Effect of hop growing technology on the accounting system in the agricultural entity

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Abstract. With the beginning of market relations, Russian hop-growing practically ceased to function due to the lack of purchases from the side of brewing companies. But the government policy of import substitution, pursued in recent years, has given a certain impetus to the revival of this industry. The purpose of this study is to describe the agrobiological and technological features of hop growing and their impact on the accounting process in an agricultural organization. To reveal the main scientific provisions, such general scientific techniques and methods were used as observation, comparison, analysis and synthesis, operation research, etc. Hops as a perennial crop require large capital and current expenditures. When carrying out agrotechnical measures related to the cultivation of hops, it becomes necessary to group costs in a certain system. The study shows that in the international and Russian scientific community, the issue of cost formation and accounting is considered within the framework of crop production in general. The article reveals the main stages of the formation of costs in hop-growing with an indication of accounting objects. Separately, innovations in the regulatory framework for accounting for non-current assets in connection with the reform of the national accounting system are touched upon.

1. Introduction
CROP production is an important branch of agriculture as a source of food, animal feeding stuffs and raw materials in many industries. Hop production is one of the crop cultivation groups within this industry.

European countries and the USA are the world centers of hop production. The data of Pivnoe Delo (Beer Business) International Analytical Journal show that at year-end 2017, world hop production was concentrated in 19 major countries, where the top three countries can be identified: the USA, Germany and the Czech Republic [1]. At this date, the annual world output of hops amounted to more than 115 thousand tons with an occupied area of more than 57 thousand hectares. The share of above three countries was 84% in total output and 55.7% in total occupied area. Currently, a growth cycle and increasing demand for this crop is observed in the world hop market.

Russian hop production reached its maximum values in 1990, then the indicators began to decline and it may be said that the domestic hop production collapsed. The main reason for such a crisis, according to hop growers, was the large-scale purchase of imported hop products by Russian brewers, resulting in the absence of demand for the harvested crop. According to figures from the Federal State Statistics Service for the period 1990-2020, the hop plantation areas were reduced from 4.5 to 0.2
thousand hectares and the gross yield of hop was reduced from 3.5 to 0.2 thousand tons [2]. The Chuvash Encyclopedia states that by the 1990s, 67% of the bearing hop plantation area was in Chuvashia, and the ratio of Chuvash hops in the country’s gross yield was 75-80% annually [3].

However, in recent years, the situation has improved substantially and this industry has been recovered gradually. This is attributable to such factors as the relatively low cost of Russian hops after devaluation of the rouble, government grants for the harvested hops and the general focus on import substitution. This resulted in a situation where foreign brewing companies began to leave the Russian market, making way for domestic producers. As referred to in the conference proceedings, various forms of government support are intended to cut down the expenses of the entities specializing in hop production, and to contribute to obtaining an optimal financial result [4].

Till present, the Chuvash Republic has remained the main hop producing region of Russia. In 2020, 185.1 tons of hops were grown in Chuvashia, which is more than 90% of gross hop yield in the country, and about 10% of the harvested Chuvash hops were exported. Therefore, the ‘Concept for the development of hop production in the Chuvash Republic for 2020-2025’ was approved at the regional level.

The development, state and production of the hop-growing industry were considered in the works of ‘Hops – A millennium review’ [5] and ‘Geography of World Hop Production 1990-2019’ [6]. The issues of ensuring economic benefits and the possible expansion of hop production in order to increase the efficiency of hop-growing products were raised in the works of ‘Economic efficiency of hop-producing organizations’ [4] and ‘Improving the efficiency of production of hop products in the context of a lockdown of the economy’ [7]. The technologies of cultivation and production of hops were reflected in the international studies of ‘Effect of deficit irrigation on yield quantity and quality, water productivity and economic returns of four cultivars of hops in the Yakima Valley, Washington State’ [8], as well as in the scientific studies of ‘Modern ways of improving the mechanization of hop cultivation’ [9], ‘Hop Cultivation Machine Technologies’ [10] and ‘Resource-saving hop production technology in Russia’ [11].

