

## TECHNICAL SCIENCES

**P.L. Lekomtsev, A.S. Soloviev, A.S. Korepanov**

Izhevsk State Agricultural Academy

### **Calculation of vortex induction water heater**

Hot and warm water is required both in household use and practically in all sectors of the economy. As far as water heating has high energy costs, it is expensive for consumers. Consequently energy-saving technologies in heat power engineering applied for producing warm and hot water are absolutely essential especially in regions with cold climate. Currently induction heating is the simplest, most convenient and less energy-consuming method of heating water for heat and water supply systems. Particularly in case of its efficient application it is possible to obtain substantial saving of energy and numerous reduction of total material, technical and financial expenses on installation and operation of independent systems of heat supply of any accommodation. The energy parameters of indirect induction heating of water are considered. Experimental and theoretical approaches for determination of energy parameters of vortex induction water heater and their further comparison are suggested.

**Key words:** induction heating; inductor; capacity; efficiency, winding; electromagnetic field; heat energy; electric heating.

#### **Authors:**

**Lekomtsev Petr Leonidovich** – Doctor of Technical Sciences, Professor of the Department of Energetics and Electrotechnics. Izhevsk State Agricultural Academy (11, Studencheskaya street, Izhevsk, Russian Federation, 426069, e-mail: feash@izhgsha.ru).

**Soloviev Alexander Sergeevich** – postgraduate of the Department of Energetics and Electrotechnics. Izhevsk State Agricultural Academy (11, Studencheskaya street, Izhevsk, Russian Federation, 426069, e-mail: dotsfam91@mail.ru)

**Korepanov Andrey Semenovich** – postgraduate of the Department of Energetics and Electrotechnics. Izhevsk State Agricultural Academy (11, Studencheskaya street, Izhevsk, Russian Federation, 426069).

**T.N. Sterkhova, P.D. Kornaukhov**

Izhevsk State Agricultural Academy

### **Behavioral research of seeds in electrostatic field**

According to the «National Program on agricultural development and market regulation of agricultural products, raw materials and food for 2013-2020», it is necessary to increase field vegetables production to 5.2 million tons, and greenhouse vegetables to 1.4 million tons. In addition, the program issues the challenge of providing agricultural industry with domestic seeds of main cultivated crops in the amount of not less than 75%. Nowadays an urgent issue is to improve the seedbed preparation of vegetable seeds. The purpose of the

research is to modernize the facility for electrotechnological pre-seeding treatment of gourd family seeds. The research task is to study the behavior of seed particles in the interelectrode interval of the electrostatic belt trier, in particular the study of temporal characteristics of charge, orientation, and seeds bursting in an electrostatic field. The studies were conducted on experimental stand using film camera Panasonic Lumix GX 7. For uniform illumination two types of lighting were used: diffused shadowless lighting directed at the investigated facility and contoured lighting directed at shelves with the seed mass. Experimental results have accurately determined the time during which the seeds acquire a charge required for its orientation, movement and disruption from the shelf. The conducted experiments show that orientation tension is a typical value characteristic of each seed and can be used when assessing their quality. The obtained time dependences are instrumental in further development of the proposed facility for the purpose of sorting seeds automation.

**Key words:** filming; orientation time; time of seeds charging; orientation tension; bursting tension; contour lighting; shadowless lighting.

**Authors:**

**Sterkhova Tatyana Nikolayevna** – Candidate of Technical Sciences, Associate Professor of the Department of Energetics and Electrotechnics. Izhevsk State Agricultural Academy (11, Studencheskaya street, Izhevsk, Russian Federation, 426069, tel. (3412) 59-88-84).

**Kornaukhov Pavel Dmitriyevich** – postgraduate of the Department of Energetics and Electrotechnics. Izhevsk State Agricultural Academy (11, Studencheskaya street, Izhevsk, Russian Federation, 426069, tel. (3412) 59-88-84).

