic of) Guinea India Liberia Morocco Togo	Angola Burkina Faso Australia Malaysia Benin Democratic Republic of the Congo Ghana Mauritania Nigeria	France Guinea-Bissau Hungary Italy Republic of Korea Romania Spain Trinidad and Tobago Turkey Greece

Republic Ecuador	Venezuela (Bolivarian Republic of) Paraguay Uruguay	Niger Ethiopia Madagascar Nepal Somalia Sudan Bhutan	Thailand Viet Nam Zambia Brunei Darussalam Cameroon China, Macao SAR Indonesia Philippines Timor-Leste Central African Republic Chad Lao People's Democratic Republic Mozambique Myanmar South Sudan Uganda Congo Gabon Rwanda	Côte d'Ivoire Portugal Russian Federation United Republic of Tanzania Zimbabwe Bulgaria Albania Ukraine Cambodia Azerbaijan China Democratic People's Republic of Korea Egypt Kenya Afghanistan Burundi Kazakhstan Malawi Pakistan Guyana Suriname Armenia Kyrgyzstan Sri Lanka Tajikistan Turkmenistan Uzbekistan North Macedonia
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Table 4. Climate-projected trade communities for rice.

Community 1	Community 2	Community 3	Community 4	Community 5
Colombia El Salvador Guatemala Haiti Honduras Japan Mexico United States of America Belize Dominican Republic Burundi Ecuador	Argentina Bolivia Brazil Chile Costa Rica Cuba Gambia Nicaragua Panama Peru Sierra Leone Venezuela (Bolivarian Republic of) Paraguay Uruguay	Burkina Faso Iraq Mali Senegal Bangladesh Iran (Islamic Republic of) Guinea India Liberia Morocco Togo Niger Ethiopia Madagascar Nepal Somalia Sudan Bhutan	Angola Australia Malaysia Benin Democratic Republic of the Congo Ghana Mauritania Nigeria Thailand Zambia Zimbabwe Cameroon China, Macao SAR Indonesia Philippines Timor-Leste Central African Republic Chad Lao People's Democratic Republic Mozambique Myanmar South Sudan Uganda Congo Gabon Rwanda	France Guinea-Bissau Hungary Italy Republic of Korea Romania Spain Trinidad and Tobago Turkey Greece Côte d'Ivoire Portugal Russian Federation United Republic of Tanzania Viet Nam Bulgaria Albania Ukraine Cambodia Azerbaijan Brunei Darussalam China Democratic People's Republic of Korea Egypt Kenya Afghanistan Kazakhstan Malawi Pakistan Guyana Suriname Armenia Kyrgyzstan Sri Lanka

				Tajikistan Turkmenistan Uzbekistan North Macedonia
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Maize

Table 5. Present-day trade communities for maize. Countries in bold represent major global producers.

Community 1	Community 2	Community 3	Community 4	Community 5	Community 6
India Indonesia Nepal Pakistan Philippines Somalia Myanmar Lao People's Democratic Republic Bhutan Eritrea Thailand Timor-Leste Cambodia	Bolivia Canada Colombia Costa Rica Dominican Republic El Salvador Guatemala Honduras Jamaica Japan Republic of Korea Mexico Nicaragua Nigeria Panama Peru Guinea-Bissau Trinidad and Tobago United States of America Venezuela (Bolivarian Republic of) Australia Guyana Belize Haiti	Argentina Afghanistan Algeria Angola Bangladesh Botswana Brazil Cameroon Chile Congo Cuba Benin Ecuador Egypt Gabon Gambia Ghana Guinea Iran (Islamic Republic of) Iraq Côte d'Ivoire Jordan Liberia Malaysia Mali Mauritania Morocco Niger Paraguay Senegal Sierra Leone Singapore South Africa Togo Burkina Faso Uruguay Viet Nam Ethiopia Yemen Democratic Republic of the Congo Namibia Madagascar Mozambique Lesotho	Armenia Albania Austria Bulgaria China Finland France Germany Bosnia and Herzegovina Greece Hungary Croatia Italy Lebanon Libya Lithuania Netherlands North Macedonia Czechia Poland Portugal Romania Spain Switzerland Syrian Arab Republic Turkey Belgium Sudan New Zealand Belarus Georgia Russian Federation Slovenia Slovakia Ukraine Serbia Democratic People's Republic of Korea Republic of Moldova Sri Lanka Estonia Latvia Palestine Azerbaijan Montenegro Mongolia Luxembourg	Kenya United Republic of Tanzania Burundi Uganda Rwanda South Sudan Malawi Zimbabwe Zambia Eswatini Central African Republic	Kazakhstan Kyrgyzstan Uzbekistan Tajikistan Turkmenistan

Table 6. Climate-projected trade communities for maize.

Community 1	Community 2	Community 3	Community 4	Community 5	Community 6
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<p>India Indonesia Nepal Pakistan Philippines Somalia Myanmar Lao People's Democratic Republic Bhutan Eritrea Thailand Timor-Leste Cambodia</p>	<p>Bolivia Canada Colombia Costa Rica Dominican Republic El Salvador Guatemala Honduras Jamaica Japan Republic of Korea Mexico Nicaragua Nigeria Panama Peru Guinea-Bissau Trinidad and Tobago United States of America Venezuela (Bolivarian Republic of) Australia Guyana Belize Haiti</p>	<p>Argentina Afghanistan Algeria Angola Bangladesh Botswana Brazil Cameroon Chile Congo Cuba Benin Ecuador Egypt Gabon Gambia Ghana Guinea Iran (Islamic Republic of) Iraq Côte d'Ivoire Jordan Liberia Malaysia Mali Mauritania Morocco Niger Paraguay Senegal Sierra Leone Singapore South Africa Togo Burkina Faso Uruguay Viet Nam Ethiopia Yemen Democratic Republic of the Congo Namibia Madagascar Mozambique Lesotho</p>	<p>Albania Austria Bulgaria China Finland France Germany Bosnia and Herzegovina Greece Hungary Croatia Italy Lebanon Libya Lithuania Netherlands North Macedonia Czechia Poland Portugal Romania Spain Switzerland Belgium New Zealand Slovenia Slovakia Ukraine Serbia Democratic People's Republic of Korea Republic of Moldova Sri Lanka Montenegro Luxembourg</p>	<p>Kenya United Republic of Tanzania Burundi Uganda Rwanda South Sudan Malawi Zimbabwe Zambia Eswatini Central African Republic</p>	<p>Armenia Syrian Arab Republic Turkey Sudan Belarus Georgia Kazakhstan Russian Federation Estonia Latvia Palestine Azerbaijan Kyrgyzstan Uzbekistan Tajikistan Turkmenistan Mongolia</p>
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Supplementary Data E

Table 1. Present-day and climate-projected wheat roles climate change. Connectivity refers to within-module degree, and participation to participation coefficient.

