ECONOMIC AND ENVIRONMENTAL STUDIES No. 6 OPOLE 2004

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PROBLEMS IN THE MANAGEMENT OF SUSTAINABLE LANDUSE AND ECOLOGICAL AGRICULTURE IN THE REPUBLIC OF BELARUS

1. Introduction

Ecological agriculture refers to a self-sustaining agro-ecosystem, approaching the characteristics of material and energy management in mature, natural ecosystems. Man and his activities are integrated into the system. Production is characterized by a holistic view of crop production and animal husbandry. In the end we humans will have to rely on such a system for food – vegetal and animal – fibres – wood and wool – and maintenance of the landscape in which we live. Ecological agriculture is the conception for development in the future. For many regions ecological agriculture is not only a better alternative nowadays, but also the only possible way of long-term agricultural development.

Agriculture, orientated towards the prevailing landscape conditions, does not offer general prescriptions. In view of the great diversity of natural, industrial and cultural landscapes, agriculture clearly shows the necessity of the development of conceptions for each of these landscapes. One of the important elements of a system of rational use of natural resources and environmental protection in the agro-industrial complex of the Republic of Belarus is effective landuse and land preservation, protecting soil from pollution, degradation, destruction and increasing its natural fertility, introducing ecologically safe systems of agriculture which give an opportunity to minimise the negative influence of agricultural manufacture on the natural environment. It is necessary to maintain a complex approach towards the planning and rational use of land

in view of the influence of various economic and social factors on a local environment.

2. Change in the structure of land use

The amount of land occupied by the Republic of Belarus as of January, 1 2002 is 20759.6 th. hectares. Of this 9204.7 th. ha. is farm land, including arable land – 5761.1 th. ha. However, an analysis of the quantity of various types of land over the last few years testifies that the structure of land use has undergone certain changes, both according to the type of land and by use [*Condition of the...*, 2001, 2002; *Information-Statistic materials...*, 2002; *Land Degradation...*, 2002].

Changes in the structure of land use in the Republic of Belarus during 2001 according to land type are presented in Table 1.

Table 1. Changes in the structure of land use in the Republic of Belarus during 2001 according to land type

Types of land	Area, th. ha		
	on 01.01.2001	on 01.01.2002	+; –
Agricultural land in total, **including:**	9257.7	9204.7	–53.0
Arable	6133.2	5761.1	– 72.1
Wood and forests	8436.8	8571.1	+134.3
Marshes	964.3	934.0	–30.3
Covered by water	475.2	475.6	+0.4
Under roads, tracks, pipelines etc.	358.1	358.4	+0.3
Under streets, squares and other places of general use	154.7	153.0	–1.7
Under buildings and court yards	328.7	329.8	+1.1
Used for extraction of raw materials	24.1	19.6	–4.7
Other types	760.3	713.8	–46.5

Source: *Condition of the...*, 2001.

As can be seen from the data given above, in 2001 the previously observed tendency of the general area of agricultural land to reduce continued. (53.0 th. ha of agricultural land was transformed to other uses). However, it should be noted that the decrease in the quantity of arable land was great (a decrease of 372.1 th. ha.). Over the last 5 years

(01.01.1997 – 01.01.2002) the areas of these types of land have reduced by 128.0 and 253.2 th. ha, respectively. The principal causes of these reductions were the transformation of low productive land to other uses, paludification and overgrowth of small-sized planimetric sites of farmlands by mallee vegetation, assignment of the lands to construction purposes and the extraction of minerals, as well as a radical fall in the amount of meliorative work carried out.

The area covered by woods and forests increased significantly in 2001 (by 134.3 th. ha.). In total, over the last five years this area has increased by 253.2 th. ha. The areas of other kinds of land in the year 2001 did not change so significantly.

Analysis of the area of land drained and irrigated over the last few years indicates that the level of meliorative work in Belarus is at a very low level. In 2001 the area of drained land increased only by 800 ha. and at the beginning of 2002 such land covered 3416.8 th. ha. The area of irrigated land remained constant at 115.0 th. ha. Over the longer (five year) period the increase in the area of drained and irrigated land is extremely insignificant (14.1 th. ha. and 200 ha, respectively).

