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Transformation of the Experience of Agribusiness Management of TEAM the European Union to Kazakhstan and the countries of Central Asia

КИнЭУ BILIM BOSTANDYK ORKENDEU

Materials of the XII International Scientific and Practical Conference "Transformation of the experience of agribusiness management of the European Union in Kazakhstan and the countries of Central Asia", dedicated to the 135th anniversary of the birth of the Kazakh poet and writer Myrzhakyp Dulatov

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CONTENTS

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Comparative characteristics of the applied methods of business planning for investment activities in the European Union and Central Asian countries

Abstract. This article presents the results of the study, during which the comparative characteristics of the theoretical and methodological aspects of the formation of business plans for investment projects in the countries of the European Union and Central Asian countries are studied, conclusions are given on the possibilities of adapting the experience of business planning of the European Union countries to the countries of Central Asia

Introduction

There are no universal methods for developing a business plan, but there are general recommendations for drawing up such documents.

First of all, a business plan should include several components:

- introduction (summary) - a short summary of the entire plan. As a rule, this is the part that potential investors pay attention to. Therefore, it is recommended to reflect in this part: the required amount of external borrowing, the estimated time frame for the return of funds, who is the guarantor of the return, or what the guarantee of the return of funds is. It is also necessary to reflect the amount of internal investment in the project. If there are several external investors, it is appropriate to list them all;
- enterprise and industry profile - the most important economic characteristics of the company relevant to the new project are reflected: economic and financial data, qualitative and quantitative composition of the company's top managers and employees, the company's main achievements and prospects. When characterizing the industry as a whole, the state of affairs in it is briefly described, and production and other connections of the company are shown;
- new product description - the features of the new product are described, its new features and it differs from competitors' products are listed. The technological issues and innovations that will be used in the launch of the new product are also mentioned. It should be emphasized that this part would be accessible for perception not only by a narrow specialist. It is necessary to note all the advantages of the new product, as well as to show that in the future, the characteristics can be further improved in accordance with the market requirements;
- marketing and sales policy - a story about what can make consumers buy your product or service. An overview of the planned advertising activities to promote a new product, a story about sales routes, a report on consumer surveys conducted to find out image preferences, etc.;
- production section - report on existing or planned production, data on your contractors in the production. The specific issues of optimizing new production, data on production processes, supply of the right raw materials or ingredients for the new product, planned delivery times of the new item to the retail network, etc. are reflected;
- organizational measures - data on the developers of the project and those who will be engaged in its implementation. Highlights the main issues of promotion and motivation of personnel of the management vertical, etc.;
- financial data-displays the main financial aspects. A number of data is shown, namely the costs of producing new products, calculating the cost of a new product, calculating the necessary financial revenues and their sources, cash flow, estimated profit, etc. The effectiveness and direction of the project - in a concise form, it shows who the new product is designed for, determines and sets out how effective the project will be, how great the return on investment will be;
- possible risks and risk management - analyses existing risks in the market, describes the

perceived risks, taking into account possible contingencies, lists what kind of guarantees the intended external investors have [45, p.138].

Object and methodology

There are several standard methods for developing a business plan:

- KPMG;
- ЕБРР;
- UNIDO.

KPMG is an international network of companies and offers consulting, auditing and other services. It offers its vision of the business plan structure (in terms of a professional approach).

KPMG is an international network of firms providing audit, tax and advisory services. It helps clients across the globe find new growth opportunities, improve performance, manage risk and enhance value for both shareholders and other stakeholders. The company's specialists help solve challenges related to enterprise strategy and business model requirements.

KPMG's approach is focused on increasing the value of the company or individual businesses and involves determining the added value at each stage, forming a list of internal reserves and developing an operating model that most effectively meets modern strategies and existing key competencies [36].

For the implementation of projects, KPMG specialists develop the most effective approach and form a team to implement the desired task. In general, all projects involve the following activities:

– quick review of the business for value creation;
– building a high-level business model;
– developing an operating model;
– development of an action plan for implementing change;
– assessment of market prerequisites;
– improving the efficiency of operations.

Also one of the accepted standards in business planning is the structure developed by the European Bank for Reconstruction and Development. The EBRD is essentially an investment vehicle that was created to support market economies in Central Europe and Asia. The EBRD was founded in 1991 with the participation of 60 countries of the world and a number of international organizations. The European Bank for Reconstruction and Development is one of the largest investors in Europe and the Central Asian region. The EBRD attracts many foreign investments and uses its own funds to develop these regions. Investments are made both to support and develop existing enterprises and to create new companies and industries. The close relationship and engagement of EBRD with public institutions allows it to participate in the creation of a more favourable environment for entrepreneurs [36].

The United Nations Industrial Development Organization (UNIDO) has developed a methodology for evaluating investment projects, which is recognized by experts all over the world. It is universal, i.e. it is suitable for all sectors of activity in almost all conditions. For our country, this methodology is the most acceptable. The downside of universality is a lack of flexibility and a lack of consideration for local conditions. However, for the first steps, this is not so important. It is extremely valuable that the UNIDO projects are understandable to Western investors both in terms of terminology and structure. According to UNIDO recommendations, any investment project goes through three stages:

- pre-investment;
- investment, or implementation phase;
- operational.

In the first, pre-investment phase, feasibility studies are carried out. The investor's requirements usually determine the level of detail. Three levels of research are distinguished:

- exploring opportunities
- preparatory (pre-project studies)

- feasibility assessment.

The larger the enterprise, the more precise the research has to be. In smaller projects, the design is usually not very detailed. The cost of pre-investment studies ranges from 0.8 % for large projects to 5 % for smaller investments. In addition to the studies, the pre-investment phase of a project includes a number of organisational activities: company registration, contracting, issuing securities, etc. The most important outcome of this phase should be a business plan, which will be implemented.

The point of pre-investment studies is to provide sufficient evidence about the viability of the project. Sometimes they are supplemented by expert advice (supporting studies). A project appraisal allows the investor to decide whether to invest or not. Financial and economic appraisal is particularly important. It is based on the results of all pre-investment studies. The validity of the assessment depends on the completeness and reliability of the data and on the competence of the experts.

The general criteria for commercial attractiveness of projects are financial viability and economic evaluation. Both criteria complement each other. The first gives an indication of a project's liquidity, i.e. its creditworthiness. The second refers to the ability to preserve the invested funds and ensure their growth. A formalized assessment of financial viability includes: a profit and loss statement, a cash flow statement, and a balance sheet. The economic evaluation is formalised using two methods: the simple method and the discounting method. Simple methods: simple rate of return, payback period. Discounting methods: present value of the project, internal rate of return. The calculations are made on the basis of prepared data according to certain formulas, and the calculations are recorded in tables [39, c.87].

The last stage of accepting a business plan, which is called a due diligence, deserves special mention. This check is performed by the investor to familiarise himself with the project on site. Its objectives are as follows:

- verify the accuracy of the financial information provided;
- find confirmation of the assumptions plaid in the business plan;
- make sure that all the necessary documents are executed correctly, including compliance with the current legislation;
- verify that the managers of company are able to implement the strategy and ensure that the objectives are achieved.

Comparing all the above-mentioned variants of business plan structures, it should be noted that the structure proposed by KPMG contains most of the market research. This is not surprising, since the company has a consulting nature and marketing analysis from its point of view - an independent objective observer - is quite necessary. The production and investment plans, on the other hand, were abolished as separate sections and included in the financial analysis. Special attention is paid to the section of the advertising company, its strategy and the promotion of the innovation to the market, and the management processes have not been spared. With the help of these sections, you can identify the purpose of a business plan - it is to promote a product to the market with the help of competent advertising and how to implement this in order to obtain economic benefits.

The second version of the business plan structure developed by the European Bank for Reconstruction and Development is similar to both the first and the last business plan versions discussed. However, it is much less detailed compared to them. On the other hand, it is the simplification that was the focus of the EBRD in developing its model. Yet this methodology would be poorly applicable in our market environment.

In contrast, the structure proposed for use by UNIDO appears to be much more extensive in its coverage of business planning aspects. It not only looks in detail at marketing and finance, but also at production and investment analysis as separate sections.

The plan is therefore more detailed. In addition, a separate column is dedicated to risk analysis, which is quite relevant for the Russian economy. All the sections are logically linked. Starting with an analysis of the industry, the business plan then moves on to an examination of

the enterprise itself and its capabilities. This is followed by a description of the future project and its essence.

The next section justifies the need for the product and how to market it. After that, the plan deals directly with the process of project implementation - by technical and financial means. Next is the investment analysis, and it concludes with a discussion of possible risks in the implementation of the project.

The structures proposed by the EBRD and KPMG are most commonly used in developed market economies. Belarus does not currently belong to them. The United Nations Industrial Development Organization (UNIDO) is an organisation that promotes global prosperity by supporting the industrial development of developing and transition economies. Therefore, the plan they propose is likely to be the most appropriate [36].

Research results

Starting a business in Kazakhstan, first decide on the legal status. Two forms of business organisation can be used in Kazakhstan: individual entrepreneur and organisation (or its branch).

An individual entrepreneur must register with the territorial tax authority of Kazakhstan.

The activity of an entrepreneur without registration is prohibited. Individuals are recognized as entrepreneurs if one of the following conditions is met:

1) the presence of employees on a permanent basis;

2) the total annual income from entrepreneurial activity in excess of the non-taxable income established by the legislative documents of the Republic of Kazakhstan.

When forming a business plan, Kazakhstani entrepreneurs adhere to a certain form of it, disclosing all information about the planned investment project.

Table 1 - Comparative characteristics of applied business planning methods for investment activities

European Union countries	Central Asian countries
1. Introduction (summary)	1. Summary of the business plan
2. Characteristics of the enterprise and industry	2. Financial evaluation of the project
3. New Product Description	3. Product Description
4. Marketing and Sales Policy	4. Information about the market and competitors
5. Production section	
6. Organizational arrangements	5. The project implementation plan
7. Financial data	6. Description of required resources
8. Possible risks and risk management	7. Financial plan

The results of the comparative characterisation of the business planning process in the European Union and Central Asia showed that in general the basic structure of the business plan does not differ significantly, except for the section "Possible risks and risk management", which in our opinion should be taken into account when formulating a business plan in Central Asia, as inevitable difficulties arise in business development and risks have to be taken.

Conclusion

Thus, business planning in the enterprise is the starting point for starting financial activities. It tells us whether to invest in it, defines specific areas of activity of the company, formulates long-term and short-term goals, and assesses the financial situation of the company. In this chapter, the content of the business plan was given, and the issues addressed in each paragraph were identified. Business planning models used in foreign countries are described, and the method closest to the market situation in our country is determined. The content shows the importance of all factors for starting and running a business. No less important is the financial strategy of the company. It gives an idea of the company's activities in the short and long term, determines the ways of development. To sum up, it is safe to say that a business plan is of high importance for the start of any business.

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Methods of managing financial flows in the countries of the European Union

Abstract. For Kazakhstan and countries of Central Asia world experience is very important European Union in an agribusiness. The study of this experience must be begun with consideration of historical aspects of origin of theory of investments and investment management. In the article management methods are expounded by financial streams on the example of countries of European Union, basic principles over of portfolio of investments construction are brought in particular.

Key words: theorem about an efficient set, random error term, efficient set "Beta" is a coefficient, feasible set, "aggressive" actions, efficient portfolios, "defensive" actions, inefficient portfolios, market risk, optimal portfolio, own risk, market model, diversification.

Introduction

In order to use the basics of investment management of the countries of the European Union, Kazakhstani farmers should study the problems existing in modern European investment management.

The European Union has one of the best international practices in applying methods of managing financial flows in production. Studying and disseminating this experience is strategically important both for Kazakhstan and for all countries of Central Asia.

Object and methodology

The object of the study in this work was the methods of managing financial flows, considered from the perspective of the experience of the countries of the European Union.

The methodological basis of the work was the general scientific principles and research methods: analytical, logical, monographic methods, as well as groupings and comparisons.

Research results

Comprehensive study of theoretical issues and practical foundations of European Union financial management methods.

Conclusions

It is concluded that, having studied the methods of managing financial flows, we will have a comprehensive understanding of the basics of portfolio investment in accordance with the basic principles of forming a portfolio of investments adopted in the scientific literature of the European Union.

Portfolio investment allows you to plan, evaluate, control the final results of all investment activities in various sectors of the stock market.

As a rule, a *portfolio* is a certain set of corporate stocks, bonds with varying degrees of collateral and risk, as well as securities with a fixed income guaranteed by the state, i.e. with a minimum risk of losses on the principal amount and current receipts.

For example, until recently, banks, based on the foreign experience of the European Union, forming an investment portfolio, collected it in the following ratio: in the total amount of securities, about 70% are government securities, about 25% are municipal securities and about 5 % - other securities. Thus, the stock of liquid assets is approximately 1/3 of the portfolio, and investments for profit - 2/3. As a rule, such a portfolio structure is typical for a large bank, while small banks in their portfolio have about 90% of government securities. Theoretically, a portfolio can consist of securities of one type, as well as change its structure by replacing some securities with others. However, each security individually cannot achieve a similar result.

The main objective of portfolio investment is to improve investment conditions by giving a set of securities investment characteristics that are unattainable from the standpoint of a single security and are possible only when combined. Only in the process of portfolio formation is a new investment quality achieved with specified characteristics. Thus, the securities portfolio is the tool with which the investor is provided with the required stability of income with minimal risk.

Consider the basic principles of forming an investment portfolio:

when forming an investment portfolio should be guided by the following considerations:

-safety of investments (invulnerability of investments from shocks in the investment capital market);

-stability of income;

-liquidity of investments, i.e., their ability to participate in the immediate purchase of goods (works, services) or quickly and without loss in price turn into cash.

None of the investment values have all of the properties listed above. Therefore, a compromise is inevitable. If the security is reliable, then the yield will be low, since those who prefer reliability will offer a high price and bring down the yield. The main goal in the formation of the portfolio is to achieve the most optimal combination between risk and income for the investor. In other words, the corresponding set of investment instruments is designed to reduce the risk of the depositor to a minimum and at the same time increase his income to a maximum.

The main issue in portfolio management is how to determine the proportions between securities with different properties. So, the *basic principles of building a classic conservative (low-risk) portfolio* are the principle of conservatism, diversification and sufficient liquidity.

The ratio between highly reliable and risky shares is maintained so that possible losses from a risky share are overwhelmingly covered by income from reliable assets.

Investment risk, therefore, does not consist in the loss of part of the principal amount, but only in obtaining insufficiently high income. Naturally, without risking, one cannot count on any super-high incomes. However, practice shows that the vast majority of customers are satisfied with incomes that range from one to two deposit rates of banks of the highest reliability category and do not want to increase income due to a higher degree of risk.

Diversification of investments is the main principle of portfolio investment. The idea of this principle is well manifested in an old English saying: “Do not put all eggs in one basket”.

In the language of an economist, this is - do not invest all the money in one paper, no matter how profitable this investment may seem to you. Only such restraint will avoid catastrophic damage in the event of an error.

Diversification reduces the risk due to the fact that possible low incomes on one securities will be offset by high incomes on other securities. Risk minimization is achieved through the inclusion in the securities portfolio of a wide range of industries that are not closely related to each other in order to avoid synchronization of cyclical fluctuations in their business activity. The optimal value is from 8 to 20 different types of securities.

Spraying of investments occurs both between those active segments that were mentioned, and inside them. For government short-term bonds and treasury bonds, we are talking about diversification between securities of various series, for corporate securities between shares of various issuers.

Simplified diversification consists simply in dividing funds between several securities without serious analysis. A sufficient amount of funds in the portfolio allows you to take the next step to carry out the so-called sectoral and regional diversification.

The principle of industry diversification is to prevent portfolio distortions in the direction of securities of enterprises of the same industry. The fact is that a cataclysm can comprehend the industry as a whole. For example, a drop in oil prices on the world market may lead to a simultaneous drop in the share prices of all oil refineries, and the fact that your investments will be distributed among various enterprises in this industry will not help you. The same applies to enterprises in one region. A simultaneous decline in stock prices may occur due to political instability, strikes, natural disasters, the introduction of new transport routes passing the region.

An even deeper analysis is possible using a serious mathematical apparatus. Statistical studies show that many stocks rise or fall in price, usually at the same time, although there are no such visible links between them as belonging to the same industry or region. Changes in prices of other pairs of securities, on the contrary, are in antiphase. Naturally, diversification between the second pair of securities is much more preferable. The methods of correlation analysis allow, exploiting this idea, to find the optimal balance between different securities in the portfolio.

The principle of sufficient liquidity is to maintain the share of quick-selling assets in the portfolio not lower than the level sufficient to conduct unexpectedly high-profitable transactions and satisfy customer cash requirements. Practice shows that it is more profitable to keep a certain part of the funds in more liquid (albeit even less profitable) securities, but be able to quickly respond to changes in market conditions and certain advantageous offers. In addition, contracts with many customers simply oblige to keep part of their funds in liquid form.

Portfolio investment income represents gross profit for the entire set of securities included in a portfolio taking into account risk. There is a problem of quantitative correspondence between profit and risk, which should be addressed promptly in order to continuously improve the structure of already formed portfolios and the formation of new ones, in accordance with the wishes of investors. It must be said that this problem is one of those for the solution of which it is quickly enough possible to find a general solution scheme, but which are practically not solved until the end.

When considering the creation of a portfolio, the investor must determine for himself the parameters by which he will be guided:

- you need to choose the optimal type of portfolio;
- assess an acceptable combination of risk and portfolio income and, accordingly, determine the specific gravity of the securities portfolio with different levels of risk and income;
- determine the initial composition of the portfolio;
- choose a scheme for further portfolio management.

The main advantage of portfolio investment is the ability to choose a portfolio to solve specific investment problems. To do this, various portfolios of securities are used, each of which will have its own balance between the existing risk acceptable to the owner of the portfolio and the expected return (income) for a certain period of time. The ratio of these factors and allows

you to determine the type of portfolio of securities. The type of portfolio is its investment characteristic, based on the ratio of income and risk. At the same time, an important feature in classifying a portfolio type is the way in which and from what source this income was received: due to an increase in the market value or due to current payments - dividends, interest.

There are *two main types of portfolio*: a portfolio focused on the predominant receipt of income from interest and dividends (*income portfolio*); a portfolio aimed at the predominant increase in the exchange rate of its investment values (*growth portfolio*). It would be simplified to understand the portfolio as a kind of homogeneous aggregate, despite the fact that the growth portfolio, for example, is focused on stocks, the investment characteristic of which is an increase in the market value. It may include (securities with other investment properties. Thus, they also consider growth and income portfolios.

