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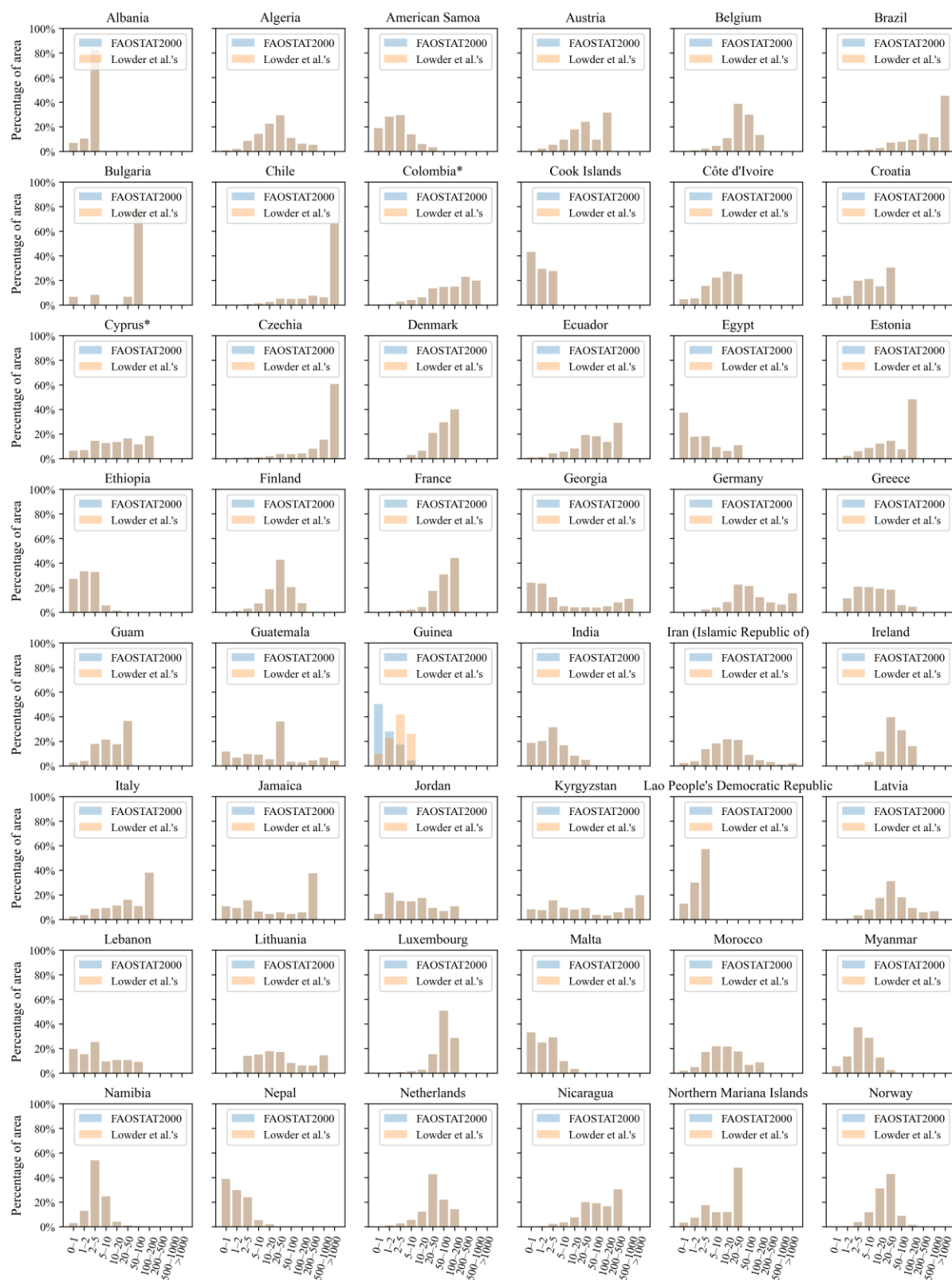
Gridded 5 arcmin datasets for simultaneously farm-size-specific and crop-specific harvested areas in 56 countries

Han Su et al.