The technical condition of meliorative systems on drained land continues to worsen. A large proportion of these systems require reconstruction, improvement or repair. The technological level of hydromeliorative systems on irrigated land is also deteriorating from year to year. Due to this, it is necessary to realise their complex reconstruction, restoration or replace irrigation machines and installations.

The structure of land in the Republic of Belarus according to ownership and use as of 01.01.2002 is presented in Figure 1.

In 2001 the tendency of a fall in the area of the land owned by agricultural enterprises and citizens, that had been observed in the previous few years, continued. The fall in the area of such land in 2001 was 398.5 th. ha. and over the five year period 1997–2002 was 1521.8 th. ha. Thus, the proportion of such land as a proportion of the total area of land in the country fell from 57.1 to 49.8%. The main causes of such a change were the transfer of this land to state forest economic enterprises (the area covered by such enterprises increased by 320.5 th. ha. in 2001 and over the period 1997–2002 – by 1266.8 th. ha.), to housing construction and gardening, to needs of industry, to land set aside for the purposes of nature protection, land left fallow.

Analysis of changes in land use according to administrative area testifies that at the beginning of 2002 the highest share of agricultural land is observed in the Grodno (51.0%) and Mogilyov (50.5%) regions and the lowest share in the Gomel (35.7%) and Vitebsk (40.8%) regions. The highest percent of land covered by woods and forests is in the Gomel

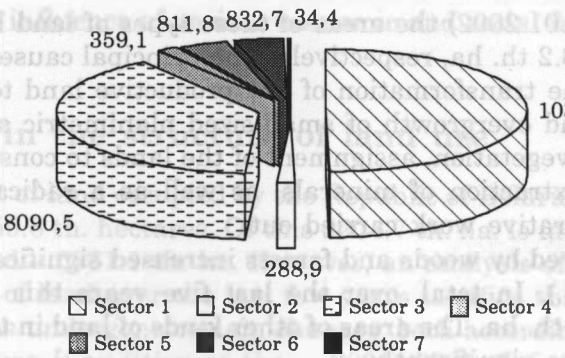

Fig. 1. The structure of land in the Republic of Belarus (by area, th. ha)
Legend: 1 – lands owned by agricultural enterprises and citizens; 2 – fallow land; 3 – land owned by state forest economic enterprises; 4 – land for general use in settlements; 5 – land used for industry, transport, defense, power, communication and other uses; 6 – areas of nature protection, areas for recreational use and protected for historical and/or cultural reasons; 7 – land used for hydraulic engineering and other hydraulic constructions.

Source: *Condition of the...*, 2001.

(47.9%) and Vitebsk (44.8%) regions and the lowest in the Grodno (36.1%) and Brest (37.1%) regions.

Changes in the area of agricultural farmland and arable land per inhabitant in the Republic of Belarus over the period from 1980 to 2001 is presented in Table 2.

Table 2. Changes in the area of agricultural farmland and arable land per inhabitant in the Republic of Belarus over the period from 1980 to 2001, ha

Region	1980		1990		2000		2001	
	Farm land	Arable land	Farm land	Arable land	Farm land	Arable land	Farm land	Arable land
Brest	1.04	0.60	0.99	0.57	0.99	0.58	1.00	0.58
Vitebsk	1.27	0.87	1.21	0.84	1.18	0.81	1.21	0.69
Gomel	1.02	0.58	0.89	0.53	0.93	0.57	0.94	0.57
Grodno	1.13	0.78	1.09	0.75	1.08	0.75	1.10	0.73
Minsk	0.66	0.44*	1.20	0.81	1.23	0.85	1.25	0.86
Mogilew	1.27	0.83	1.19	0.80	1.20	0.84	1.23	0.78
Average	**1.01**	**0.64**	**0.92**	**0.60**	**0.92**	**0.61**	**0.93**	**0.58**

*The calculation is made with respect to the population of Minsk.

Source: *Land Degradation*, 2002.

As we see, by the beginning of 2001 there was 0.93 ha of agricultural farmland per inhabitant in the country, including 0.58 ha of arable land. In general, this exceeds the equivalent figures for other countries in Europe by a factor of 1.5–2.0.

