

ACCOUNTING AND CONTROL OF AGRICULTURAL LAND UNDER INNOVATIVE DEVELOPMENT

Olga Ilchak

National University of Life and Environmental Sciences of Ukraine, Faculty of Economics, Department of Accounting, Analysis and Audit

Katarzyna Boratyńska

Warsaw University of Life Sciences, Faculty of Economic Sciences, Department of Economics and Organization of Enterprises

Abstract. This article is devoted to the problems of land accounting and control at agricultural enterprises under the conditions of economic transformation and development. The last scientific publications, related to the topic, are analyzed. Specific features of land accounting based on modern technology are identified. The model of land control on different levels is built. The findings are justified by the research.

Key words: land, accounting, control, innovative development, information

INTRODUCTION

Land using forms the food, industrial, technical, natural base of a society and its economic development. Land areas are essential in all modern sectors of economy. Land serves as a spatial basis in some sectors of it, whereas it directly affects production processes in the others. However, undoubtedly, it is used the most extensively in agriculture, acting both as the object and the means of labor. It is the need to solve the global problem of hunger that has turned land using into an urgent problem.

An accounting information system is able to increase the efficiency of land using in the macro and the micro economics [Rosenthal 2013]. However, it is possible under the conditions of development and implementation of accounting and

control for land relations only. Considerable attention of economists and accountants is an evidence of its importance for the science and practical accounting. The research in land accounting development and land economic relations took an important place in the works of V. M. Zhuk, who proposed the concept of accounting in the agricultural sector, based on the postulates of sustainable development and the theory of physical economics [Zhuk 2009]. Various aspects of using agricultural land are discussed in the publications of T.G. Kaminska, L.S. Shatkovska, H.M. Haugen, B. Kebede. Scientists believe that accounting is a necessary part of an efficient land using.

The amount of land, used for agriculture in the world, has been changed slightly (Figure 1).

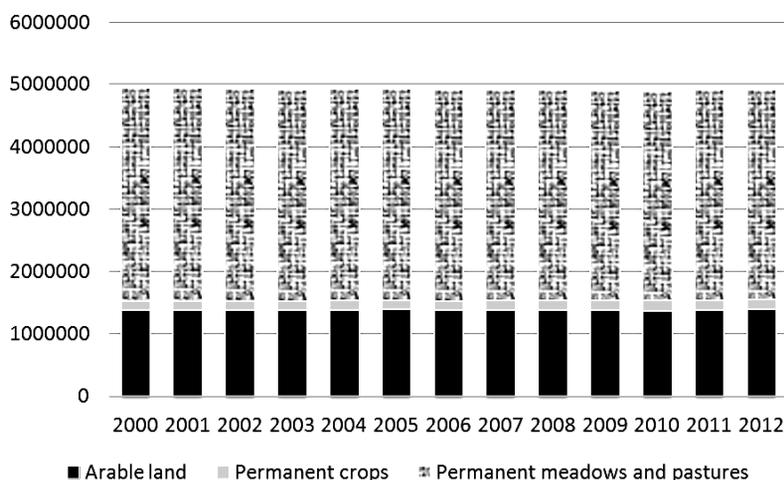


FIGURE 1. Composition of agricultural area

Source: Own elaboration based on FAOSTAT data <http://faostat3.fao.org/faostat-gateway/go/to/browse/R/RL/E>

According to the forecasts, by 2100 the world population will exceed 10 billion people [http://zn.ua/WORLD/oon-obnarodovala-globalnyy-prognoz-po-chislennosti-naseleniya-zemli-124031_.html]. This poses a challenge in science to ensure the world's population with food.

Considering the important predecessors' contribution in solving complex theoretical and methodological issues of land accounting and control, we found that using it without specific technology development of enterprises causes the discrepancy in theory and maintenance of land accounting and economic control in the practice of management and organization, and it complicates accounting and control of land, which together reduce the quality and efficiency of decision-making [Haugen 2012].

Therefore, the aim of the article is a scientific and theoretical foundation of accounting and control of agricultural land, which is directed to improve the performance of agricultural enterprises under the conditions of innovative development.

RESEARCH METHODS

To accomplish the objective of the investigation, we apply the following scientific methods of theoretical generalization: analysis and synthesis, a systematic relation approach, analogy, abstraction. Methods of theoretical generalization and comparison are used to study the theory of land accounting. The methodology of land accounting and control is proved by using abstract and logical analysis. A graphical method is used to display visual material.