Doing business in any industry is reflected in a special procedure for the formation of accounting information. The conducted review of international studies allows us to conclude that the problem of cost accounting is considered in relation to crop production in general. So, in the work ‘An Assessment of the total external costs of UK agriculture’ provides a general assessment of the costs of agriculture for the UK [12].

The main accounting problems associated with cost recording were discussed in the article ‘Green accounting: from theory to practice’ through the concept of environmental accounting [13]. New calculation methods based on modeling production processes in agriculture are reflected in the work ‘Application of simulation technique to activity-based costing of agricultural systems: a case study’ [14].

Paying tribute to the research carried out, it should be noted that these scientific works raised the problems of the development of hop growing or general issues of growing hops, as well as basic principles for determining costs and calculating the cost of crop production. To date, the methodology for the formation and accounting of costs in hop growing remains practically outside the field of scientific research.

Therefore, the purpose of the presented study consists in considering the agrobiological and technological features of hop growing, determining the influence of the specifics of hop growing on the features of accounting for an agricultural organization. This will make it possible to group the costs incurred in a certain system, to use systematized material to develop methodological approaches for accounting for capital and current costs.

2. Methods and materials
The informational basis of the research was the scientific works of foreign and Russian scientists and practitioners in the agricultural sector of the economy and in plant growing. Additionally, the
monitoring of the Russian regulatory framework and economic literature on the organization of the accounting process of crop production was carried out.

The methodological basis of the study was made up of general scientific techniques and methods. With the help of observation, there was an acquaintance with the technological features of growing hops in an agricultural organization. By comparison, the agrobiological characteristics of hops and its difference from other agricultural crops were determined. Analysis and synthesis made it possible to differentiate the costs of growing hops and describe the order of their formation in hop growing. Using the method of comparison and description, it became possible to identify methodological approaches to accounting for capital costs for laying and growing hops.

3. Results and discussion

As a crop product, hop has certain conditions of agricultural production, which will certainly influence the management of accounting in hop production.

For a start, consideration should be given to the biological characteristics of hops as an industrial crop. Hops are a perennial crops cultivated in the same location. The rated period of heavy use of bearing plantations is 10-15 years. During the cultivation period (20-30 years), only the underground part, consisting of the main rootstock and lateral roots, remains alive. Plantings are young during two years after the establishment, only in the third year of use the hop enter the bearing age. Hops are the liana-like climbing plants. Therefore, hop cultivation requires special trellises, i.e. support pillars up to 7 meters high with a top mesh of wire or twine to support the plants [15].

The hop cultivation technology assumes the consistent implementation of agro-engineering measures for establishment and management of an agricultural crop (reclaiming and harrowing the land, fertilizer treatment, pest and weed management, and others). Hop production is one of the most labour-intensive branches of agriculture, which is based on the use of both manual and machine labour. During the many years of hop cultivation, about half of the labour costs are for harvesting. Labour costs can be reduced by upgrading the level of mechanization of the process of hop cultivation, harvesting and processing.

However, a special set of machines is used in the production of this crop (e.g. hop harvester, hop dryer, hop processing equipment). As a consequence of the prolonged crisis, technical means for management of hop plantations, as well as harvesting and drying machinery were not produced, old machinery was technically and physically obsolete, and new imported machinery is expensive or is banned for deliveries from the European Union. Therefore, we face with the issue of providing hop producers with domestic materials and equipment of a new generation, which will determine the efficiency of their further operation and the profitability of production.

Upon reaching industrial ripeness, the hop vine is cut manually for stripping and sorting the cones manually or mechanically, after which the post-harvest treatment is carried out, which ends with the production of commercial yield. This processing involves drying freshly harvested hops in a hop-kiln, strong compacting and packing. The main raw material supplied by hop production are hop cones. They are used in natural appearance or processed into hop products. The global practice shows that 80% of hops and hop products are used in brewing. The remaining raw materials are used in food (production of kvass and baker's yeast), cosmetic, medical, paint and coatings and other types of business activities.

Having examined the agrobiological and technological features of hop growing, it is necessary to outline a set of features of this industry and determine their impact on the accounting system in the agricultural entity (table 1).