Wheat: Present-day roles				Wheat: Climate-projected roles			
name	connectivity	participation	role	name	connectivity	participation	role
Afghanistan	0.18	0.50	Peripheral non-hub	Afghanistan	0.18	0.50	Peripheral non-hub
Albania	-0.28	0.54	Peripheral non-hub	Albania	-0.28	0.54	Peripheral non-hub
Algeria	-0.41	0.54	Peripheral non-hub	Algeria	-0.41	0.54	Peripheral non-hub
Argentina	1.58	0.73	Connector hub	Argentina	1.58	0.73	Connector hub
Armenia	-0.43	0.44	Peripheral non-hub	Armenia	-0.43	0.44	Peripheral non-hub
Australia	1.01	0.67	Connector hub	Australia	1.01	0.67	Connector hub
Austria	0.89	0.48	Peripheral non-hub	Austria	0.89	0.48	Peripheral non-hub
Azerbaijan	-0.43	0.44	Peripheral non-hub	Azerbaijan	-0.43	0.44	Peripheral non-hub
Bangladesh	-0.43	0.77	Connector non-hub	Bangladesh	-0.43	0.77	Connector non-hub
Belarus	-0.43	0.72	Connector non-hub	Belarus	-0.43	0.72	Connector non-hub
Belgium	1.16	0.40	Connector hub	Belgium	1.16	0.40	Connector hub
Bolivia (Plurinational State of)	-0.79	0.00	Ultra peripheral non-hub	Bolivia (Plurinational State of)	-0.79	0.00	Ultra peripheral non-hub
Bosnia and Herzegovina	-1.37	0.44	Peripheral non-hub	Bosnia and Herzegovina	-1.37	0.44	Peripheral non-hub
Botswana	-0.28	0.74	Connector non-hub	Botswana	-0.28	0.74	Connector non-hub
Brazil	0.79	0.72	Connector non-hub	Brazil	0.79	0.72	Connector non-hub
Bulgaria	0.46	0.58	Peripheral non-hub	Bulgaria	0.46	0.58	Peripheral non-hub
Burundi	-0.58	0.67	Connector non-hub	Burundi	-0.58	0.67	Connector non-hub
Canada	2.78	0.72	Connector hub	Canada	2.78	0.72	Connector hub
Chile	-0.79	0.44	Peripheral non-hub	Chile	-0.79	0.44	Peripheral non-hub
China	-0.33	0.79	Connector non-hub	China	-0.33	0.79	Connector non-hub
Colombia	-0.55	0.44	Peripheral non-hub	Colombia	-0.55	0.44	Peripheral non-hub
Croatia	-0.50	0.52	Peripheral non-hub	Croatia	-0.50	0.52	Peripheral non-hub
Cyprus	-0.13	0.64	Connector non-hub	Cyprus	-0.13	0.64	Connector non-hub
Czechia	0.72	0.53	Peripheral non-hub	Czechia	0.72	0.53	Peripheral non-hub
Democratic People's Republic of Korea	-0.58	0.00	Ultra peripheral non-hub	Democratic People's Republic of Korea	-0.58	0.00	Ultra peripheral non-hub
Denmark	0.98	0.48	Peripheral non-hub	Denmark	0.98	0.48	Peripheral non-hub
Ecuador	-0.55	0.72	Connector non-hub	Ecuador	-0.55	0.72	Connector non-hub
Egypt	0.02	0.65	Connector non-hub	Egypt	0.02	0.65	Connector non-hub
Eritrea	-0.43	0.00	Ultra peripheral non-hub	Eritrea	-0.43	0.00	Ultra peripheral non-hub
Estonia	-0.33	0.53	Peripheral non-hub	Estonia	-0.33	0.53	Peripheral non-hub
Ethiopia	-0.28	0.69	Connector non-hub	Ethiopia	-0.28	0.69	Connector non-hub
Finland	-0.85	0.24	Peripheral non-hub	Finland	-0.85	0.24	Peripheral non-hub
France	1.77	0.58	Connector hub	France	1.77	0.58	Connector hub
Georgia	-0.43	0.63	Connector non-hub	Georgia	-0.43	0.63	Connector non-hub
Germany	1.85	0.56	Connector hub	Germany	1.85	0.56	Connector hub

Greece	-1.72	0.61	Peripheral non-hub	Greece	-1.72	0.61	Peripheral non-hub
Guatemala	-0.33	0.56	Peripheral non-hub	Guatemala	-0.33	0.56	Peripheral non-hub
Hungary	0.72	0.57	Peripheral non-hub	Hungary	0.72	0.57	Peripheral non-hub
India	0.18	0.60	Peripheral non-hub	India	0.18	0.60	Peripheral non-hub
Iran (Islamic Republic of)	-0.43	0.44	Peripheral non-hub	Iran (Islamic Republic of)	-0.43	0.44	Peripheral non-hub
Iraq	-0.33	0.69	Connector non-hub	Iraq	-0.33	0.69	Connector non-hub
Ireland	-0.33	0.49	Peripheral non-hub	Ireland	-0.33	0.49	Peripheral non-hub
Israel	-0.28	0.58	Peripheral non-hub	Israel	-0.28	0.58	Peripheral non-hub
Italy	0.89	0.52	Peripheral non-hub	Italy	0.89	0.52	Peripheral non-hub
Japan	-0.33	0.78	Connector non-hub	Japan	-0.33	0.78	Connector non-hub
Jordan	0.02	0.74	Connector non-hub	Jordan	0.02	0.74	Connector non-hub
Kazakhstan	2.34	0.67	Connector hub	Kazakhstan	2.34	0.67	Connector hub
Kenya	0.02	0.66	Connector non-hub	Kenya	0.02	0.66	Connector non-hub
Kuwait	-0.33	0.56	Peripheral non-hub	Kuwait	-0.33	0.56	Peripheral non-hub
Kyrgyzstan	-0.54	0.50	Peripheral non-hub	Kyrgyzstan	-0.54	0.50	Peripheral non-hub
Latvia	0.47	0.56	Peripheral non-hub	Latvia	0.47	0.56	Peripheral non-hub
Lebanon	-0.13	0.72	Connector non-hub	Lebanon	-0.13	0.72	Connector non-hub
Lesotho	-0.28	0.74	Connector non-hub	Lesotho	-0.28	0.74	Connector non-hub
Libya	-0.50	0.60	Peripheral non-hub	Libya	-0.50	0.60	Peripheral non-hub
Lithuania	0.20	0.56	Peripheral non-hub	Lithuania	0.20	0.56	Peripheral non-hub
Luxembourg	-0.68	0.12	Peripheral non-hub	Luxembourg	-0.68	0.12	Peripheral non-hub
Malawi	-0.58	0.75	Connector non-hub	Malawi	-0.58	0.75	Connector non-hub
Mali	-1.72	0.78	Connector non-hub	Mali	-1.72	0.78	Connector non-hub
Mexico	-0.33	0.79	Connector non-hub	Mexico	-0.33	0.79	Connector non-hub
Mongolia	-0.58	0.50	Peripheral non-hub	Mongolia	-0.58	0.50	Peripheral non-hub
Montenegro	-0.43	0.00	Ultra peripheral non-hub	Montenegro	-0.43	0.00	Ultra peripheral non-hub
Morocco	-0.50	0.58	Peripheral non-hub	Morocco	-0.50	0.58	Peripheral non-hub
Myanmar	-0.33	0.69	Connector non-hub	Myanmar	-0.33	0.69	Connector non-hub
Nepal	-0.54	0.00	Ultra peripheral non-hub	Nepal	-0.54	0.00	Ultra peripheral non-hub
Netherlands	0.89	0.46	Peripheral non-hub	Netherlands	0.89	0.46	Peripheral non-hub
New Zealand	-0.55	0.00	Ultra peripheral non-hub	New Zealand	-0.55	0.00	Ultra peripheral non-hub
Nigeria	-0.13	0.65	Connector non-hub	Nigeria	-0.13	0.65	Connector non-hub
North Macedonia	-0.43	0.46	Peripheral non-hub	North Macedonia	-0.43	0.46	Peripheral non-hub
Norway	-0.85	0.46	Peripheral non-hub	Norway	-0.85	0.46	Peripheral non-hub
Oman	0.02	0.75	Connector non-hub	Oman	0.02	0.75	Connector non-hub
Pakistan	0.17	0.54	Peripheral non-hub	Pakistan	0.17	0.54	Peripheral non-hub
Palestine	-0.58	0.00	Ultra peripheral non-hub	Palestine	-0.58	0.00	Ultra peripheral non-hub
Paraguay	-0.79	0.67	Connector non-hub	Paraguay	-0.79	0.67	Connector non-hub
Peru	-0.55	0.72	Connector non-hub	Peru	-0.55	0.72	Connector non-hub
Poland	0.89	0.53	Peripheral non-hub	Poland	0.89	0.53	Peripheral non-hub

Portugal	-0.33	0.49	Peripheral non-hub	Portugal	-0.33	0.49	Peripheral non-hub
Republic of Korea	-0.33	0.75	Connector non-hub	Republic of Korea	-0.33	0.75	Connector non-hub
Republic of Moldova	-0.76	0.68	Connector non-hub	Republic of Moldova	-0.76	0.68	Connector non-hub
Romania	2.11	0.59	Connector hub	Romania	2.11	0.59	Connector hub
Russia	4.96	0.69	Connector hub	Russia	4.96	0.69	Connector hub
Rwanda	-0.58	0.78	Connector non-hub	Rwanda	-0.58	0.78	Connector non-hub
Saudi Arabia	-0.24	0.51	Peripheral non-hub	Saudi Arabia	-0.24	0.51	Peripheral non-hub
Serbia	2.41	0.56	Connector hub	Serbia	2.41	0.56	Connector hub
Slovakia	0.46	0.49	Peripheral non-hub	Slovakia	0.46	0.49	Peripheral non-hub
Slovenia	-1.55	0.32	Peripheral non-hub	Slovenia	-1.55	0.32	Peripheral non-hub
Somalia	-0.28	0.61	Peripheral non-hub	Somalia	-0.28	0.61	Peripheral non-hub
South Africa	0.17	0.64	Connector non-hub	South Africa	0.17	0.64	Connector non-hub
Spain	0.72	0.42	Peripheral non-hub	Spain	0.72	0.42	Peripheral non-hub
Sudan	-0.13	0.74	Connector non-hub	Sudan	-0.13	0.74	Connector non-hub
Sweden	0.55	0.40	Peripheral non-hub	Sweden	0.55	0.40	Peripheral non-hub
Switzerland	-0.59	0.54	Peripheral non-hub	Switzerland	-0.59	0.54	Peripheral non-hub
Syrian Arab Republic	-0.43	0.44	Peripheral non-hub	Syrian Arab Republic	-0.43	0.44	Peripheral non-hub
Tajikistan	-0.54	0.50	Peripheral non-hub	Tajikistan	-0.54	0.50	Peripheral non-hub
Thailand	-0.33	0.80	Kinless non-hub	Thailand	-0.33	0.80	Kinless non-hub
Tunisia	-0.50	0.53	Peripheral non-hub	Tunisia	-0.50	0.53	Peripheral non-hub
Turkey	0.47	0.66	Connector non-hub	Turkey	0.47	0.66	Connector non-hub
Turkmenistan	-0.54	0.50	Peripheral non-hub	Turkmenistan	-0.54	0.50	Peripheral non-hub
Uganda	-0.13	0.74	Connector non-hub	Uganda	-0.13	0.74	Connector non-hub
Ukraine	1.50	0.67	Connector hub	Ukraine	1.50	0.67	Connector hub
United Kingdom of Great Britain and Northern Ireland	0.63	0.45	Peripheral non-hub	United Kingdom of Great Britain and Northern Ireland	0.63	0.45	Peripheral non-hub
United Republic of Tanzania	-0.43	0.70	Connector non-hub	United Republic of Tanzania	-0.43	0.70	Connector non-hub
United States	2.12	0.74	Connector hub	United States	2.12	0.74	Connector hub
Uruguay	0.00	0.00	Ultra peripheral non-hub	Uruguay	0.00	0.00	Ultra peripheral non-hub
Uzbekistan	-0.54	0.50	Peripheral non-hub	Uzbekistan	-0.54	0.50	Peripheral non-hub
Viet Nam	-0.13	0.77	Connector non-hub	Viet Nam	-0.13	0.77	Connector non-hub
Yemen	-0.13	0.75	Connector non-hub	Yemen	-0.13	0.75	Connector non-hub
Zambia	-1.55	0.00	Ultra peripheral non-hub	Zambia	-1.55	0.00	Ultra peripheral non-hub
Zimbabwe	-0.77	0.54	Peripheral non-hub	Zimbabwe	-0.77	0.54	Peripheral non-hub