Correspondence to: Han Su (h.su@utwente.nl)

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Figure S1. Comparison between FAOSTAT structural data of 2000 (FAO, 2022) and Lowder et al. (2016) on their respective estimates of the percentage of crop area per farm size. Only the countries covered by both datasets are shown. * Note that FAOSTAT provides obtained (part of) the structural data by interpolating other reported data, rather than taking it not directly from countries' official reports.



(To be continued)

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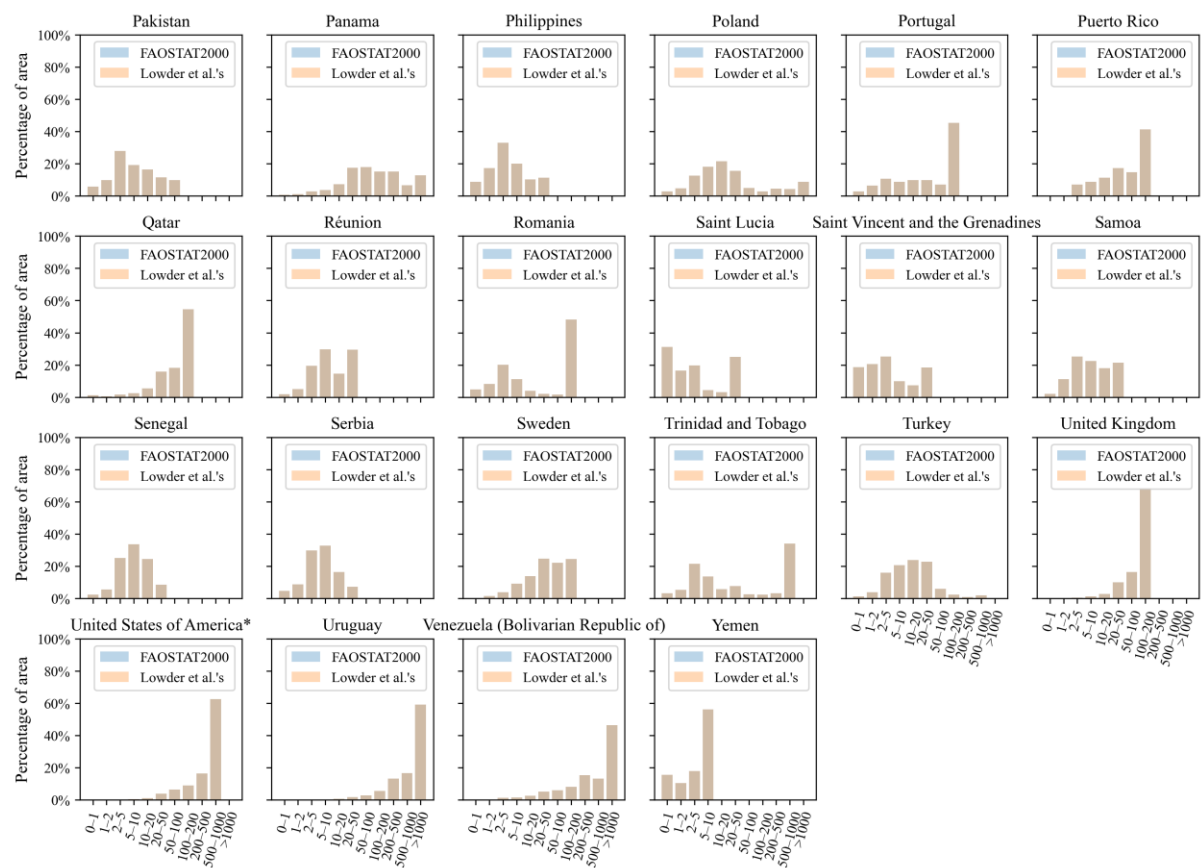


Table S1. List of 56 countries and their country code that are included in this study.