Stage 1. As part of the annual scope of work performed, a significant part falls on the periods of hop seeding and harvesting. The costs incurred are seasonal and uneven throughout the year. The yield of the main raw material (hop cones) is attributable to the maturation of hop plantations and occurs during the harvesting period. Therefore, during the seasonal production, the scope of accountable activities increases significantly.
Table 1. Influence of hop production specifics on the features of accounting.

| Stage | Name                                      | Description                                                                 |
|-------|-------------------------------------------|-----------------------------------------------------------------------------|
| 1     | Seasonal nature of the industry           | Natural conditions for the ripening of hop plantations                       |
| 2     | Production cycle of hop cultivation       | Mismatch between the timing of the formation of production costs and the output of finished products (hop cones) |
| 3     | Grants to hop growers                     | Measures of government support for hop production in the Chuvash Republic, Russia |
| 4     | Hop production process                    | The production process exceeds the operating vegetation period of hop plantations and includes a set of agrotechnical activities |
| 5     | Land plot under hop plantations           | The main means of production requiring financial investments in order to maintain fertility |

Stage 2. The production cycle of hop cultivation provides for a long process. The costs for establishment of hop gardens and 2-years management imply significant capital investments, i.e. the installation of support posts (trellises), the purchase of special machinery and equipment for cultivation of hop plantations and the implementation of agro-engineering measures to manage them.

The costs incurred have a long payback period, and will require attracting investors or reimbursing part of the costs through government grants. Hence, in the accounting system, the costs should be differentiated by production cycles which do not match the year of crop harvesting: a) establishment and management of young hops; b) management of bearing hops.

Stage 3. Since the Soviet period, the Chuvash Republic has been the main Russian hop production region. Within the government program for the agriculture development, the republican budget provides for allocations for the implementation of hop production measures. In order to support hop production in the Chuvash Republic, the following support measures are provided – grants to reimburse the part of costs for:
1) purchase of specialized machinery and equipment for hop cultivation;
2) production and processing of hops with its subsequent sale;
3) other grants (for the establishment and management of perennial plantations, for the construction and reconstruction of hop trellises).

Hence, the budgetary funds given to the hop producers provide for the financing of both capital costs and operating expenses. Therefore, accounting is designed to generate information on the receipt of government support in the relevant areas, since there is a different procedure for writing off budget funds from the targeted financing ledgers. Moreover, it may happen that budgetary funds shall be returned in case of violation of the conditions for grant provision or misuse of the grant.

Stage 4. The hop production technology is associated with crop growing and development season. But the production process itself goes beyond the vegetation period, since it is divided into a number of various agrotechnical activities performed in strict sequence throughout the year in spring, summer and autumn. The technological process in hop production consists of the main set of activities associated with soil preparation, planting management and harvesting. Moreover, each of these sets affects the performance of a large number of specific types of work (mineral and organic fertilization, soil tillage and reclaiming, shoot and leaf removal, spraying against pests and diseases, and other activities).

Therefore, in accounting, there is a need for accounting and monitoring of costs for the main processes, where the costs for production of hops should also be differentiated by sets of work and types of work items. This breakdown of the costs incurred will contribute to the implementation of effective control over the costing at each process stage and will allow for real calculation of hop cost. In addition, when comparing the actual costs incurred with their planned (rated) indicators, it will be possible to identify the savings or overspending of various resources in certain process activities.
Stage 5. In hop growing, the primary means of production is land under perennial plantings, and subject to availability of ownership rights, it becomes a key aspect of a functioning owner’s equity. The land plot is limited in space; the consumer performance of the land is not changed over time and its value is not reduced during production process. The land is a product of nature and cannot be depreciated. When used reasonably, it will always be a high-yielding asset capable of generating profit upon further sale.

Consequently, when carrying out agro-engineering measures in hop production, a variety of costs arise: seedlings, fertilizers, oil products are consumed, physical wear and tear of technical equipment occurs, production workers labour is paid, and so on. Therefore, the costs incurred should be differentiated and accounted separately, systematized in a total amount and grouped by elements and costing items according to their industry nomenclature.

Summarizing the above, we propose to highlight the following cost accounting items in hop production (figure 1). The presented diagram indicates that cost accounting lies at the core of the accounting system of an agricultural entity.