Table 2. Present-day and climate-projected rice roles. Connectivity refers to within-module degree, and participation to participation coefficient.

Rice: Present-day roles				Rice: Climate-projected roles			
name	connectivity	participation	role	name	connectivity	participation	role
Afghanistan	-0.93	0.56	Peripheral non-hub	Afghanistan	-0.92	0.56	Peripheral non-hub
Albania	0.17	0.46	Peripheral non-hub	Albania	0.18	0.46	Peripheral non-hub
Angola	-0.38	0.63	Connector non-hub	Angola	-0.41	0.63	Connector non-hub
Argentina	1.65	0.74	Connector hub	Argentina	1.65	0.73	Connector hub
Armenia	-0.93	0.56	Peripheral non-hub	Armenia	-0.92	0.56	Peripheral non-hub
Australia	-0.38	0.66	Connector non-hub	Australia	-0.41	0.66	Connector non-hub
Azerbaijan	-0.71	0.45	Peripheral non-hub	Azerbaijan	-0.70	0.45	Peripheral non-hub
Bangladesh	0.21	0.71	Connector non-hub	Bangladesh	0.12	0.71	Connector non-hub
Belize	-0.72	0.44	Peripheral non-hub	Belize	-0.67	0.44	Peripheral non-hub
Benin	-0.38	0.68	Connector non-hub	Benin	-0.41	0.68	Connector non-hub
Bhutan	-0.34	0.00	Ultra peripheral non-hub	Bhutan	-0.42	0.00	Ultra peripheral non-hub
Bolivia (Plurinational State of)	-0.86	0.32	Peripheral non-hub	Bolivia (Plurinational State of)	-0.86	0.32	Peripheral non-hub
Brazil	1.90	0.79	Kinless hub	Brazil	1.90	0.79	Kinless hub
Brunei Darussalam	-0.38	0.67	Connector non-hub	Brunei Darussalam	-1.14	0.67	Connector non-hub
Bulgaria	0.73	0.32	Peripheral non-hub	Bulgaria	0.73	0.32	Peripheral non-hub
Burkina Faso	-0.38	0.75	Connector non-hub	Burkina Faso	0.39	0.75	Connector non-hub
Burundi	-0.93	0.61	Peripheral non-hub	Burundi	-0.67	0.61	Peripheral non-hub
Cambodia	0.95	0.72	Connector non-hub	Cambodia	1.17	0.70	Connector hub
Cameroon	-0.18	0.75	Connector non-hub	Cameroon	-0.20	0.75	Connector non-hub
Central African Republic	0.23	0.50	Peripheral non-hub	Central African Republic	0.23	0.50	Peripheral non-hub
Chad	-0.38	0.50	Peripheral non-hub	Chad	-0.41	0.50	Peripheral non-hub
Chile	-0.11	0.65	Connector non-hub	Chile	-0.11	0.65	Connector non-hub
China, Macao SAR	-0.38	0.69	Connector non-hub	China, Macao SAR	-0.41	0.69	Connector non-hub
China, mainland	2.05	0.76	Kinless hub	China, mainland	1.94	0.76	Kinless hub
Colombia	-0.72	0.72	Connector non-hub	Colombia	-0.67	0.72	Connector non-hub
Congo	-0.38	0.72	Connector non-hub	Congo	-0.41	0.72	Connector non-hub
Costa Rica	-0.61	0.73	Connector non-hub	Costa Rica	-0.61	0.73	Connector non-hub
Côte d'Ivoire	-0.60	0.71	Connector non-hub	Côte d'Ivoire	-0.59	0.69	Connector non-hub
Cuba	-0.86	0.67	Connector non-hub	Cuba	-0.86	0.67	Connector non-hub
Democratic People's Republic of Korea	-0.93	0.56	Peripheral non-hub	Democratic People's Republic of Korea	-0.92	0.56	Peripheral non-hub
Democratic Republic of the Congo	0.23	0.74	Connector non-hub	Democratic Republic of the Congo	0.23	0.74	Connector non-hub
Dominican Republic	-1.05	0.69	Connector non-hub	Dominican Republic	-0.99	0.69	Connector non-hub
Ecuador	-0.72	0.72	Connector non-hub	Ecuador	-0.67	0.72	Connector non-hub
Egypt	-0.71	0.56	Peripheral non-hub	Egypt	-0.70	0.56	Peripheral non-hub
El Salvador	0.27	0.73	Connector non-hub	El Salvador	0.26	0.73	Connector non-hub
Ethiopia	-0.34	0.61	Peripheral non-hub	Ethiopia	-0.42	0.61	Peripheral non-hub
France	0.95	0.49	Peripheral non-hub	France	0.95	0.49	Peripheral non-hub
Gabon	-0.38	0.63	Connector non-hub	Gabon	-0.41	0.63	Connector non-hub
Gambia	-0.86	0.69	Connector non-	Gambia	-0.86	0.69	Connector non-