No.	Country code	Country	No.	Country code	Country
1	ALB	Albania	29	LUX	Luxembourg
2	AUT	Austria	30	LVA	Latvia
3	BEL	Belgium	31	MEX	Mexico
4	BFA	Burkina Faso	32	MLI	Mali
5	BGR	Bulgaria	33	MLT	Malta
6	BIH	Bosnia and Herzegovina	34	MNG	Mongolia
7	BRA	Brazil	35	MWI	Malawi
8	COL	Colombia	36	NER	Niger
9	COS	Costa Rica	37	NGA	Nigeria
10	CYP	Cyprus	38	NLD	Netherlands
11	CZE	Czechia	39	NOR	Norway
12	DEU	Germany	40	PAN	Panama
13	DNK	Denmark	41	PER	Peru
14	ESP	Spain	42	POL	Poland
15	EST	Estonia	43	PRT	Portugal
16	ETH	Ethiopia	44	PRY	Paraguay
17	FIN	Finland	45	ROM	Romania
18	FRA	France	46	RUS	Russian Federation
19	GBR	United Kingdom	47	SVK	Slovakia
20	GHA	Ghana	48	SVN	Slovenia
21	GRC	Greece	49	SWE	Sweden
22	HRV	Croatia	50	TJK	Tajikistan
23	HUN	Hungary	51	TLS	Timor-Leste
24	IND	India	52	TZA	United Republic of Tanzania
25	IRL	Ireland	53	UGA	Uganda
26	ITA	Italy	54	URY	Uruguay
27	KHM	Cambodia	55	USA	United States of America
28	LTU	Lithuania	56	ZAF	South Africa

Table S2. Classification of GAEZv4 crops and crop groups used to reclassify FAO crops, adapted based on Fischer et al. (2021). The GAEZv4 crop name and crop group were taken from Fischer et al. (2021). FAO items for each GAEZv4 crop were provided by Fischer et al. (2021) and identified by this study based on the GAEZv4 description if the respective FAO item was not mentioned by Fischer et al. (2021).

GAEZv4 crop	FAO item code	Crop group
Banana	486	Fruits & nuts
Barley	44	Cereals
Cassava	125	Roots & tubers
Cotton	328	Cotton
Fodder crops	639, 640, 643, 637, 638, 641, 645, 647, 651, 655	Fodder crops
Fruits and nuts	217, 220, 222, 225, 234, 249, 490, 495, 507, 515, 521, 526, 534, 536, 558, 560, 567, 568, 571, 572, 574, 577, 587, 592, 603, 619, 491, 492, 493, 494, 497, 512, 569, 591, 600, 523, 530, 531, 541, 542, 544, 547, 549, 550, 552, 554, 489	Fruits & nuts
Groundnut	242	Oilcrops
Maize	56	Cereals
Millet	79	Cereals
Oil palm	254	Oilcrops
Olive	260	Oilcrops
Other cereals	71, 75, 89, 108, 68, 92, 94, 97, 101, 103	Cereals
Potato and sweet potato	116, 122	Roots & tubers
Pulses	176, 181, 187, 191, 195, 201, 211, 203, 205, 210, 197	Pulses
Rapeseed	270, 292	Oilcrops
Rest of crops	161, 280, 289, 333, 339, 687, 689, 720, 723, 777, 782, 788, 789, 263, 265, 275, 296, 299, 336, 773, 780, 800, 809, 821, 216, 221, 223, 224, 226, 671, 677, 692, 693, 698, 702, 711, 748, 754, 836, 839, 277, 305, 310	Rest
Sorghum	83	Cereals
Soybean	236	Oilcrops
Stimulants	656, 661, 667	Stimulates
Sugar beet	157	Sugar crops
Sugar cane	156	Sugar crops
Sunflower	267	Oilcrops
Tobacco	826	Stimulates
Vegetables	358, 372, 373, 388, 393, 394, 397, 399, 402, 406, 423, 426, 446, 449, 463, 366, 367, 401, 407, 414, 417, 420, 430, 459, 461, 1735	Vegetables
Wetland rice	27	Cereals
Wheat	15	Cereals
Yams and other roots	135, 136, 137, 149	Roots & tubers