The growth portfolio is formed from the shares of companies whose market value is growing. The purpose of this type of portfolio is to increase the capital value of the portfolio along with the receipt of dividends. However, dividend payments are made in a small amount, therefore it is the growth rate of the exchange value of the aggregate of shares included in the portfolio that determines the types of portfolios included in this group.

The aggressive growth portfolio is aimed at maximizing capital gains. The structure of this type of portfolio includes stocks of young, fast-growing companies. Investing in this type of portfolio is quite risky, but at the same time they can bring the highest return.

The portfolio of conservative growth is the least risky among the portfolios of this group. It consists mainly of shares of large, well-known companies characterized by, albeit low, but steady growth rate of the market value. The portfolio composition remains stable over a long period of time. This type of portfolio is aimed at preserving capital.

A medium-growth portfolio is a combination of the investment properties of aggressive and conservative growth portfolios. In this type of portfolio, risky stock instruments, the composition of which is periodically updated, are included along with reliable long-term securities. At the same time, an average capital gain and a moderate degree of investment risk are ensured. Reliability is provided by securities of conservative growth, and profitability - by securities of aggressive growth. This type of portfolio is the most common portfolio model and is very popular among investors who are not prone to high risk.

The income portfolio is focused on obtaining high current income - interest and dividend payments. The income portfolio is mainly composed of income shares characterized by moderate growth in market value and high dividends, bonds and other securities whose investment property is high current payments. A feature of this type of portfolio is that the purpose of its creation is to obtain an appropriate level of income, the value of which would correspond to the minimum degree of risk acceptable to a conservative investor. Therefore, the objects of portfolio investment are highly reliable instruments of the stock market with a high ratio of stable interest and exchange rate.

The regular income portfolio is formed from highly reliable securities and brings average income with a minimum level of risk. The yield portfolio consists of high-yield corporate bonds, high-yield securities with medium risk.

The formation of the type of growth and income portfolio is carried out in order to avoid possible losses on the stock market both from a fall in the exchange rate and from low dividend or interest payments. One part of the financial assets included in this portfolio brings the owner an increase in capital value, and the other - income. The loss of one part can be offset by an increase in the other. We describe the types of this type of portfolio.

The structure of a dual-purpose portfolio includes securities that bring its owner a high income with an increase in invested capital. In this case, we are talking about securities of dual-purpose investment funds. They issue their own shares of two types: the first - bring high income, the second - capital gains. The investment characteristics of the portfolio are determined by the significant content of these securities in the portfolio.

A balanced portfolio assumes a balance not only of income, but also of the risk that accompanies transactions with securities, and therefore, in a certain proportion, consists of securities with a rapidly growing market value and highly profitable securities. The portfolio may include highly risky securities. As a rule, this portfolio includes ordinary and preferred shares, as well as bonds. Most of the funds invested in various stock instruments included in this portfolio, depending on market conditions.

Using the effective set theorem, an infinite number of portfolios can be formed from a set of N securities. Consider the situation with companies A, B and C, when N is three. An investor can buy only shares of company A, or only shares of Baker, or some combination of shares of two companies. For example, he can invest half of the money in one and half in another company, or 75% in one, and 25% in another, or 33% and 67%, respectively. Ultimately, an investor can invest any percentage (from 0 to 100%) in the first company, and the balance in the second. Even without considering the shares of company C, there are an infinite number of possible investment portfolios. Does an investor need to evaluate all of these portfolios? Fortunately, the answer is no. The fact that an investor should consider only a subset of possible portfolios is explained in the following effective set theorem.

The investor will choose his optimal portfolio from a variety of portfolios, each of which:

- provides the maximum expected return for a certain level of risk;
- provides minimal risk for a certain value of expected return.

A set of portfolios that satisfy these two conditions is called an efficient set, or effective boundary.

Reachable set, (Figure 4.1.1) is an illustration of the location of the feasible set, also known as set of possibilities, from which an effective set can be extracted. Achievable set represents all portfolios that can be formed from a group of securities. This means that all possible portfolios that can be formed from N securities lie either on the border or within the reachable set (points G, E, S and H in Figure 4.1.1 are examples of such portfolios). In the general case, this set will take the form of an umbrella type, similar to that shown in the figure. Depending on the securities used, it can be shifted more to the right or left, up or down, in addition, it can be wider or the set already given here. The main thing is that, with the exception of degenerate cases, it will look like the set shown in Figure 1.

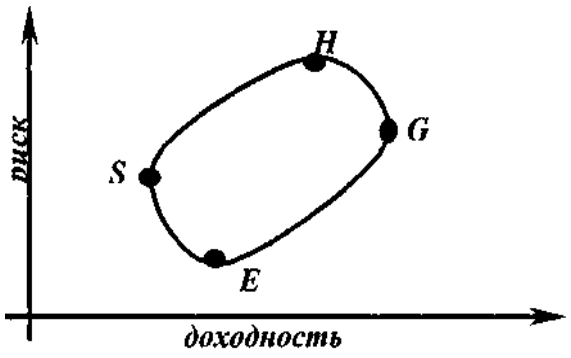

Рис. 4.1.1. Достижимые и эффективные множества

We can determine the location of an effective set by applying the effective set theorem to an reachable set.First, we single out the set of portfolios satisfying the first condition of the effective set theorem. If you look at fig. 4.1.1, it can be noted that there is no less risky portfolio than portfolio E. This is because if you draw a vertical line through E, then no point of the reachable set will lie to the left of this line. Moreover, there is no riskier portfolio than N. Portfolio. This is because if you draw a vertical line through H, then no point of the reachable set will lie to the right of this line. Thus, the set of portfolios that provide the maximum expected return with a varying level of risk is the part of the upper boundary of the reachable set located between points E and H.

Considering the second condition below, it can be noted that there is no portfolio that provides a higher expected return than portfolio S, because none of the points of the reachable set lies above the horizontal line passing through S. Similarly, there is no portfolio that provides a lower expected return, than portfolio G, because none of the points of the reachable set lies below the horizontal line passing through G.

Thus, by a set of portfolios that provide minimal risk with a changing level the expected return is the part of the left border of the reachable set located between points S and G. Given that both conditions must be taken into account when determining the effective set, we note that we are satisfied only with portfolios lying on the upper and left border of the reachable set between points E and S. Accordingly, these portfolios constitute an effective set, and from this set of effective portfolios, the investor will choose the best one for himself. All other achievable portfolios are inefficient portfolios, so we can ignore them.

How does an investor choose the best portfolio? As shown in Figure 4.1.2, the investor must draw his indifference curves in one drawing with an effective set, and then proceed to choose a portfolio located on the indifference curve, located above and to the left of the others. This portfolio will correspond to the point at which the indifference curve touches the effective set.

As can be seen from Figure 4.1.2, such a portfolio is portfolio O on the indifference curve I2. There is no doubt that the investor would prefer a portfolio located on curve I3, but such an achievable portfolio simply does not exist.

The desire to be on a particular curve cannot be realized if the given curve does not cross the reachability set anywhere. As for curve I1, there are several portfolios that an investor can choose (for example, O).

However, the figure shows that portfolio O is the best of these portfolios, as it is on the indifference curve located above and to the left.

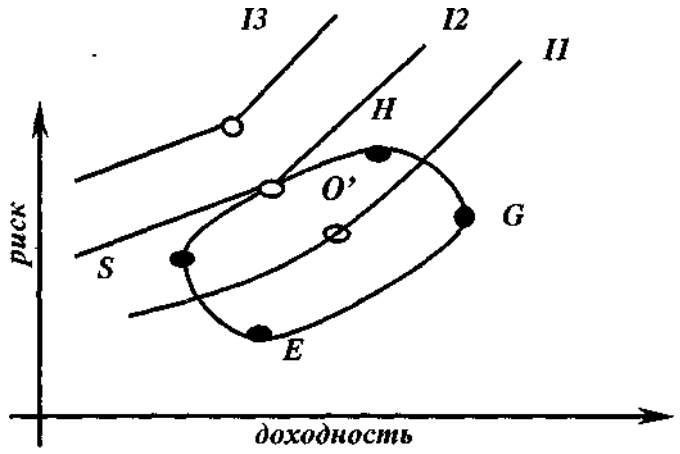

Рис. 4.1.2. Выбор оптимального портфеля

The effective set theorem seems quite rational. The investor must choose a portfolio lying on the indifference curve located above and to the left of all other curves.

The effective set theorem states that the investor should not consider portfolios that do not lie on the upper left boundary of the reachability set, which is its logical consequence.

The indifference curves for an investor avoiding risk are convex and have a positive slope. Now we show that the effective set is generally concave and has a positive slope, that is, the segment connecting any two points of the effective set lies below this set.

This property of effective sets is very important, since it means that there is only one point of tangency of the effective set and indifference curves.

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European experience in corporate culture formation

Abstract: The European experience in the formation of corporate culture is an important socio-philosophical approach to the culture of domestic business organizations.

Keywords: corporate culture, European Union, development, cooperation, organization, production, corporation, result, foreign experience.

Introduction

Corporate culture is a system of material and spiritual values and manifestations that interact with each other, and is inherent in the corporation, reflect its individuality and perception of itself and others in the social and material environment, which manifests itself in behavior, interaction, perception of oneself and the environment. The development of cooperation between the European Union and Central Asian countries in the format of corporate culture will contribute to the integration of experience in domestic corporations.

Object and methodology

The object is European corporate culture.

In the process of the study, organizational methods were used that allow us to establish relationships and interdependencies between phenomena of various types.

These methods are aimed at theoretical study of the material, comparison, analysis of literary sources and documents, generalization.

Research results

Europe is characterized by the coexistence of different cultures with their similarities and differences. The cultural differences that exist in the European Union are not an obstacle to European integration; they are gradually becoming the source of many competitive advantages for EU companies and Central Asian countries.

In Britain, where social status is very important, the hierarchy within the company is very tight, while Italy, on the contrary, is characterized by a “spirit of freedom" and, as a result, a low level of discipline, "weak" management. French corporate culture is characterized by arrogance and snobbery; managerial techniques in French companies are somewhat old-fashioned due to the tendency to manage "the old fashioned way".

Germans are characterized by excellent discipline and zeal. For example, a German employee at Nutzwerk might be fired if he is caught complaining about life in his workplace. The contract that Nutzwerk employees fill out when they go to work has the following clause: "... complaints to Nutzwerk are prohibited ... unless they are accompanied by constructive proposals to improve the situation." Negative energy affects not only the mood of the employee, but also labor productivity. “If you want to work in your company it would be interesting and fun, and if you want to realize really significant goals, then you are unlikely to be able to achieve this if your employees are constantly in a bad mood. In this case, they just waste time, and this time belongs to the company,” the head of the company believes [1].

A very large number of employees are involved in the decision-making process in a German company, and although it takes a lot of time to attract various specialists to this process, the “quality of decision-making” is very high. A German company respects a clear division of rights, duties and related responsibilities.

In general, European corporate culture is considered the most bureaucratic, most researchers believe that the vertical decision-making system existing in European companies makes it difficult to express personal initiatives, however, the mandatory implementation of ethical business standards, correct behavior and courtesy create a pleasant friendly atmosphere.

Many European companies adopt and transform the “American experience”, for example, corporate universities were created at Siemens, DaimlerChrysler (Germany), Heineken (Netherlands), however, unlike a similar American institution, European implies a “place for the exchange of knowledge and competencies "Or" a link between the transfer of knowledge and its creation. " In general, European companies are characterized by an effective knowledge management system, which, on the one hand, simplifies the management system and significantly improves the social status of workers, their labor productivity, and on the other, significantly increases the profit of companies.

The discovery of the fact that a special culture is formed and develops in organizations very quickly led to numerous studies that argue among themselves and offer various ways of describing organizational cultures and their classification. But all researchers agree that, willing or not, corporate culture always exists in the organization, sets its uniqueness and always affects business results.

Creating a corporate culture most often occurs spontaneously. It consists of fragments of cultures introduced by different people from previous collectives, and often does not correspond to the aspirations of leadership.

Unofficial corporate culture manifests itself in a managerial style and real interactions between employees.

The official corporate culture is reflected in the corporate code of the company: (mission, vision, slogans, values, goals, rules and norms of internal and external behavior and interactions).

The mismatch of the official and unofficial corporate culture leads to a worsening of the adaptation of new employees, increasing employee anxiety and reducing motivation.

How much does corporate culture in Kazakhstan differ from corporate culture in European countries??

Each successful organization evaluates itself according to various criteria. In production (it doesn't matter - Kazakhstan or foreign), in the first place are manufacturability, feasibility, compliance with quality standards and criteria.

In commercial structures of any nationality, sales volume, compliance with market requirements, customer focus is always in the first place. According to these values, rules of conduct and requirements for people are built.

Very often, the organization's culture is based on the experience and values of the founders or first persons of the company. If the first persons are accustomed to staying at work until late at night, then employees will also have to adhere to this rule, even if there is no production need for this. If the first persons of the company are accustomed to solve all issues, up to the purchase of staples, then the employees of such a company should not strive to do anything on their own. And independent and aspiring to make responsible decisions will never take root in such a structure.

Thus, the corporate culture of the company represents certain values and norms shared by the employees of this organization. These values are embodied in symbols, legends, heroes, mottos and ceremonies: somewhere in the morning they sing hymns (a Kazakhstan company), and somewhere every day before the workday they read out values (foreign). It is simply very important to clearly articulate who we are and what we want. And, of course, having determined this, put in the basis of personnel selection.

And therefore, when hiring a multinational company for Kazakhstani production, the main criterion for screening was the question: "How will you behave if a fire occurs in the factory?" The correct answer, according to the instructions, is to run and try to extinguish it. Therefore, only 1 out of 5 applicants answered the question correctly, but this one was fully consistent with the corporate culture of this company and ensured its success.

On the other hand, one client, the financial director of the largest foreign company, having moved from Kazakhstan to Switzerland, was very upset, talking about how easy it was to work with Russian subordinates, who, if necessary, remained working until late, without requiring compensation, whereas Swiss employees left work at 5 p.m. regardless of whether the task was completed or not.

Thus, far-sighted leaders of successful enterprises consider the corporate culture of the organization as a strategic tool that allows them to orient all divisions and individual employees of the company towards common goals and values, ensure dedication to the cause and the company, facilitate communication and achieve mutual understanding.

And, strictly speaking, it doesn't matter what the national identity of the company is. It is important to be aware of your particularities, select employees for yourself in accordance with these particularities, and always be open to feedback so as not to miss the moment when the unofficial culture begins to diverge from the official.

Despite the fact that the corporate cultures of various organizations of each country are significantly different, they, one way or another, fit into the general national economic culture or economic mentality. In recent decades, in both economic and socio-philosophical literature, more and more attention has been paid to problems associated with the national characteristics of the economic mentality.

It becomes obvious that the national economic mentality is a very important factor in the thinking and behavior of people, as well as the economic life of society as a whole.

A higher stage in the development of corporate culture is business culture.

Business culture can be described as a tool for transforming management technologies into technologies for systemic organization of the corporation. Those companies that go to the level of business culture have better conditions for their development, since:

- contribute to the formation of new opportunities for business development;
- form a new cultural environment that provides the emergence of new needs of society in the development of additional types of business.

Companies at different levels of corporate culture development have different perspectives (table 1).

Table 1 - the Prospects of companies with different levels of corporate culture

Level	Company Profile	Company prospects
Corporate culture	Developed attributes of corporate culture; orientation to profit, gaining and maintaining market positions; patriotism, team spirit	In the absence of the ability to take into account the rapidly changing macro environment, the company may become ineffective
Intercorporate Culture	Openness, willingness to change. The corporate culture of the company is tolerant of other cultures, their values, norms and attributes.	Additional business opportunities, expansion of information resources, staff development, stable operation of the company
Business culture	Readiness for social partnership; mutual enrichment of the corporate culture of the company and public values	Developed values and needs form the prerequisites for the emergence of new activities

The culture of the corporation and its components is the result of human actions, thoughts, desires, is accepted by the vast majority of corporation members. It is multifaceted, it can be changeable or unchangeable, knowable or unknowable, conscious or unconscious.

The national economic culture reacts positively to advanced foreign experience, with the ability to combine Western technology and the Kazakh spirit.

At the same time, foreign innovations are quickly becoming an organic element of the Japanese economy. In contrast, in our economic history there is an alternation of attempts to blindly copy foreign experience or to reject it.

Conclusion

The concept of corporate culture does not have a single universally accepted interpretation.

An important approach to understanding corporate culture is the socio-philosophical approach to the culture of an economic organization, in which the latter is considered as a specific social group, the members of which share certain common norms and values. It was revealed that corporate culture includes, first of all, acquired forms of behavior and thinking, it changes over time, it is characterized by continuity, assimilation of tradition, as well as variability, creation of a new.

In the corporate culture, the level of ideas, values, ideals that people have created or discovered and which they are trying to translate into real behavior is also important. Corporate culture must be constantly maintained and reproduced, and this is impossible if it does not contribute to meeting the needs of the organization’s employees, especially social and spiritual.

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Forecasting as an activity to form the prerequisites for making investment decisions

Abstract. In this article, the author presents the results of a study in the field of forecasting, in particular as an activity on the formation of prerequisites for making investment decisions. The article outlines the essence, principles and types of forecasting in the European Union countries, considers the methods and methods for forecasting the investment activity of the European Union countries, the sequence of investment analysis in making investment decisions, and also presents the possibilities of forecasting and making investment decisions in the agribusiness of Kazakhstan and Central Asia taking into account the experience of the European Union.

Key words: plan, business plan, planning, management, project, strategic plan, conceptual plan, tactical plan, operational plan, functional plan, scheduling, critical work duration.

Introduction

In modern conditions of market economy does not doubt the relevance of planning and management activities of the company as effective economic development must meet the goals and objectives set by the governing body. In this sense, forecasting is the most important function of making investment decisions.

Object and methodology

The theoretical foundations of investment forecasting processes, viewed from the perspective of the European Union experience, served as the object of research in this publication.

The methodological basis of the work was based on general scientific principles and research methods: analytical, logical, monographic methods, as well as grouping and comparison.

Research results

The results of the study have theoretical and practical relevance and can be recommended for use in introducing selected elements into the forecasting and investment decision-making systems of Central Asian countries.