			hub				hub
Ghana	-0.18	0.71	Connector non-hub	Ghana	-0.20	0.71	Connector non-hub
Greece	0.62	0.58	Peripheral non-hub	Greece	0.62	0.58	Peripheral non-hub
Guatemala	0.60	0.72	Connector non-hub	Guatemala	0.57	0.72	Connector non-hub
Guinea	-0.34	0.72	Connector non-hub	Guinea	-0.15	0.74	Connector non-hub
Guinea-Bissau	-0.93	0.74	Connector non-hub	Guinea-Bissau	-0.92	0.74	Connector non-hub
Guyana	0.17	0.61	Peripheral non-hub	Guyana	0.18	0.61	Peripheral non-hub
Haiti	-0.39	0.73	Connector non-hub	Haiti	-0.36	0.73	Connector non-hub
Honduras	0.27	0.75	Connector non-hub	Honduras	0.26	0.75	Connector non-hub
Hungary	0.51	0.52	Peripheral non-hub	Hungary	0.51	0.52	Peripheral non-hub
India	3.83	0.74	Connector hub	India	3.87	0.73	Connector hub
Indonesia	0.03	0.69	Connector non-hub	Indonesia	0.02	0.69	Connector non-hub
Iran (Islamic Republic of)	-0.07	0.61	Peripheral non-hub	Iran (Islamic Republic of)	-0.15	0.61	Peripheral non-hub
Iraq	-0.07	0.60	Peripheral non-hub	Iraq	-0.15	0.60	Peripheral non-hub
Italy	2.05	0.73	Connector hub	Italy	2.06	0.73	Connector hub
Japan	-0.06	0.77	Connector non-hub	Japan	0.26	0.78	Connector non-hub
Kazakhstan	0.62	0.19	Peripheral non-hub	Kazakhstan	0.62	0.19	Peripheral non-hub
Kenya	-0.60	0.63	Connector non-hub	Kenya	-0.59	0.63	Connector non-hub
Kyrgyzstan	-0.71	0.53	Peripheral non-hub	Kyrgyzstan	-0.70	0.53	Peripheral non-hub
Lao People's Democratic Republic	-0.38	0.75	Connector non-hub	Lao People's Democratic Republic	-0.41	0.75	Connector non-hub
Liberia	-0.34	0.72	Connector non-hub	Liberia	-0.42	0.72	Connector non-hub
Madagascar	-0.34	0.69	Connector non-hub	Madagascar	-0.42	0.69	Connector non-hub
Malawi	-0.82	0.57	Peripheral non-hub	Malawi	-0.92	0.61	Peripheral non-hub
Malaysia	0.44	0.75	Connector non-hub	Malaysia	0.44	0.75	Connector non-hub
Mali	-0.07	0.78	Connector non-hub	Mali	0.12	0.77	Connector non-hub
Mauritania	-0.18	0.77	Connector non-hub	Mauritania	-0.20	0.77	Connector non-hub
Mexico	-0.06	0.74	Connector non-hub	Mexico	-0.05	0.74	Connector non-hub
Morocco	-0.34	0.64	Connector non-hub	Morocco	-0.42	0.64	Connector non-hub
Mozambique	-0.38	0.78	Connector non-hub	Mozambique	-0.41	0.78	Connector non-hub
Myanmar	-0.38	0.63	Connector non-hub	Myanmar	-0.41	0.63	Connector non-hub
Nepal	-0.34	0.72	Connector non-hub	Nepal	-0.42	0.72	Connector non-hub
Nicaragua	-0.61	0.72	Connector non-hub	Nicaragua	-0.61	0.72	Connector non-hub
Niger	-0.34	0.72	Connector non-hub	Niger	-0.42	0.72	Connector non-hub
Nigeria	0.03	0.75	Connector non-hub	Nigeria	0.02	0.75	Connector non-hub
North Macedonia	-0.60	0.00	Ultra peripheral non-hub	North Macedonia	-0.59	0.00	Ultra peripheral non-hub
Pakistan	2.49	0.74	Connector hub	Pakistan	2.39	0.75	Kinless hub
Panama	-0.36	0.70	Connector non-hub	Panama	-0.36	0.70	Connector non-hub
Paraguay	1.14	0.77	Kinless hub	Paraguay	1.14	0.77	Kinless hub
Peru	-0.36	0.63	Connector non-hub	Peru	-0.36	0.63	Connector non-hub
Philippines	-0.38	0.62	Peripheral non-hub	Philippines	-0.41	0.62	Peripheral non-hub
Portugal	0.73	0.60	Peripheral non-hub	Portugal	0.73	0.60	Peripheral non-hub
Republic of Korea	-0.38	0.74	Connector non-hub	Republic of Korea	-0.26	0.74	Connector non-hub
Romania	0.84	0.44	Peripheral non-hub	Romania	0.84	0.44	Peripheral non-hub

Russian Federation	1.39	0.45	Connector hub	Russian Federation	1.39	0.45	Connector hub
Rwanda	0.03	0.61	Peripheral non-hub	Rwanda	0.02	0.61	Peripheral non-hub
Senegal	-0.07	0.74	Connector non-hub	Senegal	0.12	0.74	Connector non-hub
Sierra Leone	-0.86	0.71	Connector non-hub	Sierra Leone	-0.86	0.71	Connector non-hub
Somalia	-0.34	0.72	Connector non-hub	Somalia	-0.42	0.72	Connector non-hub
South Sudan	-0.18	0.57	Peripheral non-hub	South Sudan	-0.20	0.57	Peripheral non-hub
Spain	1.17	0.73	Connector hub	Spain	1.17	0.73	Connector hub
Sri Lanka	-0.93	0.74	Connector non-hub	Sri Lanka	-0.92	0.74	Connector non-hub
Sudan	-0.34	0.58	Peripheral non-hub	Sudan	-0.42	0.58	Peripheral non-hub
Suriname	-0.27	0.40	Peripheral non-hub	Suriname	-0.26	0.40	Peripheral non-hub
Tajikistan	-0.93	0.56	Peripheral non-hub	Tajikistan	-0.92	0.56	Peripheral non-hub
Thailand	4.93	0.75	Connector hub	Thailand	4.72	0.75	Connector hub
Timor-Leste	-0.18	0.61	Peripheral non-hub	Timor-Leste	-0.20	0.61	Peripheral non-hub
Togo	-0.34	0.76	Connector non-hub	Togo	-0.42	0.76	Connector non-hub
Trinidad and Tobago	-0.93	0.72	Connector non-hub	Trinidad and Tobago	-0.92	0.72	Connector non-hub
Turkey	1.06	0.59	Connector hub	Turkey	1.06	0.59	Connector hub
Turkmenistan	-0.82	0.50	Peripheral non-hub	Turkmenistan	-0.81	0.50	Peripheral non-hub
Uganda	0.44	0.67	Connector non-hub	Uganda	0.44	0.67	Connector non-hub
Ukraine	-0.27	0.50	Peripheral non-hub	Ukraine	-0.26	0.50	Peripheral non-hub
United Republic of Tanzania	-0.71	0.74	Connector non-hub	United Republic of Tanzania	-0.81	0.76	Connector non-hub
United States of America	2.58	0.77	Kinless hub	United States of America	2.75	0.77	Kinless hub
Uruguay	1.14	0.75	Connector hub	Uruguay	1.14	0.75	Connector hub
Uzbekistan	-0.93	0.56	Peripheral non-hub	Uzbekistan	-0.92	0.56	Peripheral non-hub
Venezuela (Bolivarian Republic of)	-0.36	0.72	Connector non-hub	Venezuela (Bolivarian Republic of)	-0.36	0.72	Connector non-hub
Viet Nam	-0.38	0.72	Connector non-hub	Viet Nam	-0.81	0.72	Connector non-hub
Zambia	-0.18	0.72	Connector non-hub	Zambia	-0.20	0.72	Connector non-hub
Zimbabwe	-0.93	0.67	Connector non-hub	Zimbabwe	-0.41	0.67	Connector non-hub

Table 3. Present-day and climate-projected maize roles. Connectivity refers to within-module degree, and participation to participation coefficient.

Maize: Present-day roles				Maize: Climate-projected roles			
name	connectivity	participation	role	name	connectivity	participation	role
Afghanistan	-0.41	0.56	Peripheral non-hub	Afghanistan	-0.41	0.56	Peripheral non-hub
Albania	-0.83	0.46	Peripheral non-hub	Albania	-1.10	0.56	Peripheral non-hub
Algeria	-0.06	0.64	Connector non-hub	Algeria	-0.06	0.70	Connector non-hub
Angola	-0.29	0.59	Peripheral non-hub	Angola	-0.29	0.59	Peripheral non-hub
Argentina	4.28	0.69	Connector hub	Argentina	4.28	0.71	Connector hub
Armenia	-1.16	0.48	Peripheral non-hub	Armenia	-0.52	0.64	Connector non-hub
Australia	-0.51	0.69	Connector non-hub	Australia	-0.51	0.69	Connector non-hub
Austria	1.19	0.34	Connector hub	Austria	1.02	0.48	Connector hub
Azerbaijan	-0.88	0.20	Peripheral non-hub	Azerbaijan	-0.28	0.57	Peripheral non-hub
Bangladesh	-0.29	0.76	Connector non-hub	Bangladesh	-0.29	0.78	Connector non-hub
Belarus	-0.27	0.10	Peripheral non-hub	Belarus	-0.05	0.40	Peripheral non-hub
Belgium	0.41	0.41	Peripheral non-hub	Belgium	0.20	0.54	Peripheral non-hub
Belize	-0.04	0.00	Ultra peripheral non-hub	Belize	-0.04	0.00	Ultra peripheral non-hub
Benin	-0.41	0.00	Ultra peripheral non-hub	Benin	-0.41	0.00	Ultra peripheral non-hub
Bhutan	-0.81	0.00	Ultra peripheral non-hub	Bhutan	-0.81	0.00	Ultra peripheral non-hub
Bolivia (Plurinational State of)	-0.35	0.54	Peripheral non-hub	Bolivia (Plurinational State of)	-0.35	0.54	Peripheral non-hub
Bosnia and Herzegovina	-0.66	0.14	Peripheral non-hub	Bosnia and Herzegovina	-0.82	0.14	Peripheral non-hub
Botswana	-0.41	0.61	Peripheral non-hub	Botswana	-0.41	0.61	Peripheral non-hub
Brazil	2.57	0.72	Connector hub	Brazil	2.57	0.75	Kinless hub
Bulgaria	0.97	0.33	Peripheral non-hub	Bulgaria	0.88	0.45	Peripheral non-hub
Burkina Faso	-0.06	0.00	Ultra peripheral non-hub	Burkina Faso	-0.06	0.00	Ultra peripheral non-hub
Burundi	-0.08	0.00	Ultra peripheral non-hub	Burundi	-0.08	0.00	Ultra peripheral non-hub
Cambodia	0.64	0.62	Peripheral non-hub	Cambodia	0.64	0.62	Peripheral non-hub
Cameroon	-0.52	0.00	Ultra peripheral non-hub	Cameroon	-0.52	0.00	Ultra peripheral non-hub
Canada	2.31	0.68	Connector hub	Canada	2.31	0.71	Connector hub
Central African Republic	-1.25	0.00	Ultra peripheral non-hub	Central African Republic	-1.25	0.00	Ultra peripheral non-hub
Chile	0.17	0.68	Connector non-hub	Chile	0.17	0.68	Connector non-hub
China	-0.32	0.63	Connector non-hub	China	-0.62	0.71	Connector non-hub
Colombia	-0.20	0.70	Connector non-hub	Colombia	-0.20	0.75	Connector non-hub
Congo	-0.52	0.00	Ultra peripheral non-hub	Congo	-0.52	0.00	Ultra peripheral non-hub
Costa Rica	-0.51	0.65	Connector non-hub	Costa Rica	-0.51	0.69	Connector non-hub
Côte d'Ivoire	0.28	0.31	Peripheral non-hub	Côte d'Ivoire	0.28	0.31	Peripheral non-hub
Croatia	0.63	0.15	Peripheral non-hub	Croatia	0.68	0.19	Peripheral non-hub
Cuba	-0.41	0.50	Peripheral non-hub	Cuba	-0.41	0.50	Peripheral non-hub
Czechia	0.24	0.13	Peripheral non-hub	Czechia	0.13	0.24	Peripheral non-hub
Democratic People's Republic of Korea	-1.22	0.48	Peripheral non-hub	Democratic People's Republic of Korea	-1.51	0.48	Peripheral non-hub
Democratic Republic of the Congo	-0.41	0.50	Peripheral non-hub	Democratic Republic of the Congo	-0.41	0.50	Peripheral non-hub
Dominican Republic	-0.51	0.66	Connector non-hub	Dominican Republic	-0.51	0.69	Connector non-hub
Ecuador	-0.52	0.59	Peripheral non-	Ecuador	-0.52	0.59	Peripheral non-

