Topic 4.

Ecological and economic problems of management of land resources and their protection

Plan of lection

1. Land as the basis of biosphere processes and human wellbeing.
2. Patterns and trends of land resources usage.
3. Indicators of using and pollution of land resources.
4. Measures concerning rational using of land resources and its protection.

1

Land is one of the main natural resources, source of life. Earth - is basis, the spatial basis of human life and the main means of food production and raw material base of agricultural production.

Great value have productive soils, that give 88% of necessary food to mankind. The main part of the processing area of land located in the northern hemisphere.

Condition of land resources of the world

The total area of arable land - 1.5 mlrd.ha

- require drying -16%
- Irrigation - 30%
- terrace of slopes -2%
- unsalting -1%

Conclusion of FAO

There are 55 countries worldwide that have insufficient land resources to feed its inhabitants

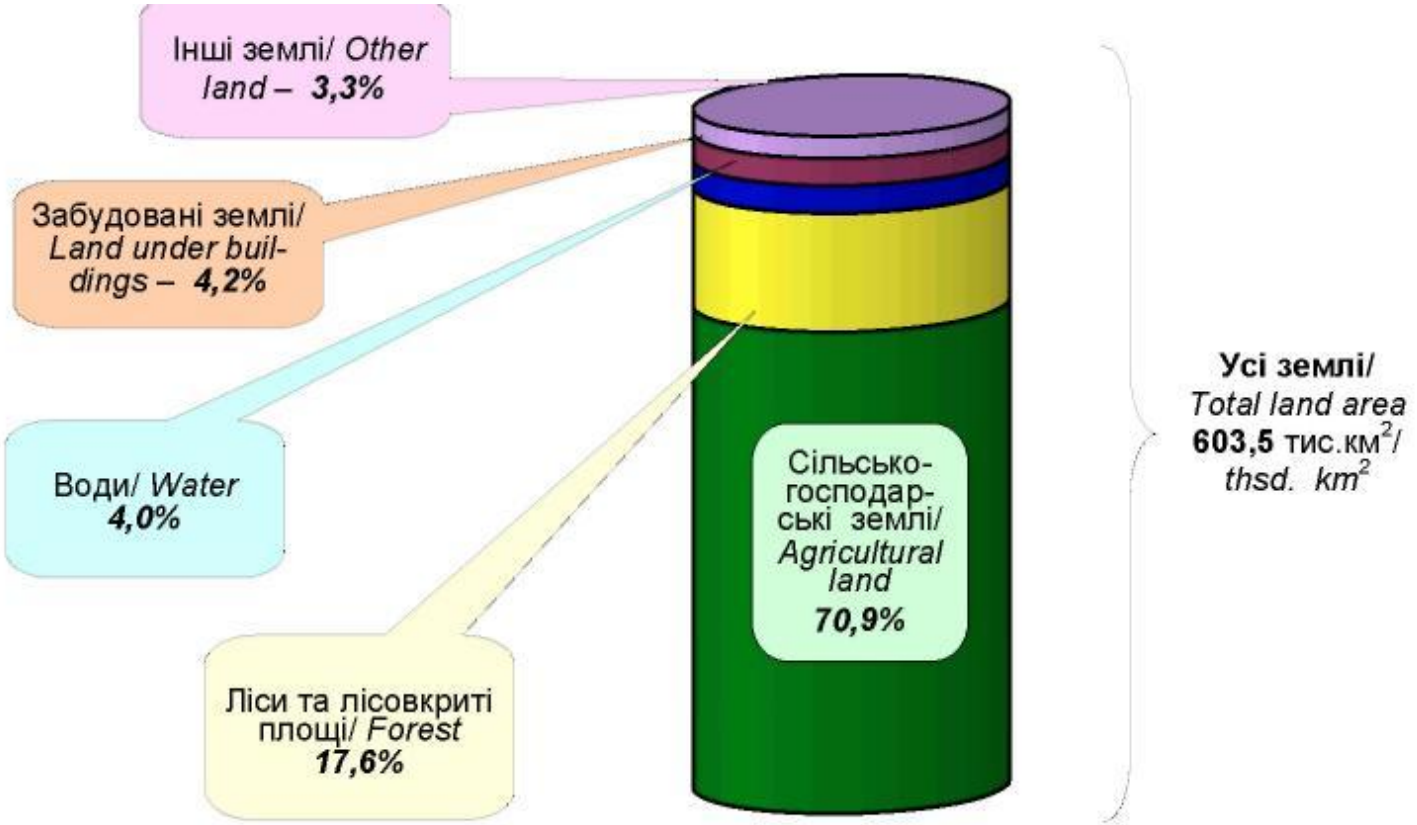
Africa -22

Asia -22

America -11

The total area of land in Ukraine is 60, 354 million hectares, 69% from it - agricultural lands, within which tillage is 70 percent. Ground (soil) resources of Ukraine are characterized by highly fertile black earth, which are the best in Europe.

Land area of Ukraine in 2010



Distribution of agricultural land in Ukraine by zones

Zone, region	Total land area, th. ha	Among agricultural lands		Of these, all arable land	
		th. ha	%	th. ha	%
Stepe	25019,9	19276,4	77,7	15960,3	82,8
Forest stepe	20291,1	14801,6	72,9	12639,7	85,4
Polissia	15044,0	8324,0	55,3	5742,3	69,0
Total in Ukraine	**60355,0**	**42402,0**	**70,9**	**34342,3**	**81,0**

Ownership on land issues:

43 million has arable land

Out of ~12000 kolkhozes created:

- ~7 million new small landowners
- only 57000 farm structures

Many very large and super-large farms : corporate farms dominate

Grains and agro-industrial crops : top 150 operators produced a~60 % corn, ~40 % wheat, ~40 % meat, ~85% sunflower oil