In 2001 there was a further fall in the quantity of farms – from 2525 at the beginning of 2001, down to 2397 by the beginning of 2002. However, the area of land covered by these farms increased from 82.8 th. ha. up to 93.2 th. ha, *i.e.* some farms were incorporated into other farms. There was also a decrease in the area of land used by citizens for gardening and small holdings from 79.7 down to 78.1 th. ha.

Various types of economic activities, including those not directly linked with land use or agricultural production, are frequently accompanied by transformation, degradation or pollution of the soil. Soil is exposed to considerable degradation due to water and wind erosion, mining activity (exploration, extraction and processing of minerals), poor quality realisation of meliorative structures, construction (industrial, housing, road, hydraulic engineering, pipeline construction etc.), storage of waste products from manufacture and consumption.

Soil pollution mainly occurs as a result of agricultural activity, the influence of cities and industrial enterprises, storage of various industrial and household waste products, transport, technological failures and shortcomings resulting in the emission of pollutants into the environment, etc. In Belarus the most serious problem in this field is the problem of radioactive pollution of the soil as a result of the Chernobyl catastrophe, which more than 21% of the territory of the country was exposed to.

According to the data from the second round of soil inspections in the republic, approximately 424.8 th. ha. of land are exposed to water and wind erosion, which accounts for 7.5% of the total area of cultivated land (Table 3). The share of water erosion in this is about 84%, of wind erosion 16%.

Table 3. The distribution of cultivated soil affected by water and wind erosion, together with the degree of erosion

The type of erosion	The area, th. ha.	Degree of erosion, th. ha		
		weak	medium	strong
Water	355.8	238.0	97.3	20.5
Wind	69.0	57.9	10.5	0.6
Total	**424.8**	**295.9**	**107.8**	**21.1**

Source: *Condition of the...*, 2001.

Of the total area of soils, which are exposed to water erosion, weakly eroded soils make up 67%, soils with a medium level of erosion – 27% and strongly eroded soils – about 6%.

Among the regions of the republic, the largest amounts of water eroded land are in the Vitebsk region (125.7 th. ha. or 11.3% of arable land), the least in the Gomel region (30.9 th. ha. or 3.8% of arable land). The vast majority of water eroded land is observed in the Vitebsk, Minsk, Mogilew and Grodno regions. These regions account for 73.8–98.5% of the total area of water eroded land in these 3 categories. The Gomel and Brest regions differ from the others in the amount of wind eroded land and this difference is caused by the character of landforms and the soil and climatic conditions. In these regions the amount of soil affected by wind erosion is 23.7 th. ha. or 34.3% and 17.7 th. ha or 25.7% of the total area of the eroded land, respectively. Soils liable to wind erosion such as sandy, sandy-loam soils (either automorphic, or drained) and peaty paludal soils occupy 1668.1 th. ha. of the republic (approximately 30% of the arable land). Such land is most commonly found in the Gomel – 472.3 th. ha. (57.5% of arable land), Grodno – 389.2 th. ha. (47.5% of arable land) and Brest regions – 289.7 th. ha. (38.3% of arable land).

In order to counteract soil erosion, a system of anti-erosion actions of organizational-economic, agro-technical, wood- and hydromeliorative characters is being carried out. In the past anti-erosion actions were carried out on an area of more than 600 th. ha. annually in Belarus. However, in recent years this amount has sharply reduced.

In the conditions faced by Belarus the most significant factors of soil transformation, both by scale and effect, are land melioration and mining activity. Especially large-scale meliorative projects were carried out in the 1960s and 1970s. At present, the total area of drained land in Belarus is 3414.3 th. ha. (16.4% of the country's territory). Of this land, agricultural land occupies 2927.9 th. ha, including arable land – 1324.8 th. ha, pasture land – 1601.3 th. ha. During the last decade, the drying of areas of waterlogged land have been carried out at a very low level. The most significant areas of land used for extracting raw materials are connected with the development of peat deposits and non-metallic materials (clay, sand and sand-gravel mixes, carbonate materials, building stone, etc.). The peat deposits make up about 70% of the total area of this land. However, in the last few years the amount of peat extracted, as well as of non-metallic minerals, has constantly fallen. As a result, there has been a reduction in the area of the such land which occupied 36.28 th. ha. on 01.01.2001.