Conclusions

It is concluded that when justifying the prospects for further development of the forecasting system, it is necessary to take into account the sectoral features of the functioning of enterprises in Kazakhstan and Central Asian countries.

Planning is the process of making and practical implementation of management decisions, and forecasting involves the formation of prerequisites for their adoption. Such prerequisites and at the same time forecasting functions are:

- quantitative and qualitative analysis of trends in investment processes, existing problems and new phenomena;

- probabilistic, alternative foresight of the future development of priority sectors of the national economy as possible objects of capital investment;

- assessment of the opportunities and consequences of investing capital in a particular area of the economy.

Having studied the works of such foreign scientists as Teyubov R.T. [1], Minkeev O.D. [2], Charaeva M.V., Paleev A.V. [3], Kutepov O.E. [4], Hofreither M. F. [5], Emily Beament, Conrad Duncan [6], M. Wigier, A. Kowalski [7], Alan Matthews [8], Robert Ackrill [10], Bureau J.C. [11], Mahé, L.P., Daugbjerg, C., Swinbank, A [14] the author provides the theoretical foundations of forecasting as an activity to form the prerequisites for making investment decisions.

Plan and forecast are not two alternative approaches to determining the prospects for capital efficiency in a particular industry, but mutually complementary stages of planning, with planning playing a defining role. However, forecasting precedes the possibility or likelihood of certain events occurring. A plan is developed on the basis of a forecast. Although interdependent, foresight is different from planning:

Firstly, the planning indicators should mainly meet the structure and requirements of investment process management, while the forecast indicators should meet the requirements of cognition of objective processes.

Secondly, the plan is directive in nature, it is assumed to be targeted, that is, the plan is an already made management decision. In turn, the forecast may not correspond to the existing organizational structure of the economy and may not have an administrative address.

Thirdly, the process of developing a plan is of a variant nature, but the adopted plan is an already chosen variant of development, subject to practical implementation. The forecast is a variant, alternative, and not only as a development method, but also as an end result.

Fourthly, the nature of planning is determined by the desire to strengthen the determinism of future development, while forecasting is based on probabilistic anticipation. By ignoring forecasting, an investor approaches consideration of the future by acting blindly. He or she makes decisions without regard to future consequences (favourable or unfavourable). Even if external conditions do not change, most of the decisions made will be ineffective.

Forecasting is a complex process of examining the main areas of capital investment. Forecasting defines the planning boundary, establishes the realistic pace of development, lists all available options and ensures the development of baselines for the plan. Given the challenges of forecasting, different methods are used. Of particular interest are: Delphi method, analogy forecasting, extrapolation, normative method.

A forecasting method involving the use of commissions or groups of experts is called the Delphi method. It is characterised by anonymity, i.e. the group members are not known to each other. Forecasting is carried out by interviewing a group of experts through a series of questionnaires. Prediction by analogy involves finding similarities of phenomena in some particulars while being dissimilar in others. The method is less subjective, but not very accurate. Forecasting from the achieved level is carried out in accordance with the existing development trends (extrapolation). This establishes the interdependence between the present and the future. The method itself is simple and does not sufficiently take into account the dynamics of societal needs. The normative (goal-oriented) method characterises another aspect of projected processes, the dependence on goals. Any goal can be fixed in the form of some normative state and in the form of a desirable trajectory of transition from the existing state to the normative one. The role of this forecasting method increases when the forecasting period is lengthened.

Forecasting is based on the following principles:

- systematicity - economic phenomena and processes, financial results are considered as a single object, as a set of relatively independent areas (blocks) of forecasting;

- adequacy - identification and quantitative measurement of stable trends and relationships, the creation on this basis of a theoretical analogue of real economic processes;

- alternativeness, i.e. the possibility of investing capital in different areas with different

interrelations and structural relations;

- purposefulness, i.e. the need to build a hierarchy of social needs in the form of goals or other structure.

Planning is the process of making and implementing management decisions, while *forecasting* implies the formation of prerequisites for making them. These prerequisites and at the same time the functions of forecasting are:

• Quantitative and qualitative analysis of trends in investment processes, existing problems and new developments;

• A probabilistic, alternative foresight of the future development of priority sectors of the economy as possible targets for capital investment;

• Assessment of the possibilities and consequences of capital investment in a particular area of the economy.

Since the 1920s, efforts to describe and predict economic cycles based on statistical series have led some countries to either expand the function of government statistical agencies or to create new institutions for short-term economic analysis. Methods for solving these problems also developed, causing numerous disputes. Three such methods currently being implemented are not, of course, mutually exclusive, but in each of the countries they were often and in different ways opposed to each other.

The first method is the method of short-term economic analysis. Its essence is in the study of intra-annual series, usually monthly, since the 50s this method has been supplemented by a survey of the confidence of business leaders. The credibility of this approach is "qualitative" and is not supported by either balance sheets or economic modeling.

The second method is the "national accounts" method. It involves the maintenance of annual national accounts, which are then "projected" into the current and next year for the preparation of "economic budgets" or medium-term forecasts. They consist of projections of annual flows (often based on expert judgment) presented in the framework of national accounts, which are considered consistent and universal.

The third method, associated with the name of the Dutch economist Jan Tienbergen, relies on econometric modeling of stable trends observed in the past. This method appeared in the Netherlands in 1936 and is used for dynamic planning, which is strikingly different from the French planning, which was used until the end of the 60s of the last century.

The Federal Republic of Germany has achieved a high level of tax and budget transparency. Fiscal management is carried out in accordance with a comprehensive, accurate and carefully enforced body of laws and regulations. Although the fiscal system in Germany is highly decentralized, and the different levels of government have significant autonomy, within the same legal framework, a clear division of roles and responsibilities is made. Reasonable budgeting, accounting, and reporting standards apply to all levels of government, and long-term budget preparation is an integral part of the process, while fiscal reports reflect contingent liabilities, guarantees, tax expenditures and equity interests.

Both the Constitution and the Law on Stability and Growth Promotion oblige all levels of government to pursue responsible fiscal policy in order to achieve macroeconomic targets. The federal center and the federal states are obliged to build their budgets, taking into account the goal of general economic equilibrium. Borrowing by the federal center is limited to the amount of the investment budget (the "golden rule"), and many federal states have similar rules, although in all other respects, the federal center and the states enjoy independence when making decisions on borrowing. The federal center has received some limited rights to legislate the ceiling on borrowing if there is a threat to the general economic equilibrium. In turn, the financial affairs of the local government (Gemeinden) are subject to control by the respective federal states, which are entitled to approve their budgets and borrowings. Without their approval, Gemeinde can only spend on statutory obligations. Self-government bodies are also required to report regularly, but within one year and only on the final accounts. With regard to fiscal management, the federal state has the right to appoint a tax administrator for local government.

Budgeting at the general government level is coordinated by the Finance Council (Finansplanungsrat), however, due to the budgetary autonomy of the federal center, the states and local governments, the agreements between them are purely political and not legally binding. The Financial Council was established by the Law on Budgetary Principles, and its role was strengthened by the recent amendment to this law. The Council includes the finance ministers of the federation and the federal states, as well as representatives of local governments. Recently, the Finance Council agreed to adjust spending patterns for each level of government to ensure compliance with Maastricht Treaty fiscal limits and medium-term balanced budget targets. However, no detailed breakdown of expenditure targets by federal states is provided, and the Financial Council has not published any justification for linking expenditure targets to budget deficits.

Budget documents disclose budget forecasts and allow all macroeconomic assumptions to be made publicly available. It does not provide any formal characterization or analysis of the relationship between assumptions, fiscal projections and performance. There are well-documented procedures for developing macroeconomic parameters for the budget. Relevant ministries, a number of research institutes, as well as the Bundesbank regularly hold formal meetings, in addition to this; informal contacts are established between experts. However, the final decision is made by the government: the Chancellor, the Ministry of Finance, the Ministry of Labor and the Ministry of Economy. The work on the forecast ends with an official statement in the press and is openly discussed in the media, as well as in parliament as part of the budget process. The government is not guided by any one model for forecasting; rather, it relies on experts. The forecast is made three times a year: once at the beginning of the year for the preparation of the Annual Economic Report, and then in the spring and autumn for the Working Group on Tax Calculations. The government's annual economic report, mandated by the Law on Promoting Economic Stability and Growth, includes detailed supply and demand forecasts, as well as a comprehensive analysis of the government's forecasts.

The macroeconomic forecast provides the basis for the assessment of the revenue side of the budget by the Working Group on Tax Calculations, but the relationship between macroeconomic assumptions and revenue items is not analyzed for subsequent use, nor is a sensitivity analysis given. This limits the usefulness of such forecasts when macroeconomic conditions change. The inter-budget working group on tax calculations includes representatives of the Federal center, all 16 federal states, local governments and the Bundesbank, the Federal Statistical Office, the Council of Economic Experts and Research Institutes. This group is responsible for preparing official government forecasts for specific revenue items. Two weeks before the meeting, the members of the working group exchange their own forecasts among themselves. While the models can be used by participants, the final officially published forecast reflects the consensus of the entire group. Aggregate forecasts for the general government are published in a variety of sources, such as stability and growth programs, and detailed fiscal forecasts for general government can be obtained from the official medium-term financial plan.

Investment analysis is a set of practical and methodological techniques and actions that make it possible to assess the feasibility of investing in a project. A good and timely investment analysis helps to achieve the following objectives: evaluate the real need for investment and the availability of necessary conditions for investment. To select the best investment solutions that will strengthen the competitiveness of the company in view of its tactical and strategic objectives. Identify all factors that could influence the actual investment performance and its deviation from the planned performance. Evaluate the risk and return parameters of the investment that are acceptable to the investor. If the potential returns and payback period are acceptable to the investor, the investment can be started, if not, the project can be scrapped at the pre-investment stage. Develop recommendations and measures for post-investment monitoring to improve the company's qualitative and quantitative performance.

Investment analysis should be carried out on the basis of comparing the situations in the company not “before the implementation of the project” and “after the implementation”, but

from the standpoint of changes in the efficiency of activities “with the project” and “without the project”.

Investment analysis involves the creation of a clear organization scheme for the entire project - from its initial stage to making a profit. At the initial stage, information about the investment sector is collected, the data is analyzed, and on their basis the structure of the investment project is formed. If risk factors and deficiencies are identified, measures are taken to eliminate or minimize them.

Investment analysis is most often undertaken by the investor (the company owner or its management). The priority areas of analysis in this case will be the return on invested capital and the financial stability of the company due to the potential impact of investment projects on it.

The second group of stakeholders is the owners of companies seeking to attract investors. In this case, an investment analysis is carried out in order to determine how attractive a particular business is to investors and what steps should be taken to increase this attractiveness.

The investment analysis may also be of interest to the company's counterparties, as it allows them to understand the company's ability to fulfil its contractual obligations from the perspective of assessing the possible changes in its financial position caused by investment activities. The target audience also includes the company's creditors, since for them the investment analysis is primarily of interest in terms of its creditworthiness, paying capacity and balance sheet liquidity.

Finally, representatives of state authorities may be interested - in the case of a decision to provide financial state support.

There are several types of investment appraisal in modern appraisal practice, and the choice of one or another type depends on a number of factors - the purpose of the study, its scope and depth, the period of the study, and the type of investment planned. Let us review the main types of investment appraisal, classified according to different characteristics.

Investment analysis is differentiated:

1. by type of investment:

- analysis of capital investments, i.e. investments in reconstruction, construction of new production facilities, technical re-equipment or diversification of the company. These investments are aimed at reducing the costs of the enterprise, are long-term, are linked to the strategic objectives of the enterprises, and their volume is usually significant. Therefore, they require the most comprehensive, multi-factor project analysis.

- analysis of financial investments, that is, the purchase of securities - stocks, bills of exchange, bonds. Financial investments are aimed directly at making a profit. The most common types of financial investment analysis are fundamental analysis based on the study of the global securities market, technical analysis, which consists in predicting securities prices based on their changes in the recent past, and portfolio analysis, in which the main assessment criterion is the risk and return indicators of the investment portfolio.

2. by object of analysis:

- An analysis of the company as a whole, without isolating individual business units or activities. This analysis can provide an objective and comprehensive picture of the effectiveness of the firm's investments and, if necessary, develop ways to optimise them. This method of analysis is more often applied to capital investments that can affect the market position of the company, e.g. in the case of diversification of activities.

- The analysis of individual investment events. Usually applied in cases where local projects need to be financed, e.g. purchase of equipment, research to improve products, etc.

3. by analysis periods:

- pre-investment analysis is an analysis at the stage from preliminary research to the final decision to invest in a particular project. It may be one of the stages of a comprehensive analysis, or it may be a stand-alone analysis, which may be limited to short-term investments of relatively small amounts.

- current, or operational, which is carried out to monitor the consistency of current

performance with targets and to make operational adjustments to investment activities. It may be carried out periodically and cover only a small time period.

- post-investment, or retrospective, analysis for a selected reporting period - month, quarter or year. Retrospective analysis provides a more thorough examination of the investment position and performance of an organisation through the availability of complete statistical and accounting records.

4. in terms of the scope of the analysis:

- full analysis - conducted to examine absolutely all aspects of the company's investment activities, as well as all characteristics of the company's investment position.

- trend, or thematic, analysis is limited to the study of individual areas of investment activity - the state of the investment portfolio, the efficiency of implementing individual projects, the optimality of forming sources of investment resources, and so on.

5. by depth of analysis:

- express or aggregated analysis - it uses standard algorithms to calculate the main analytical indicators of a company's investment activities based on data from its financial statements for a given period.

- fundamental analysis - a factor study of the dynamics of investment activity.

6. on the organisation of the procedure:

- Internal analysis is carried out by the company's own investment managers together with its owners. All available informative indicators are used for the analysis. However, the results of the internal analysis often constitute trade secrets.

- External analysis is carried out by employees of accounting firms, banks and insurance companies in order to examine the results of the company's investment activities and their impact on its financial position.

Any type of investment analysis follows a general pattern:

1) selecting and preparing the necessary information;

2) processing of raw information and formation of analytical information;

3) interpretation of analytical information;

4) preparation of conclusions and recommendations.

Project investment analysis involves two main stages, each of which in turn is a complex process consisting of several sub-stages and involving different approaches.

Stage 1. Analysis of the effectiveness of the investment project. From the point of view of classical financial analysis, there is only one criterion for assessing efficiency - the presence or absence of profit from the project. In this case, not accounting, but economic profit is considered, taking into account not only costs, but also the cost of capital used for investment. The analysis is carried out in two main directions: Assessment of the effectiveness of investment costs determines the degree of attractiveness of the project in terms of its profitability. The efficiency analysis is calculated taking into account such indicators as discounted and simple payback period, net present value of the project, internal rate of return, return on investment. Assessment of the financial viability of the project, that is, an assessment of the company's ability to pay off the project's obligations in full. It is carried out on the basis of the settlement account model, based on the control of the positive balance of funds in each of the planning periods. To assess the effectiveness of an investment project from the point of view of the owner, investor, bank or government authorities, it is necessary to consider the various components of the project. If only one set of performance indicators is compiled, there may be a risk of inadequate representation of the project from the perspective of other stakeholders.

Stage 2: Risk analysis is an essential part of any investment analysis. Investment risk is defined as the occurrence of an adverse event that could jeopardise the implementation of a project.

There are two groups of risks:

1. Risks associated with external factors. They are also called systemic or systematic, they are caused by processes taking place in the external environment and cannot be reduced by

diversifying investment objects.

2. Risks associated with internal factors that reflect the quality of the company's management system and its general condition. Unlike systemic risks, internal risks can be mitigated through diversification.

The following methods can be used in risk analysis:

- The method of expert assessments, involving a risk assessment by a specialist, based on the experience, knowledge and intuition of the latter.

- Statistical method - measuring risks using certain indicators, which are calculated based on the predicted values of the object's profitability. Both groups of risks, without taking countermeasures, lead to the same result - financial losses, while the magnitude of risks is directly dependent on the profitability of investment objects - with an increase in profitability, risks also grow.

In the investment analysis process, valuation specialists use different methods to quantify investment activities in terms of their individual aspects, both statistically and dynamically, to solve specific tasks:

1. Horizontal or trend method. When using this method, the growth rate of investment indicators is calculated for a certain period of time - month, quarter or year. The method is used to examine the indicators of the reporting period and compare them with the previous period, to conduct analytical research to determine the dynamics of growth at different times. For comparison, indicators for the previous period or the same period of the previous year can be taken, for example, data of the first quarter of the reporting period are compared with similar indicators of the first quarter of the previous year. It is recommended that the results of the trend analysis be plotted in order to facilitate the identification of the trend line.

2. The vertical, or structural, method. This analysis calculates the share of individual indicators of a company's investment performance. Typically, the vertical method is used to analyse investments, investment resources and cash flows of investment activities. The results obtained using the vertical method are also presented graphically.

3. The comparative method is the examination and comparison of similar indicators in different groups. For example, a comparison of a company's investment performance data with industry averages or reported performance with targets. The method is the basis for monitoring a company's current investment performance. The analysis identifies the extent to which reported indicators deviate from normative indicators, identifies the reasons for these deviations, and forms recommendations for adjustments.

4. The coefficient method (analysis) is based on calculating the ratio of various absolute indicators of the company's investment activities to each other. In the process of analysis, the relative indicators of investment activity and its influence on the level of financial condition of the company are determined.

Most often, investment analysis uses the coefficients for assessing the profitability of investment activity, the turnover of operating assets and invested capital, and the coefficients for assessing financial stability.

5. Integral method. It is usually used when buying securities to form the volume of net investments in the investment object. With the help of this method, it is possible, by selecting an “effective portfolio”, to reduce the level of risk and improve the ratio of the indicators under consideration in favor of profitability. Simulation is carried out using special computer programs.

The choice of method for analysing investment performance depends on which indicators are to be investigated in the procedure. It is not uncommon for evaluators to use all methods of analysis simultaneously, especially in cases where a comprehensive picture is required.

The countries of Central Asia and the European Union are committed to further developing mutually beneficial cooperation, with the EU remaining committed to promoting stable, secure and sustainable development in the region.

The European Union is one of the key foreign policy, trade, economic and investment

partners for the Central Asian countries. The dialogue and cooperation between them has gained new momentum in recent years. In turn, the platform of the annual Ministerial Conferences makes a significant contribution to the deepening of cooperation, providing a good opportunity to discuss pressing issues and further prospects for cooperation in a practical plane.