Table S3. Classification of SPAM2010 crops and crop groups used to reclassify FAO crops, adapted based on Yu et al. (2020). The SPAM2010 crop name and crop group were taken from Yu et al. (2020). FAO items for each SPAM2010 crop were provided by Yu et al. (2020) and identified by this study based on the SPAM2010 description if the respective FAO item was not mentioned by Yu et al. (2020).

SPAM2010 crop	Crop long name	FAO item code	Crop group
acof	Arabica Coffee	656	Stimulates
bana	Banana	486	Fruits
barl	Barley	44	Cereals
bean	Bean	176	Pulses
cass	Cassava	125	Roots & tubers
chic	Chickpea	191	Pulses
cnut	Coconut	249	Oilcrops
coco	Cocoa	661	Stimulates
cott	Cotton	328	Fibres
cowp	Cowpea	195	Pulses
grou	Groundnut	242	Oilcrops
lent	Lentil	201	Pulses
maiz	Maize	56	Cereals
ocer	Other Cereals	68, 71, 75, 89, 92, 94, 97, 101, 103, 108	Cereals
ofib	Other Fibre	773, 777, 780, 782, 788, 789, 800, 809, 821	Fibres
	Crops		
oilp	Oilpalm	254	Oilcrops
ooil	Other Oil Crops	260, 263, 265, 275, 277, 280, 296, 299, 333, 336, 339, 305, 310	Oilcrops
opul	Other Pulses	181, 187, 203, 205, 210, 211	Pulses
orts	Other Roots	135, 136, 149	Roots & tubers
pige	Pigeon Pea	197	Pulses
plnt	Plantain	489	Fruits
pmil	Pearl Millet	79	Cereals
pota	Potato	116	Roots & tubers
rape	Rapeseed	270, 292	Oilcrops
rcof	Robusta Coffee	656	Stimulates
rest	Rest Of Crops	161, 216, 217, 220, 221, 222, 223, 224, 225, 226, 234, 671, 677, 687, 689, 692, 693, 698, 702, 711, 720, 723, 748, 754, 836, 839	Rest
rice	Rice	27	Cereals
sesa	Sesame Seed	289	Oilcrops
smil	Small Millet	79	Cereals
sorg	Sorghum	83	Cereals
soyb	Soybean	236	Oilcrops
sugb	Sugarbeet	157	Sugar crops

sugc	Sugarcane	156	Sugar crops
sunf	Sunflower	267	Oilcrops
swpo	Sweet Potato	122	Roots & tubers
teas	Tea	667	Stimulates
temf	Temperate Fruit	515, 521, 523, 526, 530, 531, 534, 536, 541, 542, 544, 547, 549, 550, 552, 554, 558, 560, 592, 619	Fruits
toba	Tobacco	826	Stimulates
trof	Tropical Fruit	490, 491, 492, 493, 494, 495, 497, 507, 512, 567, 568, 569, 571, 572, 574, 577, 587, 591, 600, 603	Fruits
vege	Vegetables	358, 366, 367, 372, 373, 388, 393, 394, 397, 399, 401, 402, 406, 407, 414, 417, 420, 423, 426, 430, 446, 449, 459, 461, 463, 1735	Vegetables
whea	Wheat	15	Cereals
yams	Yams	137	Roots & tubers

Table S4. List of eleven household surveys that harmonized into FAO RuLIS (Rural Livelihoods Information System) database (FAO, 2021) and used to estimate the percentage of irrigated area per farm size in this study for comparison.