Agriholding companies reportedly operate up to 500,000 hectares (about as much cultivable as in Costa Rica; more than Switzerland or Israel)

- large number of household plots, but mostly for own production.
- missing 'middle' commercial family farm
- evidence of underutilized lands and low average productivity.

Total land area and distribution of agricultural land between landowners and landusers in 2010
(at end of year; thousands hectares)

	Total land area	Total agricultural land[1]	Of which		
			arable land	hayfields	pastures
Total land area	**60354,8**	**41576,0**	**32476,5**	**2410,9**	**5481,9**
Land of agricultural enterprises and individuals	37843,8	36487,9	30932,1	1604,8	2972,2
including					
land of agricultural enterprises	21376,5	20589,6	19237,4	410,2	729,3
of which					
state	1205,8	1022,0	844,9	33,5	107,3
non-state	20170,7	19567,6	18392,5	376,7	622,0
land of individuals	16467,3	15898,3	11694,7	1194,6	2242,9
Land of other landusers	22511,0	5088,1	1544,4	806,1	2509,7

[1] Arable land, orchards, vineyards, hayfields and pastures.

Soil ecology - studies the relationship between soil and environmental conditions that developed as result of human activities.

Soil, as an object of study is considered in the development and interaction with environmental factors in the process of continuous metabolism and energy.

Its most important feature - fertility, i.e. *the ability of soil to provide the necessary amount of plant nutrient elements.*

Fertility plays a primary role in human life and is essential for the existence and reproduction.

The current state of soil fertility in Ukraine (Derzhrodyuchist)

index	The level of provision,% of total area				
	very low	**low**	**medium**	**increased**	**high and very high**
Humus content	1	15	34	32	18
Content of movable phosphorus	2	31	42	10	16
Content of exchange potassium	1,7	7	21,3	35,6	33,4

Rational soil usage means not only the using of land for direct purposes, but also its security. There are two *basic problems for land protection*:

- *economical* - protection from depletion of soil productivity;
- *ecological* - protection against pollution.