Currently, the state of bilateral relations between the European Union and the Central Asian countries is being actively reviewed, and the positive dynamics of intraregional interaction is noted, where the latest positive trends in the region open up broad prospects for cooperation between the European Union and the region.

Priorities include deepening cooperation on regional security, economic development in the region and further deepening broad-based EU-CA cooperation, including in the framework of the currently updated EU Strategy for Central Asia.

The main areas of cooperation are updated, clear goals and indicators are defined, and new tools are introduced to achieve these goals. In General, the priorities given the new global trends and regional needs was the development of human capital, the rule of law and good governance, the development of private entrepreneurship, including the promotion of female entrepreneurship, the promotion of universal digitalization, the cohesion and the development of transport and logistics infrastructure, increase of efficiency and introduction of green technologies, environmental protection.

Experts from the European Union countries have prepared an investor guide designed to assist specialists in the preparation of investment projects in the field of environmental protection, climate change and water resources in Central Asia. This document will assist specialists from Central Asian countries in preparing economically sound project proposals for international financing. It contains general guidelines and best practices for the preparation of a project proposal, as well as information on requirements and conditions, including project evaluation, relevant project cycles and applicable environmental and social criteria established by various relevant international financial institutions and sponsors that provide funds for environmental protection, water resources and climate change adaptation projects in the Central Asian region, including the EU Investment Fund for Central Asia (IFCA), the European Investment Bank (EIB), The European Bank for Reconstruction and Development (EBRD), the Green Climate Fund (GCF), the World Bank (WB), the Asian Development Bank (ADB), the Asian Infrastructure Investment Bank (AIIB), the German State Development Bank (NDB), the French Development Agency (FAR).

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Economic evaluation of forage crops

Abstract: The article notes the need to improve the economic assessment of forage crops. Considering that fodder production is becoming a commodity industry, it speaks of the advisability of using a wider range of indicators.

Key words: feed base, feed crops, feed yield, feed production, economic evaluation, productivity, effective feed crops, trends in feed production, approaches and evaluation criteria, prices, suppliers and consumers, commodity relations, feed unit, production costs, profitability.

Introduction

Cultivation of the most productive fodder crops, by increasing their share in the structure of the fodder wedge is important in strengthening the fodder base. The process of intensification of agriculture, increasing the efficiency of additional funds and labour invested in land cultivation are connected with the use of highly efficient crops and varieties.

Thanks to scientific and technological progress and the growth of the material and technical base of agriculture, the structure of fodder crops is improving. However, there are still considerable reserves for its further improvement in many farms and they should be brought into action as soon as possible. The economic evaluation of forage crops is very important for this purpose.

Object and methodology

The object of the study is forage production for dairy cattle breeding. The study is based on scientific and theoretical sources devoted to the economic evaluation of fodder crops under the conditions of introduction of new technologies of fodder production. The main methods of research: economic-statistical, abstract-logical.

Research results

Selecting the optimum ratio of crops will have a positive effect on forage yield and improve the economic efficiency of forage production. Due to the different feed requirements of the animals and the large number of forage crops available, the economic evaluation of these crops cannot be determined by any single indicator and requires a number of factors to be taken into account. First of all, the economic evaluation of forage crops should be based on the role of the main groups of forages obtained: concentrated, roughage, succulents and pastures, which are the basis of cattle diets. In addition, data is needed on the potential for replacing one feed group or crop with another.

This means not only a change in the specific weight of one type of feed compared to the others within acceptable zootechnical limits, but also the possibility of preparing forages of high value from forage crops. This is the case on large specialised dairy farms where the preparation of green, pasture and succulent forage crops, briquettes and pellets as concentrated feed is common.

The Rothamsted Experimental Station, England, is recognised in world practice as a classic of long term observation studies with a time span of tens, hundreds of years. The study of the process in farming has been going on for more than two centuries. Long-term experiments are carried out in our country, in particular, in fodder production at the FWRC FPA. On the economics of fodder production of this nature, research is not given due attention. In market conditions, they are necessary. By expressing certain tendencies, they allow you to choose the right orientation, make decisions, and achieve success. Moreover, due to limited opportunities, the use of statistics on feed production is difficult (due to a decrease in the range of data) and the high cost of purchasing the available ones. In these conditions, we recognized that in important areas of the economy of feed production, not only the assessment and calculations for modern indicators, but also the data of past years.

Another characteristic feature is that the productivity of forage crops is increasing. In the succulent fodder crops group, maize for silage is 1.8 times more productive than other silage crops.

Perennial grasses for hay and green fodder are more efficient than annual grasses for the same purpose. Improved hayfields are twice as productive as natural hayfields; the most productive crops are fodder root crops, maize for silage and perennial grasses for green fodder.

Grain legumes and perennial grasses should be used in the first instance to increase protein fodder production.

There are a number of suggestions for the economic evaluation of forage crops. The analysis of planning practices, as well as the enforcement of those tasks that must be solved in the sector, show that at present the methodology of economic evaluation of forage crops should be based primarily on the behaviour of accounting the value of yields in kind and productivity in fodder units per 1 ha and obtaining digestible protein, production costs and labour costs for forage.

The economic evaluation of forage crops according to the data of economic operators shows that their productivity varies not only by crop, but also within crop groups.

The dissemination of experience in obtaining high yields is an important prerequisite for increasing the productivity of field fodder production throughout the zone and for this, the most efficient fodder crops should be cultivated in the first place.

Thus, the use of results obtained from economic evaluation data can reinforce desirable trends in forage production and thereby improve its efficiency. However, these issues are also difficult to address due to the contradictory nature of the various indicators, and their application does not always make it possible to correctly assess the role of particular forage crops.

This situation makes it necessary to look for new approaches and criteria for evaluating forage crops, which would fully reflect the current state of forage production and help to successfully meet the challenges faced by the sector.

Difficulties in evaluating forage crops are also largely due to the fact that forage is largely not a marketable product and many types of forage are not priced scientifically, so that there is some disagreement between suppliers and consumers in terms of mutual settlements.

However, the situation is changing rapidly. The specialisation of livestock production, in particular dairy farming and the developing market create conditions for strengthening market relations in forage production and, consequently, the need to ensure cost-effective costs in this sector.

There are many suggestions for improving the economic evaluation of forage crops, the use of which to a certain extent helps to characterise the efficiency of forage production.

For example, K. P. Obolensky took the net income received as the difference between the cost of gross milk production and the amount of production costs per unit of crops of a particular feed crop as the criterion for the efficiency of cultivation of forage crops. This approach allows a single farm to fairly correctly assess the efficiency of feed production through livestock products. But at the same time, the factor of immediacy is lost, because forage crops themselves are not evaluated, and thus the scope of commodity relations in feed production is narrowed, which is not acceptable in the conditions of specialization of this industry. In addition, this method of comparison evaluates individual fodder crops, although it is known that several types of fodder are fed for milk production.

We must not forget that the efficiency of feed use is also influenced by the level of productivity of cows, which also cannot be taken into account in this method of assessment.

Many attempts are being made to evaluate forage crops in terms of protein content and overall nutritional value. For this purpose, an assessment of forage crops by the yield of forage protein units was proposed.

However, this indicator averages the characteristics of feed crops, at a time when it is necessary to identify the possibility of obtaining a certain amount of protein with a minimum cost. Due to the fact that the costs of producing protein feed have significant differences depending on the structure of forage crops and the cheapest protein is obtained when cultivating crops rich in protein, such a mixing of the two qualities is not justified.

Based on the nutritional value of forage crops and their digestible protein supply, a number of other proposals for economic evaluation have been developed.

It is suggested that a "coefficient of nutritional value" be used as a criterion, meaning a slightly different degree of availability of digestible protein in the different types of feed. Oats are taken as the basis for calculating the coefficient and the other fodder crops are compared with it.

This coefficient as well as the various feed protein units are difficult to use due to the uncertainty of their role in feeding. If 1 centner of hay, 1 centner of fodder unit, 1 centner of digestible protein quite definitely and clearly characterise their role, it is impossible to determine and compare the value of fodder using the difficultly calculated "coefficient of fullness" and other similar indicators.

Such an indicator can express, for example, a protein content of 90 to 150 g per feed unit. Therefore, in addition to the "coefficient of nutritional value", indicators such as crop

productivity, labour and inputs for crop production can be used to further characterise forage production.

Use of separate offers at considerable complication of calculations allows to reflect only some features of a condition of forage production, but they are insufficient to characterize economic efficiency of forage crops in full, and consequently do not receive wide application.

The main task of economic evaluation of forage crops we see is not only to characterize those or other aspects of forage production, but, above all, to provide forage crops the same production conditions of equivalent exchange as there are for other highly efficient commercial crop products.

The current stage in agriculture in terms of improving its efficiency is to further strengthen the economic leverage in the organisation of fodder production.

This approach is particularly important in the context of the specialisation of livestock breeding and its transfer to an industrial basis.

The concentration of livestock and the associated need for high quality feed is a crucial prerequisite not only for the intensification of feed production, but also the most important condition for its specialisation.

With the development of agro-industrial associations, with the increase in the preparation of such new types of feed as pellets and briquettes, both for their own needs and for sale in the United States and other countries, the practice of producing basic types of feed for large highly specialized dairy farms in specialized farms is widespread.

At the same time, forage crops are cultivated on nearby farms for the production of green and juicy feed. Therefore, the assessment of forage crops should ensure the identification of cost effectiveness by the main indicators in feed production inherent in commodity production, especially in modern economic conditions.

In the currently used methods for assessing forage crops, it is not mandatory to calculate the indicators of net income and profitability.

The lack of evaluation of these indicators has far-reaching consequences for feed production. It hinders the development of economic ties between feed production and other industries, and does not give the opportunity to sufficiently stimulate scientific and technological progress.

Therefore, along with the indicators that characterize the growth of feed production, their quality, labor and money costs, estimates on net income and the level of profitability should be applied.

Conclusions

Thus, using indicators of net income, profitability, etc. will accelerate the solution of a number of economic problems that hinder the development of forage production, in particular the determination of: scientifically based prices for forage, cultivation of the most efficient forage crops, production of new types of forage, specialisation of forage production, introduction of forage crop rotations.

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Features of the agro-industrial complex in Kazakhstan

Abstract. This article discusses the development of the agro-industrial complex in the Republic of Kazakhstan, as well as the goals, features, stages of implementation of the sectoral program of development of the agro-industrial complex for 2013-2020. The purpose of this article is to consider the results of the development of agriculture in the Republic of Kazakhstan.

Key words: agricultural economy, agribusiness, agricultural products, agricultural production, crop production, animal husbandry.

Introduction

The agro-industrial complex (AIC) is an important component of the economy of our country, which includes the production and processing of agricultural products and their supply to consumers, as well as provides agriculture and processing industry with means of production.

The structure of agribusiness is divided into three main industries or industries and production groups:

1 Agriculture (agriculture and animal husbandry), forestry and fisheries.

2 Agricultural processing, food processing, light industry, cotton and wool.

3 Industries producing agricultural inputs and processing agricultural products (manufacture of agricultural machinery, machines, equipment for food and light industry, mineral fertilizers, etc.) [1, 8 p.].

Modern agribusiness is in a difficult financial and economic situation: unprofitable agro-industrial enterprises operate in the industry, the cost of production remains high, accounts payable are not decreasing. In addition, fixed assets are very worn out, there is a lack of working capital, there are no necessary methods of technological modernization of production facilities, the mechanisms of economic activity of agribusiness enterprises using modern technologies of production, management and organization are insufficiently effective.

One of the main tasks that provide the blocks of the innovation system of agribusiness is the formation of a pool of innovations and the creation of favorable conditions for their development in production, while smoothing the gap between the results obtained in production and the potential of scientific and technical developments. There is a quantitative set of existing

and new innovations available to consumers, as well as opportunities to improve their production, economic and other indicators of agricultural activity.

Object and methodology

The object of study in the article is the agricultural sector of Kazakhstan. The practical significance of the study is associated with the development of a new program for the development of agribusiness in Kazakhstan.

Kazakhstan is an agro-industrial country where agriculture is the mainstay of the population. Forty-three percent of the population now lives in rural areas, and the level of development of agricultural production depends not only on the living standards of the people working here, but also on the living standards of people who are to some extent related to this industry. The welfare of the majority of Kazakhstanis is closely linked with the level of development of agricultural production.

During the period of independence of the Republic of Kazakhstan, the country's agribusiness has achieved significant results: stable growth of production on the basis of market relations, increased productivity, modernisation of fixed assets and restoration of infrastructure, self-sufficiency in basic foodstuffs. Exports of grain, oilseeds and fish products have increased considerably.

At the moment, new trends are emerging in the global agrarian economy and demography, integration processes in the region are clearly developing, and global climate change is taking place. Kazakhstan has joined the Customs Union (hereinafter, the CU) and the World Trade Organisation (hereinafter, the WTO).

However, the low level of labour productivity in the sector, imperfect technologies used, and small marketability of production do not allow agricultural production to be intensive, ensure the most complete use of material, labour and other resources, and comply with environmental requirements. These factors reduce the competitiveness of the domestic agricultural sector, which in the case of WTO and CU can lead to the predominance of imports of foreign products, forcing local producers from markets.

There is a rapid growth of food consumption and population growth in the country, where the structure of consumption is changing in favor of better quality products.

Research results

In 2017, on the basis of the "Agribusiness 2020" program, a program for the development of agro-industrial complex in Kazakhstan was developed. It is expected that KazNU will receive additional income of 830 billion tenge. This will allow us to move away from the anti-crisis plan this year, which we have introduced in a timely manner to address current challenges in the implementation of strategic development objectives. In this regard, there are three main questions on this issue: The first is the need to develop a state programme for the development of agribusiness by the end of this year, based on the Agribusiness 2020 programme [2].

The priorities of this program will be to increase and diversify agricultural production, focusing on the most popular markets and products, as well as the export of processed agricultural products. The document should provide for affordable lending to agricultural producers, primarily long-term lending to «benefit them».

The second is the creation of service and procurement cooperatives for primary processing, storage and sale of products.

The third is the introduction of irrigated lands. Over the next five years, the task is to put into operation at least 600 thousand hectares of irrigated land. The Ministry of Agriculture and governors must strictly control the rational use of agricultural land. It is necessary to provide these lands with the required amount of water through the construction of emergency and new reservoirs.

The President set new tasks for the agribusiness. These are the issues of using the potential of private farms, improving the system of subsidies, rational use of agricultural land, as well as the introduction of irrigated lands and veterinary safety. The issues of processing of

agricultural products, loading of processing capacities, development of wholesale and distribution centers and product storage systems are determined by a separate block.

Due to the changing external and internal environment, a new programme for agribusiness development in Kazakhstan has been developed in connection with Kazakhstan's accession to the CU and forthcoming accession to the WTO, the need to use new tools of state regulation and modernisation of the sector.

Agribusiness development involves analytical research and development of recommendations with the involvement of foreign experts, study and implementation of best foreign practices, as well as intensification of the process of attracting foreign investment and finding new external markets for agribusiness products. [3, 10 p.].

In this regard, cooperation with international organizations is especially relevant. Currently, Kazakhstan actively cooperates with such organizations as the Organization for Economic Cooperation and Development (OECD), the United Nations (UN), the Food and Agriculture Organization (FAO), the Organization of Islamic Cooperation (hereinafter - OIC).

Within the framework of cooperation with the OECD, Kazakhstan receives consultations on the diversification and growth of foreign direct investment, as well as on improving the competitiveness of various sectors of Kazakhstan's economy, including agriculture.

In December, the Government of Kazakhstan adopted a sectoral program for the development of the agro-industrial complex for 2013-2020, aimed at creating conditions for increasing the competitiveness of agribusiness entities.

The program is aimed at creating conditions for increasing the competitiveness of agribusiness entities and their further development. The program was widely discussed in the regions of the country, with the heads of agricultural structures, the parliamentary corps, industry and business associations, experts.

The program will be implemented in four areas: financial recovery, increasing the availability of goods, works and services for agribusiness entities, development of government systems for agribusiness entities, as well as improving the efficiency of state regulation of agribusiness.

Under the program, mechanisms have been developed to reduce the credit burden on the state and prevent the bankruptcy of agricultural producers. In particular, financial recovery will be carried out through the financing of existing debts by farmers.

For the first time, the programme provides for such forms of support to agribusinesses as investment subsidies, insurance and loan guarantees for agribusinesses to financial institutions, and second-tier bank financing. The programme also subsidises the production of crops, livestock and processed agricultural raw materials.

Conclusions

The state finances agricultural production from the national and local budgets. The national budget funds allocated for the support and development of agribusiness are provided in a separate section of the national budget and include:

1. To support for investment activities, including the purchase of new machinery and equipment, breeding animals in accordance with state programs for the development of agribusiness;

2. To carry out scientific research and activities for the prevention and eradication of quarantine and particularly dangerous infectious animal diseases, and for the protection of the environment;

3. Lending and insurance in the agribusiness sector;

4. Subsidies to support livestock breeding, etc.

The priority task for Kazakhstan in solving the problem of food security is to increase the efficiency of domestic agricultural production, development of food and processing industry, improvement of the mechanism of state regulation of the agricultural food market, as well as the implementation of foreign trade policy in accordance with the interests of national producers.

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State support for the agricultural sector of the economy in the European Union

Abstract. The article notes state support for the agricultural sector of the economy. Sections of the EU's agricultural budget, the structure of the EU's unified agricultural policy, and expenditures on agricultural support were also considered.

Keywords: agricultural sector, state support, subsidies, agricultural policy, expenditures.

Introduction

The members of the European Union have a common sectoral and territorial (regional) policy. The greatest success has been achieved in the implementation of joint agricultural policy. It is the largest item of expenditure in the Union's budget.

Common agricultural policies are based on agricultural price subsidies, i.e. surcharging farmers to the level of income common in other areas of the economy.

This policy has helped the EU to become the second largest supplier of agricultural products to world markets after the US.

At the same time, the agricultural market of the EU itself is fenced off by high customs barriers, which prevent the access of agricultural goods from other countries.

The artificial displacement of external competitors and high domestic food prices stimulate agricultural production.

The supply of these products far exceeds demand and gives rise to the problem of agricultural overproduction.

Various limitations on the volume of agricultural production have been adopted to solve this problem. Recently, a restriction in the form of a "guaranteed maximum quantity" has been spreading.