Country	Year	Survey
Albania	2005	Living Standard Measurement Survey
Cambodia	2009	Cambodia Social-Economic Survey
Ethiopia	2014	Ethiopia Socioeconomic Survey
India	2012	India Human Development survey
Malawi	2011	Integrated Household Survey
Mali	2014	Enquête Agricole de conjoncture integree aux Conditions de Vie des Menages
Niger	2011	National Survey on Household Living Conditions and Agriculture
Nigeria	2013	General Household Survey
Timor-Leste	2008	Survey of Living Standards
United Republic of Tanzania	2009	National Panel Survey
Uganda	2010	The Uganda National Panel Survey

Table S5. Pearson correlation coefficient between the harvested area of oil palm estimated by satellite images from Descals et al. (2020) and i) GAEZv4 crop map based farm-size- and crop-specific dataset and ii) SPAM2010 crop map based farm-size- and crop-specific dataset, respectively, for small farms (<10 ha) and large farms (≥ 10 ha). Different from Table 2 in the manuscript, the threshold in this table is 10 ha. * $p < 0.005$. ** $p < 0.001$.

		Small farms			Large farms		
		5 arcmin	15 arcmin	25 arcmin	5 arcmin	15 arcmin	25 arcmin
Colombia	GAEZv4 based	0.160**	0.290**	0.372**	0.112**	0.235**	0.335**
	SPAM2010 based	0.194**	0.460**	0.580**	0.383**	0.624**	0.704**
Costa Rica	GAEZv4 based	0.187**	0.493**	0.574**	-0.012	-0.073	-0.141**
	SPAM2010 based	0.310**	0.858**	0.935**	0.730**	0.888**	0.932**
Brazil	GAEZv4 based	0.194**	0.313**	0.367**	0.193**	0.279**	0.305**
	SPAM2010 based	0.063	0.120**	0.180**	0.138**	0.141**	0.135**
United republic of Tanzania	GAEZv4 based	0.011	-0.107*	-0.199**	-0.012	-0.040	-0.065
	SPAM2010 based	0.008	-0.005	0.027	0.058	0.145**	0.293**
Peru	GAEZv4 based	0.112**	0.309**	0.422**	0.028	0.118**	0.213**
	SPAM2010 based	0.307**	0.285**	0.329**	0.109*	0.213**	0.231**

Table S6. Pearson correlation coefficient between the harvested area of oil palm estimated by satellite images from Descals et al. (2020) and i) GAEZv4 crop map based farm-size- and crop-specific dataset and ii) SPAM2010 crop map based farm-size- and crop-specific dataset, respectively, for small farms (<50 ha) and large farms (\geq 50 ha). Different from Table 2 in the manuscript, the threshold in this table is 50 ha. * $p<0.005$. ** $p<0.001$.

		Small farms			Large farms		
		5 arcmin	15 arcmin	25 arcmin	5 arcmin	15 arcmin	25 arcmin
Colombia	GAEZv4 based	0.209**	0.368**	0.468**	0.106**	0.232**	0.322**
	SPAM2010 based	0.225**	0.588**	0.748**	0.388**	0.618**	0.695**
Costa Rica	GAEZv4 based	0.127*	0.248**	0.314**	-0.073	-0.176**	-0.254**
	SPAM2010 based	0.784**	0.891**	0.927**	0.780**	0.903**	0.940**
Brazil	GAEZv4 based	0.254**	0.436**	0.500**	0.080**	0.106**	0.116**
	SPAM2010 based	0.146**	0.230**	0.295**	0.033	0.023	0.013
United republic of Tanzania	GAEZv4 based	0.010	-0.110*	-0.204**	-0.011	-0.037	-0.061
	SPAM2010 based	0.024	0.025	0.069			
Peru	GAEZv4 based	0.213**	0.403**	0.491**	0.045	0.152**	0.256**
	SPAM2010 based	0.402**	0.414**	0.441**	0.182**	0.245**	0.297**

Table S7. Percentage farm-size-specific irrigated area, for eleven countries for which household surveys were available (see S4). For each country with household survey, we calculated the percentage of total irrigated area (irrigated area divided by cultivated area) for each farm size (classified by crop area) where at least five survey samples are available. For each country with our dataset, we divided the harvested area under irrigated farming system used the total harvested area for each farm size.

