OBJECT-BASED LAND USE MAP OF KHOREZM

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I. OBJECT BASED LAND USE MAP OF KHOREZM

1.1 Introduction

In recent decades, multi-spectral and hyper-spectral remotely sensed imageries with high and modern spatial resolutions at sufficient time-series interval have been developed. This allows for detecting crop types and its distribution over large areas and at short time intervals. Among the advantages of remote sensing technologies are its cost effective evaluation over extensive areas and the ability to provide reliable information on land surface conditions. This is useful also for areas with sporadic information on the spatial extent of croplands effected by for instance water scarcity. The elaboration of sustainable natural resource management that demands a judicious management of land and fresh water, requires accurate information on status of these croplands. For classifying on field basis, agricultural fields were digitized based on very high spatial resolution SPOT 5 imageries. For the actual land use classification, 5 time-series images were used for the growing period in 2013. In order to consider accuracy assessment of classified training data, the random forest confusion matrix was implemented and training data allowed to classify an accuracy of 93 percent.

1.2 Methodology

Satellite data and preprocessing.

Analyses were based on Landsat 8 OLI images (path 159, raw 31), recorded in 2013. For this year, cloud-free images were available to cover crop growing stages, from the late of spring (mid of May), early summer (beginning/mid of June), mid of summer (beginning/mid of July), late summer (mid/end of August) and early autumn (beginning of September).

All images were geometrically adjusted to 30-meter Landsat 8 OLI scene, projected to UTM coordinate system (zone 41) and radiometrically corrected.

Table 1. Landsat OLI images, used in the study

First scene	Second scene
15 May	24 May

31 May	9 June
9 July	11 July
12 August	19 August
28 August	4 September

1.1 Results

1.3.1 Ground sampling methods and accuracy assessment matrix

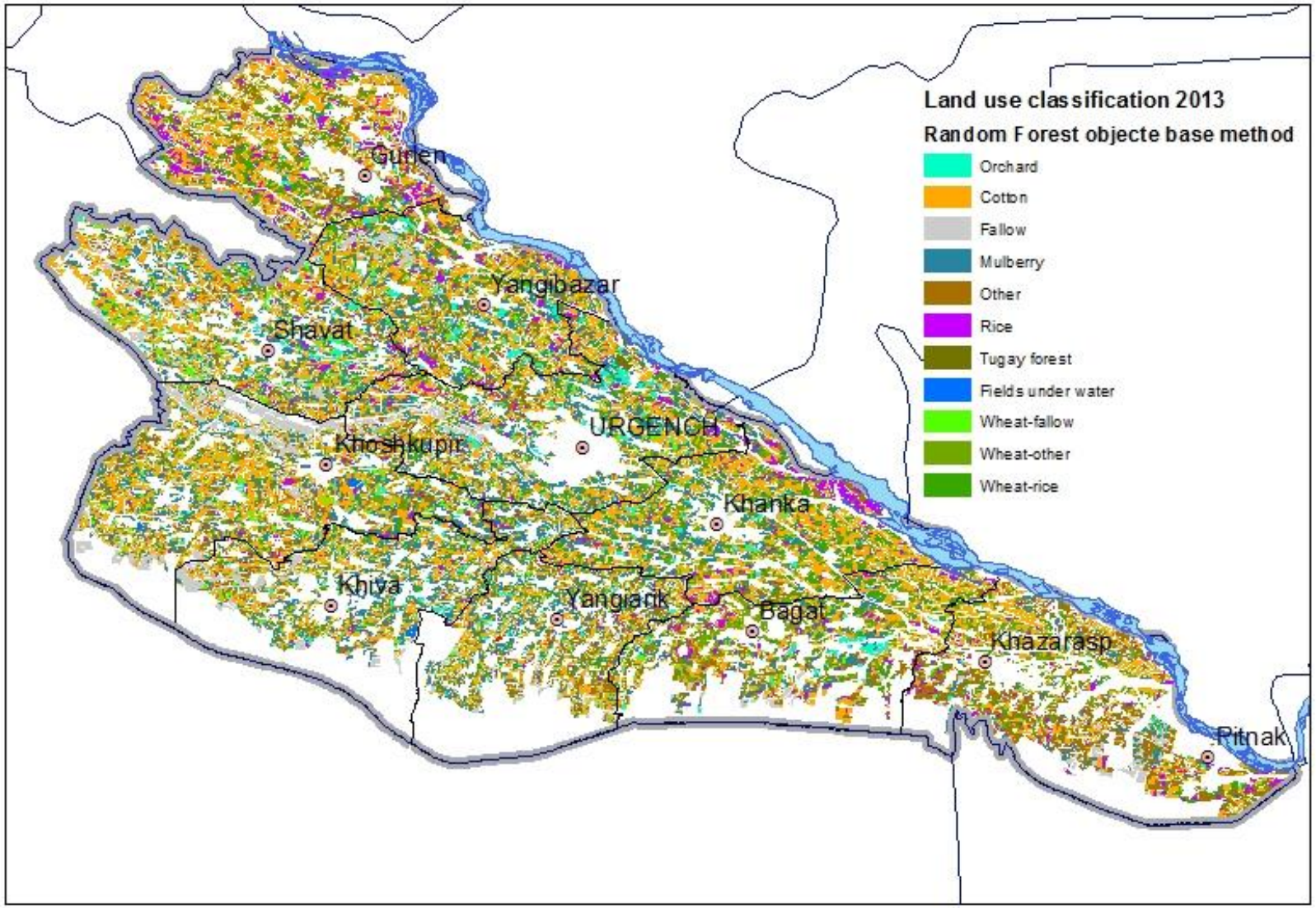
Totally, 143 ground samplings were used to detect crop types using Maximum Likelihood classification method with the help of GIS, ArcMap 10.0 version.

