The spatial statistical generalization of information for regional land-use management in Ukraine

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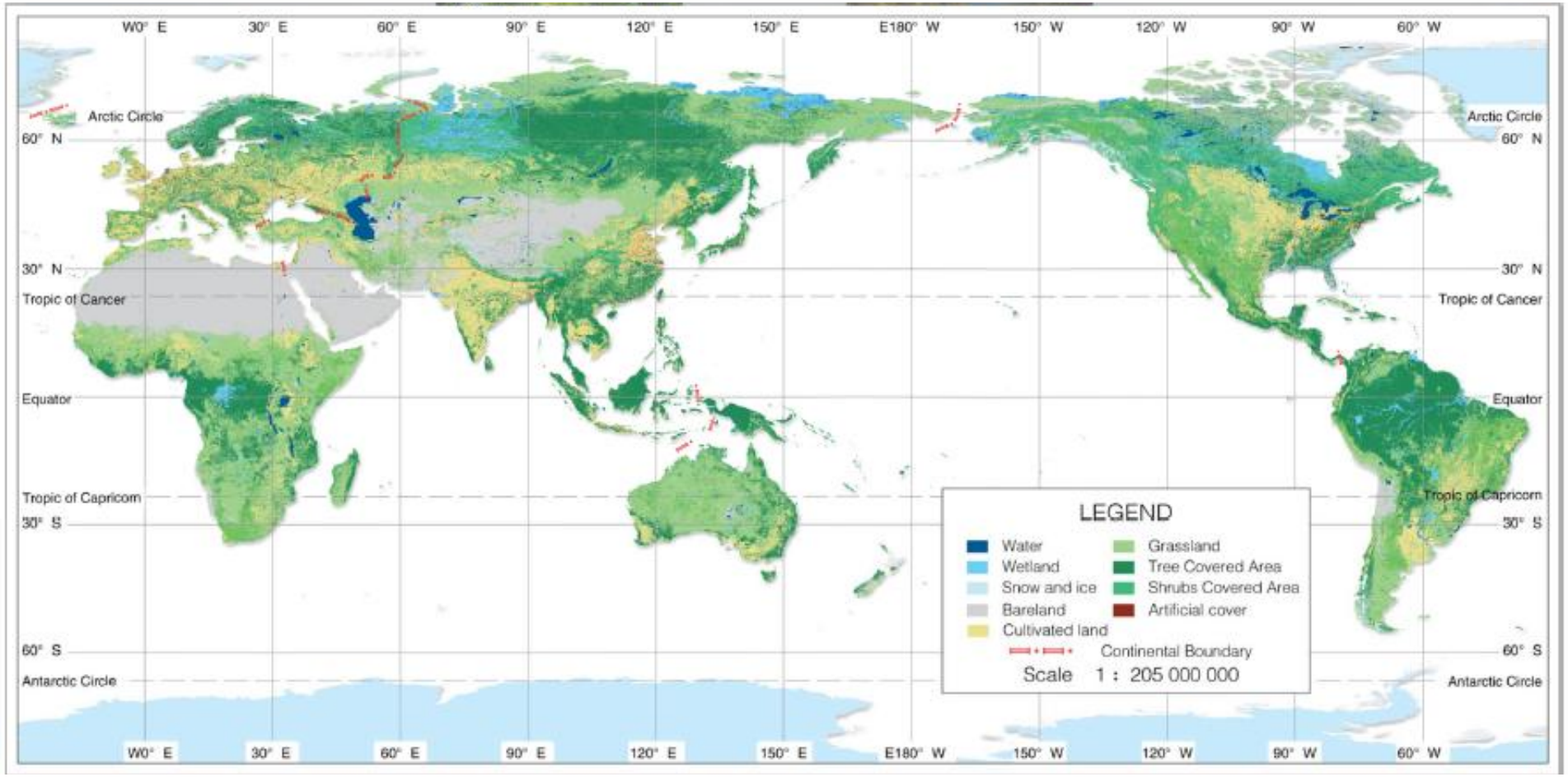
Background

- European program CORINE has established a single land use cover for Europe on the basis of approved standards. Ukraine in this project did not participate, so a long time accurate data of land use were not available for the territory of Ukraine.
- GlobeLand30-2010, mapping product of global land cover at 30-meter spatial resolution derived from remote sensing images in 2010 is produced.
- Formation program management of natural resources and land use in Ukraine has four levels of organization: national, regional, district, local. At each level, there is a correction of management programs and input data used for decision-making in land management.

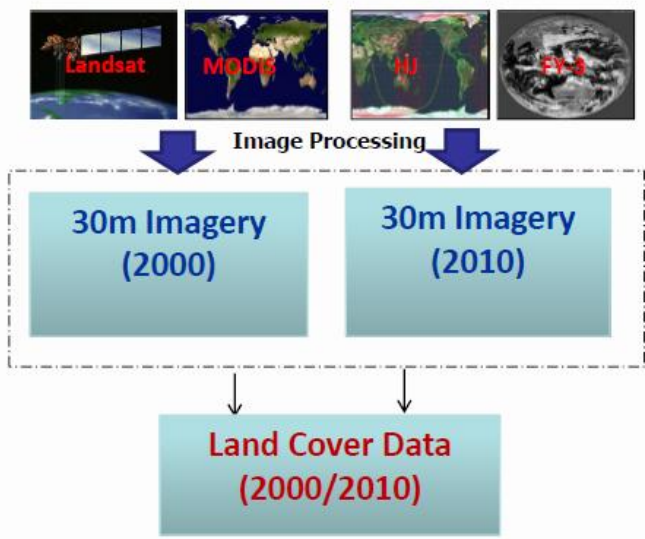
Global land 30



10 Major Classes

Code	Type	Content
10	Arable land (Cropland)	dry land, paddy field, Land for greenhouses, vegetable field, Artificial Tame Pastures, economic cropland which is planted shrub crop or herbaceous crop, abandoned by the land reclamation of arable land
20	Forest	broadleaved deciduous forest, evergreen broad-leaf forest, deciduous coniferous forest, evergreen coniferous forest, mixed broadleaf-conifer forest
30	Grassland	typical grassland, meadow grassland, alpine grasslanddesert grassland, grass
40	Shrubland	desert scrub, mountain scrub, deciduous and evergreen shrubs
50	Wetland	lake swamp, river flooding wetlands, seamarsh, shrub/forest wetlands, mangrove forest, tidal flats/salt marshes
60	Open Water	lake, reservoir/fishpond, river
70	Tundra	brush tundra , poaceae tundra, wet tundra , bare tundra , mixed tundra
80	Artificial Cover	settlement place, industrial and mining area , traffic facilities
90	Bare Land	saline-alkali land , sand, gravel, rock , microbiotic crust
100	Perm.snow & Glac.	permanent snow, ice sheet and glacier

2 baseline years: 2010&2000



Mapping Globe land cover with 30m imagery

2000:10270 Landsat scenes

2010:9907 Landsat scenes
2640 Chinese HJ scenes

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Data Validation by International Colleagues

	Summary of Overall Disagreement - Population only
CORINE	1.97
Peng Gong All	17.25
Peng Gong Minus Cloud etc	16.04
MODIS Own Validation	0.17
MODIS Geo-Wiki Validation	37.99
GLC-2000 Own Validation	0.21
GLC-2000 Geo-Wiki Validation	32.68
GlobCover Own Validation	0.21
GlobCover Geo-Wiki Validation	25.48
GLC Chen Jun Geo-Wiki No Mixed	2.09
GLC Chen Jun Geo-Wiki No Mixed + High Confidence	1.98
GLC Chen Jun Geo-Wiki All + Mixed Pixels	2.64

- **KTH, Sweden, (Prof. Yifang Ban) : similar to CORINE**
- **Greece** (Ioannis Manakos, Centre for R& Techn. Hellas ,CERTH): **87%**
- **CAS (Chuang Liu): 85%**
- **USGS (Zhiliang Zhu)**
- Italy (Maria Antonia Brovelli)