Country	Farm size	0 - 1	1 - 2	2 - 5	5 - 10	10 - 20	20 - 50	50 - 100	100 - 200	200 - 500	500 - 1000	> 1000
Albania	Survey	55.2%	36.4%	25.5%								
	SPAM2010 based	26.2%	30.4%	26.8%	33.2%	38.2%	3.9%	55.8%				
	GAEZv4 based	47.3%	46.2%	47.8%	44.8%	43.8%	47.4%	88.9%				
Cambodia	Survey	49.1%	43.6%	42.7%	29.0%							
	SPAM2010 based	24.2%	19.4%	18.3%	21.3%	21.5%	14.0%	21.5%	11.1%	10.5%		
	GAEZv4 based	31.2%	19.5%	16.1%	13.3%	8.4%	17.1%	5.5%	10.7%	4.5%		
Ethiopia	Survey	5.1%	3.1%	2.4%	2.9%							
	SPAM2010 based	1.5%	1.1%	1.0%	1.1%	6.5%	4.3%	6.9%	0.9%	3.6%	1.9%	3.1%
	GAEZv4 based	3.0%	2.2%	1.8%	1.4%	5.5%	9.9%	40.9%	8.5%	2.9%	2.5%	3.2%
India	Survey	62.5%	64.5%	70.7%	76.8%	74.1%	55.9%					
	SPAM2010 based	41.3%	33.0%	31.8%	30.5%	30.8%	26.7%	26.7%	21.3%	17.3%	33.1%	31.1%
	GAEZv4 based	48.3%	41.7%	42.7%	44.1%	46.3%	42.8%	45.3%	33.5%	45.0%	52.0%	18.5%
Malawi	Survey	1.8%	2.6%	2.6%								
	SPAM2010 based	0.5%	0.9%	0.1%			0.1%					
	GAEZv4 based	1.8%	2.8%	3.2%								
Mali	Survey	39.0%	26.6%	12.3%	7.3%	4.7%	1.7%					
	SPAM2010 based	27.4%	25.8%	19.7%	9.6%	14.2%	4.9%	9.5%	4.1%	2.2%	31.6%	5.5%
	GAEZv4 based	56.1%	33.9%	15.9%	8.0%	9.1%	3.9%	7.0%	5.8%	2.2%	15.3%	53.1%
Niger	Survey	19.4%	10.5%	3.8%	2.0%	1.6%	0.1%					
	SPAM2010 based	0.0%	0.1%	0.0%			0.0%					

Nigeria		GAEZv4 based	2.4%	0.8%	1.5%	4.9%	4.7%	0.6%	0.7%	1.7%	15.8%		
		Survey	1.8%	1.8%	0.6%	0.0%							
		SPAM2010 based	1.8%	0.9%	0.8%	0.5%	2.5%	1.8%	0.1%	0.6%	0.6%	0.9%	0.4%
Timor-Leste		GAEZv4 based	0.5%	0.4%	0.4%	0.2%	0.4%	0.3%	0.4%	0.1%	0.1%		0.2%
		Survey	12.5%	8.3%	7.1%								
		SPAM2010 based	22.7%	11.0%	14.9%	2.7%	18.6%		64.7%				
United Republic of Tanzania		GAEZv4 based	20.6%	9.1%	20.3%	0.8%	6.7%		100.0%				
		Survey	4.0%	2.9%	3.0%	2.8%	1.0%						
		SPAM2010 based	1.8%	1.2%	1.0%	1.1%	1.0%	1.7%	1.5%	1.3%	1.8%	2.5%	1.5%
Uganda		GAEZv4 based	5.2%	2.4%	1.5%	1.6%	1.2%	0.8%	0.7%	0.9%	1.6%	0.8%	0.0%
		Survey	0.6%	1.0%	0.9%	0.0%							
		SPAM2010 based	1.0%	0.7%	4.8%	1.7%	1.0%						
		GAEZv4 based	0.0%	0.2%	0.6%	1.0%	0.0%						