			hub				hub
Egypt	0.39	0.58	Peripheral non-hub	Egypt	0.39	0.69	Connector non-hub
El Salvador	0.12	0.46	Peripheral non-hub	El Salvador	0.12	0.46	Peripheral non-hub
Eritrea	-0.81	0.00	Ultra peripheral non-hub	Eritrea	-0.81	0.00	Ultra peripheral non-hub
Estonia	-0.88	0.20	Peripheral non-hub	Estonia	-0.52	0.49	Peripheral non-hub
Eswatini	-1.25	0.50	Peripheral non-hub	Eswatini	-1.25	0.50	Peripheral non-hub
Ethiopia	-0.41	0.61	Peripheral non-hub	Ethiopia	-0.41	0.67	Connector non-hub
Finland	-0.66	0.34	Peripheral non-hub	Finland	-0.96	0.52	Peripheral non-hub
France	2.09	0.52	Connector hub	France	1.84	0.64	Connector hub
Gabon	-0.63	0.00	Ultra peripheral non-hub	Gabon	-0.63	0.00	Ultra peripheral non-hub
Gambia	-0.29	0.00	Ultra peripheral non-hub	Gambia	-0.29	0.00	Ultra peripheral non-hub
Georgia	-0.71	0.36	Peripheral non-hub	Georgia	0.18	0.66	Connector non-hub
Germany	1.42	0.34	Connector hub	Germany	1.22	0.50	Connector hub
Ghana	-0.06	0.58	Peripheral non-hub	Ghana	-0.06	0.58	Peripheral non-hub
Greece	0.18	0.32	Peripheral non-hub	Greece	0.00	0.44	Peripheral non-hub
Guatemala	-0.20	0.59	Peripheral non-hub	Guatemala	-0.20	0.62	Peripheral non-hub
Guinea	-0.18	0.00	Ultra peripheral non-hub	Guinea	-0.18	0.00	Ultra peripheral non-hub
Guinea-Bissau	-0.67	0.44	Peripheral non-hub	Guinea-Bissau	-0.67	0.44	Peripheral non-hub
Guyana	-0.51	0.38	Peripheral non-hub	Guyana	-0.51	0.38	Peripheral non-hub
Haiti	-0.82	0.00	Ultra peripheral non-hub	Haiti	-0.82	0.00	Ultra peripheral non-hub
Honduras	-0.04	0.49	Peripheral non-hub	Honduras	-0.04	0.49	Peripheral non-hub
Hungary	1.81	0.36	Connector hub	Hungary	1.57	0.52	Connector hub
India	2.10	0.75	Connector hub	India	2.10	0.77	Kinless hub
Indonesia	0.28	0.70	Connector non-hub	Indonesia	0.28	0.70	Connector non-hub
Iran (Islamic Republic of)	-0.29	0.48	Peripheral non-hub	Iran (Islamic Republic of)	-0.29	0.58	Peripheral non-hub
Iraq	-0.29	0.44	Peripheral non-hub	Iraq	-0.29	0.63	Connector non-hub
Italy	0.69	0.46	Peripheral non-hub	Italy	0.61	0.54	Peripheral non-hub
Jamaica	-0.51	0.48	Peripheral non-hub	Jamaica	-0.51	0.48	Peripheral non-hub
Japan	-0.20	0.66	Connector non-hub	Japan	-0.20	0.73	Connector non-hub
Jordan	0.51	0.63	Connector non-hub	Jordan	0.51	0.66	Connector non-hub
Kazakhstan	1.55	0.63	Connector hub	Kazakhstan	1.10	0.65	Connector hub
Kenya	0.80	0.49	Peripheral non-hub	Kenya	0.80	0.49	Peripheral non-hub
Kyrgyzstan	0.36	0.50	Peripheral non-hub	Kyrgyzstan	0.18	0.28	Peripheral non-hub
Lao People's Democratic Republic	-0.81	0.50	Peripheral non-hub	Lao People's Democratic Republic	-0.81	0.50	Peripheral non-hub
Latvia	-0.83	0.18	Peripheral non-hub	Latvia	-0.52	0.46	Peripheral non-hub
Lebanon	-0.55	0.55	Peripheral non-hub	Lebanon	-0.82	0.64	Connector non-hub
Lesotho	-0.63	0.00	Ultra peripheral non-hub	Lesotho	-0.63	0.00	Ultra peripheral non-hub
Liberia	-0.63	0.50	Peripheral non-hub	Liberia	-0.63	0.50	Peripheral non-hub
Libya	-0.71	0.42	Peripheral non-hub	Libya	-1.03	0.58	Peripheral non-hub
Lithuania	-0.21	0.17	Peripheral non-hub	Lithuania	-0.55	0.43	Peripheral non-hub
Luxembourg	-1.28	0.00	Ultra peripheral non-hub	Luxembourg	-1.57	0.00	Ultra peripheral non-hub
Madagascar	-0.63	0.32	Peripheral non-hub	Madagascar	-0.63	0.32	Peripheral non-hub
Malawi	-0.37	0.50	Peripheral non-hub	Malawi	-0.37	0.50	Peripheral non-hub