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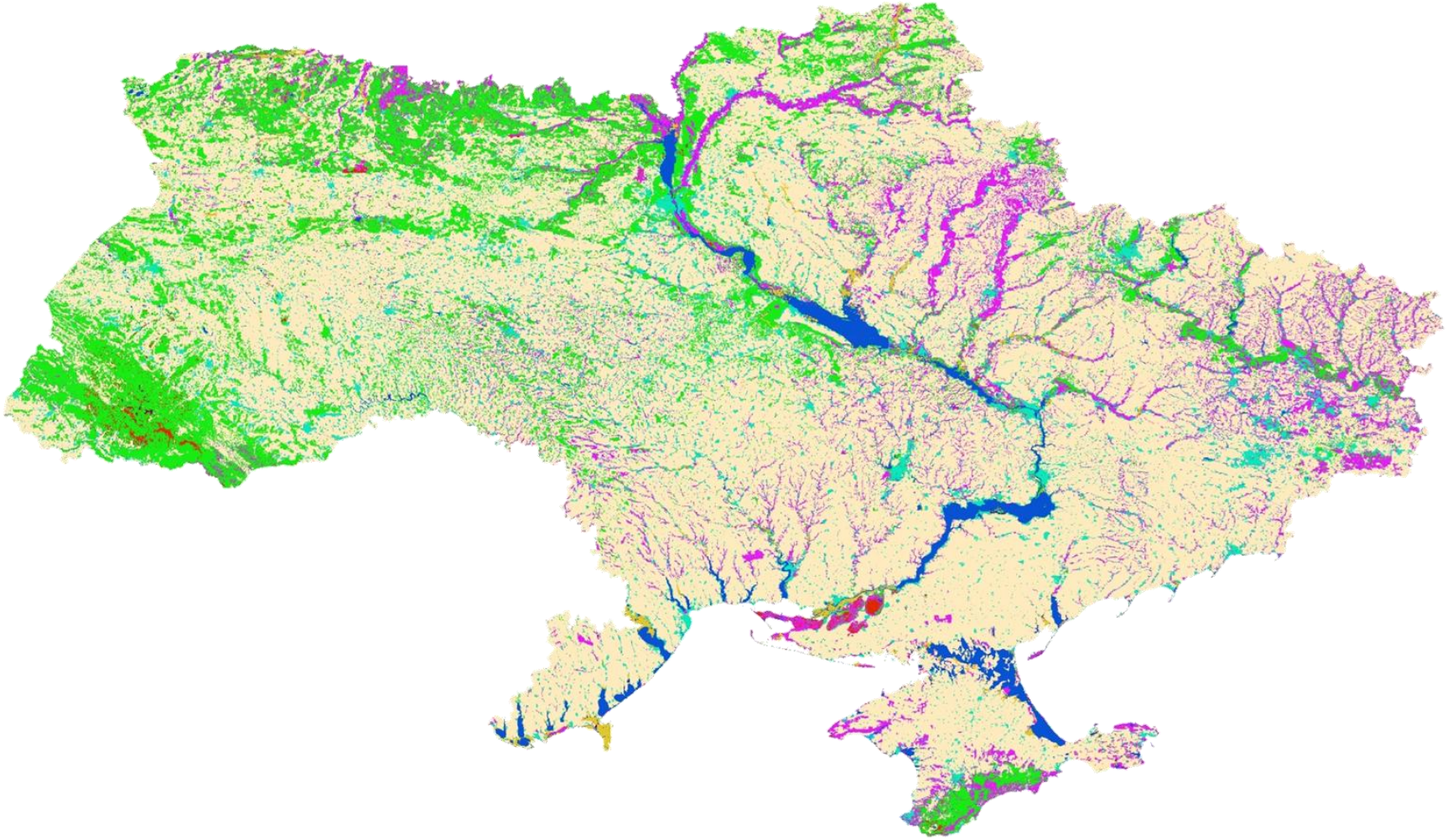
Land use of Ukraine from Global land 30



