

Table S1. Confusion matrix of crop categorization with Random Forest.

Class data	Reference Data																									
	SHR	SUG	OTH	ENER	FRST	TREE	GRAS	HERB	WEED	MAIZ	ALF	REED	SUNF	WCER	FLAND	RAPS	RICE	FIBP	SOY	GRPE	FVEG	FPLA	SCER	VEG	Σ REF	Recall (%)
SHR	311	0	0	0	4	584	620	0	2	28	106	0	17	26	339	1	0	0	0	780	0	3	5	18	2844	10.9
SUG	0	962	0	0	0	3	1	0	0	28	4	0	81	1	1	0	0	0	6	1	0	2	4	13	1107	86.9
OTH	0	0	7	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	9	77.8
ENER	0	0	0	26	0	2	48	0	0	5	8	1	0	2	12	0	0	0	0	1	0	0	0	1	106	24.5
FRST	0	0	0	0	4169	431	918	0	5	33	54	0	15	3	186	0	0	0	0	105	3	1	3	71	5997	69.5
TREE	26	2	0	0	286	18943	3301	1	1	172	546	0	85	134	1594	4	0	0	1	1245	24	2	65	320	26752	70.8
GRAS	15	5	0	0	191	1263	133470	1	12	626	5952	5	321	1216	2710	39	1	0	20	555	53	135	283	55	146928	90.8
HERB	0	9	0	0	1	178	252	742	0	251	141	0	144	258	485	90	0	0	4	119	155	42	60	662	3593	7.0
WEED	0	0	0	0	12	21	152	0	11003	14	13	0	13	4	25	0	0	0	2	7	1	0	0	0	11267	97.7
MAIZ	1	7	0	0	13	146	263	6	1	175697	266	0	2085	1218	925	70	3	0	122	220	90	83	378	389	181983	96.6
ALF	3	6	0	0	9	344	5366	2	5	452	40814	0	326	539	979	26	0	0	18	262	79	78	268	94	49670	82.2
REED	0	0	0	0	12	9	77	0	1	37	0	98	3	0	3	0	0	0	0	0	0	0	0	3	243	40.3
SUNF	0	18	0	0	1	35	97	2	2	1743	97	0	88762	424	572	57	5	0	41	68	64	28	70	221	92307	96.2
WCER	1	2	0	0	4	87	595	4	2	1336	494	0	494	192669	1551	264	1	1	18	87	56	75	863	66	198670	96.9
FLAND	9	6	0	0	64	832	6834	12	15	1063	1077	1	1252	2323	17762	97	3	0	34	1020	240	90	427	553	33714	52.7
RAPS	0	1	0	0	0	16	59	6	0	108	59	0	67	755	145	35718	0	0	7	2	3	8	33	10	36997	96.5
RICE	0	0	0	0	0	0	0	0	0	6	0	0	1	0	1	0	540	0	0	0	0	0	0	0	548	98.5
FIBP	0	0	0	0	0	2	1	0	0	15	0	0	15	1	10	0	0	19	14	1	1	1	2	1	83	22.9
SOY	0	2	0	0	0	2	5	0	0	456	4	0	217	30	47	7	0	0	6977	9	7	11	13	9	7796	89.5
GRPE	2	1	0	0	0	569	795	0	2	83	108	0	40	30	764	02	0	0	0	21959	8	2	10	43	24418	89.9
FVEG	0	10	0	0	5	63	104	14	1	287	61	0	914	114	545	6	0	0	20	92	4999	133	215	584	8167	61.2
FPLA	1	4	0	0	5	94	1790	12	1	1143	1056	0	428	770	862	64	1	0	101	136	277	4071	656	132	11604	35.1
SCER	0	3	0	0	1	56	376	0	1	2489	238	1	624	1485	1175	21	0	0	34	187	117	123	10815	132	17878	60.5
VEG	3	16	0	0	6	328	151	36	2	479	164	0	704	207	1100	29	0	0	15	304	414	80	197	7002	11237	62.3
Σ CLASS	372	1054	7	26	4783	24008	155276	838	11056	186551	51262	106	96608	202209	31794	36495	554	20	7434	27160	6591	4968	14367	10379	O.A.	88.9
Prec. (%)	83.6	91.3	100	100	87.2	78.9	85.9	88.5	99.5	94.2	79.6	92.5	91.9	95.3	55.9	97.9	97.5	95.0	93.9	80.6	75.6	81.9	75.3	67.5		
F1-score	19.3	89.0	87.5	39.4	77.4	74.6	88.3	13.0	98.6	95.4	80.9	56.2	93.9	96.1	54.2	97.2	98.0	36.9	91.6	85.2	67.8	49.1	67.1	64.8		