Malaysia	-0.06	0.70	Connector non-hub	Malaysia	-0.06	0.70	Connector non-hub
Mali	-0.41	0.00	Ultra peripheral non-hub	Mali	-0.41	0.00	Ultra peripheral non-hub
Mauritania	-0.52	0.50	Peripheral non-hub	Mauritania	-0.52	0.63	Connector non-hub
Mexico	2.00	0.65	Connector hub	Mexico	2.00	0.68	Connector hub
Mongolia	-1.28	0.50	Peripheral non-hub	Mongolia	-0.75	0.50	Peripheral non-hub
Montenegro	-1.22	0.00	Ultra peripheral non-hub	Montenegro	-1.51	0.00	Ultra peripheral non-hub
Morocco	-0.41	0.61	Peripheral non-hub	Morocco	-0.41	0.72	Connector non-hub
Mozambique	-0.63	0.38	Peripheral non-hub	Mozambique	-0.63	0.38	Peripheral non-hub
Myanmar	-0.08	0.61	Peripheral non-hub	Myanmar	-0.08	0.61	Peripheral non-hub
Namibia	-0.52	0.63	Connector non-hub	Namibia	-0.52	0.63	Connector non-hub
Nepal	-0.81	0.56	Peripheral non-hub	Nepal	-0.81	0.56	Peripheral non-hub
Netherlands	0.29	0.39	Peripheral non-hub	Netherlands	0.13	0.50	Peripheral non-hub
New Zealand	-0.71	0.51	Peripheral non-hub	New Zealand	-0.96	0.57	Peripheral non-hub
Nicaragua	-0.04	0.54	Peripheral non-hub	Nicaragua	-0.04	0.54	Peripheral non-hub
Niger	-0.18	0.00	Ultra peripheral non-hub	Niger	-0.18	0.00	Ultra peripheral non-hub
Nigeria	-0.67	0.41	Peripheral non-hub	Nigeria	-0.67	0.41	Peripheral non-hub
North Macedonia	-0.94	0.22	Peripheral non-hub	North Macedonia	-1.16	0.22	Peripheral non-hub
Pakistan	-0.08	0.71	Connector non-hub	Pakistan	-0.08	0.76	Connector non-hub
Palestine	-1.28	0.50	Peripheral non-hub	Palestine	-0.75	0.50	Peripheral non-hub
Panama	-0.51	0.69	Connector non-hub	Panama	-0.51	0.69	Connector non-hub
Paraguay	1.77	0.67	Connector hub	Paraguay	1.77	0.68	Connector hub
Peru	0.12	0.69	Connector non-hub	Peru	0.12	0.73	Connector non-hub
Philippines	0.28	0.71	Connector non-hub	Philippines	0.28	0.71	Connector non-hub
Poland	0.97	0.29	Peripheral non-hub	Poland	0.75	0.46	Peripheral non-hub
Portugal	-0.15	0.40	Peripheral non-hub	Portugal	-0.35	0.50	Peripheral non-hub
Republic of Korea	-0.35	0.63	Connector non-hub	Republic of Korea	-0.35	0.69	Connector non-hub
Republic of Moldova	0.58	0.32	Peripheral non-hub	Republic of Moldova	0.34	0.49	Peripheral non-hub
Romania	1.75	0.52	Connector hub	Romania	1.50	0.64	Connector hub
Russian Federation	1.47	0.53	Connector hub	Russian Federation	2.94	0.66	Connector hub
Rwanda	-0.37	0.00	Ultra peripheral non-hub	Rwanda	-0.37	0.00	Ultra peripheral non-hub
Senegal	0.05	0.48	Peripheral non-hub	Senegal	0.05	0.48	Peripheral non-hub
Serbia	1.42	0.32	Connector hub	Serbia	1.22	0.48	Connector hub
Sierra Leone	-0.63	0.44	Peripheral non-hub	Sierra Leone	-0.63	0.67	Connector non-hub
Singapore	-0.18	0.71	Connector non-hub	Singapore	-0.18	0.71	Connector non-hub
Slovakia	0.63	0.15	Peripheral non-hub	Slovakia	0.54	0.28	Peripheral non-hub
Slovenia	-0.10	0.00	Ultra peripheral non-hub	Slovenia	-0.14	0.00	Ultra peripheral non-hub
Somalia	-0.81	0.72	Connector non-hub	Somalia	-0.81	0.72	Connector non-hub
South Africa	2.91	0.71	Connector hub	South Africa	2.91	0.73	Connector hub
South Sudan	-0.67	0.00	Ultra peripheral non-hub	South Sudan	-0.67	0.00	Ultra peripheral non-hub
Spain	1.14	0.44	Connector hub	Spain	1.02	0.55	Connector hub
Sri Lanka	-0.88	0.52	Peripheral non-hub	Sri Lanka	-1.16	0.60	Peripheral non-hub
Sudan	-1.28	0.44	Peripheral non-hub	Sudan	-0.75	0.44	Peripheral non-hub
Switzerland	-0.27	0.44	Peripheral non-	Switzerland	-0.41	0.49	Peripheral non-

			hub				hub
Syrian Arab Republic	-0.77	0.38	Peripheral non-hub	Syrian Arab Republic	-0.52	0.57	Peripheral non-hub
Tajikistan	-0.84	0.00	Ultra peripheral non-hub	Tajikistan	-0.75	0.00	Ultra peripheral non-hub
Thailand	1.74	0.71	Connector hub	Thailand	1.74	0.71	Connector hub
Timor-Leste	-0.81	0.00	Ultra peripheral non-hub	Timor-Leste	-0.81	0.00	Ultra peripheral non-hub
Togo	-0.41	0.00	Ultra peripheral non-hub	Togo	-0.41	0.00	Ultra peripheral non-hub
Trinidad and Tobago	-0.51	0.48	Peripheral non-hub	Trinidad and Tobago	-0.51	0.48	Peripheral non-hub
Turkey	0.74	0.65	Connector non-hub	Turkey	1.56	0.72	Connector hub
Turkmenistan	-0.84	0.44	Peripheral non-hub	Turkmenistan	-0.52	0.44	Peripheral non-hub
Uganda	1.39	0.28	Connector hub	Uganda	1.39	0.28	Connector hub
Ukraine	1.42	0.57	Connector hub	Ukraine	1.02	0.68	Connector hub
United Republic of Tanzania	1.09	0.58	Connector hub	United Republic of Tanzania	1.09	0.58	Connector hub
United States of America	3.10	0.73	Connector hub	United States of America	3.10	0.77	Kinless hub
Uruguay	-0.41	0.38	Peripheral non-hub	Uruguay	-0.41	0.38	Peripheral non-hub
Uzbekistan	-0.24	0.49	Peripheral non-hub	Uzbekistan	-0.05	0.59	Peripheral non-hub
Venezuela (Bolivarian Republic of)	-0.51	0.64	Connector non-hub	Venezuela (Bolivarian Republic of)	-0.51	0.67	Connector non-hub
Viet Nam	-0.06	0.77	Connector non-hub	Viet Nam	-0.06	0.81	Kinless non-hub
Yemen	-0.18	0.64	Connector non-hub	Yemen	-0.18	0.68	Connector non-hub
Zambia	1.39	0.49	Connector hub	Zambia	1.39	0.49	Connector hub
Zimbabwe	-0.67	0.61	Peripheral non-hub	Zimbabwe	-0.67	0.61	Peripheral non-hub

Supplementary Data F

Table 1. Production changes within wheat trade communities.

Name	Production	Climate Change	Production after climate change impacts	Total change in production within cluster
Community 1				
Argentina	18,518,045	0.116206	20,669,946	
Bolivia	301,689	0.024387	309,046	
Brazil	5,418,711	-0.00945	5,367,508	
Chile	1,469,003	0.323584	1,944,349	
Uruguay	440,000	0.153877	507,706	
Paraguay	722,400	-0.13215	626,935	
SUM	26,869,848		29,425,491	9.5%
Community 2				
Canada	31,769,200	0.118974	35,548,902	
China	131,440,500	0.236694	162,551,648	
Colombia	11,139	0.008215	11,231	
Ecuador	5,398	0.042064	5,625	
Japan	764,900	0.533352	1,172,861	
Mexico	2,943,445	-0.1698	2,443,646	
Peru	195,088	0.548213	302,038	
Thailand	1,351	-0.22133	1,052	
United States	51,286,540	0.282653	65,782,851	
Australia	20,941,134	0.507775	31,574,519	
Myanmar	134,372	-0.09778	121,233	
Iraq	3,211,382	0.378974	4,428,413	
Republic of Korea	37,577	0.70602	64,107	
Kuwait	9	-0.34222	6	
New Zealand	371,027	0.257151	466,437	
Zimbabwe	41,488	-0.02296	40,535	
Guatemala	1,282	-0.10216	1,151	
SUM	243,155,832		304,516,255	25.2%
Community 3				
Algeria	3,981,219	0.093461	4,353,306	
Mali	29,185	-0.32705	19,640	
Netherlands	985,297	0.322058	1,302,619	
Italy	6,932,943	0.17698	8,159,936	
Saudi Arabia	586,413	-0.2896	416,589	
United Kingdom of Great Britain and Northern Ireland	13,555,000	0.306182	17,705,295	
Austria	1,370,960	0.410568	1,933,832	
Bulgaria	5,832,449	0.262856	7,365,546	
Denmark	2,654,819	0.310184	3,478,302	
France	35,798,234	0.209902	43,312,338	

Germany	20,263,500	0.284579	26,030,073	
Hungary	5,245,890	0.266836	6,645,683	
Ireland	506,800	0.267724	642,482	
Norway	123,500	0.185805	146,447	
Czechia	4,417,841	0.415287	6,252,515	
Poland	9,820,315	0.34067	13,165,798	
Portugal	67,749	0.123617	76,124	
Slovakia	1,927,926	0.335582	2,574,904	
Spain	7,989,906	0.146194	9,157,982	
Sweden	1,620,300	0.296827	2,101,249	
Switzerland	497,250	0.283732	638,336	
Belgium	1,652,249	0.323198	2,186,252	
Luxembourg	78,409	0.332547	104,484	
Lithuania	2,838,899	0.222928	3,471,768	
Estonia	450,265	0.292206	581,835	
Finland	494,700	0.274625	630,557	
Zambia	114,463	0.090511	124,823	
Bosnia and Herzegovina	295,810	0.288737	381,221	
Croatia	744,405	0.283686	955,582	
Greece	1,072,940	0.422343	1,526,088	
Republic of Moldova	1,162,778	0.225061	1,424,475	
Slovenia	121,901	0.311506	159,874	
SUM	133,234,315		167,025,958	25.4%
Community 4				
Bangladesh	1,099,373	-0.21048	867,980	
Botswana	0	0.050781	0	
Kenya	336,600	0.268733	427,055	
Lesotho	9,058	0.129034	10,227	
Nigeria	65,433	-0.08466	59,893	
South Africa	1,868,000	0.151383	2,150,783	
Uganda	23,597	0.160585	27,386	
Viet Nam		-0.16094		
Egypt	8,800,000	0.089352	9,586,296	
Jordan	20,668	0.07033	22,122	
United Republic of Tanzania	104,870	0.144125	119,984	
Oman	3,579	-0.31682	2,445	
Yemen	105,503	0.171787	123,627	
Sudan	595,000	-0.21604	466,454	
Israel	70,500	0.342873	94,673	
North Macedonia	241,106	0.338467	322,712	
Romania	10,143,671	0.310402	13,292,288	
Ethiopia	4,238,836	0.252416	5,308,787	
Albania	240,294	0.360232	326,856	
Cyprus	18,054	0.064857	19,225	
Lebanon	135,411	0.400199	189,602	