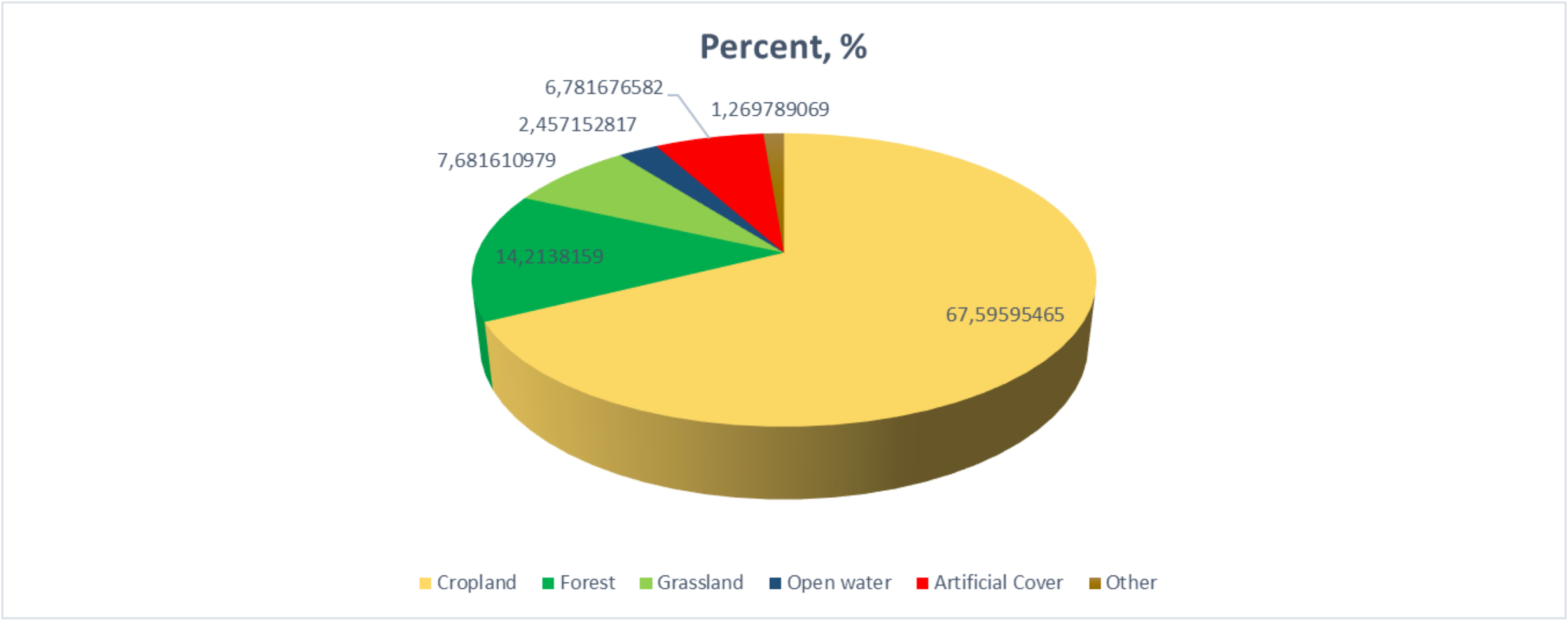
LAND RESOURCES OF UKRAINE

Total area – 60.37 million ha

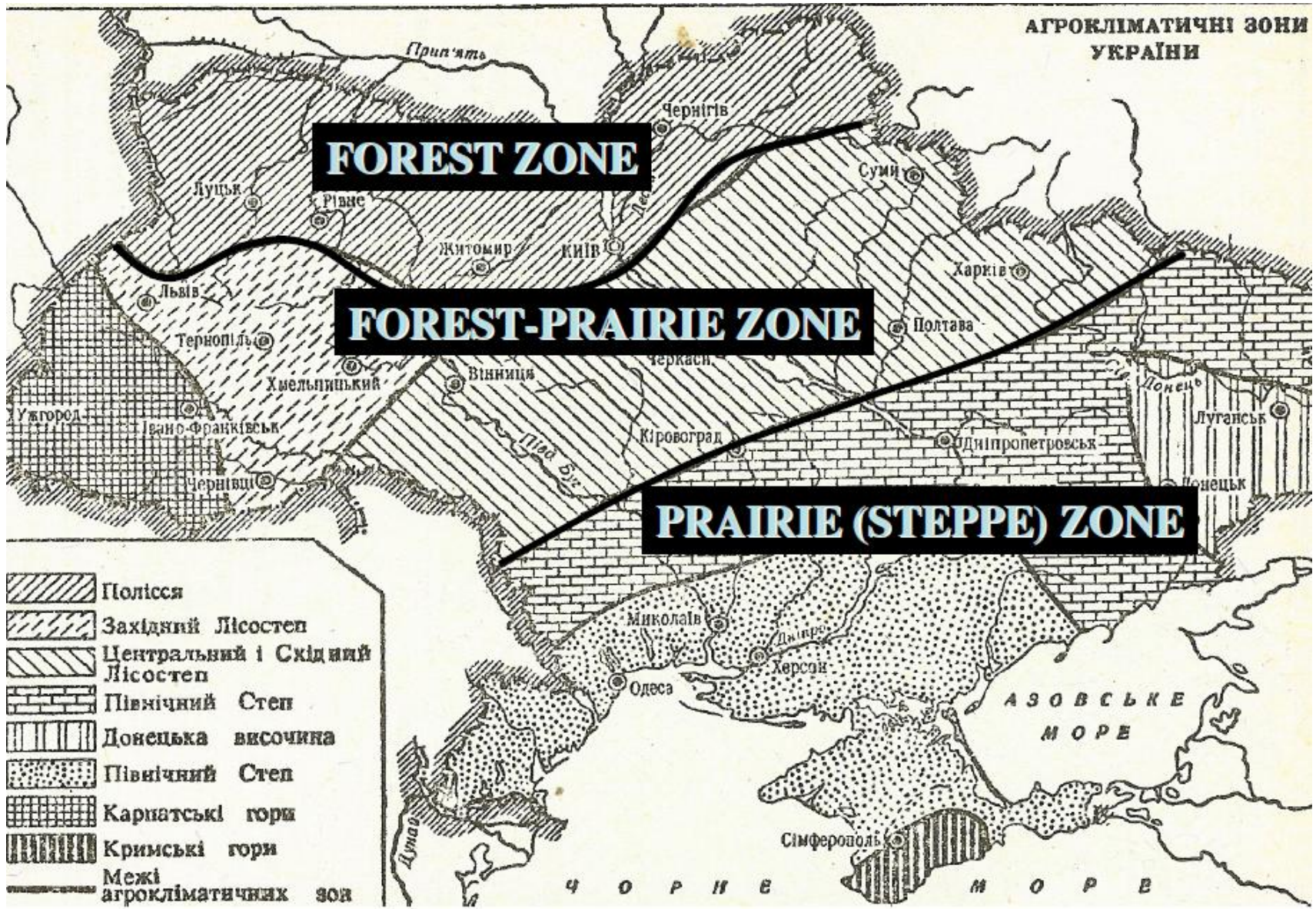
Agricultural lands - 41.76 million ha

- ploughed lands - 32.4 million ha or 54%
- pastures – 9%
- hay – 4%

Structure of land use in Ukraine

