

STEPAN POZNIAK*, NATALIA HAVRYSH**

SOCIAL SOIL SCIENCE AS A NEW APPROACH IN SOIL SCIENCE

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Abstract. The article contains the authors' reflections on the formation and substantiation of many aspects in soil science, concerning its connections with social sciences. Arguments about the exceptional importance of soil resources in the modern world and the importance of scientific research in soil science, which can become an important instrument of solving social problems, are found. It is shown that soil resources, being the basis of agricultural development, are the long-term capital through which different nations exist and develop. In order to maintain the normal living conditions of the population and to improve them, it is important to use this global resource wisely. The attitude of people to the soil is recognized as fundamental for nation's sustainable development and, moreover, the life expectancy of a civilization may depend on the people attitude to soils. In order to maintain collective well-being of people, a long-term interest of the society in soil protection needs to be reoriented – this should become a priority task for our civilization. The current state of soils can be a characteristic of the development of society as well as a criterion for assessing the activity of government and social stability in the country.

Keywords: social soil science, soil resources, soil protection, fertility of soils, soil conservation technologies

* Ivan Franko National University of Lviv, Department of Soil Science and Soil Geography, Doroshenka St. 41, 79007, Lviv, Ukraine. Corresponding author's e-mail: stepan.pozniak@lnu.edu.ua.

** National University "Odessa Law Academy", Department of Agricultural, Land and Environmental Law, Pionerska St. 2, 65009, Odessa, Ukraine, natahavrysh@gmail.com

INTRODUCTION

Soil science has a rich and long history of research, oriented both towards the knowledge of environmental factors in the development of soils in vast expanses, and the assessment of the role of soil as a unique component of the environment – the basis of many forms of life. From time to time, there is a need in society to determine the place which one or another science has in the general system of knowledge, to clarify the role which it plays in the scientific, cultural, productive, and, in general, in social life of people. It is not the first time that this necessity occurs in the history of soil science; it is still actual in the modern world. Generally, we can state that the soil science is a formed natural history science, one of the fundamental disciplines of modern natural science.

In the development of soil science there are singled out three directions: agro-ecological, agriculture-chemical, and genetic (Fallou 1862, Liebig 1863, Dokuchayev 1950). Some researchers have established in what way it is expedient to use the soil for certain, mostly agricultural, purposes. Besides, it is required the maximum increase of the long-term productivity of the soil for the minimum negative soil changes. Society is also worried about the definition of the role of soil as an environment that contains various types of waste, as a factor of water quality, as a key component of biochemical cycles and their global changes.

DISCUSSION

New more complex and more diverse social demands for soil science emphasize on the exceptional importance of land resources in the modern world. The growth of social orders, and also undoubted successes that have already been achieved by referring to soil science, especially in terms of providing humanity with food, feed and technical crops, have created the idea that theoretical soil science usually arises as a secondary research tool in the field of agriculture, construction and environmental protection. As a result of such development in soil science it was formed a problem-oriented tradition in which the prevailing desire is to resolve the special problems that arise in the sphere of application of soil science to agriculture, irrigation, drainage, water and health quality control, etc. It becomes increasingly obvious that the diversity and complexity of modern practical tasks now require a broad approach to soil science, since approaches that stimulate only applied tasks of land use were insufficient. From the global perspective, soil science has a unique opportunity to unite efforts with other sciences to formulate and solve important problems of our time. Mostly, the global food shortage, quality of natural resources and the state of the environment are connected with political, economic and social problems,

but scientific research can become an important means for its solving (Pozniak and Havrysh 2019).

Being the basis of agricultural development, soil recourses are the long-term capital owing to which different nations exist and develop. In order to maintain the normal living conditions of the population and to improve them, it is necessary to use this global resource rationally. Soil is our most unappreciated and yet the most important natural resource (Montgomery 2012). That means that the attitude of people to the soil, is fundamental to its sustainable development. Social and political conflicts often shook the social system that needed to feed a greater amount of people than soils could provide. History shows that the life of civilization can be determined by the way people relate to their soil. After all, what and how much can be grown on the soil and for how long depends on the state of this soil. So, saving the basis of the wealth of future generations is possible only by providing for the rational management of soil resources that are passed from generation to generation. Different social, cultural and economic factors influence people's attitude towards soils, whereas the ability of the soil to meet people's needs, in turn, affects the level of social development. Therefore, soil is a natural capital that can be used for a long time, but on the other hand, it can be easily and quickly wasted. Accordingly, it is stated that for every country, soil is the most important resource in terms of ecology or economy (Medvediev 2017).