The development of hop production requires significant initial investments and it is important for a start-up business to understand and gain insight into the peculiarities of accounting for such operations. The structure of the initial investments includes: 1) establishment of hop plantations (construction of new hop trellis or reconstruction of existing supports); 2) purchase of special machinery and equipment for hop cultivation. All investments form long-term investments, i.e. the costs of creating and acquiring non-current long-term assets (capital investments), which subsequently change to fixed assets.

So far, the issues of accounting for non-current assets in the agricultural sector of economy are governed by the industry documents approved by the Ministry of Agriculture of Russia: Guidelines for accounting of fixed assets of agricultural entities and Guidelines for accounting of investments made in the form of capital investments in agricultural entities (dated October 22, 2008). Moreover, the general principles of accounting for fixed assets (including capital investments) in the national economy were at one time laid down in the Accounting Regulations (PBU 6/01) ‘Accounting for Fixed Assets’.

As part of the reforming of accounting and approximation to the International Accounting Standards (hereinafter referred to as IAS), the Ministry of Finance of Russia revised the old accounting regulations and guidelines. This resulted in two new federal accounting standards - FSBU 6/2020 ‘Fixed assets’ and FSBU 26/2020 ‘Capital investments’, which starting from 2022 establish mandatory rules for accounting for non-current assets. Both Russian standards are based on IAS 16 Property, Plant and Equipment. Industry documents thereafter will lose their legal force.

The examination of the old and new methods of accounting for the costs of establishment and growing perennial plantations (hops) are indicative of different approaches to generation of such costs (table 2).

As can be seen from table 2, with the old approach, at the end of each calendar year, the current costs for establishment and growing of perennial plantings are put to account 01 ‘Fixed assets’ in terms of young perennial plantations not put into operation yet. Moreover, depreciation is not charged on young plantations. After the end of the growing process and the onset of the bearing period, young plantings are transferred to the category of perennial plantings in operation. Young and accepted into operation perennial plantings are accounted by types and years of planting. The planted area (hectare) is the accounting item.
Figure 1. Costing in hop production by accounting items.

The capital investment accounting standard put into effect provides for many innovations. Some of them are completely new and not mentioned before. Thus, the value of capital investments shall not include the costs incurred in connection with the improper structuring of the process of their implementation (excess consumption of raw materials, materials, energy, labour, and so forth). Hence, the necessity arises to plan and specify the costs for establishment and growing perennial plantings, and to monitor these costs. This once again points to the importance of the procedure for drawing up the process flow charts for establishment and management of crop. In addition, a mandatory review of capital investments for impairment and accounting for changes in their value due to impairment was introduced in accordance with the procedure provided for in IAS 36 Impairment of Assets, enacted in the Russian Federation by Order of the Ministry of Finance of Russia No. 217n dated December 28, 2015.

From the third year of use, perennial plantations (hops) are taken into operation and depreciation is charged on them according to the established rates (according to the chosen method of depreciation). Thus, hop plantations belong to the fifth depreciation group (property with a useful life of more than 7 years to 10 years inclusive) with the code 520.00.10.04 of the All-Russian Classifier of Fixed Assets.

FSBU 6/2020 ‘Fixed assets’ also introduces a number of innovations in the definitions, and in the valuation and depreciation rules. Let’s take a look at the most significant innovations for starting hop producers. Thus, the methods for calculating the amount of depreciation for the accounting period has changed – by the end of the useful life, the book value of the item must correspond to the disposal value, which cannot be equal to zero. In addition, like capital investments, a mandatory review of
fixed assets for impairment and accounting for changes in their book value due to impairment was introduced.