Somalia	1,033	0.045053	1,080	
Turkey	20,000,000	0.442362	28,847,242	
Serbia	2,941,601	0.269428	3,734,150	
Burundi	22,751	0.119358	25,467	
Malawi	729	0.227993	895	
Rwanda	10,875	0.070939	11,646	
Belarus	1,814,765	0.219594	2,213,276	
Russia	72,136,149	0.121262	80,883,550	
Eritrea	28,939	0.560571	45,161	
Latvia	1,431,600	0.211177	1,733,921	
Georgia	107,100	0.20795	129,371	
Armenia	187,453	0.154341	216,385	
Iran	14,500,000	0.426691	20,687,014	
Azerbaijan	1,991,683	0.201644	2,393,294	
Mongolia	436,115	0.255315	547,462	
Syria	1,200,000	0.355383	1,626,460	
Pakistan	25,076,149	-0.17964	20,571,523	
Montenegro	2,467	0.475082	3,639	
Democratic People's Republic of Korea	35,000	0.317986	46,130	
Palestine	34,167	0.319041	45,068	
SUM	170,078,129		197,181,129	15.9%
Community 5				
Morocco	7,320,620	0.68886	12,363,500	
Tunisia	1,500,000	0.194829	1,792,243	
Libya	138,770	0.405886	195,095	
Ukraine	24,652,840	0.160662	28,613,617	
SUM	33,612,230		42,964,456	27.8%
Community 6				
India	99,700,000	0.036276	103,316,692	
Afghanistan	3,613,300	0.412851	5,105,055	
Nepal	1,949,001	0.364294	2,659,011	
Kazakhstan	13,944,108	0.298198	18,102,217	
Kyrgyzstan	615,926	0.352404	832,981	
Tajikistan	778,986	0.699722	1,324,060	
Turkmenistan	1,000,000	0.40048	1,400,480	
Uzbekistan	5,410,760	0.499498	8,113,422	
SUM	127,012,081		140,853,917	10.9%
TOTAL	733,962,435		881,967,206	20.2%

Table 2. Production changes within rice trade communities.

Name	Production	Climate Change	Production after climate change impacts	Total change in production within cluster
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Community 1				
Colombia	3,322,937	0.118289	3,716,005	
El Salvador	22,764	-0.4131	13,360	
Guatemala	31,498	-0.27174	22,939	
Haiti	183,000	-0.31431	125,482	
Honduras	59,698	-0.29364	42,168	
Japan	9,727,500	0.830103	17,802,332	
Mexico	283,763	-0.36145	181,197	
United States	10,170,040	-0.1416	8,730,010	
Belize	13,375	-0.29349	9,450	
Dominican Republic	627,362	0.03442	648,956	
Ecuador	1,350,093	0.699075	2,293,910	
SUM	25,792,030		33,585,808	30.2%
Community 2				
Argentina	1,367,968	-0.0481	1,302,172	
Bolivia	541,157	-0.10717	483,163	
Brazil	11,749,192	-0.12029	10,335,881	
Chile	192,808	0.109482	213,917	
Costa Rica	158,311	0.270388	201,116	
Cuba	460,870	-0.20853	364,766	
Gambia	53,809	-0.13867	46,348	
Nicaragua	365,000	-0.42791	208,813	
Panama	314,946	-0.08908	286,891	
Peru	3,557,900	1.112452	7,515,892	
Sierra Leone	919,785	0.238418	1,139,078	
Venezuela	494,549	-0.27932	356,411	
Paraguay	894,600	-0.28138	642,879	
Uruguay	1,360,000	0.106571	1,504,936	
SUM	22,430,895		24,602,262	9.7%
Community 3				
Iraq	274,788	0.173284	322,404	
Mali	3,167,528	-0.06656	2,956,710	
Senegal	762,776	-0.22507	591,099	
Bangladesh	56,417,319	-0.09979	50,787,210	
Iran	1,990,000	0.002784	1,995,541	
Guinea	2,339,747	0.012325	2,368,585	
India	172,580,000	0.032872	178,253,083	
Liberia	257,995	0.166987	301,077	
Morocco	63,037	0.130174	71,243	
Togo	145,489	-0.28178	104,493	
Niger	101,607	0.005827	102,199	
Ethiopia	144,200	0.012572	146,013	
Madagascar	4,030,000	0.055564	4,253,923	
Nepal	5,151,925	0.612046	8,305,141	

Somalia	4,766	-0.24906	3,579	
Sudan	30,000	-0.47909	15,627	
Bhutan	88,753	0.960239	173,977	
SUM	247,549,930		250,751,903	1.3%
Community 4				
Angola	56,441	4.584482	315,194	
Burkina Faso	160,949	-0.21441	126,440	
Australia	635,113	0.725881	1,096,130	
Malaysia	2,718,987	-0.0627	2,548,512	
Benin	459,313	-0.22851	354,355	
Democratic Republic of the Congo	990,139	0.156771	1,145,364	
Ghana	769,401	-0.24141	583,658	
Mauritania	232,196	-0.09948	209,096	
Nigeria	6,809,327	-0.17407	5,624,052	
Thailand	32,192,087	-0.12434	28,189,332	
Viet Nam	44,046,250	-0.12821	38,399,245	
Zambia	43,063	-0.08267	39,503	
Brunei Darussalam	1,569	-0.01834	1,540	
Cameroon	332,534	-0.21298	261,709	
China, Macao SAR		0.030902		
Indonesia	83,037,000	-0.00853	82,328,904	
Philippines	19,066,094	-0.09147	17,322,150	
Timor-Leste	86,647	-0.16429	72,411	
Central African Republic	11,108	-0.23794	8,465	
Chad	259,540	-0.09723	234,305	
Lao People's Democratic Republic	3,584,700	-0.0229	3,502,608	
Mozambique	134,105	0.074945	144,155	
Myanmar	25,418,142	-0.01388	25,065,423	
South Sudan		-0.10497		
Uganda	260,786	-0.12024	229,430	
Congo	1,196	-0.12439	1,047	
Gabon	1,830	0.012488	1,853	
Rwanda	119,932	-0.27232	87,272	
SUM	221,428,449		207,892,155	-6.1%
Community 5				
France	73,306	0.012375	74,213	
Guinea-Bissau	171,239	-0.00701	170,039	
Hungary	11,971	-0.08186	10,991	
Italy	1,512,241	-0.04431	1,445,232	
Republic of Korea	5,195,437	1.730726	14,187,313	
Romania	43,355	-0.08686	39,589	
Spain	808,167	-0.10751	721,283	
Trinidad and Tobago	586	-0.17131	486	
Turkey	940,000	0.176608	1,106,012	

Greece	222,690	-0.01536	219,270	
Côte d'Ivoire	2,109,333	-0.28442	1,509,397	
Portugal	160,648	-0.13745	138,567	
Russia	1,038,222	0.060293	1,100,820	
United Republic of Tanzania	3,016,695	-0.08068	2,773,296	
Zimbabwe	755	-0.15854	635	
Bulgaria	63,415	0.023271	64,891	
Albania	0	-0.15362	0	
Ukraine	69,210	-0.02206	67,684	
Cambodia	10,647,212	1.402224	25,576,985	
Azerbaijan	11,975	-0.06625	11,182	
China	212,129,000	0.051112	222,971,302	
Democratic People's Republic of Korea	2,088,000	0.315527	2,746,821	
Egypt	4,900,000	-0.29679	3,445,743	
Kenya	110,325	0.375903	151,797	
Afghanistan	352,177	0.209904	426,100	
Burundi	55,671	-0.37012	35,066	
Kazakhstan	482,945	0.08195	522,522	
Malawi	112,313	-0.05905	105,681	
Pakistan	10,802,949	-0.29771	7,586,764	
Guyana	964,472	-0.00104	963,464	
Suriname	273,916	0.02636	281,136	
Armenia		-0.00045		
Kyrgyzstan	40,783	0.084404	44,225	
Sri Lanka	3,929,831	0.08456	4,262,137	
Tajikistan	90,446	0.166033	105,463	
Turkmenistan	130,000	-0.01432	128,138	
Uzbekistan	221,089	-0.10697	197,439	
North Macedonia	19,732	0.133397	22,364	
SUM	262,800,106		293,214,047	11.6%
TOTAL	780,001,410		810,046,176	3.9%

Table 3. Production changes within maize trade communities.