This measure consists in the fact that it provides for a reduction in prices for products supplied in excess of the limit set by the state. As a result, it becomes unprofitable to increase production in agriculture.

To date, almost all barriers to the movement of goods, capital and labor have been lifted in the EU. Their abolition significantly increases the rate of economic growth of national

economies, reduces the prices of products produced in them, reduces production costs, and ultimately strengthens the position of each country in the world economy.

In accordance with the new paradigm of the agrarian system of the European Union for 2014-2020, "Reduce costs, but produce more products", countries were given freedom to choose support instruments, subject to a reduction in the share of direct subsidies, compliance with EU agro-ecological requirements regarding food safety, environmental protection , animal welfare and maintenance of land in good ecological and agricultural condition, support for young and small farmers, as well as producers working in regions with unfavorable production conditions.

By 2020, all EU countries will be able to switch to a unified per hectare payment system.

The European Union has so far neglected the support and development of small farms, with the greatest attention paid to medium and large agricultural producers.

So, in order to reduce the concentration of payments to the largest farms, it is planned to limit direct payments to one farmer by 20% (for subsidies of 150-200 thousand euros per year), by 40% (200-250 thousand euros), by 70% (for payments of 250-300 thousand euros).

The upper limit for direct subsidies is € 300,000.

In general, the current stage of the CAP reform focuses both sections of the agricultural, EU budget (direct subsidies and development of rural areas) on the following tasks: environmental protection; support for young farmers; support of territories unfavorable for agricultural production; support for small farms.

Table 1 - Sections of the EU agricultural budget

Objectives	Section I of the EU agricultural budget	Section II of the EU agricultural budget
Environmental protection	«Green direct payments»	Measures to protect the environment in agriculture and animal welfare. Support for organic agriculture. Natura 2000 programme
Support for young farmers	Supplementary payments	Business start-up and development subsidies. Higher subsidies for investment
Support for areas unfavorable for agricultural production	Supplementary payments	Hectoral support
Support for small farm	Alternative simplified	Business development grants
Support for cooperation of producers	Improved legal frameworks	Support for the creation of producer, co-operative and marketing groups

Object and methodology

EU agricultural support is characterised by a comprehensive approach and is carried out in conjunction with market regulation in general (quotas, market pricing, etc.).

The EU spends about a third of the European budget on agricultural support - an average of about 50 billion euros (Fig. 1); adding national co-financing, the total support is in the order of € 100 billion.

Additional support to local producers from the national budgets of the EU countries was at the level of about 80 euros per 1 ha of farmland. On average, one agricultural enterprise received about 12,200 euros of subsidies per year, with payments per hectare of cultivated land ranging from 527 euros in Greece to 89 euros in Latvia.

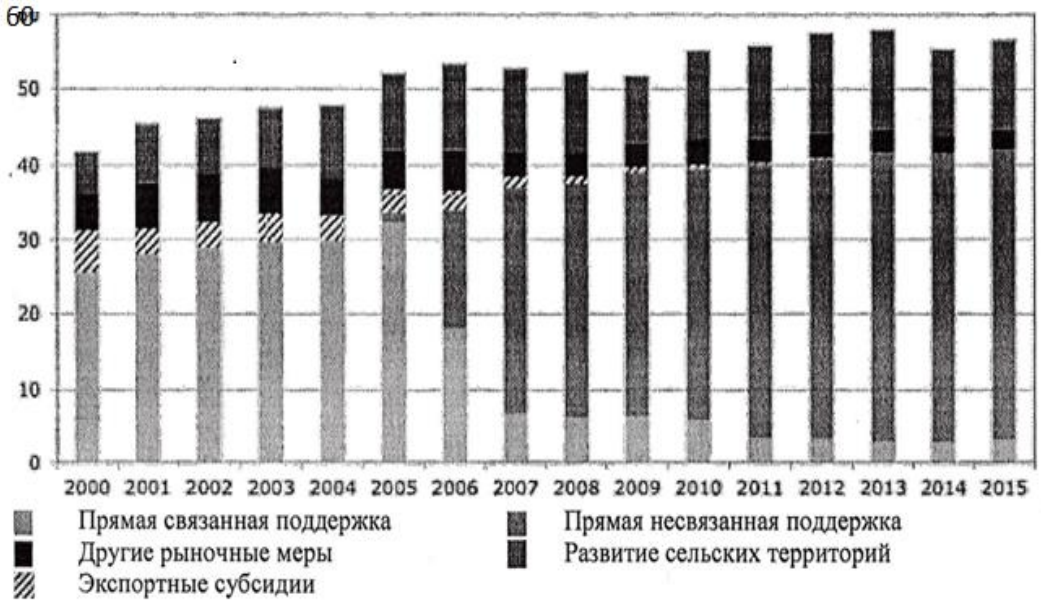

Figure 1: Expenditures for agricultural support in the EU at current prices in 2000-2015, billion euros

Research results

The achievements of the European Union in the development of the agrarian sector of the economy are largely due to the high level of subsidies. Regulation of rural development in the EU countries provides a complex, but at the same time flexible system of financial support, which in 2007-2013 amounted to 325 euros per hectare of cultivated land annually.

Overall, there are 2 sections (Pillar) in the structure of the CAP, which was defined in the Agenda 2000.

The first one constitutes a production and trade framework and is needed to regulate support measures within the framework of the Common Market and direct support to farmers.

The activities in this section are financed by the European Agricultural Guarantee Fund.

The second section provides for measures to address the challenges of integrated rural development and the competitiveness of the EU agricultural sector as a whole, which are financed by the European Rural Development Fund and national regional budgets (Table 2) (1).

The 2014-2020 EU CAP budget, which totals €386.9 billion, includes €281.8 billion (over 75%) in section 1 (direct payments and marketing costs) and €89.9 billion (24%) in section 2 (rural development) (3).

The new agricultural policy assumes a fairer distribution of direct payments, meaning that all EU member states will receive at least 75% of the average intra-community aid.

The aid per ha cannot be less than 60% of the average per administrative or agronomic area. EU Member States are given the opportunity to increase support to small and medium-sized farms, and a Single Area Payment Scheme (SAPS) - a one-off payment per hectare - will be in place for new EU members until 2020.

In addition, the EU member states are provided with opportunities for additional compensation for working in less favorable conditions, as well as a number of measures are envisaged to optimize the market orientation of European agriculture and additional support for farmers (development of competition policy rules for the market of milk, beef, olive oil and cereals, increasing the efficiency of the agricultural sector through the development of infrastructure, the abolition of sugar quotas in 2017, the introduction of new institutions of anti-crisis management, etc.).

Table 2: The structure of the EU common agricultural policy (2)

<table>
<tr><td colspan="2">EU budget</td><td rowspan="2">National regional budgets</td></tr>
<tr><td>European Agricultural Guarantee Fund</td><td>European Agricultural Fund or Rura1 Development</td></tr>
<tr><td>Market price support (MPS):
target and intervention prices
production quotas
export duties
import tariffs
tariff quotas</td><td colspan="2" rowspan="2">Rural development:
increasing the competitiveness of the agrarian and forestry sectors of the economy (financing the modernization of farms, early retirement, professional retraining of farmers, support for young farmers);
protection of the environment and rural habitat (payments to farmers working in unfavorable conditions for agriculture, etc.);
improving the quality of life in rural areas and stimulating the diversification of the rural economy (encouraging rural tourism, creating micro-enterprises in the sphere of services, etc.)</td></tr>
<tr><td>Direct support to farmers:
Single Payment Scheme - SPS
Single Area Payment Scheme - SAPS
direct per hectare, «per capita» payments</td></tr>
</table>

The main document that regulates state support for agriculture in the EU countries today is the EU Regulation № 1698/2005, and only then national laws, programs and other regulatory legal documents are applied. The total amount allocated for the implementation of the CAP for 2014-2020 amounted to 37.8% of the total EU budget for this period. In addition, it is proposed to introduce additional items of expenditure for the implementation of the CAP, for which subsidies were not previously provided.

So, for the provision of food aid to needy citizens of the EU, it is planned to allocate about 3 billion euros from the European Social Fund, and about 2.6 billion euros to ensure food safety.

In the EU fund intended for adaptation to the challenges of globalization, an additional reserve of 4 billion euros will be created for use directly in the agricultural sector of the economy. According to the new agricultural policy, a significant part of direct payments to farmers and for the development of rural areas in the EU for the first time is the provision of public goods (greening agriculture).

The first direction (Pillar 1 or Component 1) of the EU CAP is based on the dependence of direct payments on the requirements for farmers for the conversion of agricultural land, which provides for three main areas - diversification of agricultural land, maintaining the condition of existing pastures and the use of 7% of arable land in quality of ecological zones. They form part of the greening program, which is 30% of the national funding for the first direction of the CAP (Pillar 1).

According to the second direction (Pillar 2 or Component 2), EU member states are obliged to allocate up to 30% of the budget for environmental protection measures, including support for organic agriculture and protection of the agro-ecological climate, which are not included in the first direction (Pillar 1) (4.5). Thus, EU member states can use a maximum of 30% of all direct payments (Component 1 CAP) for greening agriculture, which corresponds to 89.3 billion euros, or 21.7% of the total EU budget. Component 2 provides funds for climate change mitigation and adaptation and environmental protection at 7.2% of total EU social spending for agriculture, aimed at supporting environmental public goods in the form of payments for the development of agro-ecological forms of farming (organic farming). Thus, 28.9% of the entire agricultural budget of the EU is provided for measures directly related to solving environmental problems, and the remaining more than two-thirds of the funds allocated for agriculture provide for the achievement of other goals (5). According to the notification to the WTO for the financial year 2013/2014, the total amount of support was €78.388 billion,

including €68.697 billion for the Green Box measures. The total support amounted to €68.697 billion, €2.663 billion for Blue Box measures, €7.027 billion for Yellow Box measures, and €5.971 billion for de minimis (current aggregate support measure), or 8.2% of the commitment ceiling and 7.6% of the total support, with product-specific support not exceeding the de minimis level. According to the European Commission's Department for Agriculture and Rural Development, the total amount of support was €62.8 billion in 2016 (Table 3).

Table 3: Expenditures for agricultural support in 2016

Support measure	2016, million euro	Support structure, %
Direct support, incl.	40984,1	65,3
"Unbound" support	35204,1	56,1
Other direct support	5384,7	5,6
Additional support	6	0,01
Compensation due to certain restrictions	395,4	0,6
Market support measures, incl.	3154,3	5,0
Food programs	1	0,0
Sugar	4	0,01
Olive oil	46,2	0,07
Flax - and hemp fiber	6,1	0,01
Fruits and vegetables	1172,7	1,9
Wine	1027,1	1,6
Promotion	81,1	0,1
Other measures in crop production	242,0	0,4
Milk and dairy products	406,6	0,7
Beef	30,2	0,1
Lamb and goat meat	1,8	0,0
Pork, poultry, eggs, etc.	140,6	0,2
Sugar Industry Restructuring Fund	0	0,0
Rural development	18649,6	29,7
TOTAL	62788,0	100,0

Direct subsidies are a fundamental part of the CAP, the main purpose of which is to support the income of farmers. The volume of trade distorting direct subsidies for an individual member country is limited to 8% of the direct support level or 13% if their current level exceeds 5% of the direct support volume. The European Commission can increase these limits if justified. In addition, there is the possibility of an additional 2% increase in direct trade distorting subsidies for protein crops. If the size of direct subsidies of a member state is less than 90% of the EU average, then it has the right to increase the amount of direct subsidies to 5% of its rural development funds by reducing EU funds for rural development by up to 25%. Previously, direct payments were established on the basis of historical data, either at the farm level (historical model) or regions (regional model), or on a combination of both (mixed model). EU countries with a direct subsidy per hectare below 90% of the Union average must cover 1/3 of the difference between the current level and the existing level. Overall, by 2020, the gap between the lowest and the average per hectare subsidy will be reduced by one third and at the expense of a corresponding reduction in aid by 7% for the richest countries.

Some basic direct support measures:

- «Decoupled» support

According to the WTO notification for 2013/2014 «decoupled» income support in agriculture under the Green Box measures amounted to EUR 31.845 billion, or 40.6% of the total support (sugar, fruit and vegetables).

Thus, the average level of payments per hectare of agricultural land across the EU reaches 170.9 Euro/ha. In 2015, direct subsidies accounted for 74% of all support, of which 93% was «decoupled»; in 2016, 65.3% and 85% respectively.

- Per-hectare direct payment system

As part of the green box measures, the WTO notification for 2013/2014. amounted to 7421.5 million euros, or 9.5% of the total support.

- Product-specific direct support under the "yellow box" amounted to 0.878 billion euros (12.5% of the "yellow box").
- Payments for ecosystem services

A feature of support in the EU is the widespread use of environmental protection measures and support for the development of agriculture in unfavorable regions (in 2013/2014, respectively, 7.9 billion euros, or 10.1% of the total support, and 3.6 billion euros, or 4.6% of total support). Environmental protection measures include support and protection of products manufactured in accordance with environmental standards, measures to protect the environment and preserve rural areas, and subsidies in regions that are sensitive to environmental conditions.

- Equivalent product-specific measures

These measures are calculated when the calculation of product-specific aggregate support measures is difficult. In addition, this tool of market regulation is used if the price environment does not allow the product to be sold on the market at prices that ensure a minimum profit, or if there is a high level of production when it is necessary to reduce supply. In particular, these measures include the setting of a minimum price for the purchase of agricultural raw materials by the processor and a subsidy for storage in private warehouses.

This support in 2013/2014 was provided for the following products: wine, olive oil, ethyl alcohol, sugar refined sugar, flax fiber, fresh or chilled beef from animals over 8 months of age, pork, lamb and goat meat, butter produced from raw materials derived exclusively from dairy cows, cheese, skim milk powder derived from dairy cows. Support in 2013/2014 amounted to $0.289 billion (4.1% of the "yellow box"). As already noted, the European Union's highest level of self-sufficiency in essential agricultural products is primarily due to the efficiency of production in the agricultural sector. The union provides over 1/5 of the world's annual grain production, over 1/3 of milk and 1/6th of pork, and the union is unrivalled in sugar beet and barley production. Grain yields of 100 c/ha are no longer unprecedented in France, southern Germany, the Netherlands, Belgium and Denmark.

The same is true for beet farming, where in some regions farmers obtain 120 t/ha with yields of up to 10 tonnes of pure sugar, and for potato farming, where yields of 450 kg/ha are the norm in many parts of the EU. The high and stringent environmental requirements in the production areas must not be forgotten, which forces the producers to use chemical fertilisers, pesticides and other artificial growth regulators to a very significant and highly effective extent. Significant advances have also been noted in such a synthetic indicator of livestock development as milk yield per cow. The level and structure of agricultural production costs is the most important indicator that largely determines the profitability of the farming sector in the EU. The main components in the cost structure are the costs of feed, fuels and chemicals. These are the items that have seen a rise in costs over the last 10 years. In this regard, the use of resource-saving technologies is becoming an absolutely necessary tool to improve the efficiency of farming production.

Conclusion

Obviously, a fairly cursory analysis of the main parameters of the EU agricultural sector does not allow us to fully track and reveal the deep trends of its transformation, but the following should definitely be noted (6). Effective regulatory and financial support for the functioning of the European Union's agri-food system has allowed the association to become a leading global player in the agricultural sector and achieve the highest level of food independence in a short historical period. Naturally, the processes of globalization and crisis phenomena in the world

economy dictate their own rules of the game for European farmers. But a solid foundation, achieved over the past decades, promises solid prospects for the European agri-food system, especially in the context of an aggravated world food problem and growing demand.

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Types of agricultural development in the EU

Abstract. Any country always takes foreign experience into account. The European experience is very important in the development of agriculture, which has had positive results. The article discusses the types of agricultural development in the EU countries.

Keywords: agriculture, economic development, European Union, agricultural policy, export, import, trade

Introduction

Agriculture is one of the leading industries in the EU. For the main types of agricultural products, most countries fully meet their needs and are interested in selling them on foreign markets.

Object and methodology

Under the influence of natural and historical conditions, three main types of agriculture have developed in the region [1]

- Northern European;

- Central European;
- Southern European.

The Northern European type (Scandinavia, Finland, as well as the UK) is characterised by predominantly intensive dairy farming and, in the crop production that serves it, by forage crops.

The Central European type is distinguished by the advantage of dairy and dairy-meat animal husbandry, as well as pig and poultry farming. Animal husbandry has reached a very high level in Denmark, where it has become an industry of international specialization. This country is one of the world's largest producers and exporters of butter, milk, cheese, pork, and eggs. No wonder it is often called the "dairy farm" of Europe. The Southern European type is characterized mainly by crop production, and animal husbandry plays a secondary role.

Research results

Agricultural policy is a specific system of state support and regulation of agriculture, which determines the nature of the sector's development. There are usually 8 stages in the development of the common agricultural policy of the EU [2].

The first stage (1962-1977) was a policy oriented towards providing the EU with the most essential food products. Since during this period, nine countries were members of the EU, there was a need to agree on a common policy regulating the prices of agricultural products, market regulation instruments were proposed and principles were formulated for determining purchasing prices and purchase volumes. Farmers received large amounts of subsidies. Expenditure on agriculture exceeded 65% of the total EU budget, and the high level of support for individual agricultural products led to overproduction.

The second stage (1978-1984) was the strict regulation of purchase prices, limiting overproduction of agricultural products and their supply to the market. The use of market price support instruments was considerably reduced, and financial discipline on the use of the EU general budget was strengthened. Export subsidies have been introduced, which has created more favourable price conditions for the sale of agricultural products on foreign markets. These measures were found to be insufficient, since they failed to reduce overproduction to the desired extent. In 1981, Greece joined the EU.

The third phase (1984-1988) was an effort to further reduce the volume of agricultural production: regulation of purchasing prices, a domestic market-protecting tax policy, and quotas on milk production volumes. The introduction of milk production quotas essentially changed the system of the CAP, where quantitative limits on the volume of production of a certain type of product were approved for the first time. Milk quotas were set individually for each member country and subsidies were only paid on the amount of milk set within the quota. In 1986, Spain and Portugal joined the EU (15).

The fourth stage (1988 -1992) - the EU already united 12 countries, it was possible to stabilize the supply of basic agricultural goods to the EU internal market, the development of the range and high quality of products is stimulated, farms located in less favorable regions for agricultural production are supported, the concept of the need to preserve the environment is formed among farmers, financial support is paid for the processing of certain types of agricultural products.