Table S2. Confusion matrix of crop categorization with Random Forest using randomly selected 1000 parcels per category

Class data	Reference Data																				
	SHR	SUG	FRST	TREE	GRAS	HERB	WEED	MAIZ	ALF	SUNF	WCER	FLAND	RAPS	SOY	GRPE	FVEG	FPLA	SCER	VEG	Σ REF	Recall (%)
SHR	106	0	1	214	208	0	1	13	41	4	9	114	0	0	281	0	1	1	6	1000	10.6
SUG	0	869	0	3	1	0	0	26	4	72	1	1	0	5	1	0	2	3	12	1000	86.9
FRST	0	0	726	67	134	0	1	5	6	3	0	28	0	0	17	0	0	0	13	1000	72.6
TREE	0	0	9	710	111	0	0	8	31	5	4	48	1	0	57	2	1	3	10	1000	71.0
GRAS	0	0	1	11	906	0	0	6	35	3	7	22	0	0	2	0	1	4	2	1000	90.6
HERB	0	3	1	65	70	206	0	72	38	35	77	124	24	1	37	42	15	22	168	1000	20.6
WEED	0	0	2	3	14	0	979	0	0	0	0	2	0	0	0	0	0	0	0	1000	97.9
MAIZ	0	0	0	1	0	0	0	960	0	16	10	6	0	0	0	0	0	3	4	1000	96.0
ALF	0	0	0	9	107	1	0	14	817	5	7	15	0	0	5	2	4	13	1	1000	81.7
SUNF	0	0	0	0	1	0	0	16	1	964	6	7	0	0	1	0	1	1	2	1000	96.4
WCER	0	0	0	0	2	0	0	8	4	2	967	9	3	0	0	0	0	5	0	1000	96.7
FLAND	0	0	2	27	180	1	2	31	21	26	77	548	4	2	32	7	4	9	27	1000	54.8
RAPS	0	0	0	1	2	0	0	0	2	1	23	4	964	1	0	0	0	2	0	1000	96.4
SOY	0	1	0	0	0	0	0	60	0	23	5	8	2	892	3	2	2	0	2	1000	89.2
GRPE	0	1	0	22	26	0	0	6	4	1	5	32	1	0	900	0	0	0	2	1000	90.0
FVEG	0	0	0	12	10	1	0	30	11	122	10	48	0	2	13	616	23	33	69	1000	61.6
FPLA	0	0	0	4	173	0	0	105	93	33	70	73	8	10	8	28	330	53	12	1000	33.0
SCER	0	0	1	2	22	0	0	155	16	33	84	71	1	2	12	6	10	576	9	1000	57.6
VEG	0	2	1	28	23	4	0	42	13	67	9	85	5	1	28	26	5	15	646	1000	64.6
Σ CLASS	106	876	744	1179	1990	213	983	1557	1137	1415	1371	1245	1013	916	1397	731	399	743	985	O.A.	72.0
Prec. (%)	100	99.2	97.6	60.2	45.5	96.7	99.6	61.7	71.9	68.1	70.5	44.0	95.2	97.4	64.4	84.3	82.7	77.5	65.6		
F1-score	19.2	92.6	83.3	65.2	60.6	34.0	98.7	75.1	76.5	79.8	81.6	48.8	95.8	93.1	75.1	71.2	47.2	66.1	65.1		