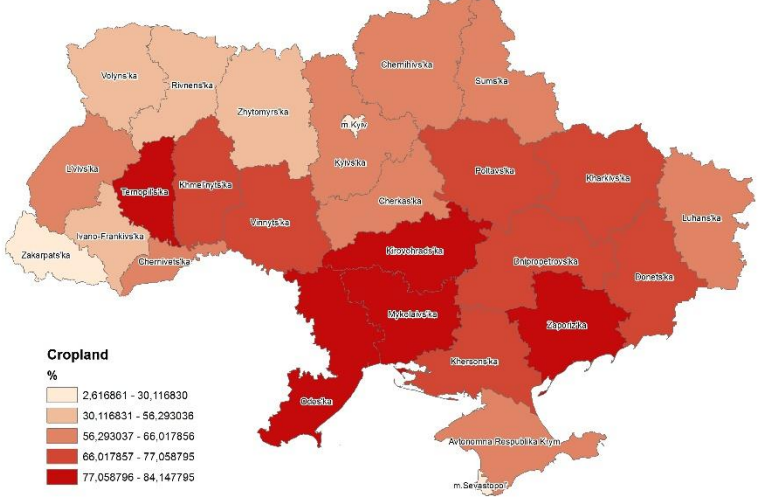


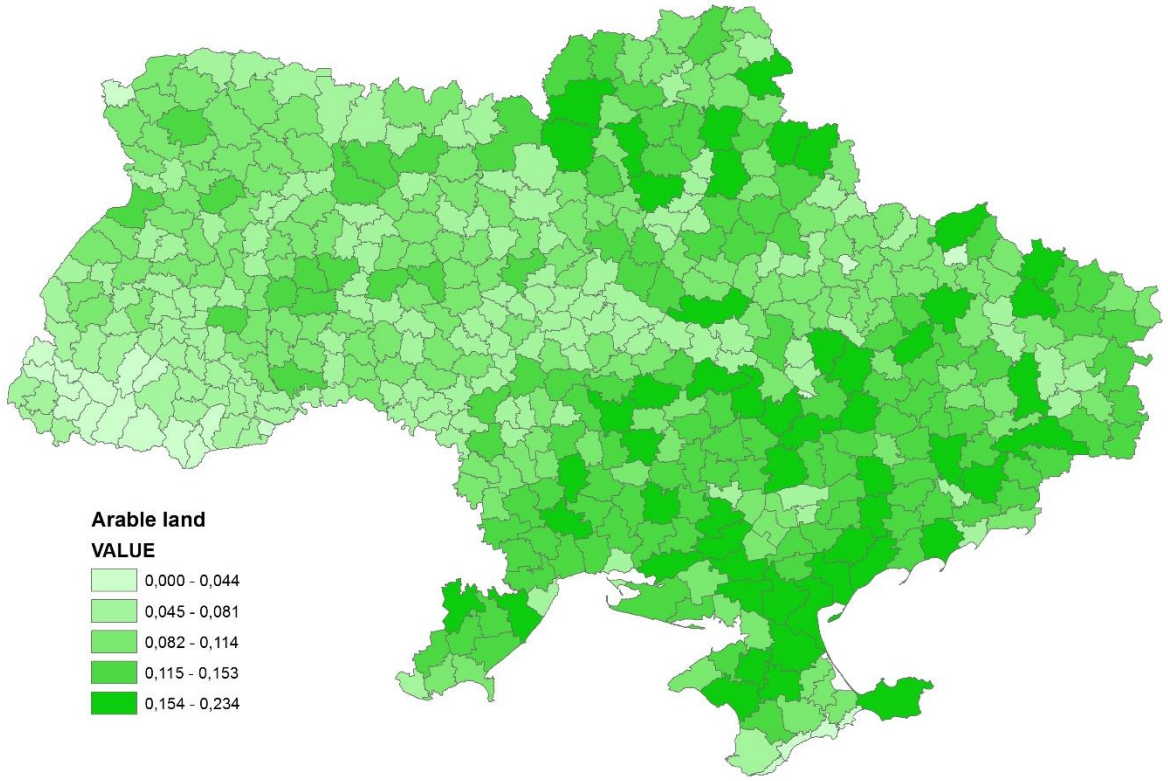
AGRO-CLIMATIC ZONES OF UKRAINE

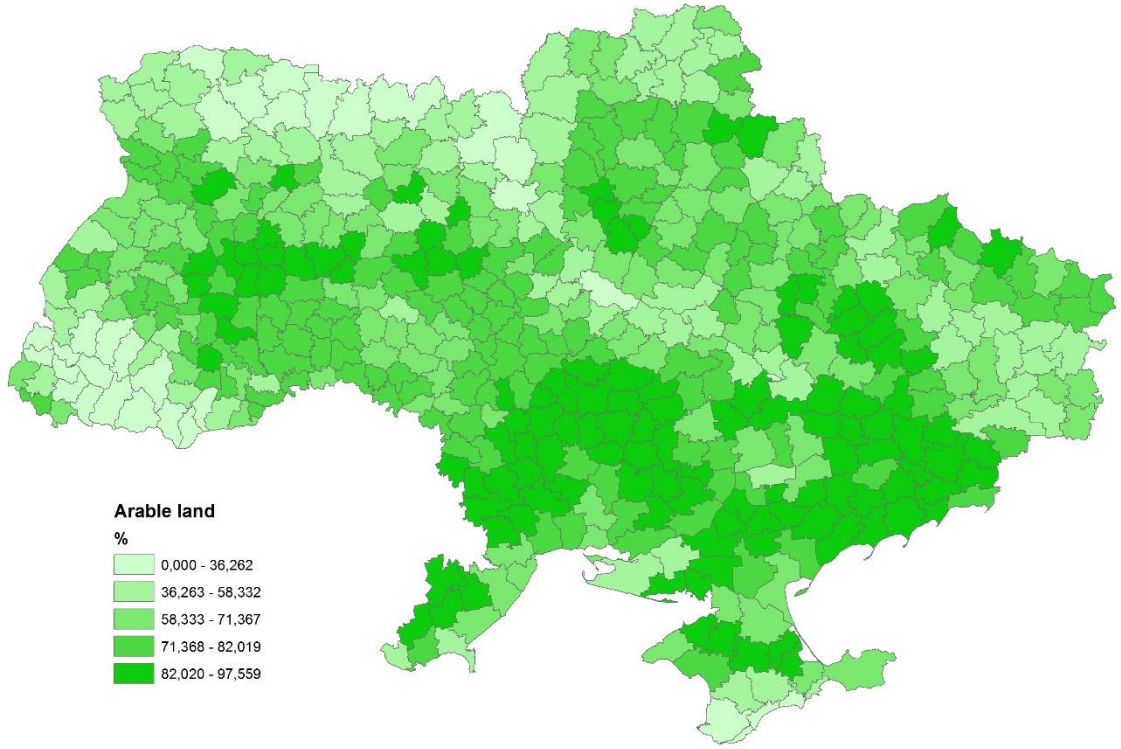


Cropland

	Region	Distrrict
Min	23,21	2,54
Max	84,14	97,55
Mean	62,49	69,04
St.Deviation	18,72	18,11