ECONOMIC AND TECHNOLOGICAL BASES OF AGRICULTURAL LAND USING

In agricultural production innovations are related primarily to the need to improve crop yields and animal productivity, as well as to continue to provide conservation. In mechanization and electrification of production a primary goal of innovation is to create effective forms and methods for application of machine technology in agricultural production and formation of appropriate technical infrastructure. The storage and processing of agricultural production innovation take place in the form of technological improvement of production and creation of new kinds of foods.

According to the opinion the FAO experts, the most promising direction of development of agricultural land is precision agriculture, which... delivers more crop for the drop, and "precision placement" of fertilizers, which can double the amount of nutrients absorbed by plants.

Integrated pest management the techniques of which discourage the development of pest populations and minimizes the need for pesticides, is yet another key element.

Such methods help adapt crops to climate change and not only help grow more food but also contribute to reducing crops' water needs by 30 percent and energy costs by up to 60 percent. In some cases crop yields can be increased six-fold, as shown by trials with maize held recently in Southern Africa. Average yields from farms practicing the techniques in 57 low-income countries increased almost 80 percent, according to one review» [FAO, <http://www.fao.org/news/story/en/item/80096/icode/>].



A precision farming system is nowadays becoming more common. It is illustrated by the experience of enterprises all over the world. The development of space technology enables the use of space photographs and satellite navigation systems performance for monitoring and management of agricultural land [Gordard 2013]. Relative availability of satellite navigation devices for agricultural producers is the engine of their use in land accounting. Precision agriculture is a system of rational technologies of crop production based on soil mapping units. There are the following important tasks for precision agriculture:

- Saving energy,
- Mapping,
- Protection of soil and groundwater,
- Improving the management techniques,
- Control of equipment,
- Improving the product quality and production efficiency overall.

Precision agriculture is regarded as an optimal management on each square meter of field [Buck, Auffhammer and Sunding 2014].

Precision agriculture provides:

- Creation of electronic maps of the field,
- Creation of a database of the information support for fields (area, yield, soil properties and development of cultivated crops),
- Analysis of indicators and proposals to correct deficiencies that are the basis for management decisions,
- Transmission parameters for differential tillage.

Such systems consist of the devices that are installed on agricultural machinery and include a signal receiver global positioning system GPS (Global Positioning System), a controller and light bar. These devices allow controlling the machines remotely, via satellite, to obtain information about position of the machine, the amount of performed work, spent fuel and other parameters. Thus, these systems can be successfully used in the accounting of agricultural enterprises to gather information and initial processing of accounting data.

There are directions of precision farming: agronomic, technical, environmental and economic [Kebede 2008]. Agronomy direction includes improving agricultural production, taking into account the real needs of crops. Technical direction of precision farming is connected with improvements in planning of agricultural operations considering technical equipment of each economy. The basis of environmental direction is reducing negative factors in agriculture, since more accurate assessment of soil fertility helps optimize fertilizers. Economic direction implies increased production, costs, providing with high quality products and expansion of its sales.



USING MODERN TECHNOLOGIES IN ACCOUNTING OF AGRICULTURAL LAND

A gradually precision farming system is being implemented in practice of the increasing number of companies which is possible due to using satellite navigation systems, such as Concord TELEMATICS and CLAAS TELEMATICS. In particular, a full set of equipment maintenance information support to precision farming is introduced. It provides precision farming with the technological support, design using computer technology planting, fertilizing, harvesting [Kaminska and Shatkovska 2013].

A precision farming system perform the following functions:

- Control of location (movement) of vehicles,
- Account of race,
- Account of machine hours,
- Account of fuel consumption standards with recording time possible fueling and draining fuel,
- Control of technical condition of vehicles,
- Analysis of work efficiency and technology,
- Creation of yield maps with program «AGRO MAP»,
- Formation of current and final accounts etc.

A precision farming system make it possible to conduct automated filing yield for each area and export the required information support [Zamula 2010].

Thus, the integration of the production process systems and the accounting system will automatically collect credentials in real time, process them, and generate reports. It is going to reduce consumption of accountant working time, to shift the technical work to the accounting system. Under such conditions, the accountant work comprises initial settings of accounting, controlling the systems, and interpreting accounting estimates.

However, information, received from satellite measurement tools, requires appropriate interpretation, analysis and coordination with the traditional means and forms of accounting [Biondi and Suzuki 2007]. This is the essence of the problem that should be solved on the scientific and methodological level. An integration system must generate information that would fully satisfy the needs of innovative process and that should be efficient and convenient to use. This system of information support will help accelerate the use of innovative technologies in the world economy.

Agricultural lands are treated and presented in financial reports of the enterprises in accordance with International Accounting Standards and International Financial Reporting Standards (Table 1).