Unlike the atmosphere and water, land is confining environment and migration of contaminations eventuate very slow, and its concentration is constantly growing and affects on people not only directly but also through the quantity and quality of crop.

The main problems of soil cover of Ukraine

High level of erodeness of farmland:

Ukraine - 81% USA - 43.5; United Kingdom - 34.5%
Germany - 68% France - 60.6%, Russia – 60.6%

The development of erosion processes:

for the last 40 years, the area of eroded lands increased by 26%.

The sharp decreasing in potential and effective fertility:

level of provideness by nutrients is lower in
2,5-3 times in comparison with Western Europe;
deficit balance of humus.

The high level of development of degradation processes

Contamination by heavy metals, pesticide residues of large area of farmland.

Acidification of soils of Polissia and Forest Stepe, and salting and alkalisation of Stepe lands

- • reduction of areas of agricultural land per capita in Ukraine. Over the past three decades, agricultural area lands in Ukraine decreased by more than 2 million hectares, including arable land - almost 1 million hectares. Expert estimates indicate, if the pace of destruction of arable land remain, then in 20-30 years a third of arable land will be destroyed;
- extremely high intensity of agricultural operations. Transit of agricultural production on industrialized and intensive technology should provide not only increase production but also the rational using of land;

- the using of powerful agricultural machines. Harmful anthropogenic impact is manifested in the deterioration of soil structure, mechanical destruction and soil compaction, reduced content of humus and nutrients, development of water and wind erosion;
- uncontrolled using of pesticides in low culture of farming. About 90% of all fungicides, herbicides 60%, 30% of pesticides used in agriculture have an adverse impact on human health.

- reducing of using of organic and mineral fertilizer imbalance - in the early 90's on the field applied 10-12 t/ha of organic and 5 mln. t of active ingredient of fertilizers, at the beginning of 2000 - 3-4 t/ha of organic and 400 thousand tons (10 kg active ingredient per 1 ha) of mineral fertilizers, respectively. Growth of deficit balance of humus, maltreatment replacement of attain with harvest minerals, its structure imbalance (increased nitrogen fertilizers) increases soil salinity, resulting in lower fertility of land;

Balance of nutrients

Dynamic of balance of nutrients in agriculture of Ukraine

Balance indexes	Nitrogen N	Phosphorus P_2O_5	Potassium K_2O	Total (NPK)	Nitrogen N	Phosphorus P_2O_5	Potassium K_2O	Total (NPK)	Nitrogen N	Phosphorus P_2O_5	Potassium K_2O
	1971-1975 years				1976-1980 years				1981-1985 years		
Income kg/ha	65,2	35,5	65,3	166,0	75,5	42,4	86,7	204,6	81,5	48,8	90,0
Pass, kg/ha	69,6	23,8	77,5	170,9	77,3	26,8	82,9	187,0	79,5	26,5	83,9
Balance, kg/ha	-4,4	11,7	-12,2	-4,9	-1,8	15,6	3,8	17,6	2,0	22,3	6,1
	1986-1990 years				1996-2000 years				2001-2003 years		
Income kg/ha	89,5	56,1	102,7	248,3	26,0	10,4	15,3	51,7	21,8	5,9	8,7
Pass, kg/ha	92,6	31,2	103,2	227,0	56,5	18,2	53,7	128,4	70,1	24,7	76,7
Balance, kg/ha	-3,1	24,9	-0,5	21,3	-30,5	-7,8	-38,4	-76,7	-48,3	-18,8	-68,0

General tendency of economic development changes in way of *increasing of loading of economic activities on land grounds.*

The economic loading on land is determined in the following parameters:

- the share of agricultural land in the land fund,%;

- plow farmland,%;

- plow area%;

-number of mineral fertilizers (in terms of 100% active ingredient), kg: on 1 ha of agricultural land and on 1 hectare of arable land;

-on 1 thousand square km of territory falls: the main production assets, thousand UAH; investments, thousand UAH, including designation of soil; gross output, thousand UAH; railways, km, motorways, km; loads turnover of all modes of transport, million t/km; protected areas, thousand hectares; field protect forest belts, thousands of hectares.