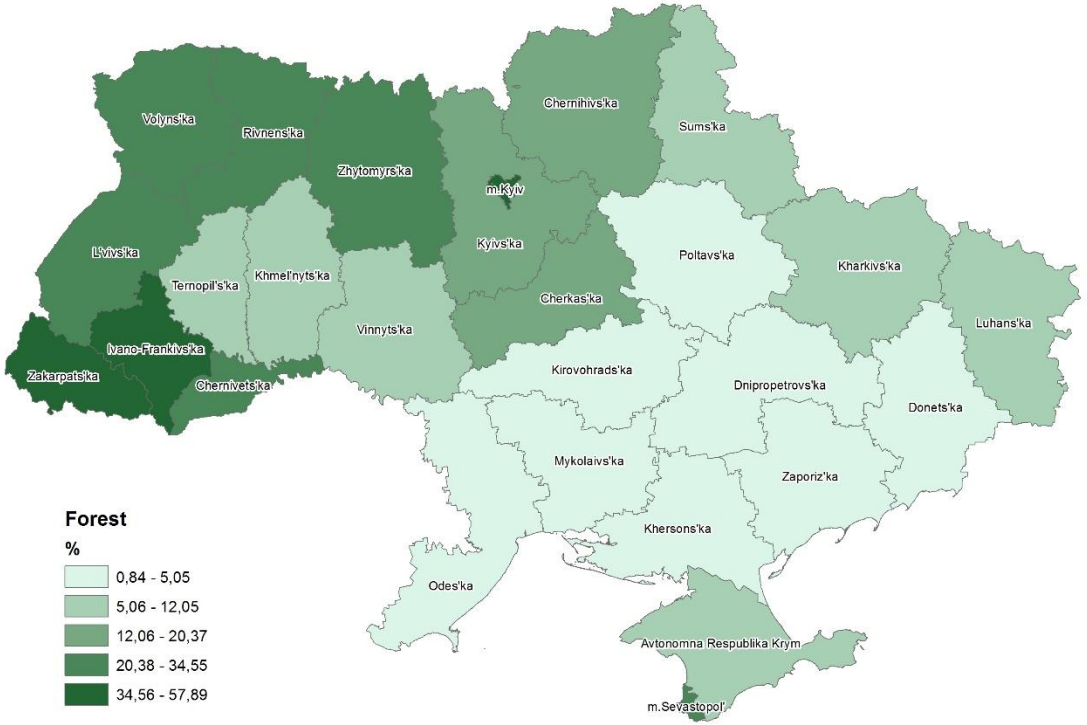


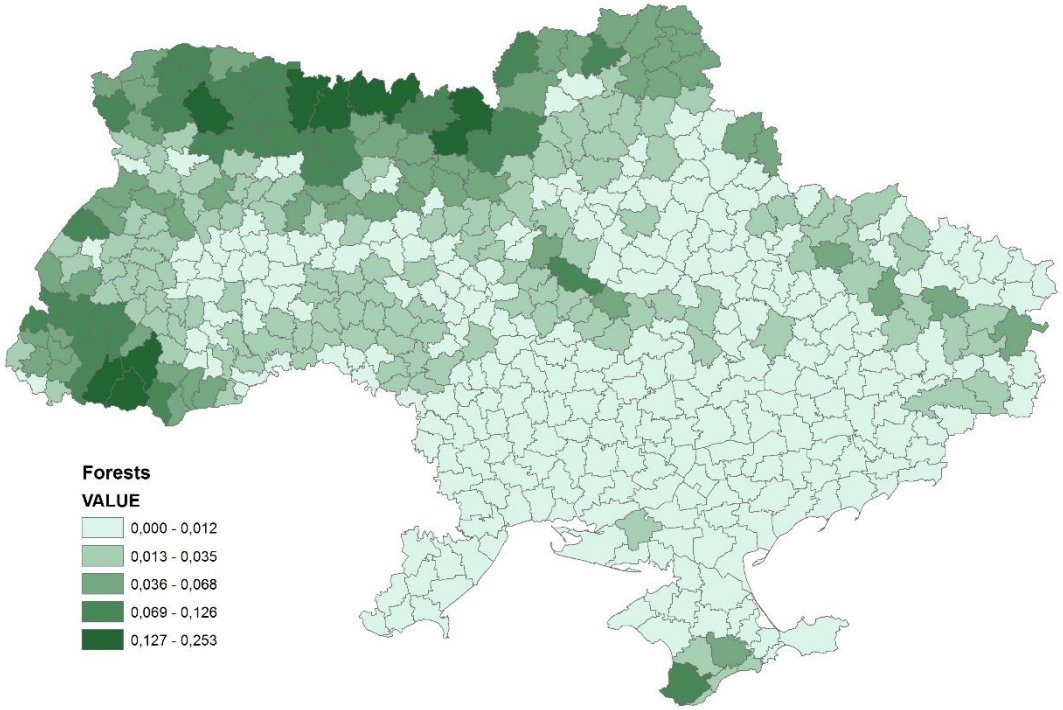


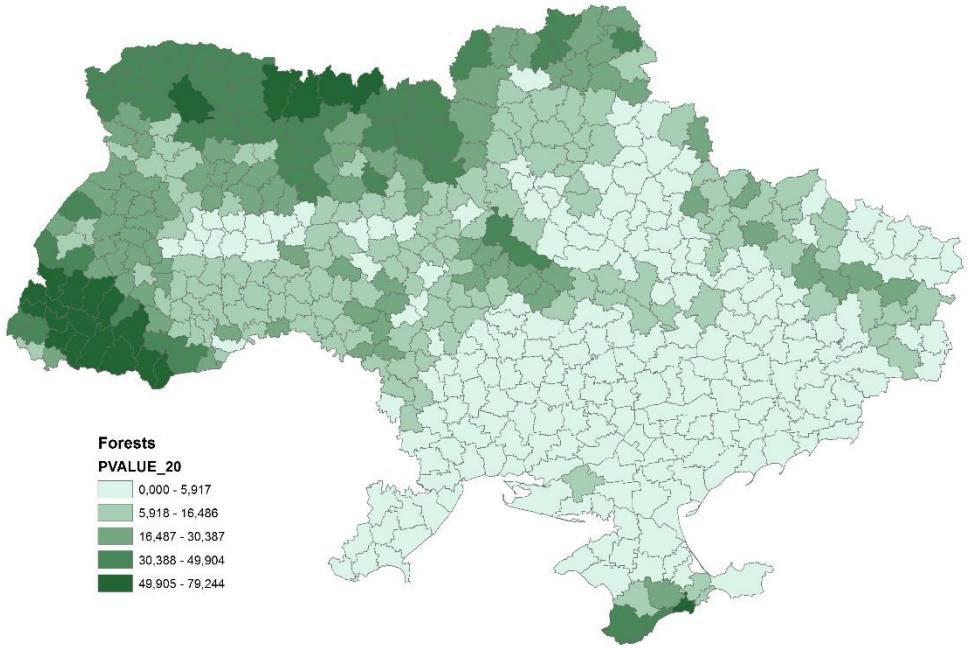


Forest

	Region	Distrrict
Min	0,84	0,02
Max	57,89	79,24
Mean	17,88	13,58
St.Deviation	15,35	15,95