Table S8. Number and percentage of grid cells that have similar, larger, and smaller dominant farm size in our datasets compared to earlier estimates by Mehrabi et al. (2020). Similar means the farm size in our datasets is the same or next to the farm size in the dataset by Mehrabi et al. (2020).

Country	Number of pixels						Percentage of Pixels					
	SPAM2010 based			GAEZv4 based			SPAM2010 based			GAEZv4 based		
	similar	larger	smaller	similar	larger	smaller	similar	larger	smaller	similar	larger	smaller
Albania	339	47	84	352	39	37	72.1%	10.0%	17.9%	82.2%	9.1%	8.6%
Austria	390	244	170	343	233	221	48.5%	30.3%	21.1%	43.0%	29.2%	27.7%
Belgium	404	99	88	386	103	56	68.4%	16.8%	14.9%	70.8%	18.9%	10.3%
Burkina Faso	820	2001	66	662	2277	49	28.4%	69.3%	2.3%	22.2%	76.2%	1.6%
Bulgaria	1288	358	35	1249	341	24	76.6%	21.3%	2.1%	77.4%	21.1%	1.5%
Bosnia and Herzegovina	302	423	16	203	589	8	40.8%	57.1%	2.2%	25.4%	73.6%	1.0%
Brazil	18218	3912	21303	21956	6891	20596	41.9%	9.0%	49.0%	44.4%	13.9%	41.7%
Colombia	998	408	3276	1145	468	3715	21.3%	8.7%	70.0%	21.5%	8.8%	69.7%
Costa Rica	46	363	14	30	396	1	10.9%	85.8%	3.3%	7.0%	92.7%	0.2%
Cyprus	19	86	0	27	78	0	18.1%	81.9%	0.0%	25.7%	74.3%	0.0%
Czechia	878	289	74	964	310	106	70.7%	23.3%	6.0%	69.9%	22.5%	7.7%
Germany	2769	1810	1574	2784	2085	1462	45.0%	29.4%	25.6%	44.0%	32.9%	23.1%
Denmark	704	128	20	647	109	23	82.6%	15.0%	2.3%	83.1%	14.0%	3.0%
Spain	917	5837	96	752	6014	88	13.4%	85.2%	1.4%	11.0%	87.7%	1.3%
Estonia	474	369	3	468	365	38	56.0%	43.6%	0.4%	53.7%	41.9%	4.4%
Ethiopia	4172	477	885	3647	494	740	75.4%	8.6%	16.0%	74.7%	10.1%	15.2%
Finland	137	1593	11	188	1608	5	7.9%	91.5%	0.6%	10.4%	89.3%	0.3%
France	6506	984	357	6850	1127	130	82.9%	12.5%	4.5%	84.5%	13.9%	1.6%
United Kingdom	2475	182	202	3070	236	158	86.6%	6.4%	7.1%	88.6%	6.8%	4.6%
Ghana	477	1809	0	540	2112	1	20.9%	79.1%	0.0%	20.4%	79.6%	0.0%
Greece	866	491	307	862	552	255	52.0%	29.5%	18.4%	51.6%	33.1%	15.3%
Croatia	256	464	62	249	495	58	32.7%	59.3%	7.9%	31.0%	61.7%	7.2%
Hungary	719	535	23	754	639	46	56.3%	41.9%	1.8%	52.4%	44.4%	3.2%
India	23358	8820	4237	23511	8250	4359	64.1%	24.2%	11.6%	65.1%	22.8%	12.1%
Ireland	713	212	139	777	231	135	67.0%	19.9%	13.1%	68.0%	20.2%	11.8%