## **ZOOTECHNICAL SCIENCES**

**A.A. Astrakhansev, N.V. Isupova**  
Izhevsk State Agricultural Academy

### **Replacement chicks growing and its impact on succeeding efficiency of egg-production chickens**

The essential part in the egg production process is the directed growing of replacement chicks involving the starting egg production in the optimal age for a particular cross, with high flock homogeneity and without pathological findings from standard dynamics of growth and development. This is the guarantee for achieving future high genetically determined egg productivity of commercial poultry flocks. However, there are cases of disharmonic growth of chickens in poultry enterprises. The aim of our study was to investigate the factors affecting the replacement chicks growing and their influence on subsequent egg efficiency of hens. The data for study were the chickens of cross "Loman Brown Classic" grown in Votkinsk branch Ltd. "Poultry plant "Varaksino " of the Udmurt Republic. The first group included young rearing birds with the growth and development at the level of standard requirements for the cross. The second group consisted of young birds lagging in growth and development up to 8 weeks of age. The study monitored the body

weight dynamics, daily average gain of rearing birds, safety index and feed costs per head. Subsequently we studied the egg productivity of chickens in the studied groups and the influence of growth retardation of youngsters on it. Finally we analyzed the economic efficiency of rearing birds with different growth and development. The results of the study concluded that a different pattern of growth and development of youngsters during its rearing period has no significant effect on subsequent productivity of laying hens in the commercial poultry flock. The calculation of the production efficiency of edible eggs revealed a higher level of profitability (38.7%) in groups of chickens, with growth and development corresponding to standard requirements during their rearing period.

**Key words:** replacement chicks; hens; growing; chickens; production efficiency; egg productivity; age periods; imbalance; safety; costs.

**Authors:**

**Astrakhantsev Anton Anatolievich** – Candidate of Agricultural Sciences, assistant Professor of the Department of Animal Husbandry. Izhevsk State Agricultural Academy (426069, Russian Federation, Izhevsk, Studencheskaya street, 11, e-mail: antonzif@list.ru).

**Isupova Nadezhda Vladimirovna** – Candidate of Veterinary Sciences, assistant Professor of the Department of Anatomy and Biology. Izhevsk State Agricultural Academy (426069, Russian Federation, Izhevsk, Studencheskaya street, 11, e-mail: medeo.78@mail.ru).

## ECONOMIC SCIENCES

**R.A. Alborov<sup>1</sup>, S.M. Kontsevaya<sup>1</sup>, S.R. Kontsevaya<sup>2</sup>**

<sup>1</sup>Izhevsk State Agricultural Academy;

<sup>2</sup>RSAU – MAA named after K. A. Timiryazev, Moscow

### **Improvement of management and its accounting and evaluation functions in agricultural production**

The article considers the issues of improving management and its accounting and evaluation functions in agriculture. The prerequisites of objective necessity of rationalization of agricultural managerial system, management accounting and cost control, evaluation of output products in agricultural production are proved. Priority development directions of the production management system, input accounting and control, output evaluation and input-output analysis of agricultural activities are defined. Business, informative and methodological aspects of management development are proposed. The technique of fair value measurement of agricultural production for determining its gross value for the purpose of marginal revenue analysis in the agricultural management system is developed. The model of organization and the process of effectiveness management of agricultural production are proposed.

**Key words:** management; accounting and evaluation functions; fair value; agricultural activity; cost alternatives; contents; form; principles; methodological; conceptual; evaluation methods; input-output control; qualitative and quantitative indicators.

**Authors:**

**Alborov Rolan Arhipovich** – Doctor of Economic Sciences, Professor, Head of Department of Accounting, Finance and Audit. Izhevsk State Agricultural Academy (30, Sverdlova street, Izhevsk, Russian Federation, 426057, e-mail: udtipb@yandex.ru).

**Kontsevaya Svetlana Mihailovna** – Candidate of Agricultural Sciences, Professor, Department of Accounting, Finance and Audit. Izhevsk State Agricultural Academy (30, Sverdlova street, Izhevsk, Russian Federation, 426057, e-mail: udtipb@yandex.ru).