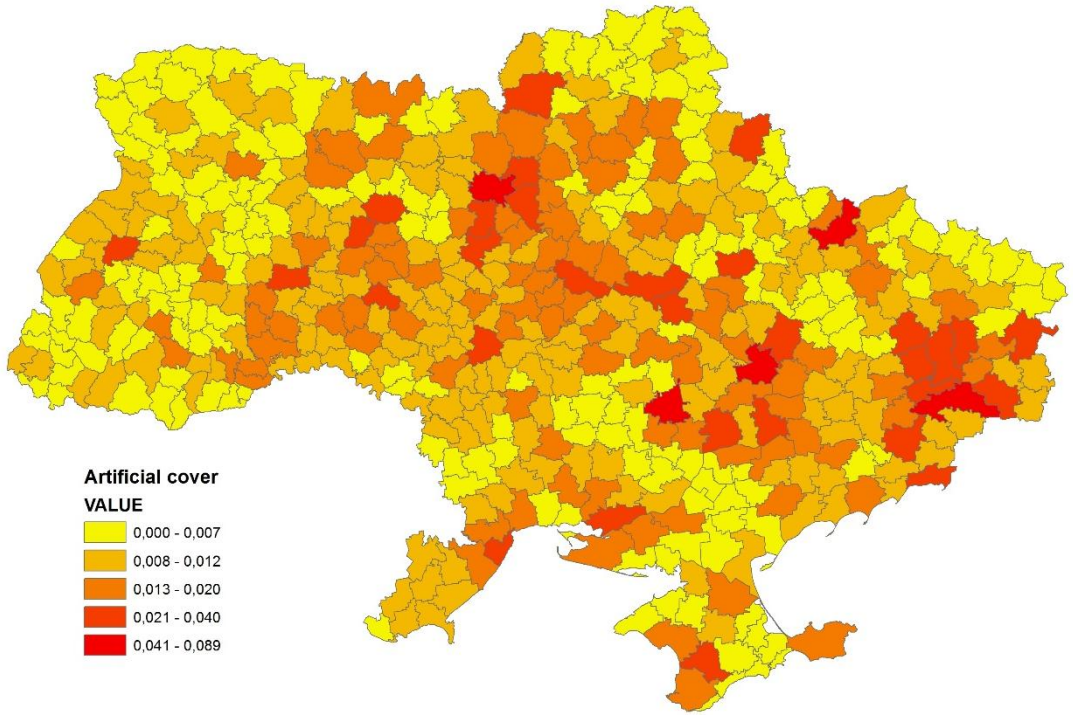


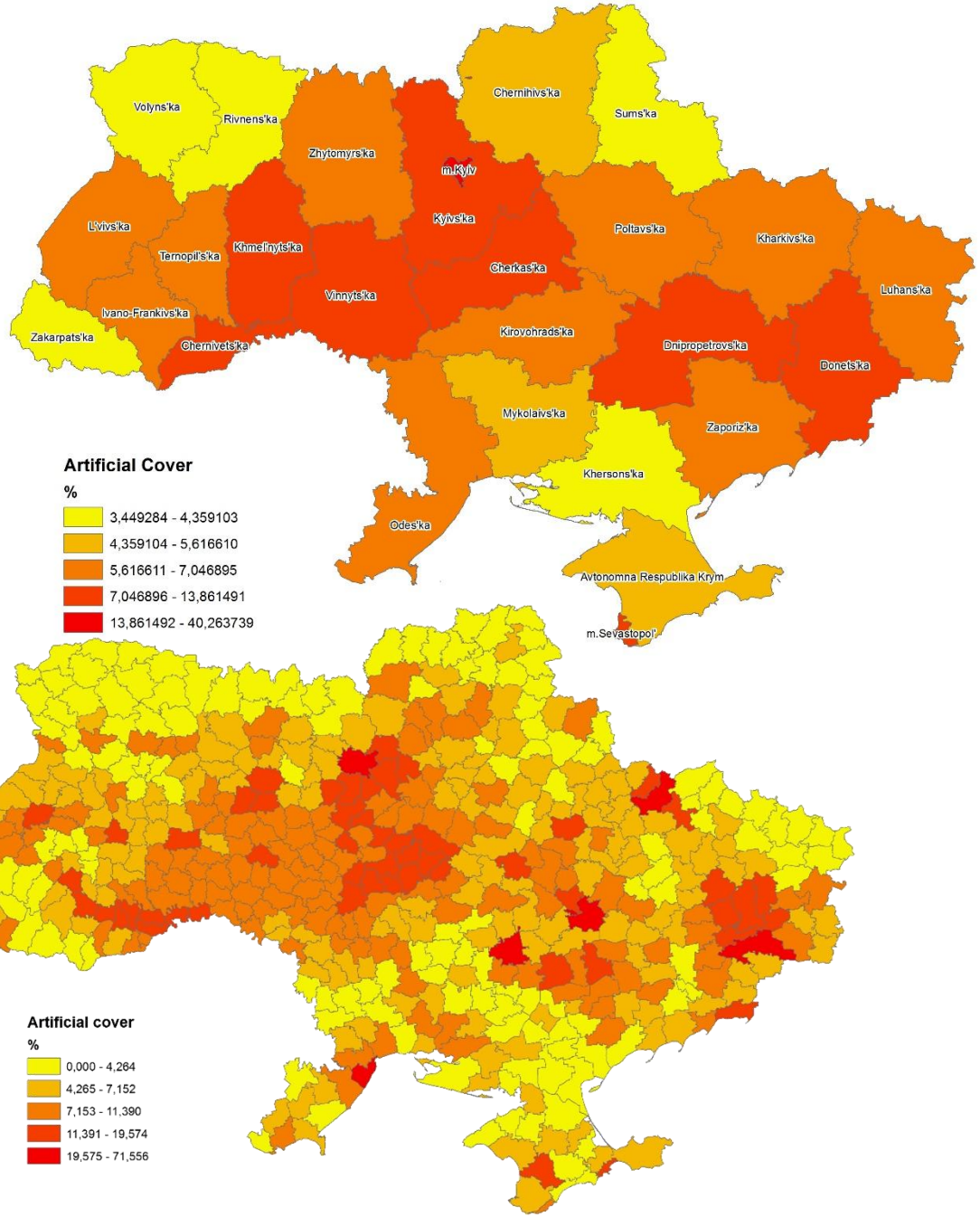




Artificial Cover

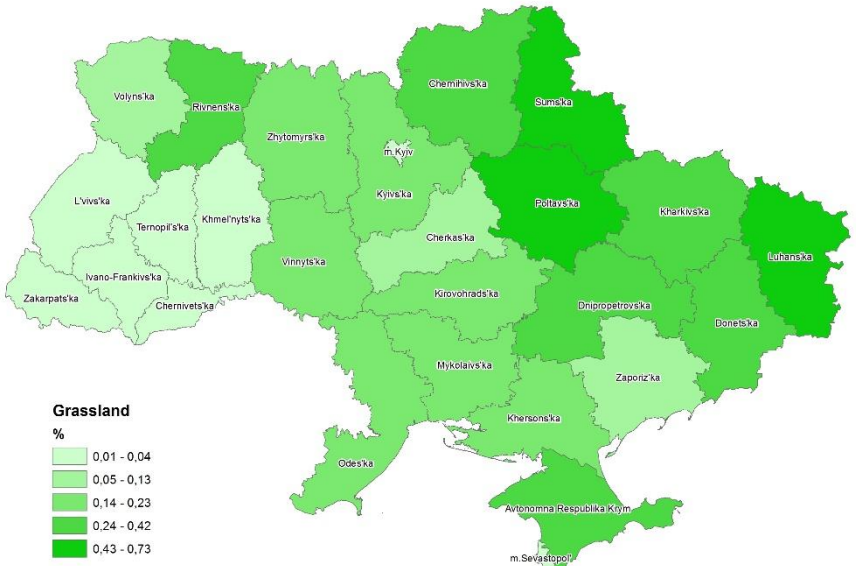
	Region	Distrrict
Min	3,44	0
Max	40,26	71,55
Mean	8,22	7,02
St.Deviation	6,77	5,12