The fifth phase (1992 -1996) is a qualitatively new phase, during which significant reforms of the CAP were introduced - the MacSharry reform abolished the system of purchase price regulation, replaced by a mechanism of compensation paid per hectare of agricultural land - direct payments. Livestock quotas for bovines, sheep, compensation for the number of cattle sold and payments for keeping sows and lambs were introduced. Farmers were provided with the preconditions for rationally managing their physical, financial and natural resources, based on the analysis of the real changes on the market, to choose themselves the optimal strategy for their own farm and the variety of agricultural products to be grown.

The sixth stage (1997-2003) - "Agenda 2000" was the beginning of the liberalization of the production process of agricultural products. A plan for continuing the reform has been

defined. The need for reform of the EU's agricultural policy was caused by many problems. Subsidies to agriculture covered about 50% of the cost of production, about half of the EU's annual budget. The EU has defined new principles of CAP:

The seventh stage (2004-2007) is associated with the largest expansion of the EU. Ten more Central and Eastern European States joined the Union. The main focus of the CAP at this stage was the complex correlation of financial support with the standards of nature protection, food safety and quality, hygiene, sanitation, and pet welfare (Cross compliance).

Eighth stage (2007-2013) - the 2003 reform continues by strengthening rural development. A separate regulation for the years 2007-2013 has been created. This regulation identifies four main programme areas of funding - pillars:

Pillar I. Competitiveness of the agricultural sector: strengthening human resources (vocational training, information, consulting), modernizing physical capital (investments, settling young farmers, premature retirement), increasing agricultural production and product quality (increasing added value).

Pillar II. Improvement of natural conditions and landscape: ecological management, payments for environmental conservation, afforestation, restoration of forest potential, NATURA 2000 payments, compensation for agricultural activities in less favorable, i.e. poor-yielding regions with physical obstacles (in mountainous conditions).

Pillar III. Improving housing conditions and stimulating alternative activities in rural areas: transition to non-agricultural activities, rural tourism, renewal of rural areas.

Pillar IV. Implementation of LEADER, method: encouraging the activity of rural communities, local initiative groups in the formation of long-term consistent activities.

Conclusion

Thus, the considered types of agricultural policies have their own characteristics that can be used in practice in other countries.

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Economic assessment of regional specialisation in the territorial-sectoral division of labour in cattle breeding production

Abstract: The article presents the results of the analysis based on the matrix of state of the BCG: the efficiency of using the resource potential of the regions. Recommendations are given on further improving the specialization of regions in the territorial division of labor.

Keywords: territorial and sectoral division of labor, agro-industrial complex, specialization, efficiency, matrix, agricultural land, grouping of factors, forage base, livestock productivity, production resources, livestock production, structure, importing region, exporting region, self-supporting region.

Introduction

In a competitive environment, the territorial-sectoral division of labor is understood as the interrelated specialization of individual regions and zones for the production of certain types of agricultural products, the size and direction of their commodity flows. The territorial division of labor in the agro-industrial complex of the country and the food relations of the regions are determined by the specific patterns of development and placement characteristic of its branches, as well as the current economic situation. Among the many factors that influence this process, the most significant are the natural factor, which determines to a large extent the place of the territory in the division of labor or its bioclimatic potential, as well as the level of self-sufficiency in agricultural products [2].

Object and methotodology

Nine representative regions of the Russian Federation from different zones of specialisation were selected as research objects. The study used abstract-logical, economic-statistical methods.

Research results

The state matrix developed by the Boston Consulting Group (BCG) was used to differentiate the role of regions in the territorial-sectoral division of labour, based on the assessment of the available bioclimatic potential and the level of self-sufficiency in milk and cattle meat. As an indicator of the resource potential, the provision of forage lands and their estimated productivity were used. It limits the availability of the main production resource for feed production – land, the size and structure of the regional agricultural sector. The estimated productivity of a hectare of agricultural land, determined in centners of fodder units, is one of the basic indicators for calculating the cadastral value of agricultural land in the constituent entities of the Russian Federation. It gives an idea of the comparative value of the regional land fund for the production of livestock products.

Thus, the range of differences in the value of this indicator ranges from 2.1 in the Republic of Tyva to 31.4 in the Krasnodar Territory, or 15.0 times.

A separate matrix was built for each type of product in the sub-sector (Fig. 1, 2).

The grouping factors in the construction were selected:

- along the X axis - the level of self-sufficiency of the region in this type of product.
- along the Y-axis - the estimated productivity of forage lands (centner of forage units).

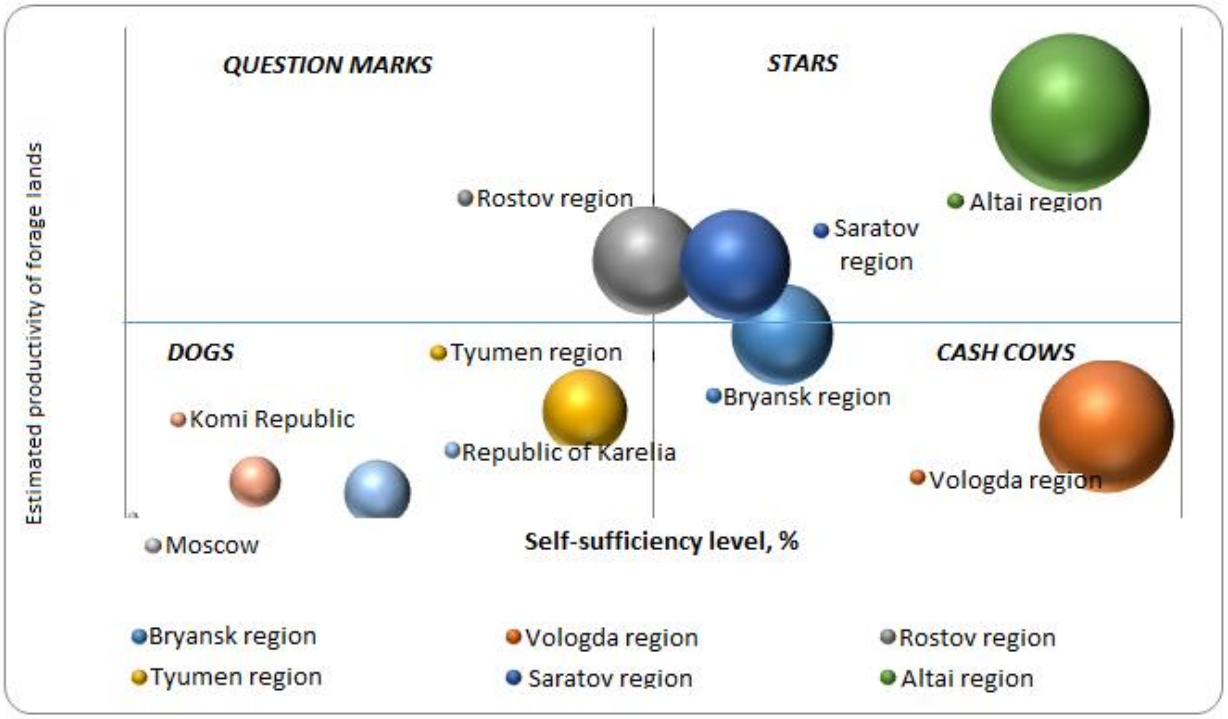

Figure 1 - Allocation of milk production specialization zones based on BCG matrix

The size of the sphere depends on the production volume per capita (kg). To demonstrate the application of this methodology, nine representative regions from different specialisation zones were selected: Bryansk Region, Tyumen Region, Republic of Karelia, Vologda Region, Saratov Region, Komi Republic, Rostov Region, Altai Territory, and Moscow.

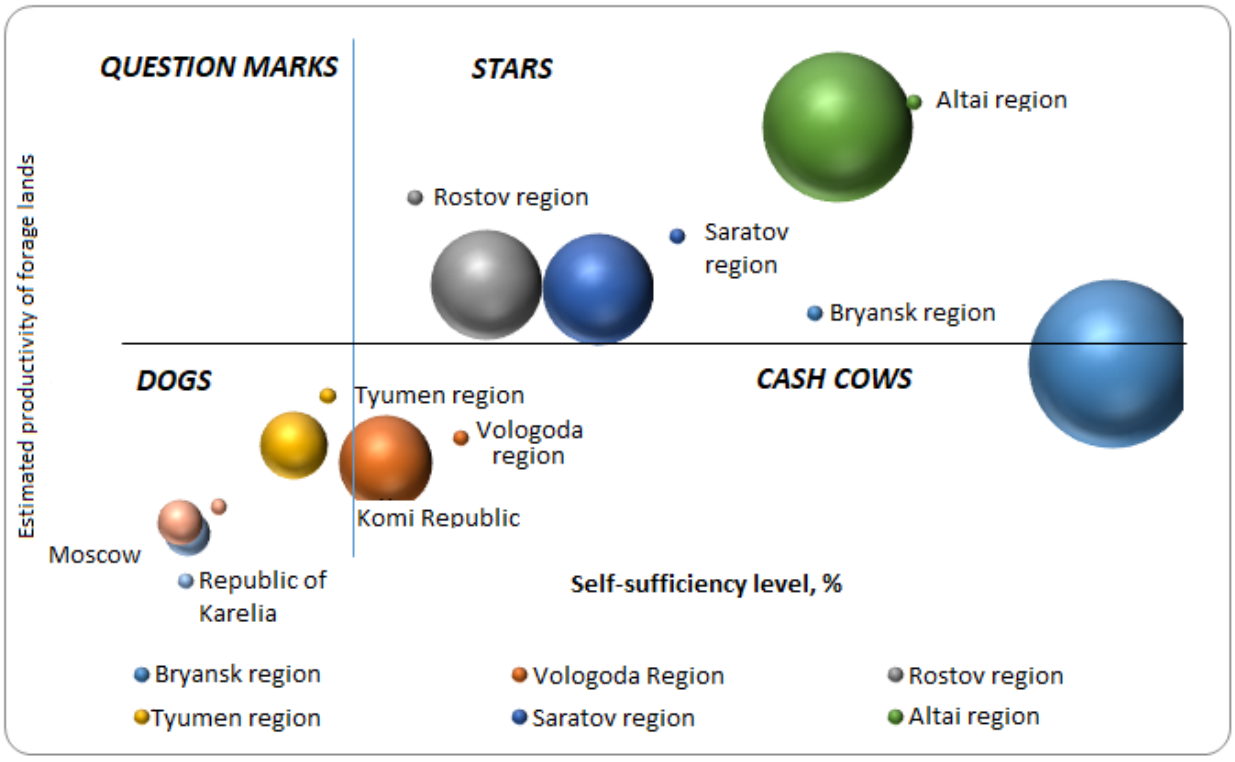

Figure 2 - Allocation of cattle meat specialisation zones based on the BCG matrix

As a result of the grouping, the following types of regions have been identified according to the combination of feed use efficiency attributes in the livestock sub-sector and the level of self-sufficiency:

1) The regions in the «Dogs» group are those importing livestock products, with no exports with a low bioclimatic potential (Moscow, Komi Republic, Republic of Karelia, Tyumen Region);

2) Regions from the «Question Marks» group - regions that are dominated by imports but could produce enough livestock to meet their own food needs (no such regions were identified in our example);

3) The «Stars» are exporting regions that have high resource potential and produce in excess of their own needs (Altai Territory, Saratov Region, and Rostov Region for meat). Milk production in the Rostov Region is at the level of satisfying its own needs, so the region is self-sufficient in this type of product;

4) «Cash cows» - regions with a predominance of export, which, despite the low resource potential, have achieved high efficiency in the livestock subsector and are able not only to meet their own needs for livestock products, but also supply products to other regions (Bryansk region, Vologda region).

In the process of dividing regions into groups, it is of great importance to determine the intervals of grouping factors. In the example presented, the cut-off value for the level of self-sufficiency in production is 100%. This value does not require justification and is logically natural. For the factor of assessing the productivity of forage lands, a preliminary justification of the boundary value is necessary. In the example considered, this value is taken as the average value between the maximum and minimum productivity of forage lands for the regions selected for the model. The most reasonable value will be the number of feed units required to achieve livestock productivity sufficient to provide scientifically based nutritional norms for the population in this type of product.

Conclusions

Analyzing the results of modeling for both types of products, we can conclude that in general, the regions effectively use their resource potential, since the group «Question Marks» was empty. At the same time, there are reserves for the growth of production volumes for a number of regions. For example, the Rostov and Saratov regions have almost the same productivity of forage lands per head (9.0 and 9.77 c of feed units), but the level of supply of products in the Rostov region is lower both for milk and meat by 16.8 and 49.6 percentage points, respectively. A similar situation is observed between the Tyumen and Vologda regions.

The regions in each of the highlighted groups face specific challenges in improving livestock specialisation.

The exporting regions need to:

−to find reserves for increasing the export of meat and dairy products;

−improve the structure, and the range of its quality;

−determine the optimal directions of cargo flows;

Deepening the specialization of exporting regions in the production of livestock products will contribute to an increase in intraregional and interregional turnover of livestock products.

Self-sustaining and importing regions will:

−develop priority sub-sectors in order to solve the problem of self-sufficiency in beef and milk;

−to find reserves for assortment exchange with other regions of the country;

−improve the structure of import of livestock products;

−optimize the distribution of livestock products among territorial suppliers;

The developed models make it possible to graphically represent the existing specialization of the regions. Give a rough estimate of its effectiveness without quantification. In

addition, to develop recommendations for further improving the specialization and placement of regions in the territorial-sectoral division of labor.

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Principal directions of improving interregional food relations

Abstract: The article discusses the current state of the development of inter-regional exchange in a market economy. The conceptual directions of improving inter-regional food relations are determined

Keywords: inter-regional food relations, region, market relations, agri-food market, specialization, food security, regional exchange, purchase and sale, food products, agricultural raw materials, development schemes, economic separatism, export, import, strategy.

Russia, the largest country in the world in terms of territory, is characterised by a great diversity and vastly ramified interregional food relations in the country's food supply system. They are significantly more important for the reliable and more complete and relatively even supply of food to its population than for many other states.

Introduction

Inter-regional food relations, which are in essence inter-regional exchanges in terms of the purchase and sale of agricultural products, raw materials and food between the individual regions of a country, largely determine the ability of some of them to supply their local population with food and even to export some of it to domestic and foreign agrifood markets,

while others - mainly due to a shortage of local food production, to partially meet domestic needs for it through interregional supplies of food products and agricultural raw materials [3].

Object and methodology

Interregional food relations between individual regions of the country. The study used abstract-logical, economic-statistical methods.

Research results

In modern conditions, the underdeveloped mechanism of market relations and the continuing weakness of state regulation of the food segments of the country's agri-food market lead to the spontaneous formation and functioning of interregional exchange in almost all types of food products and agricultural raw materials.

Market relations have intensified interregional differentiation in the development of the agrarian sector of the economy. The mechanism of market competition has divided Russian regions according to its competitive advantages and disadvantages. There is a significant adaptation to the market of the regions, where there are differences in the structure of agricultural production, the mentality of the population. The level of budgetary support for agricultural development in the regions, the amount of social compensations have decreased considerably, there is almost no communication between the regions, the interregional exchange, especially in terms of food products and agricultural raw materials supplies, has decreased.

Significant differences in the specialization of agro-industrial production between the regions of the country mainly form and to some extent contribute to the expansion of interregional food relations, largely being their driving forces. At the same time, as a rule, certain types of food products and agricultural raw materials, which mainly specialize in the region, are exported outside of it. At the same time, those types of agricultural products, raw materials and food are imported that a particular region cannot produce for objective reasons, for example, due to the presence of unfavorable soil and climatic conditions, or its own production in the foreseeable future is not able to fully meet local needs, or it is significantly less profitable, and imported products are much better than local ones. In addition, there is still a significant group of regions that, for certain types of food products and agricultural raw materials, occupy an intermediate position between the mainly exporting and importing regions of the country.

In the conditions of the weak influence of the state on the functioning of the main product segments of the domestic agri-food market, it actually lost control over the development of interregional exchange, which to a certain extent contributed to the development of regional economic separatism with all the resulting negative consequences for the reliable supply of many regions of the country with certain types of agricultural products, raw materials and food. This was especially true for providing the population with milk and dairy products, fruits and berries, vegetables and melons, meat and meat products, the consumption of which, even taking into account their large-scale imports, remained significantly below the rational norms in most regions. At the same time, for example, the consumption of sugar by the population in all regions significantly exceeded the rational norm, which indicates a fairly high rate of development of beet farming in the country, which can not be said about dairy cattle breeding.

In recent years, despite the measures taken by the state to support the development of dairy cattle breeding, the situation in the sub-sector remains difficult, which negatively affects the supply of milk and dairy products to the population. Even taking into account their large-scale import, only the population of the Altai Territory alone exceeded the rational consumption rate. Only in 31 regions of the country, the production of milk and dairy products exceeded the volume of their consumption.

The development of interregional trade based on increasing commodity resources to export food products and agricultural raw materials, contributes to a partial consumption smoothing certain types of food products by the population especially those regions that have relatively low production and particularly bioclimatic potential.

Due to different conditions, the role of individual regions varies, but each of them participates in interregional trade in agricultural products, raw materials and food, regardless of

whether it is a supplier or consumer. For example, in 2016, 27.5% of grain, 11.4% of potatoes, 23.9% of vegetables and melons, 39.7% of fruits and berries, 68.4% of meat and meat products, 31.1% of milk and dairy products, and 42.9% of eggs were consumed in the country due to interregional exchange.

In the problem of ensuring food security and independence, which is still difficult to solve, the role of individual regions of the country varies for various reasons, which directly affects the standard of living of their population. Despite the steady reduction of the gap in the level of socio-economic development between the regions of the country, there is still a high differentiation in their main indicators. For example, excluding Moscow, St. Petersburg and Autonomous regions largest per capita production of gross regional product and per capita regional income of the population of subjects of the Russian Federation differ respectively 15.6 and 4.0 times. There is still a significant differentiation of regions in terms of the level of food consumption in households.