In order to restore the natural and economic potential of such land, complex recultivation is carried out. The dynamics of the scale of work on the recultivation of such land in the past few years in Belarus are illustrated in Figure 2.

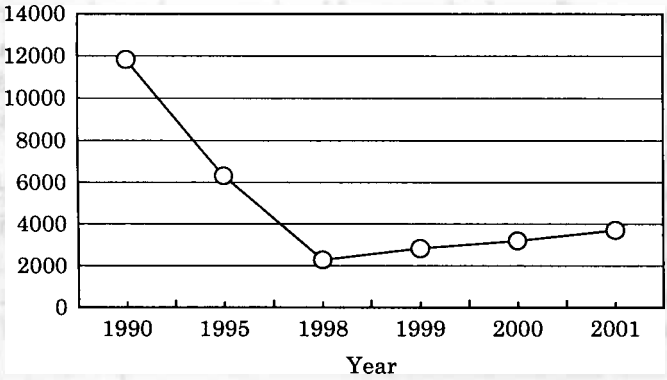

Fig. 2. Dynamic of recultivation of the disturbed lands

Source: *Condition of the...*, 2002.

It is visible that an extremely sharp fall in the amount of recultivation work occurred between 1990 and 1998, which resulted in a more than fivefold reduction in the area of land recultivated annually – from 11821 down to 2299 ha. During the last three years the area of land recultivated has increased a little, but is still at a very low level.

The following are among the basic types of activity aimed at the rational use and protection of land resources in the Republic of Belarus: perfection of a system of forecasting and planning land use, conducting of a national land cadastre and monitoring; introduction of technologies and rules of agricultural production which lower the level of negative influence on the natural environment (soil degradation, pollution, decrease of the natural fertility of soil etc.); decrease in the level of soil pollution by reducing the quantity of waste products, emissions of pollutants; expansion of land reclamation work; preservation, restoration and use of land polluted by radioactive nuclides, eroded, used for mineral extraction, construction; improvement of legislative and normative-methodical regulation in this area, etc.

Since November 27, 2001 the Republic of Belarus has been a full signatory of the Convention of the United Nations on the struggle against the desertification and degradation of land, which was signed by 178 states and the European Union. In view of the particular conditions of

the countries of Central and Eastern Europe concerning the variety of forms of land degradation and the transition of their economic systems, Appendix V to the Convention was accepted: "The appendix on the realization of the Convention at a regional level in Central and Eastern Europe", where the main ideas of the struggle against land degradation in this region are reflected: change of land use and territory organization; introduction of ecologically safe technologies in the agrarian sector; development and realisation of a variety of anti-erosion actions; ecological rehabilitation of lands used for extracting raw materials; forestation and reforestation; prevention of chemical soil pollution.

A number of strategies, plans of action and programs appropriate to the purposes and problems of the Convention are already being realized in Belarus: National strategy of Sustainable Development of the Republic of Belarus (1997); State Plan of the Territorial Organization of Belarus (2001); National Plan of Action on the Rational Use of Natural Resources and Environmental Protection of the Republic of Belarus for 2001–2005 (1997); program of Hydraulic Engineering Schemes for the Protection of Settlements and Agricultural Land from High Waters in the Areas of Polesje in 1999–2004 (1998); State Program for Preservation and Use of Reclaimed Land in 2001–2005" (2000); State Program of the Republic of Belarus on Overcoming the Consequences of the Catastrophe at the Chernobyl Atomic Power Station for 2001–2005 and for the period until 2010 (2001); Strategic Plan for the Development of Forestry in the Republic of Belarus in 1997–2015 (1997), etc.

3. Conclusions

In spite of the realisation of a number of major programs, strategies and plans of actions regarding various questions concerning the protection and rational use of land resources, the solution to these problems is still insufficiently effective. The basic constraints in the Republic of Belarus are the absence of a strategy and coordinated program of actions counteracting land degradation, lack of coordination of efforts between the state bodies, weak participation of non-governmental organizations, low knowledge and involvement of land users. Taking into consideration international experience, the development and realization of the national program of action counteracting land degradation will be an important element of sustainable development in the Republic of Belarus and will promote activisation of public organizations, state and local bodies of state management in this field.

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