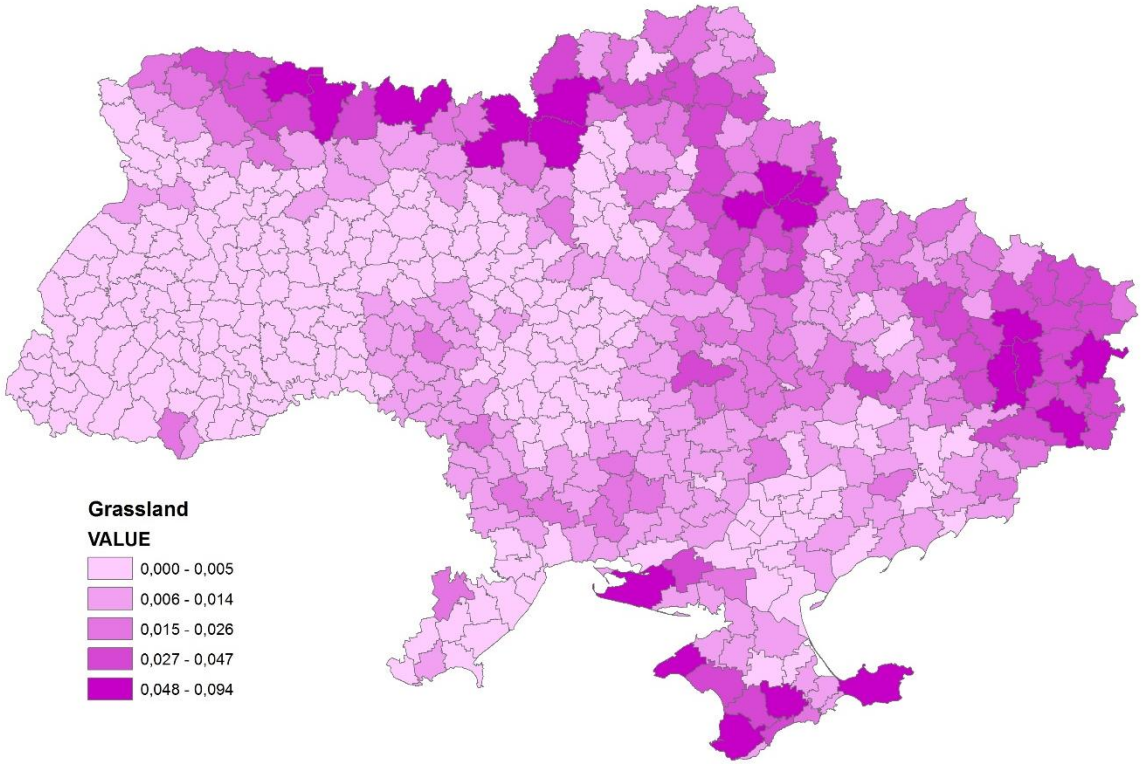


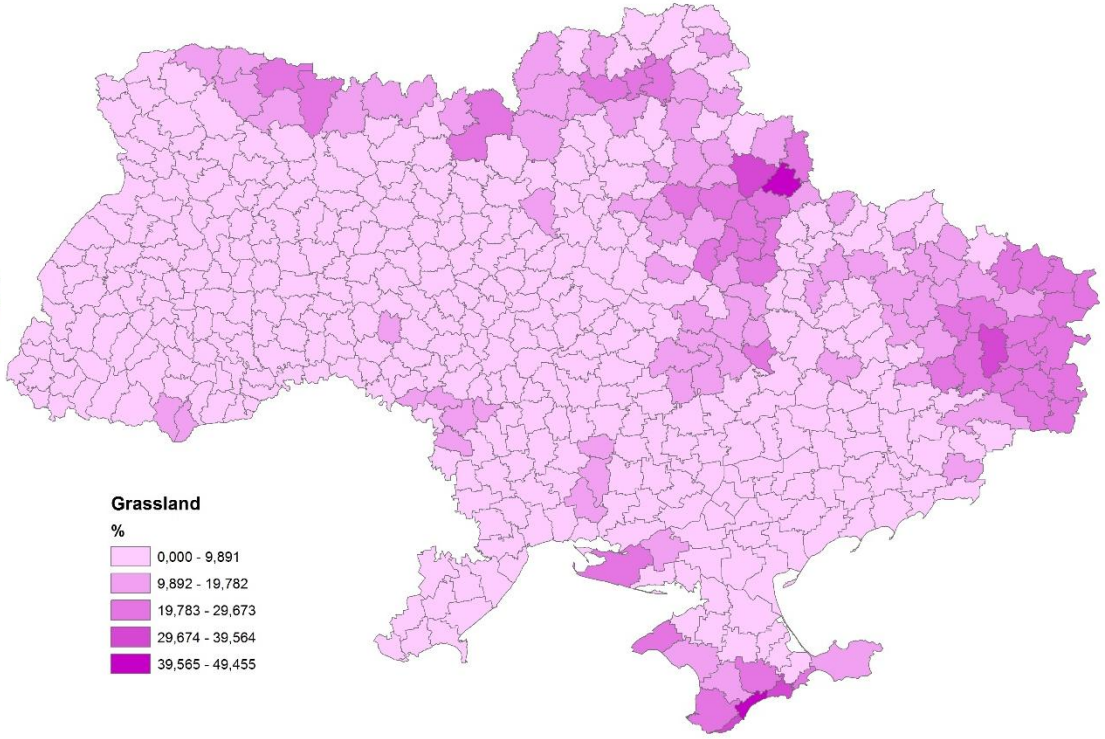


Grassland

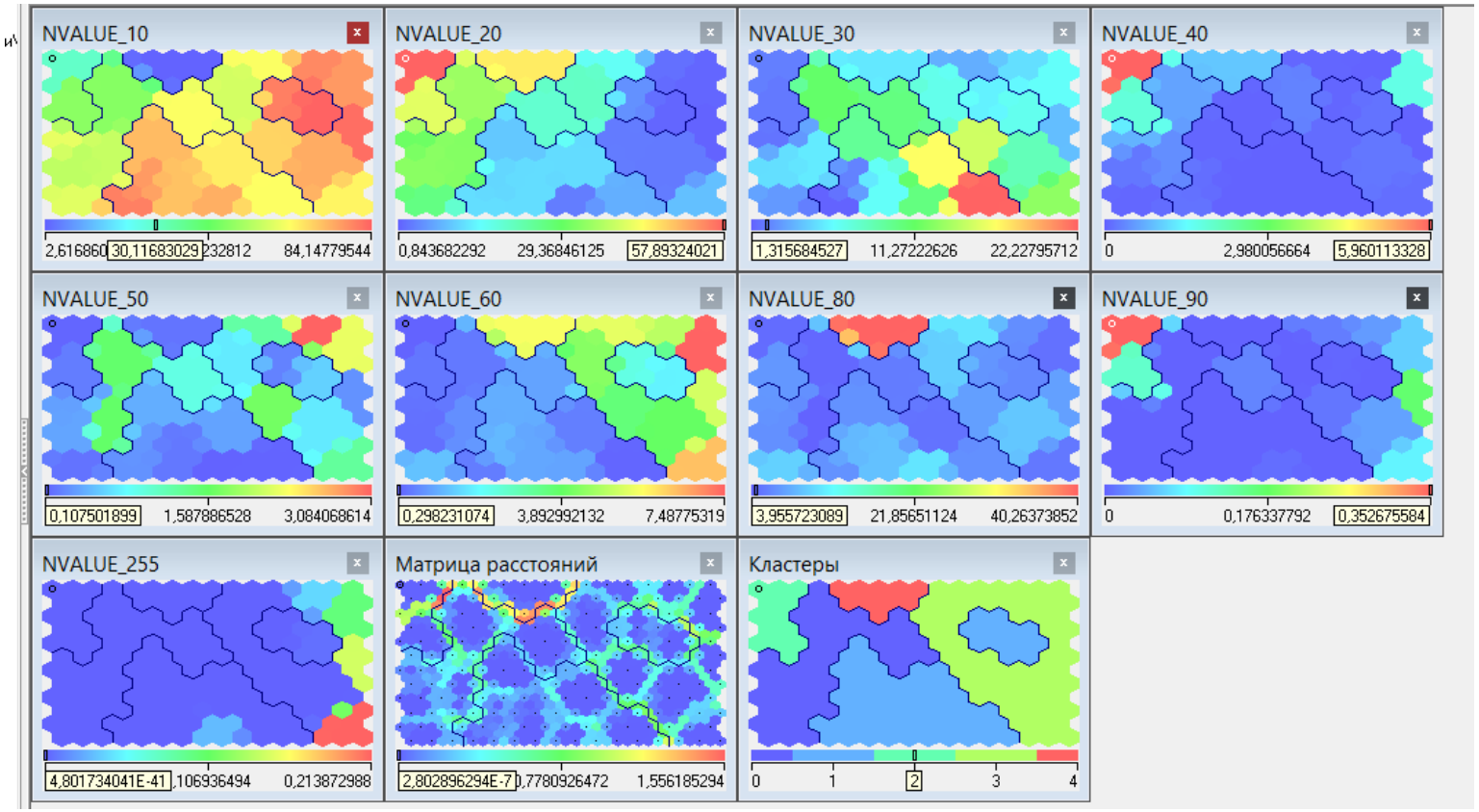
	Region	Distrrict
Min	0,31	0
Max	22,93	49,45
Mean	7,49	6,96
St.Deviation	6	7,59