Table S3. Overview of spectral indices used for crop classification

Index name	Abbreviation	Formula
Normalized Difference Vegetation Index	NDVI	$\frac{Band8 - Band4}{Band8 + Band4}$
Bare Soil Index	BSI	$\frac{(Band11 + Band4) - (Band8 + Band2)}{(Band11 + Band4) + (Band8 + Band2)}$
Enhanced Vegetation Index	EVI	$\frac{Band8 - Band4}{Band8 + 6 \times Band4 - 7.5 \times Band2 + 1}$
Structure Intensitive Pigment Index	SIPi	$\frac{Band8 - Band2}{Band8 - Band4}$
Yellow Crop Index	YCI	$(Band4 + Band3) - (2 \times Band2)$

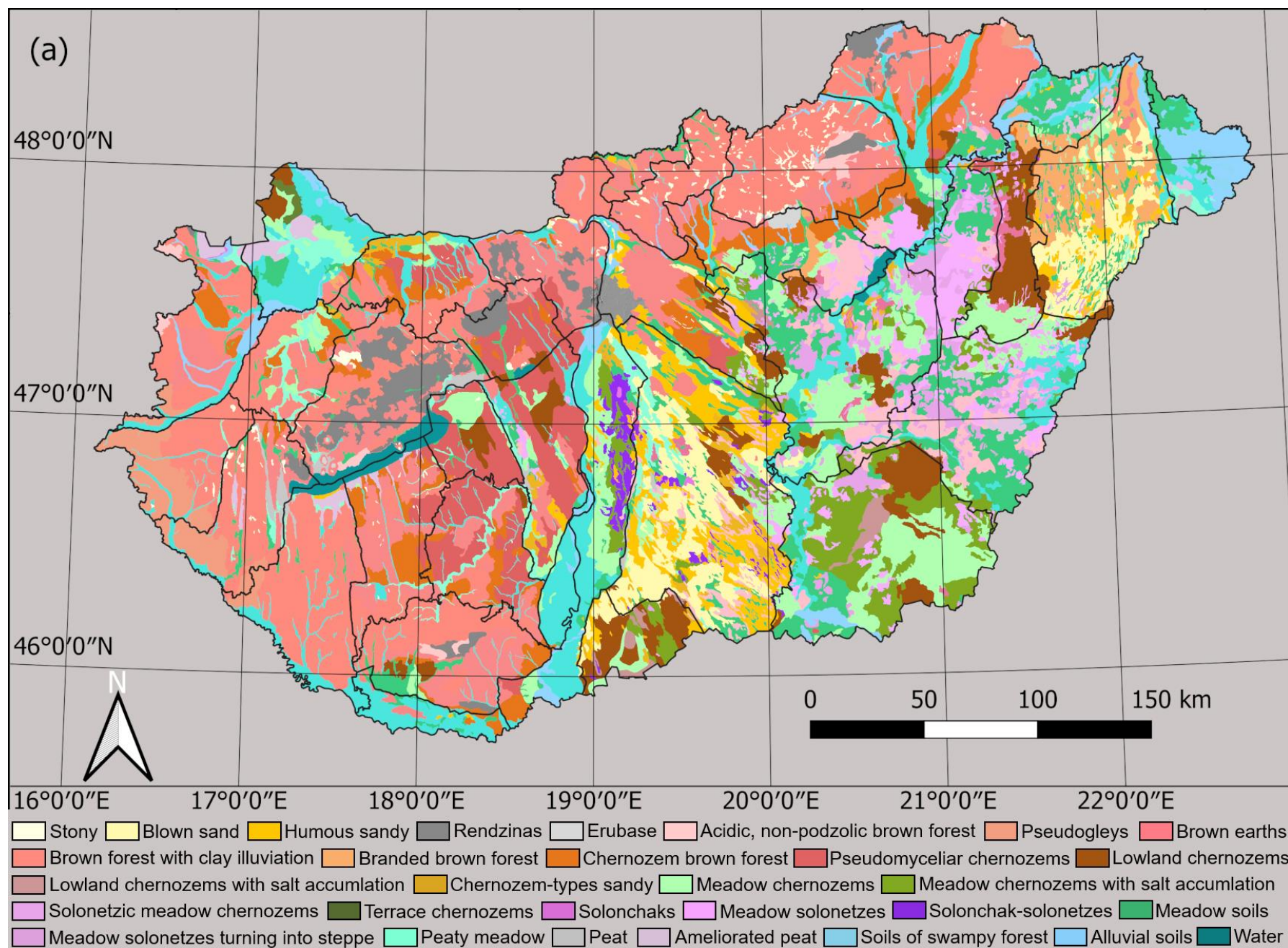


Figure S1. Agro-ecological zones of Hungary, used for stratifying crop classification, overlain on soil map where individual colours represent different soil types