Analysis of data shows that the indicators of economic loading on land resources exceed the standards adopted by more than 5 times, and the allocation of investment to enhance soil, creating areas of reserves don't suit the accepted standards.

Regularity in using of land resources tend to the increase in time value of land, and accordingly land prices.

In order to prevent adverse human impact on land resources, it's necessary to ecologization of production potential and natural sources in economic.

The system of indicators which determine the level of pollution and using of land :

- absolute and relative changes in the areas of land that are liable to the influence from economic activities of enterprises;
- reclamation of disturbed lands;
- share of production area in total area that used by farm;

- changes in the scale of agricultural production and its land volume;
- specific importance of products of improved environmental quality in total production;
- the quality of agricultural products;
-control of production on content of nitrations, pesticide residues, heavy metals.

Major problems and their solutions

- Lack of structures that carry out constant monitoring of soils quality and experts for financial expert evaluation of degradation criteria and determining losses, insurance of risks of technological solutions to the use of land for different purposes
- National University of Life and Environmental sciences of Ukraine - should be the initiator of establishing of governmental agencies to rule by potential and quality of bio resources , establishment of training of specialists for sustainable land use

Organizational

- Make an addition to the "Land Code" - the set of laws that govern the use and protection of soils fertility and reproduction of soils fertility
- Optimize the structure of cultivated lands, conservate the degraded lands, low fertility lands and technogenic lands
- Establish Soil Conservation Service as a structure that can control the quality of soils and to ensure their rational use
- Provide special status to areas with particularly valuable clean soil and introduce it to the use on safe mode

Economical

Economic incentives of landlords who provide for their own money measures of reproduction of soil fertility in the National or regional programs include:

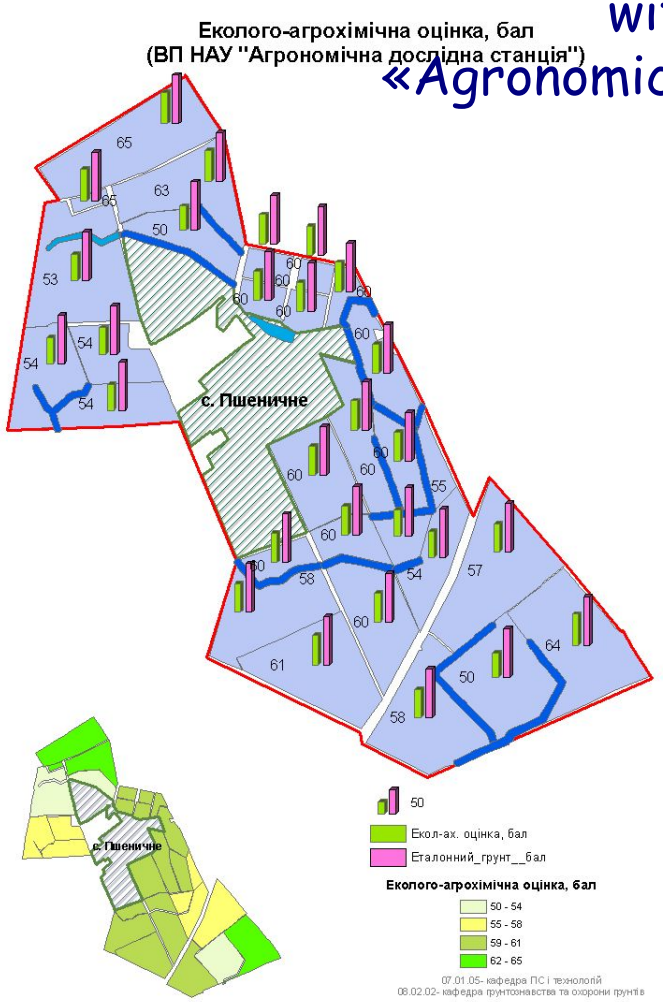
- compensation of costs from 30 to 100%;
- temporary land tax reduction or exemption from it;
- provision of privileges, full or partial repayment of compensations for loans;
- targeted subsidies for the activities of reproduction and fertility of soils

