

Table S1. Wheat insurance options: modules and characteristics.

Option ¹	Module ²	Risks covered ³	Regime	Complementary ⁴	For rainfed wheat and type B risks		Subsidies (%)				
					Loss indemnity ⁵	Max insurable yield ⁶	Base	Young/ women	Certified seeds ⁷	Collective	Renewal
Basic	P	Type A	Rainfed and irrigated	No	-	-	1	6	-	5	4
Extended	S	Types A and B	Rainfed	Yes	Per farm	Zonal	8	16	-	5	4
	2	Types A and B	Rainfed and irrigated	Yes	Per plot	Farmer yield history	17	16	5	5	9
	1	Types A and B	Rainfed and irrigated	Yes	Per farm	Farmer yield history	22	16	5	5	9

¹ Option *Basic* corresponds to Module P, while Module 1, Module 2 and Module S were aggregated in option *Extended*, as the same risks are covered in the three of them.

² Modules P, S, 2 and 1 as denominated in the arable crops insurance; they were listed according to the base subsidies from the lowest to the highest.

³ Risk types: A- Hail, fire, wild fauna, flood and excessive rainfall; B- No emergence and any other climatic adversity.

⁴ Farmers choosing the *Extended* option might increase the insured yield at midseason (contracting a complementary insurance) if their yield expectative is higher than the one insured before sowing.

⁵ *Per farm*: the farmer is indemnified only if the average final yield of the whole farm is lower than the insured yield; *Per plot*: the farmer is indemnified for each plot in which the final yield is lower than the insured yield.

⁶ *Zonal*: maximum insurable yield officially established on a geographic basis; *Farmer yield history*: maximum insurable yield adjusted based on individual farmers registered past yields.

⁷ Subsidies associated to practices that reduce risk. In the case of cereals, this subsidy is applicable for farmers using certified seeds.

Table S2. Trials seasons, anthesis and physiological maturity (days after sowing, DAS), and grain yield per location.

Location	Season	Anthesis (DAS)	Physiological maturity (DAS)	Yield (Mg/ha)
Barca (SO ¹)	2005-06 / 2008-09	179	213	1.7
Becerril (PA)	2004-05 / 2005-06 / 2007-08 / 2008-09 / 2009-10	185	–	2.9
Castrillo de la Guareña (ZA)	2005-06	164	197	2.1
Fuentepiñel (SG)	2004-05 / 2005-06 / 2007-08 / 2008-09 / 2009-10	189	222	5.8
Fuentes de Año (PA)	2005-06 / 2007-08 / 2008-09	180	221	2.5
Osorno (PA)	2005-06 / 2007-08	182	–	2.6
Palencia de Negrilla (SA)	2004-05 / 2005-06	184	–	2.6
Soto de Cerrato (PA)	2008-09	190		1.5
Tobar (BU)	2004-05 / 2005-06	189	216	4.2

¹ Soria (SO); Palencia (PA), Zamora (ZA); Segovia (SG); Salamanca (SA); Burgos (BU)

Table S3. Soil data used for the simulation of water limited yields using CERES-Wheat.

Soil type	Depth (m)	Clay (%)	Silt (%)	PWP ¹ (cm ³ /cm ³)	FC ¹ (cm ³ /cm ³)	SAT ¹ (cm ³ /cm ³)	Ksat ¹ (cm/h)	Bulk density (g cm ⁻³)
Sandy	0.05	19	7	0.131	0.197	0.369	2.59	1.59
	0.30	19	7	0.123	0.184	0.352	2.59	1.61
	1.00	21	8	0.139	0.207	0.374	0.43	1.6
Loam	0.05	25	31	0.186	0.327	0.457	1.32	1.32
	0.30	25	31	0.186	0.327	0.457	1.32	1.32
	1.00	30	24	0.187	0.297	0.411	0.43	1.44
Clayey	0.05	40	32	0.248	0.394	0.453	0.06	1.23
	0.30	40	32	0.248	0.394	0.453	0.06	1.23
	1.00	52	31	0.289	0.425	0.456	0.06	1.28

¹ PWP: permanent wilting point; FC: field capacity; SAT: saturation; Ksat: hydraulic conductivity at saturation.

Table S4. Minimum, average and maximum temperature and annual accumulated rainfall per weather zone.

Weather	Stations	Tmin (°C)	Tmean (°C)	Tmax (°C)	Rainfall (mm)
1	Torrecilla de la Orden (VA ¹); Navas de Arévalo (AV); Tordesillas (VA); Villaralbo (Za)	5.5	7.4	20.3	303
2	Fuentes de Nava (AV); Almazán (SO); Gomezserracín (SG); San Esteban de Gormaz (SO); Villoldo (PA); Nava de la Asunción (SG); Encina de Esgueva (VA)	4.5	7.5	19.3	409
3	Ciudad Rodrigo (SA); Herrera de Pisuergra (PA); Zotes del Páramo (LE); Villaluenga de la Vega (PA)	5.2	6.9	19.0	427
4	Cerralejo (LE); Mansilla Mayor (LE); Valle de Valdelucio (BU)	5.1	6.9	18.9	556

¹ Valladolid (VA); Ávila (AV); Soria (SO); Palencia (PA), Zamora (ZA); Segovia (SG); León (LE); Salamanca (SA); Burgos (BU)

Table S5. Calibration and validation of CERES-Wheat for anthesis and physiological maturity (days after sowing, DAS), and grain yield (Mg/ha).

	N	Anthesis (DAS)			Ph. maturity (DAS)			Grain yield (Mg/ha)		
		Observed	Simulated	RMSE	Observed	Simulated	RMSE	Observed	Simulated	RMSE
Calibration	7	183.4	184.3	2.6	213.0	215.5	11.5	2.5	2.4	0.4
Validation	17	183.8	182.3	6.5	217.9	218.2	9.9	3.5	3.4	0.9

P1V:60 days; P1D: 105 % reduction in rate per 10 h drop in photoperiod; P5:400 °C-days

G1:19.5 # g⁻¹; G2: 30.5 kg; G3: 2.59 g

PHINT: 95 °C-days