**Kontsevaya Stanislava Rolanovna** – Candidate of Economic Sciences, Associate Professor of Department of Economic Analysis and Audit. RSAU–MAA named after K.A. Timiryazev (49, Timiryazevskaya street, Moscow, Russian Federation, 127550, e-mail: s.kontsevaya@mail.ru).

**S.A. Danilina, A.V. Vladimirova, E.G. Karabasheva**  
Izhevsk State Agricultural Academy

**Financial planning automation on the basis of relevant information of management accounting in AIC organizations**

It is essential to simulate and evaluate the future financial condition taking into account the financial risks and business liquidity for agricultural enterprises in the financial crisis. Similar business-planning carried out on a regular basis involves the application of an effective analytical tool of the automated system Project Expert. Dynamic methods based on simulation make it possible to calculate the project taking into account a variety of factors. These methods are more effective than statistical techniques. The financial simulation model of the organization created by means of Project Expert provides the generation of standard accounting procedures and financial reporting documents as a result of ongoing business operations in time. These models reflect the actual activities of the organization through the description of cash flows as the events occurring in different time periods. Due to using Project Expert guidance and managers can receive relevant information including necessary, acceptable and realized data, enabling a comprehensive assessment of economic activity and identification of alternative solutions which provide optimal management decisions. The conclusion is drawn that it is possible to apply an effective analytical tool - system Project Expert in agricultural enterprises for automation of the planning and effectiveness analyzing of the organization or the investment project; for performing calculations of data on the basis of relevant information of management accounting, which is an efficient mean providing an opportunity to explore different strategies and make the only right managerial decision aimed at achieving the maximum objectives.

**Key words:** financial planning; automated systems; management accounting; financial models; business planning; project efficiency; costs.

**Authors:**

**Danilina Svetlana Antoninovna** – Candidate of Economic Sciences, Associate Professor of the Department of Accounting, Finance and Audit. Izhevsk State Agricultural Academy (30, Sverdlov street, Izhevsk, Russian Federation, 426057, e-mail: danilinasa@mail.ru).

**Vladimirova Aleksandra Valerievna** – Senior Lecturer of the Department of Accounting, Finance and Audit. Izhevsk State Agricultural Academy (30, Sverdlov street, Izhevsk, Russian Federation, 426057, e-mail: alexwlad74@mail.ru).

**Karabasheva Elena Gennadievna** – Senior Lecturer of the Department of Accounting, Finance and Audit. Izhevsk State Agricultural Academy (30, Sverdlov street, Izhevsk, Russian Federation, 426057, e-mail: elenakarabasheva@mail.ru).

**N.A. Alekseeva**

Izhevsk State Agricultural Academy

### **Procedure of plan-fact predictive analysis of problem directions for the development of dairy cattle breeding enterprise**

The article considers the parameters of planned wasteful production of cattle body weight gain in the agricultural academy instructional farm: livestock movement, herd structure, feed costs in centners of fodder units according to value, planned body weight gains of different categories of animals in farming and fattening. The causes of the low efficiency of the agricultural enterprise output are analyzed. The management system development of bull-calves breeding and fattening on the basis of intensive fattening of calves is proposed. It is recommended that the diet structure and fattening period should be changed. A plan-fact predictive analysis of fattening of different categories of animals on the dairy breeding enterprise is carried out. The rearing cost savings for feed units per head of a bull-calf, and an increase of sales profit are proved. Algorithms of cost prediction for calves fattening are shown. The strengths and weaknesses of the proposed procedure are justified. An earlier calf milk replacer is recommended for calves. Cost savings and extra profit resulting in an increase in marketability of milk are proved. Conclusions on the basis of study results are drawn.

**Key words:** rearing and fattening of bull-calves; profit; costs; production cost; milk; milk replacer; diets; feeding; dairy farming; efficiency; marketability of milk; growing stock; cattle; body weight gain; plan; fact; prediction.

#### **Author:**

Alekseeva Nataliya Anatolievna – Doctor of Economics, Professor, Head of the Department of Economic Analysis and Statistics. Izhevsk State Agricultural Academy (30, Sverdlov street, Izhevsk, Russian Federation, 426057, e-mail: 497477@mail.ru).