Ukraine does not pay enough attention to social development. The social sphere is all that concerns a society, it is a set of industries, organizations, enterprises, which are directly connected and determine people's life, their wealth and consumption. It includes everything related to labor relations and the help for unprotected groups of the population. However, the social sphere also refers to the system of relations among citizens, connections between people and state institutions, the strategy for the development of society, education and other phenomena and processes that are part of social life.

Soils play an important role in social development of every state. The development of soil science acquires the features of social direction in many countries. An important characteristic of social development is the period during which it occurs. It is also necessary to take into account that the main features of social development are turning out only after a certain time (Baliuk and Kucher 2015). Soils determine social well-being of people – an integrated indicator of the effectiveness of the functioning of the social sphere, reflection of social well-being, the level of prosperity, quality of life of the population, indicator of security of the social system in general. Ukraine should develop its own criteria for assessing the actions of the authorities and social stability; improve the formation of social space in accordance with the real living conditions (Baliuk and Medvediev 2012).

The history of life is undoubtedly connected with the history of soil. Soil is a kind of interface between the bedrocks that our planet consists of and the

wildlife. Undoubtedly, terrestrial life needs soil. It is the hospitable home both for plants and people and plays an important social role (Montgomery 2012). An ability to create comfortable conditions for the life of society, to supply it with a sufficient quantity of good-quality food and raw materials for industry, or to create favorable living conditions for mankind, in particular ecological, is regarded as a social role of a soil. These important issues of social development are studied by new direction of science – social soil science. World experience in the field of the use of soils shows that civilization continues to exist only as long as it has enough productive soil to provide the population with food. The solution of the food problem depends on the productivity of soils, which is determined first of all by the attitude of a human to the soil. The chaotic, unbalanced, predatory use of soils does not allow people to realize the potential of soils.

In order to estimate the number of people who can be fed owing to the planet's natural resources, it is necessary to assume an optimal correlation between the population, quality of life and qualitative components of the environment, such as biodiversity. According to most demographic calculations, by the end of this century, the population of the planet will increase to 10 billion, hence the problem of providing people with food is becoming more and more serious. If only we could find a way to preserve world-wide photosynthetic productivity at the level of 40% (which is enough today to feed the world population), we would be able to provide food resources for no more than 15 billion people (Montgomery 2012). The founder of the “green revolution”, the Nobel laureate Norman Borlaug, claims that the Earth is capable of providing food for 10 billion of its inhabitants, although he admits that this is impossible without serious advances in the development of agro-techniques (Borlaug 2001).

In the modern society, the idea that technologies are able to solve almost any problem is deeply rooted. However, the problem of the increase in the resource consumption ratio in relation to the rate of their creation cannot be solved by means of technology. What is needed here is the sensible and responsible approach towards natural resources of the planet. It should be borne in mind by both present and future generations. The amount of soil, which is necessary for meeting the basic needs of a society, depends on the population, the natural fertility of the soil, and also on the methods and technologies which are used to grow crops. In any case, fertile and healthy soil plays an essential role for the well-being of every person. This fact means that the conservation of soils is the factor which determines the life of any civilization. The steady functioning of modern society depends on the preservation of soil and its rational using, no less, than upon innovative technologies. Today, man exerts a greater impact on soil conditions than on biological or geological processes. It is important to know the amount of soil which is necessary to meet people's needs and how we can reduce that amount. Hence, today, with roughly 6 billion

people and 1.5 billion ha of cultivated land, it takes about 0.25 ha to feed each person (Montgomery 2012).