Table 2. Methods of accounting for capital costs of establishment and growing perennial plantations (hops).

| Production cycle          | PBU 6/01 ‘Fixed assets’ and industry documents                                                                 |
|---------------------------|------------------------------------------------------------------------------------------------------------------|
| Costs for establishment of hop gardens | Debit of account 08/8 ‘Investments in Non-Current Assets’ sub-account ‘Establishment and Cultivation of Perennial Plantations’ | Credit of asset accounting and settlement accounts |
| Write-off of the current year’s costs after the end of the calendar year | Debit of account 08/8 ‘Investments in Non-Current Assets’ sub-account ‘Establishment and Cultivation of Perennial Plantations’ | Credit of asset accounting and settlement accounts |
| Cost for management of hops of the first/second year of use | Debit of account 08/8 ‘Investments in Non-Current Assets’ sub-account ‘Establishment and Cultivation of Perennial Plantations’ | Credit of asset accounting and settlement accounts |
| Write-off of the current year’s costs after the end of the calendar year | Debit of account 08/8 ‘Investments in Non-Current Assets’ sub-account ‘Establishment and Cultivation of Perennial Plantations’ | Credit of asset accounting and settlement accounts |
| Transfer of young plantings into operation in the bearing year (third year) | Debit of account 08/8 ‘Investments in Non-Current Assets’ sub-account ‘Establishment and Cultivation of Perennial Plantations’ | Credit of asset accounting and settlement accounts |
| Cost for management of hops of the third and subsequent year of use | Debit of account 08/8 ‘Investments in Non-Current Assets’ sub-account ‘Establishment and Cultivation of Perennial Plantations’ | Credit of asset accounting and settlement accounts |

Effective economic management may require significant investment in measures to improve the quality characteristics of the land and increase its fertility. The costs for fundamental improvement of land plots (drainage, irrigation and other reclamation work) are usually classified as capital investments with subsequent inclusion in fixed assets. However, the work ‘Essence and economic content of expenses’ notes the presence of contradictions on this issue in industry documents and
therefore ‘it is advisable for an accountant to form his/her own professional judgement and develop an option, optimal for the entity, of accounting for capital investments in the fundamental improvement of lands’ [16]. We consider it necessary to maintain separate accounting for land plots and investments in them with recording of accounting information in physical and monetary indicators.

Business management is possible only through control. Initially properly organized accounting in hop cultivation will serve as an important means of operational control over emerging costs, help to identify inefficient expenses and take effective measures to eliminate them. Article 19 of the Law ‘On Accounting’ imposes on an economic entity the obligation to organize and exercise internal control over the committed facts of economic life. Therefore, an effective control system is characterized by its three components: subjects, control mechanisms and a system-forming factor - the goal of the system's functioning. The combination of these elements and the relationship between them will contribute to the achievement of the systemic goal [17].

Hence, it may be concluded that internal cost control is a set of procedures and methods used in order to harmonize and improve the efficiency of cost accounting. This requires the following - verification of compliance with legal requirements in terms of cost accounting, timeliness of posting, accuracy and completeness of data in cost accounting documentation, prevention of various errors and misstatements. The cost control is important because cost cutting is the main source of income growth for hop producers and a method of competition.

Thus, the study of biological characteristics of crops has shown that the hop cultivation technology requires a great deal of costs, including capital ones. The level of costs and quality of hops largely determine the profitability of this business. Starting hop growers are required not only to know the hop production technology, but also the specifics of organizing the accounting process in terms of the occurring costs. Therefore, it can be said with confidence that cost accounting lies at the core of the accounting system of an agricultural entity. Of particular importance in the implementation of control measures is the preparation of process flow charts, which provide a list of activities along with scope, type, number of staff, labour costs and other characteristics in chronological order.

4. Conclusion
Hop growing as a sub-branch of plant growing is distinguished by its specificity, it requires large material and labor costs, cultivation experience, complex and expensive structures, mechanization means that are not used in the cultivation of other crops.

The study of agrobiological and technological features of hop cultivation made it possible to identify the features of accounting in an agricultural organization. Since the technology of growing hops requires large capital and current costs, this work presents the author's view of the procedure for generalizing accounting information in the process of forming costs in hop growing. World practice notes that the profitability of this business is determined by two indicators: the level of costs and the quality of hops.

The study showed that the current industry documents on accounting for non-current assets in the agricultural sector of the economy from 2022 will not be relevant. Therefore, a new methodology was described for accounting for capital costs for the establishment and cultivation of hops.

We believe that the material presented in the article, linking the technology of hop growing and the organization of the accounting process in terms of costs arising, will be of interest to novice and functioning hop growers. The issues raised in the work will attract the attention of foreign and Russian scientists to this problem and will become the starting point for new scientific research.

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