**I.G. Sangadieva, Ch.Z. Zherbanova**

Buryat State Agricultural Academy named after V.R. Filippov, Ulan-Ude

### **Indicative assessment of efficiency of sustainable development program of rural areas**

Nowadays it is reasonably required to develop a comprehensive methodology to assess the effectiveness of social and economic development of rural municipal entities of the

Buryat Republic. For this purpose it is required to create a system of indicators determining the effectiveness of the sustainable development program of rural areas, and the practicability of current management system improvement of rural municipalities. This requires developing consistent approaches, common standards for the determination of scientifically grounded system of indicators which will identify key factors of constructing a positive control system. When choosing a source system of estimated figures of the processes occurring in rural areas, you should also consider that social and economic processes in the rural settlements are less inert than similar processes at the regional level, they respond much faster to the dynamics of the external environment, all the events and their consequences are more immediate and more contrast. Consequently, the methodology for the social-economic evaluation of rural settlements should differ from the methods for the assessment of urban districts and municipal regions in the periodicity of providing information and estimated figures.

**Key words:** sustainable development; rural areas; performance evaluation; social and economic development program.

**Authors:**

**Sangadieva Iraida Gomboevna** – Doctor of Economic Sciences, Professor, Head of Department of Economics and Regional Management. Buryat State Agricultural Academy named after V.R. Filippov (8, Pushkin str., Ulan-Ude, Russian Federation, 670024, e-mail: sangadieva@mail.ru).

**Zherbanova Chimita Zorigtoevna** – Assistant of the Department of Economics and Regional Management. Buryat State Agricultural Academy named after V.R. Filippova (8, Pushkin str., Ulan-Ude, Russian Federation, 670024, e-mail: zherbanova@yahoo.com).

**N.A. Alekseeva**

Izhevsk State Agricultural Academy

**Development of the factorial analysis technique of sales profit (loss) with the consideration of strategic factors at the dairy breeding enterprises**

The article considers the traditional approach to the analysis of sales profit (loss) involving the analysis of a profit additive model by the chain substitutions method and by the absolute distinctions method. The development of the factorial analysis technique of sales profit (loss) is offered by means of introduction to the factor-analysis model the structural and price factors reflecting strategic aspects of dairy cattle breeding enterprise activity. The mixed type of the modified model is proved. The algorithms of profit factorial analysis carried out by the chain substitutions method are revealed. The suggested model is recommended to be applied not only for the profit analysis at the enterprise, but also at all agricultural enterprises on the average in the region. Advantages and shortcomings of the proposed technique are proved. Conclusions on the basis of the factorial analysis results are drawn.

**Key words:** factorial analysis; sales profit (loss); dairy cattle breeding; efficiency; factor; strategic factors; quantum index; price index; costs control; production cost; revenue.

**Author:**

**Alekseeva Nataliya Anatolievna** – Doctor of Economics, Professor, Head of the Department of Economic Analysis and Statistics. Izhevsk State Agricultural Academy (30, Sverdlov street, Izhevsk, Russian Federation, 426057, e-mail: 497477@mail.ru).

**G.Ya. Ostaev**

Izhevsk State Agricultural Academy

**Improving methods for internal control of financial results in agricultural companies**

Modern agricultural development of our country followed by crisis phenomena requires revising various concepts of economic development. The development of new methods of management and economic relations of business entities should be directed to the creation of mobile intrafarm structures, the establishment and improvement of economic relations between them, between enterprises and the state. This means that the formation of an effective management system and active adaptation of its economic methods and leverage is essential for the effective management of the production activities in enterprises and for operational identification and mobilization of production internal reserves. Accounting of financial results is central and one of the most important issues in the whole system of accounting. The importance of financial accounting is determined by the fact that information on business profits is formed according to its data. In its turn, the profit serves as one of the most important indicators characterizing economic activity of the enterprise. Agricultural production refers to the sphere of activity that is associated with the production of goods that meet basic needs of the population. The study of the procedure organization of internal control of financial results in agricultural companies has important theoretical and practical significance. Various aspects of the account of financial results formation in agricultural organizations are analyzed by applying control procedures, the most efficient and optimal methods and verification procedures are defined. Developed working papers focus on validation planning, evidence gathering and on the implementation of the internal control of financial results in agricultural companies. It is concluded that using and evaluating objectively developed working documents during the inspection the observance of the validity, lawfulness, appropriateness and economic efficiency of financial and economic activity of agricultural organizations is carried out.