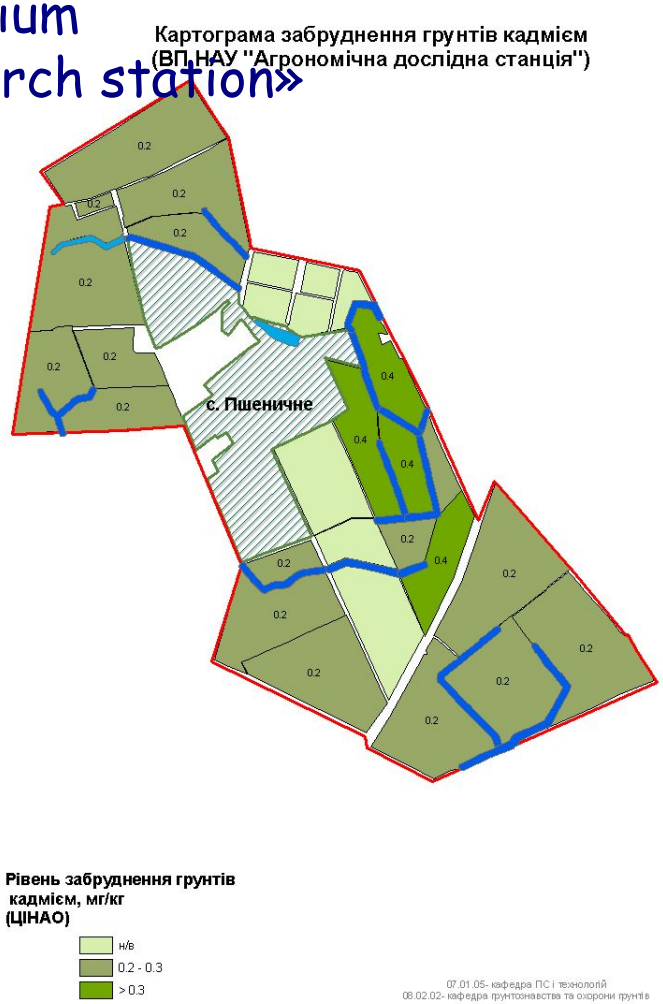
Ministry of Agricultural Policy of Ukraine **State technological center of defence and restoring of fertility of soils**	Monitoring of the quality of agricultural lands
Ministry of Environment Defence **State committee of land resources of Ukraine** **State inspection of control and defence of using of lands** **State service of Geodesy, Cartography and Cadastre**	Issuance of acts of ownership of land, permits for the removal of fertile layer, land management, land registry
National Board Security and Defense of Ukraine **Ukrainian Center of Land and Resource Management**	(ekologically safety and socially economic)

Ecological-agrochemistry rating

Cartogram of pollution of soils

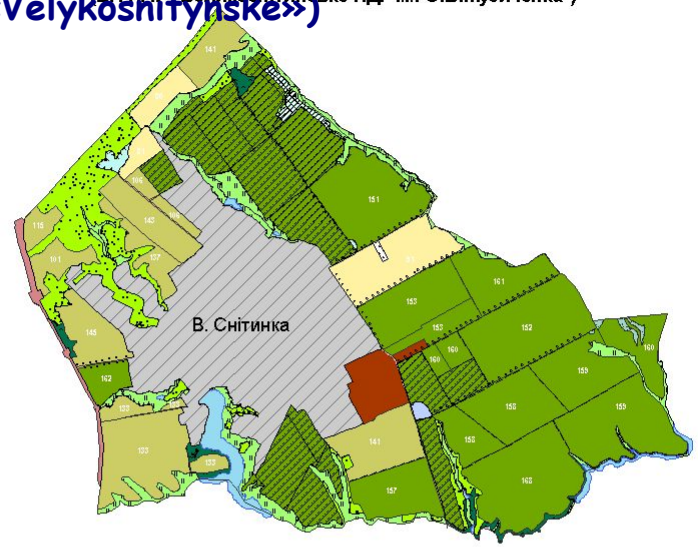
with Cadmium «Agronomical research station»