Significant fluctuations are also characteristic of the level of consumption of certain foodstuffs by the population between regions, even though years of chronic production shortages of many domestic foods have been compensated by their large-scale imports, accounting for at least one quarter of the foodstuffs consumed by the country's population, as well as food deliveries through interregional exchanges. However, in 2016. even taking into account large-scale interregional and import supplies of food products and agricultural raw materials between regions, the difference in per capita consumption of fruits and berries by the population was 10.1 times, vegetables and gourds 8, 8, potatoes 4.9, eggs 4.2, milk and dairy products (in terms of milk) 3.4, bread products 2.6, meat and meat products (in terms of meat) 2.4, vegetable oil 2.2, sugar 2.1, and a half of the calorie intake.

Despite an increase in the production of agricultural products, raw materials and foodstuffs and the persistence of large-scale imports of certain types of food, the consumption of fruit and berries, milk and dairy products, vegetables and gourds by the population is still 27.4-38.0% below the rational norm. Overall, the daily caloric intake of Russians is only 90.7% of the rational consumption norm and of the 1990 level.

At present, despite the high degree of specialisation in agricultural production of individual regions, practically none of the available regions in the country can independently provide the population with the necessary range of food. For example, in 2011-2015, 37.2% of the country's grain production was concentrated in only five regions. Five regions accounted for 60.2% of Russia's gross sugar beet harvest, 31.9% of fruit and berries, 20.1% of potatoes, and 24.5% of vegetables and melons. The five regions produced 26.6% of their meat, 23.7% of their milk and 22.4% of their eggs. Krasnodar Region accounted for 18.6% of the country's sugar beet production and 12.7% of grain production, while Belgorod Region accounted for 12.9% of meat production.

However, only about one quarter of the regions, mainly in the Central and Southern Federal Districts, are able to produce the basic list of food products in the volume that is required, based on rational dietary standards, for local residents, and partially export some food and agricultural raw materials to domestic and world markets. About 30% of the regions of the country produce only certain food products in the quantities that meet consumption standards. Some regions can provide food to the local population through their own production, but well below the norms approved by the Ministry of Health. Large shortages of domestic food products are compensated for by imports, which account for about 30% of the cost of imports and over 25% of the food consumed by the population.

Conclusion

Improvement of interregional food relations is a complex and multifaceted process involving the production, exchange, distribution and consumption of food products and agricultural raw materials. It involves the development and implementation of the strategy and scheme of development and location of agro-industrial production, the creation of specialized zones with high-tech production of specific agricultural products, regional and interregional

clusters, active participation of regions in the food exchange, the improvement of territorial and sectoral division of labor in agricultural production, which should be regulated by the state. The development of interregional exchange, will contribute to the transformation of the agro-food sector into a highly profitable segment of the agro-food sphere, reliable food security and the accelerated increase of Russian exports of food products and agricultural raw materials.

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Unification of requirements for public services is one of the conditions for improving their quality

Abstract: Given the annual growth of both types and the number of public services, issues of their quality provision become priority.

In this connection, in recent years, the existing regulatory legal acts have been changed and supplemented by requirements aimed at improving the procedure for the provision of public services, including their optimization.

Keywords: public service, proactive service, mobile subscriber unit, public service standard, subordinate regulatory legal act that defines the procedure for the provision of public services.

Introduction

With the annual increase in the number of public services, the quality of their provision becomes a priority.

In Kostanay region in 2019 the number of services provided compared to the same period of the last year has increased by 2 times.

Thus, for 393 types of public services 10,705,576 services have been provided, whereas in 2018 their number was 5,887,054 services.

It should be noted that since the introduction of amendments and additions to the Law «On Public Services», new conditions have been created to improve the quality of public services provided [1].

In particular, on November 25, 2019, the Law of the Republic of Kazakhstan dated № 272-VI ЗРК «On amendments and additions to some legislative acts of the Republic of Kazakhstan on the provision of public services» was signed [2].

Object and methodology

It should be noted that with the new regulations, improving public service delivery processes has become a key priority.

Firstly, the current concept of «public service», in contrast to the previous one, presupposes the receipt of material or non-material benefits without circulation.

Thus, the body providing the service, having the necessary information, can now initiate the process, anticipating your application.

Hence the new concept of «proactive service», which means receiving a public service in electronic form on the initiative of the service provider.

Receiving a service in this format involves the mandatory consent of the recipient of the service via a cellular communication device, the concept of which is also introduced in the legislation.

These innovations should significantly simplify the lives of citizens, as a «proactive response» to their circumstances is now provided for in a number of laws.

For example, according to the Law "On state social benefits for disability and loss of breadwinner in the Republic of Kazakhstan", the submission of an application for the appointment of disability benefits in the event of its initial establishment (or loss of the breadwinner) is not required when assigning benefits through a proactive service [3].

Second. Prior to the changes, service providers were required to provide public services in accordance with public service standards and regulations.

At the same time, the procedure for the provision of public services was also regulated by the Rules.

According to the new requirements - service providers must be guided by subordinate regulatory legal acts defining the procedure for the provision of public services. That is, all three SRLAs will be merged into one.

Consequently, the concept of «regulations» has been removed from the Law on Public Services.

The central public authorities will develop and approve the new by-laws.

At the same time, the requirements for their approval have also changed.

Whereas previously the standard of a public service was developed and approved within three months from the date of introduction of additions to the Register of public services (classified list), the by-law shall be developed and approved within two months.

Research results

It should be recognised that these innovations should have a positive impact on the quality of public service delivery due to the following:

Before the changes were introduced, in most cases the standards/regulations themselves were not ensured or the changes and amendments were made in a timely manner. Examples are the following cases of not timely approval of standards, regulations of public services. The state service «Issuance of a sailor licence» is entered in the Register of the state services decree of the Government dated 3 September 2018 № 5. Standard of services approved by Order of the Minister for investment and development of the Republic of Kazakhstan dated January 30, 2019 № 53. Thus, the standard was approved in violation of the established deadline - for 57 days.

In addition, the existence of both Rules and Standards makes it difficult to use them in practice. Often the contents of these standards contradict each other or contradict other legislative norms. For example, the content of the standard "Acquisition of rights to state-owned land plots that do not require tenders (tenders, auctions)" contradicts the Land Code. According to the standard [4], the timeframe for provision of the 2nd stage of the public service is from the date of approval of the land planning project to the issuance of a decision on granting the right to use the land plot for 7 working days. Meanwhile, Article 43 of the Land Code, which defines the

procedure for granting the right to a land plot, provides for a different edition. In particular, the decision of the local executive body on granting the right to a land plot shall be made within 7 business days of receipt of the land use project. Thus, the standard contradicts the Land Code.

Another "minus" was that the content of the regulations was not uniform and did not reflect the proper process of rendering a public service. Prior to the amendments, the service provider had to be guided by the regulations of the public service in addition to the standard of the public service. However, the results of the study showed that their content was not sufficient for quality provision of a public service. Thus, the previous version of the Law "On Public Services" established that a regulation is a regulatory legal act that establishes requirements to comply with the standard of a public service and defines the procedure for service providers' activities, including the procedure for interaction with other service providers, the State Corporation "Government for Citizens" as well as use of information systems in the process of public service delivery.

Meanwhile, some regulations adopted by local executive bodies of the oblast do not contain the procedure of service providers' activities necessary for provision of a public service. Thus, the regulations developed in the area of agriculture and land relations do not define the actions stipulated by the Rules. For example, according to the regulations of the public service «Subsidies for the development of livestock breeding, improvement of productivity and quality of livestock products», the provision of the public service only reflects the procedure for applying for and receiving the result of the service through the portal of «e-government».

Whereas, according to the Rules [5] in obtaining subsidies for the development of livestock breeding a special commission (formed by representatives of: the regional chamber of entrepreneurs of the National Chamber of Entrepreneurs «Atameken»), public sectoral union/association/republican chambers and specialists of the department of agriculture of local executive body of regions, cities of national importance) is involved in the process of service provision, whose tasks include verification of the availability of relevant information.

Thus, in the regulation of the state service «Provision of initial materials for the development of construction and reconstruction projects (redevelopment and re-equipment)» [6] there is no interaction between departments of architecture and urban development and providers of engineering and utilities services. At the same time, according to the Rules for Organisation of Development and Approval Procedures in the Field of Construction [7], service providers prepare technical conditions with a preliminary scheme of the routes of external utility networks within five working days. This circumstance allows «blurring» the responsibility of service providers and, consequently, leads to the improper performance of their duties. Hence, while the Rules for the Development of Regulations provide for the actions of employees in the provision of a public service, the current regulations do not provide for their actions to send a questionnaire for technical specifications to service providers. Thus, due to the «empty» content of the regulations, in practice, service providers are forced to be guided only by the Rules. In addition, although commissions are involved in the provision of public services, their actions are also not reflected in the content of the regulations. Whereas, according to paragraph 17 of the Rules on development of standards and regulations of public services approved by Order № 126 of the Minister of National Economy of the RK dated December 3, 2014, the regulations of a public service contain information necessary and sufficient to ensure the process of providing a public service [8].

Thus, the regulation of the state service «Issuance of certificates for driving tractors and self-propelled chassis and mechanisms, self-propelled agricultural, land reclamation and road construction machines and mechanisms, as well as special machines with increased cross-country capability» [9] does not specify the actions of the examination commission, while one of the stages of obtaining the results of the state service is passing the examination. In turn, according to the Rules [10], the results of the examination are entered on the examination sheet and are the basis for the issuance of a certificate.

Summarizing the analysis, it should be noted that the regulations regardless of their scope and procedures required to obtain them are similar to each other, involving only the service provider's office, responsible executor, and head of the service provider, which complicates their application in practice. We believe that the mentioned disadvantages are due to the requirement of paragraph 20 of the Rules, which establishes that the sections of the regulations should contain only the description of the order of interaction of structural subdivisions (employees) of the service provider in the process of providing a public service.

Thus, the current norms of the Rules do not establish in the structure of the regulations all the necessary processes for the preparation of the result of a public service.

A generalisation of the above leads to the expediency of excluding the notion of «regulations» from the Law on Public Services. The introduction of a single normative legal act will eliminate existing standardization imperfections. Thirdly, the Law on Public Services redistributes the powers of state bodies. By transferring the responsibility for the Registry from the Government to the central public authority, it is ensured that changes to the Registry can be made promptly. This work will be carried out in coordination with the Agency and the authorized body in the field of development of the public administration system. Fourth. The organization of the activities of the State Corporation has been supplemented. Thus, employees of the State Corporation, having access to personal data of citizens, as well as involved in the process of providing public services, are subject to inspection in the manner determined by the authorized body in the field of information in coordination with the National Security Committee of the Republic of Kazakhstan.

This measure will prevent the illegal use of citizens' personal information for personal purposes. In addition, the State Corporation, along with central and local executive bodies, will be involved in optimising the processes of providing public services. At the same time, the need for an employee of the State Corporation to certify an electronic copy of a document from the original document provided by the service recipient has been eliminated. Fifth. The ways of obtaining consent from the recipient of a service for the use of legally protected secret information contained in information systems have been expanded. Whereas previously only written consent was provided, it can now be confirmed by an electronic digital signature or obtained through a cellular phone subscription device.

Conclusions

Thus, comparing the previous and current versions of the Law on Public Services, a number of positive aspects affecting the improvement of the quality of public services are highlighted. Mainly, as was shown above, the unification of requirements to the procedure for public service delivery, by combining three normative legal acts (Rules, Standards, Regulations) will eliminate conflicts and greatly facilitate the procedure of their development and approval.

It is also of significant importance to save money in rulemaking as the provision of a public service on the basis of one document eliminates the need for constant adjustment of duplicating legal acts.

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On the issue of e-commerce in Kazakhstan

Abstract. The article discusses the main trends, features of the development of e-commerce in the Republic of Kazakhstan based on the study of publications, statistical data and the results of the survey.

Key words: E-commerce, electronic wholesale and retail trade, e-trade, online marketplace, online shopper, online market, online platform, product categories, electronic devices, payment card, Black Friday, global trends, business community, electronic transaction, digitalization, registry, online store, online platform, online payment, customer's trust

Introduction

The relevance of the topic is caused by the increasing influence of advances in electronic information technology on the global economic system, leading to the emergence and development of e-business. For our country this becomes especially relevant in the period of Kazakhstan's accession to the World Trade Organisation. In modern times, one of the main

conditions for doing business and interacting with consumers is the use of high-tech and telecommunication environments. All this makes it possible to create the very audience that fills the Internet with life and, of course, money. And where there is an audience and an opportunity to make a profit, that's where business comes in [1].

Object and methodology

The subject of the study is the development trends of e-commerce in Kazakhstan.

The object of the study is the social relations emerging in the process of electronic commerce. Regulatory sources, such as Article 29. "Electronic commerce" and Article 29-1, were used in the preparation and writing. "Implementation of electronic commerce" (The Law is supplemented by Article 29-1 in accordance with the Law of the Republic of Kazakhstan dated 27.10.15)

The scientific and theoretical basis for writing this article was provided by textbooks, manuals, business magazines, and analytical and business articles of financial and marketing analysts and methodological developments of various authors: O.A. Kobelev, L.P., Kuzhukeyeva K.M., Davydov F.M., A.V. Rudetskaya and others.

The methodological basis of the research is general scientific research methods: analysis, synthesis, and comparison, economic and marketing analysis. The guiding method of research is the dialectical approach to consideration of the raised problems. The methods of scientific cognition were also used: formal-logical, systematic, statistical, mathematical method, etc.

Research results

Currently, a new economic area, e-commerce, has emerged in Kazakhstan. This economic field contains all financial and trade transactions made by means of computers, as well as business processes connected with implementation of such transactions [2]. E-commerce should not be confused with electronic trade because it is a broader concept than electronic trade. E-commerce is the transfer of information data, commodity products, as well as the provision of electronic services; provision of services electronically, and service by electronic means the usual trade of goods and services by means of electronic transfer of all the documents and other information important for the foreign trade transaction, as well as storage and service of similar data. In essence, the concept of electronic trade covers only the first two purposes. The concept of «e-commerce» contains all types of trade and services contributing to trade activities [3]. For this reason, this concept is truer and more distinct than «electronic trade».

In 2018, the proportion of domestic internet users was 83.4% of the population of Kazakhstan, compared to 80.2% in 2017 (Table 1).

Table 1- Share of Internet users, %

Year	2016	2017	2018
Republic of Kazakhstan	80,2	81,5	83,4

The analysis of the e-commerce market of the Republic of Kazakhstan was carried out on the basis of data from the Statistics Committee of the Republic of Kazakhstan (Table 2).

In the period from 2016 to 2018, according to the data obtained [4], the volume of retail trade via the Internet increased by 84%, compared to the base year in absolute terms from 78,500 million tenge to 144,606 million tenge. The share of e-commerce in total retail trade increased by 0.4 % to 1.4 % in 2018. The volume of wholesale trade via the Internet increased by 69.5 % in three years from 67,741 million tenge to 114,856. 8 million tenge, as for the share of e-commerce in the total volume of wholesale trade, it can be said that in three years it increased by only 0.1% because domestic consumers are not yet ready to purchase goods in large quantities due to the fact that trade via the Internet is still not so developed. And finally, the volume of sales of services via the Internet, starting from the base year, decreased by 12 % in 2017, but then by the next year increased again by 93 % compared to 2017.

Table 2: E-commerce in the Republic of Kazakhstan (domestic market)

Indicators	2016	2017	2018	Growth rates, %	
				2018 to 2016	2018 to 2017
Volume of online retail sales, million tenge	78500,5	106918,1	144 606,0	184	135
Share of e-commerce in total retail trade, %	1,0	1,2	1,4	0,4	0,2
Volume of wholesale trade via the Internet, million tenge	67741,0	87248,8	114 856,8	169,5	131,6
Share of e-commerce in total wholesale trade, %	0,4	0,4	0,5	0,1	0,1
Volume of sales of services via the Internet, million tenge	80 198,4	70 356,2	136 123,0	169,7	193

With the development of e-commerce, the market in the country has been enriched with players in the form of various online marketplaces. Because of the diversity, each online marketplace can be categorised as follows: "marketplaces", "passenger transport", "ticket sales", "clothing sales", "electronics" as well as "classifieds". Domestic market players actively promote their platforms and compete for the number of users of their platforms. According to the international information resource Euromonitor [5], in 2018, the size of the domestic online commerce market was 287 billion tenge and increased by 23.2% compared to 2017. Market players apply other indicators, for example, Ramil Mukhoryapov, chairman of a large firm, founder of Chocofamily Holding, estimates 420 billion tenge and a growth of 25%; Maxim Melnik, general director of Satu.kz, estimates a market volume of 327.2 billion tenge. Tenge, and growth at 14-15%, taking into account not only the turnover of physical goods and services purchased online, but also the accompanying services, in the absence of which the development of commerce online would be unattainable, as this includes advertisements, online payments, as well as delivery. According to Satu.kz, domestic consumers bought 302 billion tenge worth of products and services online in 2018. This figure exceeds 2017 by 14%. Profits of entities from advertising products and various services on social networks, marketplaces and other Internet sites collected 5.3 billion tenge, revenue of online delivery operators amounted to 18.1 billion tenge, online payments - 1.8 billion tenge.

According to information from the MNE, the e-commerce portion reached 2.9% of the total monetary retail trade in 2018, a figure that must rise to 5% by 2025. Entities, on the other hand, are weighing this part at 2-4%. When there is no register of e-commerce, there is no way to speculate about the true number of online shops, but, as the MNE points out, in one way or another, e-commerce mechanisms are used by essentially every second SME. More than 1 million SME members sell their products through 20 online platforms.

According to the ministry, most domestic consumers order beauty products and clothes online - 15% and 14%. Eleven percent of online sales are for electrical appliances, 10% each for shoes and building materials, 9% for computers, 5% for smartphones, 4% for consumer products and 2% for books. In the service sector, over 59% of online sales consist of airline tickets and 13.4% of travel tickets. At least 10% go to services, 9.9% to cinemas and 7.3% to discount coupons. According to Denis Stepantsev, head of the association "Digital Kazakhstan", online shopping interested older people, the proportion of users over 45 years old was 20%. In addition to common purchases, which include electronic goods and clothing, domestic consumers began buying car parts, everything for flat interiors, sports accessories, etc. online.

According to the General Director of Satu.kz Maxim Melnikov marketplaces began to

win consumers in competition with social networks and search engines.

In Kazakhstan, there is also a tendency to increase the volume of trade through marketplaces. In contrast to offline retailers, advertising and promotion of products and services are important sources of income for marketplaces because consumers rely more on marketplaces than search ads and poorly known sites. According to SimilarWeb, some of the direct traffic is on Satu.kz was 10%, Lamoda.kz - 37%, OLX - 40%, Aliexpress - 64%. The success of marketplaces is explained by the fact that consumers value not only the device itself for purchasing goods, but also convenient conditions, a guarantee of safe purchase, prompt delivery and service.