**Key words:** internal control; accounting; financial results; income; expenses.

**Author:**

**Ostaev Gamlet Yakovlevich** – Candidate of Economic Sciences, Associate Professor of the Department of Accounting, Finance and Audit. Izhevsk State Agricultural Academy (30, Sverdlov street, Izhevsk, Russian Federation, 426057, e-mail: ostaeff@yandex.ru).

**AGRICULTURAL SCIENCES**

## **Influence of fallow, bioresources and tillage systems on fertility parameters of arable layer**

In order to identify regular changes of parameters of soil fertility of arable layer in the long-term field experiment we have studied the effect of the fallow types (pure, green manure), bioresources (cattle manure - 60 t/ha, the biomass of white mustard - 1.99, clover of the 1st year use - 2.25 m/ha of dry matter) and a method of tillage in a fallow (plowing, nonmoldboard processing) on the biological activity, nitrification and ammonification capacity of the soil, nutrient status, the physicochemical properties of the soil, soil structure and content of water-stable aggregates. The results of two years of research - the beginning of the first (2007, winter rye by type of fallow) and the second crop rotation (2014) are presented. Cattle manure application 60 t/ha intensified activities of cellulose-decomposing microorganisms, but suppressed nitrifiers activity. Embedding of mustard biomass, on the contrary, intensified the activity of nitrifying bacteria, but reduced the activity of cellulose-decomposing microorganisms. Combined application of manure and mustard biomass have optimized activity of cellulose-decomposing and nitrifying bacteria. In the clover green manure fallow with high nitrification capacity of the soil (19.2 mg/kg) accumulation of ammonia nitrogen was observed. Embedding of mustard biomass and clover led to reduction of the hydrolytic acidity of soil to 2.90 and 2.88 mmol/100 g in comparison with pure fallows with manure and without manure, where the hydrolytic acidity amounted 3.36 and 3.42 mmol/100 g. Long-term application of nonmoldboard treatment system of sod-podzolic soil compared with moldboard system showed a decrease in nitrification capacity of soil by 1.2 mg/kg, the degree of decomposition of cloths by 5.03%, an increase in hydrolytic acidity by 0.23 mmol/100 g. The uptrend of soil structure both in the wet and dry sieving was marked.

**Key words:** fallows; green manure; mustard; clover; cattle manure; tillage; moisture; cellulose-decomposing activity; nitrification activity; agrochemical parameters.

### **Author:**

**Pegova Nina Arkadievna** – Candidate of Agricultural Sciences, leading researcher at the Department of Farming, Agrochemistry and Pedology. Udmurt State Agricultural Research Institute (1, Lenin St., Pervomaiskiy, Zavyalovskiy District, Udmurt Republic, 427007, tel./fax (3412) 629-698).

### **I.Ya. Pigorev, J.A. Bulanova**

Kurskaya State Agricultural Academy

## **The change in rock properties during initial soil formation on the objects of the Kursk magnetic anomaly**

The formation of the mining landscape with heap dumps and heaps of different heights and shapes increases metabolism and energy. Nonclosure of energy flows in such ecosystems determines their instability. Artificially created meso- and micro-relief with steep unvegetated slopes strengthens the role of abiotic factors, which in turn form a hydrographic

network with its own micro water-shed areas and special aerodynamic conditions. In the ruderal ecosystems the main sources of organic substances are plant communities formed naturally. They convert the substrate of overburden into the young soils and improve agroclimatic and ecological state of the landscape. Processes and the pace of vegetation natural regeneration depend on both the abiotic (lithology and age of dumps, mesorelief elements) and biotic factors determined by the ecological capacity of biocenosis of the surrounding area. The latter factors are donors of plant forms and determine the taxonomic composition of plant communities of technogenic ecosystems. This article discusses the relevant for modern science issue of changing the rocks properties in the primary soil formation on the objects of the Kursk Magnetic Anomaly. We study the accumulation of topsoil layer for further crop cultivation. Taking into account the fact that the evolutionary transformation of rocks and original forms of relief into resistant natural and industrial complexes in a natural way is extremely slow, there is a real need for fast-track "completion" of the biota through the creation of cultivated phytocenosis.