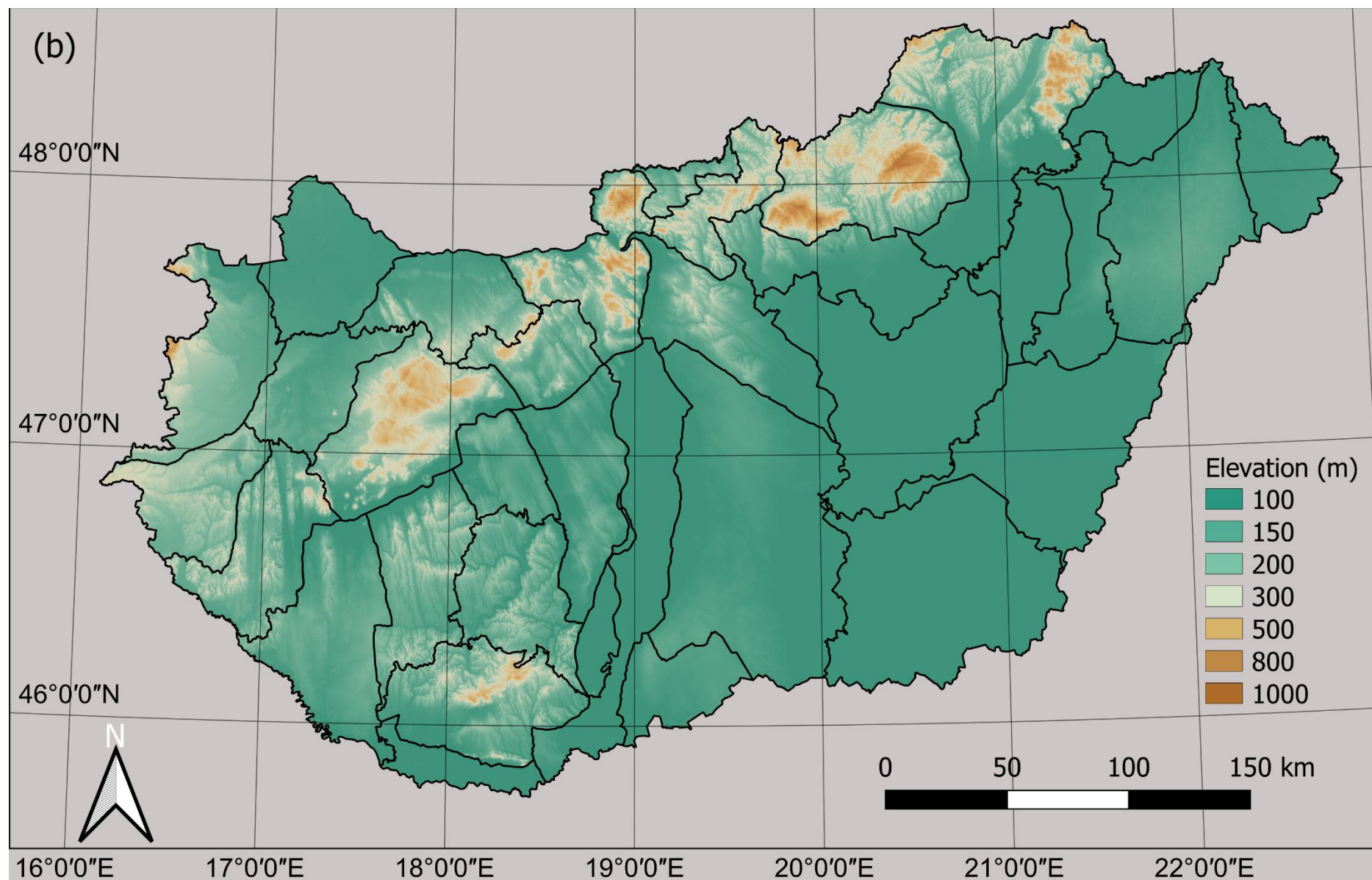


Figure S2. Agro-ecological zones of Hungary, used for stratifying crop classification, overlain on digital elevation model