Italy	1641	1236	1051	1684	1472	913	41.8%	31.5%	26.8%	41.4%	36.2%	22.4%
Cambodia	362	1103	3	603	1245	30	24.7%	75.1%	0.2%	32.1%	66.3%	1.6%
Lithuania	379	746	178	373	602	313	29.1%	57.3%	13.7%	29.0%	46.7%	24.3%
Luxembourg	25	1	0	46	1	0	96.2%	3.8%	0.0%	97.9%	2.1%	0.0%
Latvia	518	498	158	581	401	302	44.1%	42.4%	13.5%	45.2%	31.2%	23.5%
Mexico	7899	3055	2822	8526	3115	2783	57.3%	22.2%	20.5%	59.1%	21.6%	19.3%
Mali	296	3698	0	225	4274	4	7.4%	92.6%	0.0%	5.0%	94.9%	0.1%
Mongolia	83	18	65	556	466	425	50.0%	10.8%	39.2%	38.4%	32.2%	29.4%
Malawi	732	104	0	799	167	0	87.6%	12.4%	0.0%	82.7%	17.3%	0.0%
Niger	1843	1424	107	2050	1385	113	54.6%	42.2%	3.2%	57.8%	39.0%	3.2%
Nigeria	6164	3759	1	6580	3812	2	62.1%	37.9%	0.0%	63.3%	36.7%	0.0%
Netherlands	340	161	79	375	165	82	58.6%	27.8%	13.6%	60.3%	26.5%	13.2%
Norway	99	243	33	131	293	14	26.4%	64.8%	8.8%	29.9%	66.9%	3.2%
Panama	192	111	153	207	116	218	42.1%	24.3%	33.6%	38.3%	21.4%	40.3%
Peru	691	294	2533	1127	483	3721	19.6%	8.4%	72.0%	21.1%	9.1%	69.8%
Poland	2728	1709	1244	2697	1754	1352	48.0%	30.1%	21.9%	46.5%	30.2%	23.3%
Portugal	623	332	171	626	474	94	55.3%	29.5%	15.2%	52.4%	39.7%	7.9%
Paraguay	932	83	766	1289	107	838	52.3%	4.7%	43.0%	57.7%	4.8%	37.5%
Romania	1640	1207	515	1674	1234	565	48.8%	35.9%	15.3%	48.2%	35.5%	16.3%
Russian Federation	28678	12171	9310	38082	15146	9041	57.2%	24.3%	18.6%	61.2%	24.3%	14.5%
Slovakia	494	141	1	551	173	6	77.7%	22.2%	0.2%	75.5%	23.7%	0.8%
Slovenia	21	142	0	34	211	0	12.9%	87.1%	0.0%	13.9%	86.1%	0.0%
Sweden	655	1148	15	617	1128	54	36.0%	63.1%	0.8%	34.3%	62.7%	3.0%
Tajikistan	170	650	20	215	705	14	20.2%	77.4%	2.4%	23.0%	75.5%	1.5%
Timor-Leste	144	4	0	159	5	1	97.3%	2.7%	0.0%	96.4%	3.0%	0.6%
United Republic of Tanzania	1679	3706	5	2328	5416	5	31.2%	68.8%	0.1%	30.0%	69.9%	0.1%
Uganda	1047	109	946	1072	86	1074	49.8%	5.2%	45.0%	48.0%	3.9%	48.1%
Uruguay	1124	250	295	1521	339	139	67.3%	15.0%	17.7%	76.1%	17.0%	7.0%
United States of America	46349	17045	10691	51825	20422	6516	62.6%	23.0%	14.4%	65.8%	25.9%	8.3%
South Africa	1044	78	6869	870	60	6459	13.1%	1.0%	86.0%	11.8%	0.8%	87.4%

Total	176837	87167	71073	199839	101299	67389	52.8%	26.0%	21.2%	54.2%	27.5%	18.3%
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