**Key words:** soil; Kursk magnetic anomaly; soil formation; fertility.

**Authors:**

**Pigorev Igor Yakovlevich** – Doctor of Agricultural Sciences, Professor, Pro-rector for Research and Innovations. Kurskaya State Agricultural Academy named after I.I. Ivanov (70, Karl Marks street, Kursk, 305021, e-mail: kursknich@gmail.com).

**Bulanova Zhanna Anatolyevna** – Candidate of Agricultural Sciences. Kurskaya State Agricultural Academy named after I.I. Ivanov (70, Karl Marks street, Kursk, 305021, e-mail: zhanne-b@yandex.ru).

**I.Sh. Fatykhov, E.V. Korepanova, V.G. Kolesnikova, T. N. Ryabova**

Izhevsk State Agricultural Academy

**Elemental composition of fiber flax seeds and oat grains in the Middle Cis-Ural region**

In the Middle Cis-Ural region the responses of Sinichka and Voskhod varieties of fiber flax, Ulov and Konkur hulled oats, Vyatsky naked oats to abiotic conditions are manifested in different elemental compositions of seeds and grains. The elemental compositions of fiber flax seeds and oat grains grown in the experimental field of JSC «Experimental training farm Iyulskoe of IzhSAA» were defined. Based on the results of the research conducted it has been established that fiber flax seeds, hulled and naked oat grains vary in the content of 70 chemical elements. The seeds of Sinichka and Voskhod fiber flax accumulate more sodium (260-380 mg / kg), magnesium (2900-3300 mg / kg), phosphorus 5600-6800 mg / kg), sulfur (2400-2600 mg / kg), potassium (6900-9000 mg / kg), calcium (1400-2200 mg / kg), copper (9.7-12 mg / kg), zinc (41-46 mg / kg), cobalt (0.13-0.19 mg / kg), strontium (4.6-7.6 mg / kg), cadmium (0.16-0.43 mg / kg) and barium (1.8-3.8 mg / kg). The hulled oat grains contain more silicon (640-770 mg / kg), hullless - phosphorus (5400-6300 mg / kg). In favorable abiotic conditions the fiber flax seeds and oat grains with a higher content of the chemical elements are formed. The content of heavy metals in the fiber flax seeds and oat grains does not exceed the limit. The varieties of fiber flax and hulled and naked oats under study can be used for food production.

**Key words:** fiber flax; oats; chemical elements; variety; abiotic conditions.

**Authors:**

**Fatykhov Ildus Shamilevich** - Doctor of Agricultural Sciences, Professor, Vice – rector for Research. Izhevsk State Agricultural Academy (11, Studencheskya street, Izhevsk, Russia, 426069, e-mail: nir210@mail.ru).

**Korepanova Elena Vitalevna** - Doctor of Agricultural Sciences, Professor of Crop Science Department. Izhevsk State Agricultural Academy (11, Studencheskya street, Izhevsk, Russia, 426069, e-mail: nir210@mail.ru).

**Kolesnikova Vera Gennadyevna** - Candidate of Agricultural Sciences, Assistant Professor of Crop Science Department. Izhevsk State Agricultural Academy (16, Kirova street, Izhevsk, Russia, 426033, tel. 8 (3412) 58-99-64).

**Ryabova Tatyana Nikolaevna** – Candidate of Agricultural Sciences, Assistant Professor of Crop Science Department. Izhevsk State Agricultural Academy (11, Studencheskya street, Izhevsk, Russia, 426069, e-mail: ryabova.tatyana@inbox.ru).