TABLE 1. International standards, which regulate accounting of land

Standard	Regulated conditions	Field of regulation
IFRS 16 "Property, Plant and Equipment"	<ul style="list-style-type: none"> - land is tangible asset - land is held by an enterprise for use in the production or supply of goods and services, for rental, for administrative purposes 	definition, valuation, reflection lands in reporting
IFRS 5 "Non-Current Assets Held for Sale and Discontinued Operations"	measurement, classification, and reflection of held for sale non-current assets	accounting of land for sale
IAS 23 "Borrowing Costs"	including of borrowing costs of that asset that are directly attributable to the acquisition	borrowing costs in the primary cost of the lands
IAS 36 "Impairment of Assets"	reflection value reduction of land	valuation and revaluation of land
IAS 40 "Investment Property"	<ul style="list-style-type: none"> - land, used to earn rentals, capital appreciation or both - enterprises must use one of the accounting model: fair value model or cost model 	accounting of land for rent

Source: Own elaboration.

Reflection of agricultural land in the balance sheet has to automatically mean a system of clear and reliable information and account security. The information base that exists today is mainly formed by the accounting system which, in turn, provides no data, that are needed to value the land and further reflection on accounts, and other relevant information [Gren 2006]. Thereby, now we feel necessity to create a model of land accounting that matches the current state of land relations to provide the required quantity and quality of information.

SYSTEM OF AGRICULTURAL LAND CONTROL UNDER INNOVATIVE DEVELOPMENT

Accounting is an information base of control. Scientists justify the theoretical and methodological basis of accounting and control of agricultural land and land use; their recognition and evaluation are reflected in the accounting system, basic principles of control system of agricultural land, its direction, mechanisms, methods and organizational forms [O'Neill and Hanrahan 2012]. However, the issue of agricultural land control under the conditions of land relation transformation and integration processes has been ignored by scientists.



There are the following tasks of land control:

- to check availability and accuracy of documents that confirm the ownership of the land; right to use land; legality of land rent,
- to check corrections of the data for the area, the location and the land conditions,
- to check the targeted use of land,
- to detect changes in the quality of land if it is possible.

The most important and the most difficult issue that is crucial in the design procedure of land control is to determine a list of indicators which should, and, most importantly, could be checked. Land is a special object of accounting with certain peculiarities of its performance, measured in quantitative and qualitative terms, as well as a valuation [Obst and Vardon 2014]. Hence, it is clear that during the control check, it requires actual availability of land by measurement of its area and identification and a verification of documents confirming the legality of ownership or right to use it. Moreover, it is more difficult to check land value as it is not unambiguous verification procedure [Jacobs and Timmons 1974]. It is caused by many factors that affect it: spatial, market, legal, quantitative, qualitative, economic and technological. It is not possible to examine most of these factors [Trachova 2011]. It needs very much time, resources and high qualification of expert.

Special attention to preventive controls needs to be paid to ensure sufficient land use efficiency in agriculture. First of all, an analysis to determine the economic system and its weaknesses should be conducted. After the detailed analysis is done, most of the weaknesses should be eliminated.

We believe that there is appropriate implementation of three-tier system of control over the availability and use of agricultural land (Figure 2).

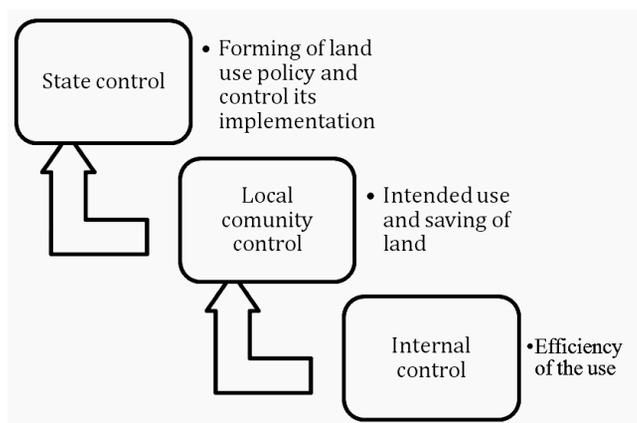


FIGURE 2. Three-tier system of control over the availability and use of agricultural land

Source: Own elaboration.

The control of agricultural land should satisfy the following requirements:

1. maximum simplicity;
2. transparency;
3. availability;
4. evidence.

During the building of a land control system, it should be certainly considered that agricultural land is the subject and the means of labor, as well as the territorial basis of production, which determines its special role.

A basic level of control – an internal control – is the deepest and the most overwhelming. The main subject of land use control for the owner is land use efficiency which, in its turn, involves many aspects. There are expenditures, selection of crops, fertilizing, productivity of land and others.