Table 2. Ground sampling accuracy assessment matrix

Correctly Classified Instances			130		93.5 %		
Incorrectly Classified Instances			9		6.4748 %		
Kappa statistic			0.922				
	TP	FP	Precis.	Recall	F-m.	roc-area	
	0.85	0.03	0.73	0.85	0.79	0.99	apple garden
	1	0	1	1	1	1	cotton
	1	0.01	0.9	1	0.96	1	fallow
	0.8	0.02	0.86	0.8	0.83	0.99	mulberry
	0.79	0.01	0.92	0.79	0.85	0.97	other
	1	0.01	0.93	1	0.97	0.99	rice
	1	0	1	1	1	1	tugay
	1	0	1	1	1	1	water
	1	0	1	1	1	1	weat-fallow
	0.9	0	1	0.9	0.95	0.99	weat-rice
Weighted Avg.	0.94	0.01	0.94	0.94	0.94	0.995	

1.3.2 Land use map

Fig.3. Map of agricultural crop types



1.3.3 Land use statistics

Table 4. Cropped area by district wise scale for dominant crops in hectare.

Districts/crop	Cotton	Rice	Fields under water	Wheat-fallow	Wheat-other	Wheat-rice	Orchard	Mulberry	Tugay forest	Fallow	Other	Grand Total
Bag'at	6959	1513		390	3385	2989	829	2454		610	2652	21782
Gurlen	12109	4139		360	1759	3855	344	1330		137	3980	28013
Khanka	11505	2263	10	187	3599	4286	748	4153		66	1534	28349
Khazarasp	6958	1655	12	219	2170	2183	424	1726	20	1530	8239	25135
Khiva	7529	433	196	539	1192	1824	862	5539	2	1885	1435	21437
Khushkupir	13647	667	174	1706	1541	1743	679	6836	31	4205	3584	34813
Shavat	11960	895	12	2494	1124	822	1288	6910	35	1695	2813	30047
Urgench	10318	1418	11	834	1913	3032	1594	6865	244	1310	2002	29543
Yangiarik	6149	345	13	571	1086	1582	683	4609	30	876	2848	18796
Yangibazar	10118	1472		726	1399	2959	1200	4576	18	849	2278	25596
Grand Total	97251	14801	429	8026	19168	25277	8652	44997	380	13163	31363	263511
Percentage	36.9	5.6	0.2	3.0	7.3	9.6	3.3	17.1	0.1	5.0	11.9	100.0

1.4. Discussion

The findings showed that object-based land use classification contributes very precise and reliable information regarding intensive irrigated agricultural lands. As Landsat 8 OLI provides 16 days interval time-series data quite sufficient for identifying crop types according to differentiations of crop growing stages and cloud free images favors to 90 percent of them efficiently. In terms of ground samplings regarding crop growing stages and crop rotation, at least at two time schedules end of May and mid of August were best times to field survey in Khorezm region. To detect most dominant crops cotton, winter wheat and rice were observed everywhere and classified almost 100 percent correctly as is shown in table 2. However, minor crops such as vegetable, maize, alfalfa were difficult to collect sufficient ground samplings and results were not satisfy. In general, statistics in table 4 contributes more reliable data sets compared to official statistics reported by state.