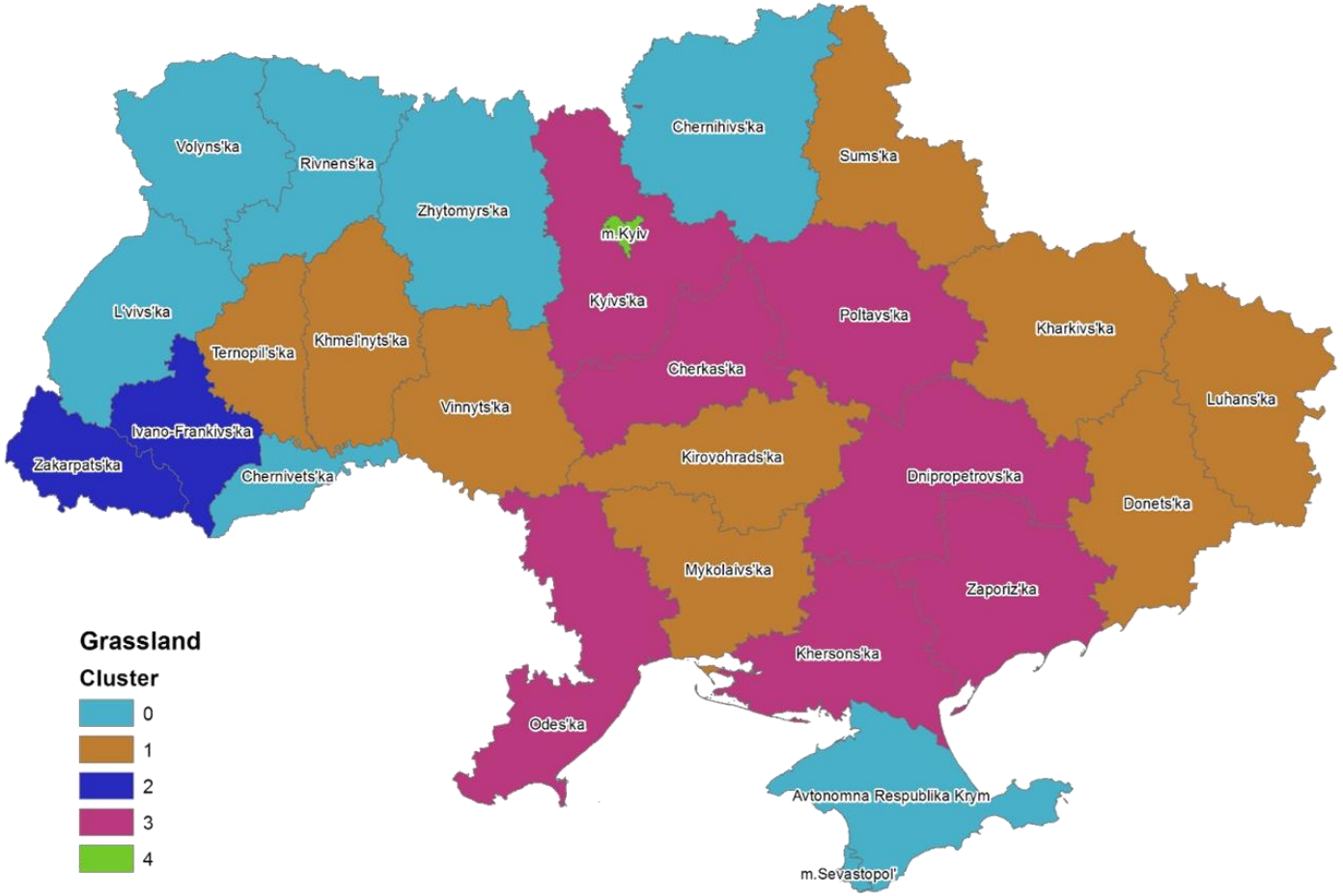




Self-organizing map for data analysis of land cover in Ukraine



Result of using self-organizing map

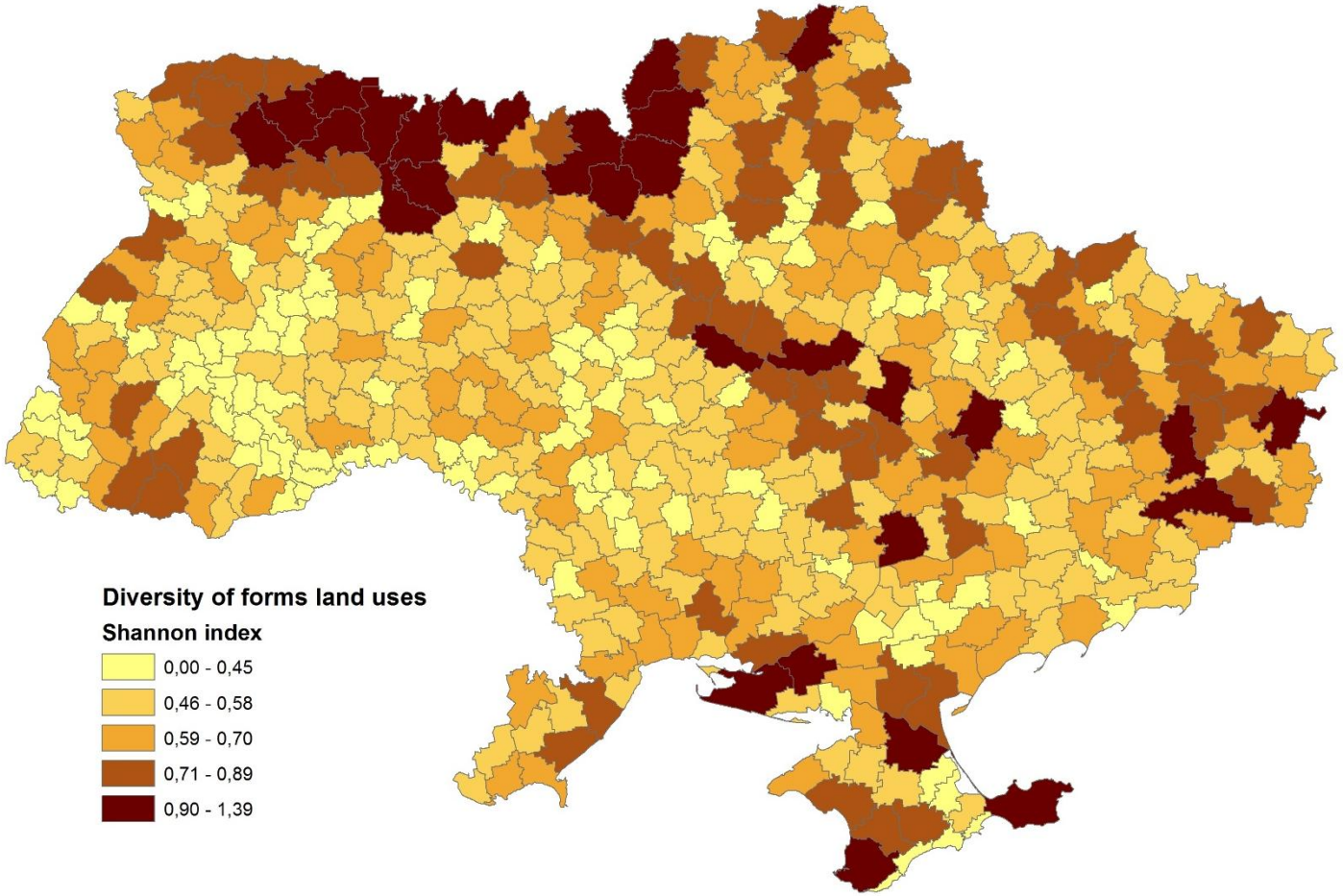


Shannon index

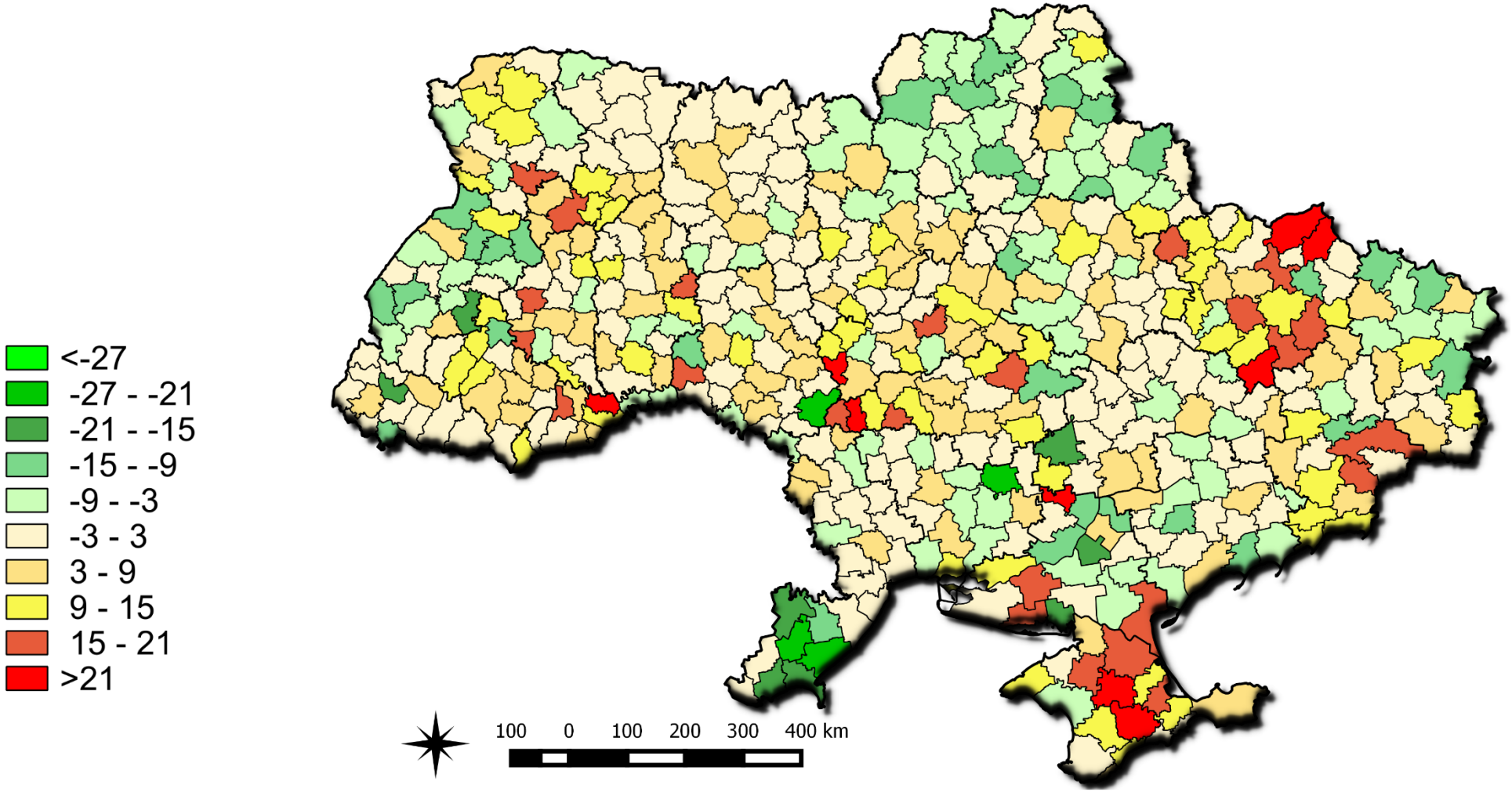
$$H = -\sum_{i=1}^{n} p_i \log_2 p_i$$

- where p_i is the proportion of characters belonging to the *i*-th type of letter in the string of interest. In ecology, p_i is often the proportion of individuals belonging to the *i*-th species in the dataset of interest. Then the Shannon entropy quantifies the uncertainty in predicting the species identity of an individual that is taken at random from the dataset

Mapping of Shannon index on the base of land use cover values



Land use changes cropland **2000-2010**



Conclusion

- Using data Global land 30 about land use can provide useful results with regard to climate change, agriculture and environmental management.
- Generalization of data about land use at different administrative levels, in association with the methods of machine learning and calculation of diversity indices can be the basis for making management decisions
- The territory of Ukraine is characterized by large disparities in the distribution of land uses, which makes Ukraine vulnerable in the face of global climate change and economic challenges of our time.

Thank you for attention!

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