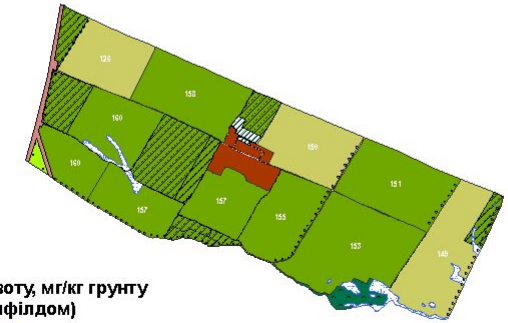




Kartogram of amount of Nitrogen, that could easily hidrolise (Scientific station «Velykosnitynske»)

Картограма вмісту азоту, що легко гідролізується
(ВП НАУ "Великоснітинське НДГ ім. О.В.Музиченка")





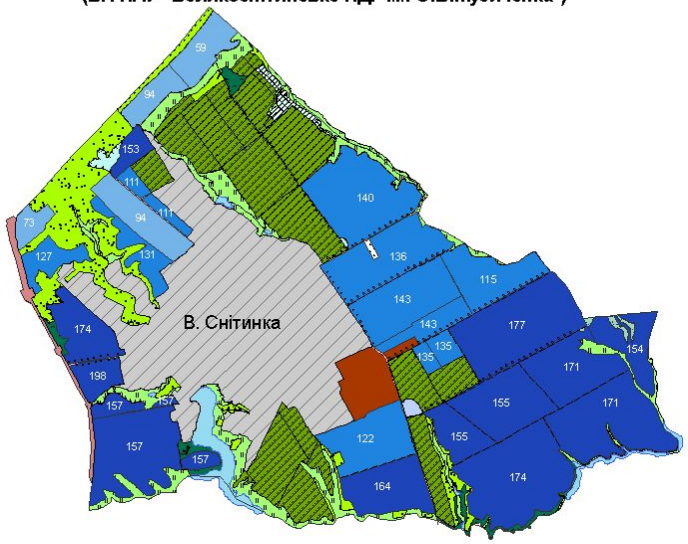
Вміст азоту, мг/кг грунту
(за Корнфілдом)

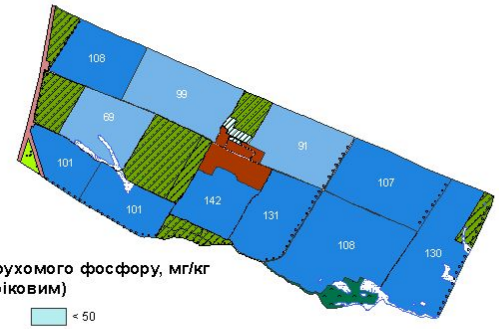
- <100
- 101 - 150
- 151 - 200
- >200

07.01.05 - кафедра геоінформаційних систем і технологій
08.02.02 - кафедра грунтознавства та охорони грунтів

Kartogram of amount of mobile Phosphorus (Scientific station «Velykosnitynske»)

Картограма вмісту рухомого фосфору
(ВП НАУ "Великоснітинське НДГ ім. О.В.Музиченка")





Вміст рухомого фосфору, мг/кг
(за Чиріковим)

- < 50
- 51 - 100
- 101 - 150
- 151 - 250
- > 250

07.01.05 - кафедра геоінформаційних систем і технологій
08.02.02 - кафедра грунтознавства та охорони грунтів


Thank you for your attention!