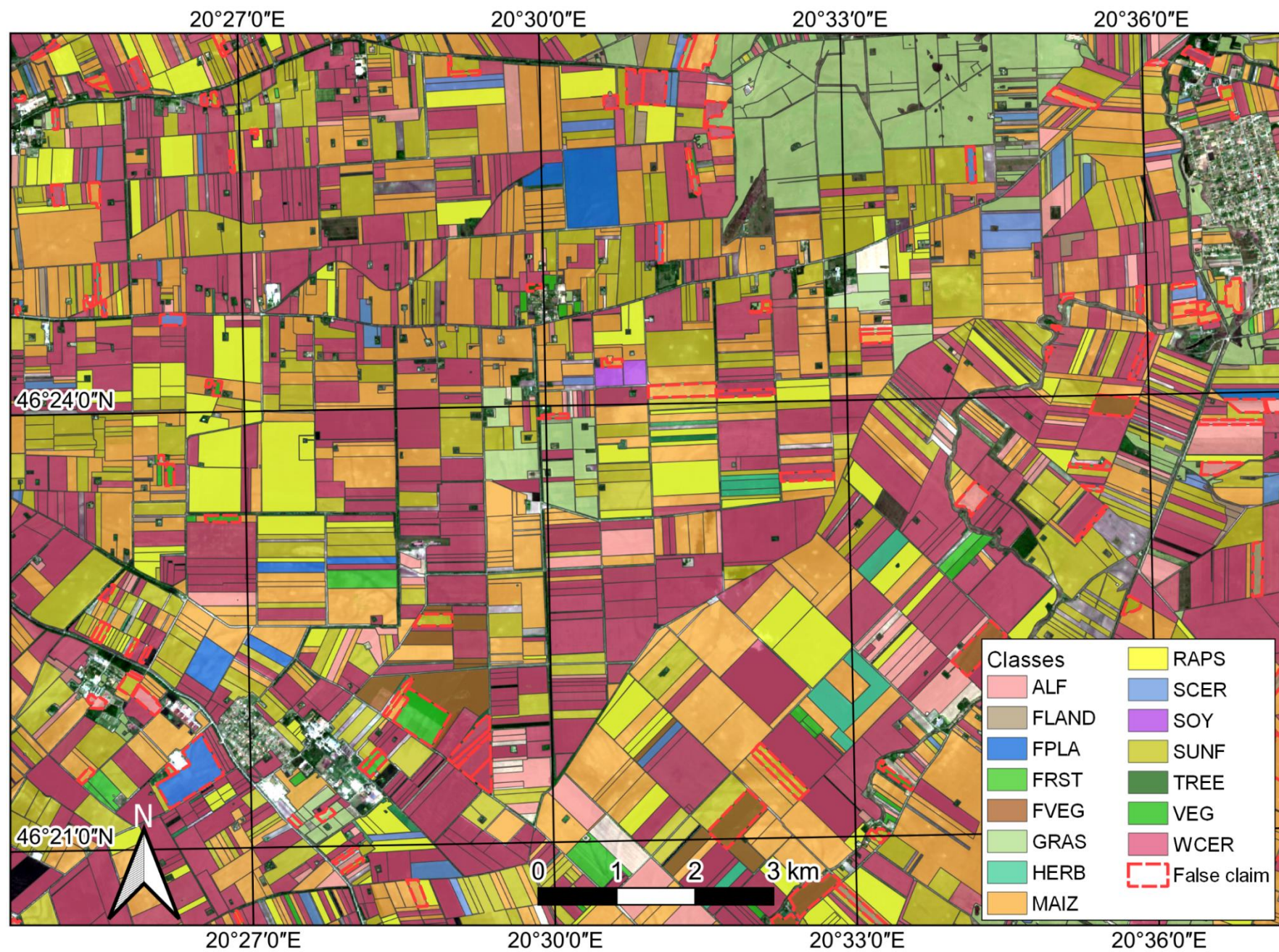


Figure S3. Example of crop type classification result with false claims (red dashed outline)