The methods used to improve the productivity of soils are not satisfactory. We need a new model of agriculture, namely no-till farming and organic farming technologies. In the past, agriculture has undergone several transformations. The implementation of organic methods is the basis for a new agrarian revolution, which is based on soil protection. While the recent agrarian revolutions were aimed at increasing yields, the current ones are aimed at creating an environmentally sustainable soil. The philosophical basis of modern agriculture is the attitude towards the soil as a bio system adapted to local conditions, rather than a complex of chemical elements. Soil is usually ignored as an independent component of agro-system. Governments should not promote genetic engineering and the intensification of agricultural mechanization which is based on fertilizers and melioration – these are those measures for which the industry advocates, using them as a key to increasing the dependence of users on their products (Montgomery 2012).

In the long-term perspective, taking into account the consequences for the soil itself, food markets could become more effective if they were reduced in size and were not so integrated into the global economic system, so that food products would be sold on local markets. Farmers who work in the agricultural sector use the soil for maximizing short-term profits, repayment of debt for equipment, purchase of pesticides and fertilizers. However, farms should remain the property of those who work there – people who know their soil and get benefit from its improvement. Agricultural lease is not in the public interest. It is necessary to subsidize small natural farms in developing countries, to teach farmers more productive ways of using soils, which will be the key to the well-being of people in general.

There are three regions in the world where stable intense, highly-mechanized agriculture is possible: extensive areas in the American plains, in Europe, and in northern China. The world geography of soils shows that only a few regions have the best soil for intensive agriculture. On a global scale, Chernozems and Gleyic Chernozems of the mild zone are most suitable for agriculture, because their natural fertility is high due to the powerful humus horizon. There is an interesting idea to move food production to the most densely populated places, i.e. to the city. Urban agricultural production develops rather quickly and already more than 800 million people around the world work in the agricultural sector within the city (Montgomery 2012).

In order to maintain the well-being of people, it is necessary to reorient the long-term interest of society in soil protection – this should become a priority for our civilization. The time which is needed for the restoration of the soil cover in specific climatic and geological conditions also determines the time of the revival of the agrarian sector. Despite significant progress in soil conservation,

annual soil losses all around the world are 24 billion tons (Montgomery 2012). However, even controversial statements of soil destruction cannot convince people to take urgent measures on soil conservation. Cultural level of a person and technological innovations, in particular, genetic manipulation of crops, and maintenance of soil fertility with the help of chemical fertilizers did not constitute a safe foundation of modern agricultural production. That is why the depletion of soil should be considered in the context of socio-economic problems.

One of the most powerful degradation processes is erosion. Soil erosion, the pace of which prevails the time of soil formation, limited the existence of those civilizations which could not ensure the basis of their wealth, namely soil resources. Human actions have accelerated the process of soil erosion, even in those places where it is simply unnoticed. The change of the attitude of people towards the soil is of great significance here, so that it would become the foundation of material and spiritual wealth (Baliuk and Kucher 2015).

In this context, social soil science should consider not only the food problem, but also the ecological, legal and political ones. The ecological imperative lies in the fact that high-moral and ethical behavior concerning soils dominate in society which means that any action that could damage the soil by causing irreversible degradation changes would be eliminated. The political imperative consists of the active land policy of the state. To change the state policy means to live not at the expense of the soil and the peasant but respecting agricultural work. The legal imperative lies in the fact that we should follow the laws concerning using, creation and protection of soils, at the legislative level the state policy should be looked through, regarding subsidies for agricultural production, and the Law of Ukraine “About soils and their fertility” should be adopted (Havrysh 2016).

CONCLUSIONS

Therefore, in order for the soil to play its social role effectively, it is necessary to develop organizational, technological, technical, educational, esthetic and educational measures, to provide soil-saving innovative technologies, saving devices, training of qualified specialists in soil science, active land law policy of the state (Medvediev 2017, Tarariko *et al.* 2016, Dmytruk 2018, Kulynych 2009). These important problems of social development of a society can be solved by social soil science, because the well-being of humanity is conditioned by its relation to the soil as an investment and cultural heritage, but not as a commodity. However, one of the main targets of social soil science should be to maintain soil conditions as well as a profitable, well-arranged landscape, constant environmental care, its monitoring and measures for the restoration and protection. Ukraine could become a model when it comes to the right approach

to the soil and environment protection, but the lack of goodwill, ineffective law enforcement, indifferent media, immature civil society do not help in the rational use, reproduction, and preservation of soil.

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