The second level of control is a control of the local community, which provides the sanctity of land boundaries, their proper use, saving and restoration of soil and so on.

On the national level, it is the compliance of land use with legislation framework for it that is monitored. Government determines land use policy and controls its implementation.

CONCLUSIONS

The development of the innovation process in agriculture causes new challenges for accounting and control and creates new opportunities for land reflection in reporting and information support for management. A lack of theoretical research in this direction is noted. Consequently, there is a strong need to develop methodological and practical recommendations on accounting for agricultural land, as well as methods of assessment, to reflect the process of innovation in land use. The use of modern achievements in the accounting and control of agricultural land will greatly expand management capabilities and the efficiency of enterprises.

References

- BIONDI Y., SUZUKI T. 2007: Socio-economic impacts of international accounting standards: an introduction, *Socio-economic Review* no 5, pp. 585–602.
- BUCK S., AUFFHAMMER M., SUNDING D. 2014: Land Markets and the Value of Water: Hedonic Analysis Using Repeat Sales of Farmland, *American Journal of Agricultural Economics* no 96, pp. 953–969.
- FAO. Composition of agricultural land <http://faostat3.fao.org/faostat-gateway/go/to/browse/R/RL/E>



- FAO. Putting nature back into agriculture, <http://www.fao.org/news/story/en/item/80096/icode/>
- GORDDARD R. 2013: Profit-Maximizing Land-Use Revisited: The Testable Implications of Non-joint Crop Production Under Land Constraint, *American Journal of Agricultural Economics* no 95, pp. 1109–1121.
- GREN I.-M. 2006: Green Accounting in Europe: A Comparative Study, *European Review of Agricultural Economics* no 33, vol. 2, pp. 595–597.
- HAUGEN H.M. 2012: Accounting for Hunger (eds). SCHÜTTER O. CORDES K. The Right to Food in the Era of Globalization, *European Journal of International Law* no 23, pp. 1175–1183.
- JACOBS J., TIMMONS J. 1974: An Economic Analysis of Agricultural Land Use Practices to Control Water Quality, *American Journal of Agricultural Economics* no 56, pp. 791–798.
- KAMINSKA T.G., SHATKOVSKA L.S. 2013: Accounting and analytical providing of financial management in agricultural enterprises, Publishing house “Comprint”, Kyiv.
- KEBEDE B. 2008: Land Reform, Distribution of Land and Institutions in Rural Ethiopia: Analysis of Inequality with Dirty Data, *Journal of African Economies* no 17, pp. 550–577.
- OBST C., VARDON M. 2014: Recording environmental assets in the national accounts, *Oxford Review of Economic Policy* no 30, pp. 126–144.
- O’NEILL S., HANRAHAN K. 2012: Decoupling of agricultural support payments: the impact on land market participation decisions, *European Review of Agricultural Economics* no 39, pp. 639–659.
- ROSENTHAL C. 2013: From Memory to Mastery: Accounting for Control in America, 1750–1880, *Enterprise and Society* no 14, pp. 732–748.
- TRACHOVA D.M. 2011: Accounting and valuation of agricultural land, *Journal of Tavria State Agritechnology University* no 3, pp. 368–374.
- UN released a global outlook on the world population http://zn.ua/WORLD/oon-obnarodovala-globalnyy-prognoz-po-chislennosti-naseleniya-zemli-124031_.html
- ZAMULA I.V. 2010: Accounting of ecological activity in providing of sustainable development of economy, ZhDTU, Zhytomyr.
- ZHUK V.M. 2009: Conception of accounting development in agriculture, National Scientific Center “Institute of Agricultural Economy”, Kyiv.

RACHUNKOWOŚĆ ORAZ KONTROLA GRUNTÓW ROLNYCH W WARUNKACH ROZWOJU INNOWACYJNEGO

Abstrakt. Artykuł poświęcono problematyce rachunkowości gruntów rolnych oraz kontroli w przedsiębiorstwach rolniczych w warunkach transformacji gospodarczej i rozwoju. Przeanalizowano aktualną literaturę przedmiotu, związaną z podjętą tematyką. Wskazano na specyficzne cechy rachunkowości gruntów ba-

zujące na nowoczesnej technologii. Zbudowano również model kontroli gruntów rolnych na następujących poziomach: wewnętrznym, lokalnym oraz państwowym. Wnioski sformułowano na podstawie studiów literaturowych oraz przeprowadzonej analizy.

Słowa kluczowe: grunt, rachunkowość, kontrola, rozwój innowacji, informacja