Name	Production	Climate Change	Production after climate change impacts	Total change in production within cluster
Community 1				
India	27,820,000	-0.23756	21,211,027	
Indonesia	30,253,938	-0.263	22,297,257	
Nepal	2,473,283	0.019997	2,522,741	
Pakistan	6,308,897	-0.12155	5,542,045	
Philippines	7,771,919	-0.23818	5,920,835	
Somalia	138,716	-0.11407	122,892	
Myanmar	1,983,122	0.131195	2,243,298	
Lao People's Democratic Republic	981,680	-0.24631	739,887	
Bhutan	92,949	0.034674	96,172	
Eritrea	19,914	0.299527	25,879	
Thailand	5,004,125	-0.41523	2,926,280	
Timor-Leste	101,564	-0.1847	82,805	
Cambodia	604,333	-0.29804	424,216	
SUM	83,554,440		64,155,333	-23.2%
Community 2				
Bolivia	1,260,926	0.02419	1,291,427	
Canada	13,884,800	-0.14372	11,889,345	
Colombia	1,388,246	-0.20204	1,107,760	
Costa Rica	5,358	-0.37533	3,347	
Dominican Republic	44,590	-0.27228	32,449	
El Salvador	685,509	-0.4027	409,454	
Guatemala	1,921,936	-0.32782	1,291,893	
Honduras	704,747	-0.35307	455,921	
Jamaica	2,177	-0.24097	1,652	
Japan	165	-0.08274	151	
Republic of Korea	74,368	-0.11839	65,564	
Mexico	27,169,977	-0.29034	19,281,508	
Nicaragua	395,226	-0.37398	247,420	
Nigeria	10,155,027	-0.27017	7,411,447	
Panama	112,446	-0.23659	85,842	
Peru	1,569,535	0.765253	2,770,626	
Guinea-Bissau	7,254	-0.22842	5,597	
Trinidad and Tobago	2,781	-0.30173	1,942	
United States	392,450,840	-0.25323	293,069,188	
Venezuela	1,318,418	-0.34825	859,273	
Australia	387,240	-0.16878	321,883	
Guyana	4,284	-0.29469	3,022	
Belize	77,766	-0.36173	49,636	
Haiti	260,000	-0.22781	200,770	
SUM	453,883,616		340,857,118	-24.9%
Community 3				

Argentina	43,462,323	-0.14393	37,206,661	
Afghanistan	106,670	-0.29003	75,732	
Algeria	4,142	0.09263	4,526	
Angola	2,271,102	0.14915	2,609,837	
Bangladesh	3,288,102	-0.30224	2,294,299	
Botswana	13,126	-0.01338	12,950	
Brazil	82,288,298	-0.13851	70,890,757	
Cameroon	2,344,665	-0.25906	1,737,257	
Chile	1,110,608	0.091033	1,211,710	
Congo	11,928	-0.25817	8,849	
Cuba	345,909	-0.3019	241,481	
Benin	1,509,758	-0.24848	1,134,621	
Ecuador	1,324,147	0.762346	2,333,605	
Egypt	7,300,000	-0.49193	3,708,925	
Gabon	46,006	-0.24002	34,964	
Gambia	39,383	-0.29737	27,672	
Ghana	2,306,384	-0.25879	1,709,509	
Guinea	818,544	-0.21884	639,414	
Iran	1,338,258	-0.25389	998,483	
Iraq	209,059	-0.45362	114,226	
Côte d'Ivoire	1,006,000	-0.38834	615,325	
Jordan	21,914	-0.07074	20,364	
Liberia		-0.19407		
Malaysia	76,362	-0.27292	55,521	
Mali	3,624,950	-0.26752	2,655,186	
Mauritania	15,519	-0.33295	10,352	
Morocco	118,392	0.073294	127,069	
Niger	29,536	0.083339	31,998	
Paraguay	5,344,650	-0.30062	3,737,918	
Senegal	264,105	-0.39888	158,758	
Sierra Leone	22,981	-0.08391	21,053	
Singapore		-0.31896		
South Africa	12,510,000	-0.06572	11,687,889	
Togo	886,630	-0.31951	603,342	
Burkina Faso	1,700,127	-0.23823	1,295,100	
Uruguay	816,000	-0.11408	722,909	
Viet Nam	4,874,054	-0.29258	3,448,002	
Ethiopia	7,360,201	0.02935	7,576,226	
Yemen	42,986	-0.14022	36,958	
Democratic Republic of the Congo	2,078,352	-0.24288	1,573,559	
Namibia	59,253	0.02522	60,747	
Madagascar	215,000	-0.14072	184,745	
Mozambique	1,654,143	0.014783	1,678,597	
Lesotho	100,242	0.084885	108,751	
SUM	192,959,809		163,405,845	-15.3%

Community 4				
Armenia	7,615	0.069735	8,146	
Albania	391,104	-0.16865	325,145	
Austria	2,130,339	0.102547	2,348,799	
Bulgaria	3,478,013	-0.16788	2,894,138	
China	257,173,900	-0.17605	211,898,074	
Finland		-0.03071		
France	12,667,393	-0.12215	11,120,111	
Germany	3,344,000	-0.06681	3,120,587	
Bosnia and Herzegovina	1,272,339	-0.19177	1,028,346	
Greece	1,205,980	-0.22516	934,443	
Hungary	7,963,217	-0.25369	5,943,007	
Croatia	2,147,275	-0.28478	1,535,767	
Italy	6,179,035	0.065761	6,585,376	
Lebanon	3,288	0.931988	6,352	
Libya	3,571	0.412079	5,043	
Lithuania	87,587	-0.05956	82,370	
Netherlands	84,894	0.002232	85,083	
North Macedonia	190,722	-0.1102	169,705	
Czechia	489,154	-0.08504	447,555	
Poland	3,864,028	-0.09931	3,480,290	
Portugal	713,860	-0.16461	596,354	
Romania	18,663,939	-0.17528	15,392,475	
Spain	3,842,519	-0.18238	3,141,720	
Switzerland	134,834	1.03366	274,206	
Syria	118,000	-0.39131	71,826	
Turkey	5,700,000	-0.02915	5,533,827	
Belgium	442,995	-0.08126	406,996	
Sudan	45,000	-0.36132	28,741	
New Zealand	191,993	0.240097	238,090	
Belarus	1,137,932	-0.11493	1,007,145	
Georgia	194,200	-0.08517	177,660	
Russia	11,419,020	-0.06744	10,648,917	
Slovenia	350,489	0.713084	600,417	
Slovakia	1,515,834	-0.07605	1,400,551	
Ukraine	35,801,050	-0.16007	30,070,304	
Serbia	6,964,770	-0.24328	5,270,358	
Democratic People's Republic of Korea	1,876,000	-0.01689	1,844,316	
Republic of Moldova	2,073,775	-0.2765	1,500,375	
Sri Lanka	270,041	-0.20404	214,942	
Estonia		-0.04063		
Latvia		-0.05827		
Palestine		0.153758		
Azerbaijan	247,939	-0.28233	177,939	
Montenegro	2,743	-0.13677	2,368	

Mongolia		-0.04832		
Luxembourg	565	-0.14177	485	
SUM	394,390,952		330,618,348	-16.2%
Community 5				
Kenya	4,013,777	0.209933	4,856,401	
United Republic of Tanzania	5,986,905	-0.05843	5,637,094	
Burundi	290,498	-0.17148	240,682	
Uganda	2,964,017	-0.15847	2,494,318	
Rwanda	410,280	-0.14775	349,661	
South Sudan	90,000	-0.03119	87,193	
Malawi	2,697,959	-0.04386	2,579,635	
Zimbabwe	730,437	0.002789	732,474	
Zambia	2,394,907	-0.06343	2,242,988	
Eswatini	91,247	-0.11533	80,724	
Central African Republic	86,976	-0.26992	63,500	
SUM	19,757,003		19,364,669	-2.0%
Community 6				
Kazakhstan	862,094	-0.1967	692,516	
Kyrgyzstan	692,877	0.054675	730,760	
Uzbekistan	413,165	-0.43009	235,469	
Tajikistan	237,355	-0.17326	196,231	
Turkmenistan	40,000	-0.43267	22,693	
SUM	2,245,491		1,877,669	-16.4%
TOTAL	1,146,791,311		920,278,982	-19.8%