According to the analytical data obtained from the shopping service Picodi.com [6] it was decided to analyze the transactions that were made by consumers using the World Wide Web in 2018.

The questions related to the devices from which the most transactions took place, how the average number of checks changed within a year, and what period of time was marked by the very peak of consumer activity.

Regardless of the fact that with global trends and indicators, Internet traffic is most often generated by mobile phone owners, the dominant number of online purchases in our country is still made from personal computers (60%). Purchases are about half as much made from mobile phones (37%), as for the share of users using portable tablets, according to data from them, about 3% of transactions go away.

At the same time, it is tablet users who have the highest average check - about 23 thousand tenge, compared with 22 thousand tenge for personal computers, as well as 20 thousand tenge from mobile phones. Users of the "iOS" operating system can boast of an average purchase amount of 4,000 tenge more than the owners of "Android". According to statistics on purchases based on gender, it is said that, as before, a large share of online purchases are made by women (62%), the share of men is approximately 38%.

As for the age attribute - a very large share is occupied by users aged 25 to 34 years, for 2018 and 2019, they accounted for about 47 % of the majority of sales on Kaznet sites. There are also other age groups: 19 % - for "solvent" youth from 18 to 24 years, 9 % of purchases go to the age group from 45 to 54 years, and 18 % - to the middle-aged group (35-44 years), 7 % of the share of all other transactions in the network goes to people from 55 years (this is almost 2 times more than in the Russian Federation).

The largest amount on the average purchase receipt happens in September, namely, during the period when fresh seasonal clothing collections arrive in stores, that is, the categories of clothing and shoes are leading among the most popular product groups online. At this time, consumers have more than 38,000 tenge.

Despite the fact that most retailers have recently been proud of their sales growth and profit from the annual "Black Friday" promotion, which takes place at the very end of autumn on the eve of the New Year holidays, the average amount of the check at this time remains within the total annual amount (10,300 tenge).

Undoubtedly, a large number of promotions and discount offers in this season of the year to some extent reveal the myths about the falsity of discounts on sale days. This statement also indicates the chart of purchasing activity for 12 months. Approximately 17% of the total number of annual sales goes away, especially in November, as the popularity of Black Friday increases annually.

In September, for 1 year, only 7% of total transactions are made in chain stores. The average transaction amount falls in January, at a time when most gifts have already been purchased.

The most active days of the week for domestic buyers fall on Friday from personal computers, as well as on Thursday and Sunday from smartphones. 9 % of most transactions are received at noon from 2 to 4 o'clock in the afternoon, in the evening, consumer activity decreases, but increases again at midnight.

The process of developing e-commerce is a common task that requires the unification of state forces and the efforts of the business community [7]. The measures envisaged by the State are aimed at improving computer literacy, improving the regulatory framework, as well as developing infrastructure. The business community, in turn, needs to improve the quality of the services offered, advertise and monetize the services.

According to experts, in the foreseeable future, the local e-commerce segment will begin to rise by about 15-25% per year. The leading market players are focused on building ecosystems and are focused on introducing them to foreign markets.

For example, Chocofamily is already developing the Republic of Uzbekistan and the Russian Federation with the help of iDoctor and HR-Bot services, and 60% of Hr-bot's revenue is currently generated in the Russian Federation.

In 2019, about 30 sites were included in the ranking. As in 2018, the leading position was taken by Kaspi.kz, followed in second place by the national air carrier AirAstana. Online platforms for online airline tickets in Chocotravel and Aviata, having merged into one company, became the main newsmakers of the e-commerce market in 2018.

According to the assessment of the results of the Internet holding Chocolife, having worked for more than a year in the new status, we can say that the association has benefited both projects.

According to them, there is a significant improvement in the economy, and the research groups are concentrated in a coordinated direction, thereby noticeably leaving behind the competitors. They are one of the pioneers who introduced a meta-search model and online travel companies in the CIS countries, which allowed them to set such prices for flights that are not in the power of competitors.

Quick automatic returns and exchanges have been introduced. In 2018, the consolidated firm started to make a real profit, but in 2017, when the data of Chocotravel holding and Aviata service is combined, a loss is noticed.

The joint profit showed the 2nd result in the segment, however, for this reason, according to the methodological requirements weighed not the firm but the online platforms; these online resources were in 3rd and 4th place respectively. In the area of online sales of household appliances, offline online shops are the leaders. In the clothing category, 2019 was a profitable year for the Wildberries site, which increased the number of customers and orders within the domestic market by 60% compared to 2018, in addition to significantly increasing its network of pick-up points.

Conclusions

E-commerce is a relatively young area of the economy, which is already developing in Kazakhstan, where the share of e-commerce is increasing every year. This is evidenced by online marketplaces and platforms of various categories, which, due to the development of the online marketplace, offer domestic consumers a more diverse and wider range of goods and services, most surprisingly without leaving home.

The leading categories of goods and services are mainly beauty products, airfare, medical supplies, household tools, children's toys, food to order, etc.

The most active age group online consists mainly of young people, who are most exposed to advertising from various social networks. Regardless of what with global trends and indicators, Internet traffic is most often generated by mobile phone owners, the dominant number of online purchases in our country is still made from personal computers.

The leading players in the internet market are focused on building ecosystems and concentrating on penetrating external markets.

For an online platform to be successful in this direction, the reputation of the firm in the local market is important. The reputation of an Internet platform is an important aspect of doing business in this area, as consumer trust plays an important role in choosing the right platform.

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EU agribusiness experience in public-private partnerships

Abstract. Agriculture and related industries directly affect the lives of most of the world's population. It is an important factor in the territorial integrity and security of the country. When implementing measures to support agribusiness, it is necessary to take into account the experience of the leading agrarian countries. An important relevant aspect in this direction is the influence of the potential of public-private partnership (PPP) on the development of agribusiness.

Key words: agribusiness, public-private partnership, agricultural sector, agribusiness, business, agriculture, interaction mechanism, experience, farming.

Introduction

The agricultural sector provides the needs of the national economy and population for basic agricultural products and is an important factor in the territorial integrity and security of a country. Agriculture and related sectors directly affect the lives of the majority of the world's population.

The sector employs more than 40 per cent of the population, including 70 per cent of the bottom billion. Agriculture also accounts for more than 70 per cent of global freshwater consumption, as well as about 30 per cent of global greenhouse gas emissions.

When implementing support measures for agribusiness it is necessary to take into account the experience of advanced countries in terms of agriculture.

An important relevant aspect in this direction is the impact of the potential of public-private partnerships (PPP) on the development of agribusiness [1].

One of the motives for the application of PPP mechanisms in agribusiness is the need to introduce advanced technologies and the lack of own resources in this area.

In this context, the need to involve small and medium-sized farms in the multiple benefits generated by agro-industrial complex (AIC) projects is a powerful incentive for the application of PPP projects in the AIC. The fact that public-private partnerships are involved in this process, which, by definition, aim to achieve sustainable and inclusive agribusiness development, can

bring some benefits to the end beneficiaries. Trends in the use of PPPs in the agro-industrial complex are gradually becoming global [2].

Object and methodology

It should be noted that state regulation and interaction between the state and the business community in agriculture in different countries varies widely in the use of economic and financial mechanisms and instruments, the degree and forms of state intervention in private business vary.

The mechanisms of interaction between the state and the business community in a number of countries are actively applied, successfully operate and are constantly being improved. These include European countries - UK, France, Germany.

For instance, Great Britain established the Private Finance Initiative (PFI) programme. The essence of this programme was to transfer to the private sector the function of financing construction (operation, reconstruction, management, etc.) of public facilities of industrial and social sphere.

In France, the application of public-private partnerships uses a model where the state, in order to attract private investors to public projects, creates so-called communities of the mixed economy (Societed'economie Mixte, SEM), which are joint ventures. When forming these enterprises, a mandatory condition is that the share of the state or local self-government bodies in the authorized capital is from 50 to 85%.

In Germany, on the basis of public-private partnerships, PPP support centers are functioning and are being re-established, operating both at the level of the federal states and at the federal level. At the federal level, such a center – CPP Deutschland AG (Partnerschaften Deutschland) was established in November 2008.

Research results

The most important factor in the successful development of public-private partnerships is the coordinated actions of state bodies in the development and implementation of investment projects. An analysis of international practice shows that in a number of countries there are special state or public-private councils, which are the most important institutions that summarize the experience of implementing projects within the framework of public-private partnerships and develop recommendations for improving the legal norms governing this area. In order to ensure the competitiveness of agribusiness, it is necessary to modernize agricultural production on the basis of a comprehensive balanced use of all available resources, including public-private partnership measures [1].

The use of public-private partnerships to design, build and deliver infrastructure around the world has increased significantly over the past decade.

Food demand is expected to increase by 70 per cent by 2050, with supply under pressure due to changing weather patterns and demand for land availability, low productivity and wastage. Approximately one third of the food produced for human consumption is lost. In low-income countries, losses occur mostly in the early and middle stages of the food supply chain as a result of poor harvesting techniques, storage and cooling under difficult climatic conditions and other infrastructure deficiencies.

Addressing these challenges requires increased productivity, which is achieved mainly by improved agricultural practices such as agrochemicals, new seed varieties or improved irrigation methods. Public-private partnership (PPP) arrangements can make these gains more affordable and encourage private sector participation.

In the wake of the global financial crisis, attention has focused on food security. Some governments have responded to the unprecedented spike in food prices in recent years by increasing the grain reserves they hold as strategic reserves.

To improve food security, cereal stocks must be kept in modern storage systems that minimise storage losses, reduce operating costs and ensure efficient storage management. Considering this problem, EU states have started to take measures to reduce food losses, including those due to poor storage and handling.

One of the solutions identified by countries with major food security programmes has been the introduction of public-private partnerships (PPPs) in food storage, especially for grain storage. PPPs in grain storage have led to simple solutions, such as storing surplus grain in vertical bins instead of warehouses or open platforms, which reduce losses through rotting, theft and misuse by 20 per cent. By working with the private sector, the state gains access to experience in building and operating large-scale modern storage facilities for port facilities, inland grain production points.

Over the past 50 years, the irrigation and drainage sector has played a vital role in food production, in the rural economy and in meeting the world's rapidly growing demand for food. But with population growth and an increasingly scarce water resource, irrigated agriculture will have to continue to grow rapidly and become more productive and efficient in order to produce 'more crops per drop'. Nevertheless, since the 1980s irrigation and drainage systems have seen declining investment and problems have arisen due to inefficient water management.

The private sector has often stimulated innovation through improved water efficiency on farms and in commercial agriculture, and yet this has not led to widespread private sector participation in traditional irrigation schemes, which remain largely under public funding and management, despite huge financial burdens.

Although PPPs in the irrigation sector have been established in Europe for many years, experience in developing countries has shown a small but growing number of PPPs in the irrigation sector. Introducing private sector knowledge, technology and incentives can help to improve water use efficiency and ensure more sustainable water management. There are different ways of using PPP arrangements in irrigation, ranging from simple management contracts, where a private party takes over operations and maintenance responsibilities in return for payment by results, to contracts in which a private firm is responsible for building, managing and to some extent financing irrigation infrastructure assets over a long period of time. In irrigation projects in particular, the scope of PPPs can also vary greatly, from the development and operation of a major water source and transport to the inclusion of on-farm agricultural development. It should also be recognised that irrigation schemes are part of a wider agricultural value chain where the private sector can play a role. This poses challenges that need to be considered when assessing the viability of a project as a PPP, and presents a unique set of risks such as land tenure, the type of agricultural practices and crops produced by farmers, the volatility of agricultural commodity prices and the role of farmers' organisations or water user associations (WUAs) that need to be considered [3].

Conclusions

However, in practice, the development of the agro-industrial complex through the use of PPP mechanisms is associated with certain difficulties. Many factors exert their invisible influence in this process. Among them, the factor of farmers’ perception of the conditions that determine the size and other parameters of the benefits received under project contracts is the most critical. Equally, the factor of vagueness in defining the mechanism that provides for withdrawal from contracts presents a certain complexity for end users.

This is due to the lack of transparent directives governing the functions of local communities that are participants in PPP projects. In addition, the factor of vagueness and ambiguity in the criteria for evaluating the results of project implementation, which ultimately calculate the total benefits of recipients, can scare off potential partners interested in the development of the agro-industrial complex [2].

The use of PPPs in the agribusiness sector largely depends on the typology of PPP-agribusiness projects. Due to the fact that Kazakhstan is currently guided by the OECD standards, the PPP-AIC typology, in terms of their practical application, is based on the approaches developed and tested by the European Commission and the countries of the European Union. Here, it is important to note that the typology of PPP-agribusiness projects, taking into account the specifics of Kazakhstan, proceeds from the understanding of two main approaches.

The first approach requires close cooperation between the private and public sectors, based primarily on PPP contracts.

The second approach provides for institutional PPP-agribusiness projects, which are a kind of partnership between the public and private sectors of the economy within the framework of the structure of legal entities.

In accordance with the first approach, projects are strictly administered and regulated by the terms of contracts. According to the second approach, the implementation of projects is guaranteed based on the jurisdiction of an individual company and the agreement reached between the shareholders of the project assets in the private and public sectors. Both approaches are subject to contractual regulation.

The categorization of PPP-agribusiness models is based on the difference in the forms of ownership of the project assets. Here, such forms as full private ownership, private financial initiative, leasing, and concession are of primary importance.

In this case, such forms of contracts as those that depend on the degree of responsibility for the investment invested in the project, the distribution of risks, the duration of the project, the terms of procurement of the project, and others, are key.

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Strategic direction for innovative agricultural development

Abstract: The article notes the need to develop proposals for the implementation of innovative achievements in large grain-producing regions, stimulation of innovative activity, improvement of material and technical base.

Key words: innovative achievements, budget financing, scientific and technological progress, regulation mechanisms, innovation process infrastructure, specialization zones, innovation policy, stimulation, state regulation.

Introduction

The unsustainable economy of agricultural production, raw materials and food in the country does not allow relying on its active receptivity to modern innovative achievements, to develop scientific and technological progress, the main elements of which are innovation, investment and innovation. Market transformations do not provide a proper solution to the problem of development of innovation activity in agriculture, which is a multidimensional and multifaceted task at the farm, regional and national levels.

Object and methodology

The object was agricultural production under conditions of innovative development. In the process of collecting, processing and analyzing the materials, monographic, abstract-logical, computational-constructive and other methods of assessing economic processes were used.

Research results

During the period of market reforms, the situation with the introduction and use of innovative achievements has worsened due to many internal and external problems. However, the impact of innovation on increasing agricultural production and efficiency in favourable grain production areas could have had better results if agro-industrial production could have been overcome:

limited and dispersed budgetary funding for elements of scientific and technological progress, a constant shortage of necessary funds, including mobilisation of own funds of grain farms, private investment, credit and extra-budgetary funds, foreign financial and credit organisations;

regular disconnection, lack of coordinated actions between state and other economic entities, lack of real mechanisms for regulating innovation processes in agricultural production and material interest of the authorities at the federal and regional levels to create sectoral funds for research and development work by attracting private investment and venture capital funds, weak information base of non-budgetary organisations;

imperfect infrastructure of the innovation process, lack of mechanisms regulating licensing and protection of intellectual property in agricultural production, regulation of organizational and economic management of innovation activities, which would encourage the consumer to implement and use scientific developments, and the developer - to improve the created new innovative projects that would contribute to the efficiency of agricultural production.

Improvement of the situation with the introduction and use of innovative achievements is obstructed by the lack of a developed regulatory framework, which should provide mandatory incentives for innovation activities and regulate the acute shortage of specialists in the field of innovative achievements and knowledge of the specifics of the grain industry. The lack of acceptance of innovation by many farm managers of agricultural products is also a constraint.

The Russian Federation differs from many developed economies in that innovation in agricultural production is not the basis for its effective functioning. The availability of the use of elements of scientific and technological progress is possible only on financially strong farms that cultivate agricultural products in regions that are generally favourable for the production of one product or another. This situation is due to the lack of a clear system of absorption of innovative achievements, as well as the lack of state regulation "to ensure the early introduction of the achievements of scientific and technological progress by farms producing agricultural products.

For example, forms of implementation of innovative achievements in some large grain-producing regions are often in the form of departments and distribution groups of scientific institutions, higher education institutions and other organisations that are producers of innovative products. Another form of introduction of scientific and technological achievements should be independent organisational structures economically unrelated to the production activities of scientific products. However, they possess a haphazard, rather limited set of implementation tools and have varying levels of efficiency and do not represent an integrated system of absorption of innovation developments, but are only able to solve specific problems in a timely manner. Therefore, we need such a form that would unite all the processes of scientific and technological progress in grain production, and this is impossible without regular support from the state [1].

Meanwhile, the current situation with the implementation of innovative achievements in grain production can be assessed as very contradictory.

«In order to minimize the negative consequences of adverse weather conditions in grain production and especially in the areas of specialization it is necessary to overcome the current

situation with the introduction of innovative developments in production for the better. Therefore it is necessary to work out more perfect mechanism of state financing of development of material-technical base of grain production by means of additional attraction of means, using various purposeful grain programs, and also use of financial support of innovation projects by state, creation of both commercial scientific-consulting centres, and state ones. An important direction in providing favorable conditions for the stable functioning of grain production should be a more perfect investment policy, activation of innovation and investment activity with the help of state support of the process of expanded reproduction in the grain industry» [2].

First and foremost, investments should be directed towards farms that grow high-quality grain. Currently, nineteen regions of the country are highly specialised zones, where relatively cheap and high quality grain is grown. They produce more than 50% of the gross harvest and more than one tonne per capita.

In an unstable economy and the almost regular insolvency of a large proportion of grain-producing farms, it is the state that should:

To support through stimulation of innovation activity, improvement of material and technical base of grain farming the implementation ensuring profitability of grain production and growth of indicators of competitiveness of domestic products of grain farming in the foreign market;

To combine state regulation of introduction of new technologies in grain sub-branch with rational functioning of innovation mechanism in conditions of market relations according to principle: market regulates, and state corrects;

Support the development of scientific and technological activities, inter-regional and inter-state rules for the promotion of advanced technologies, facilitate in the area of investment, support national interests relating to innovative entrepreneurship through regulatory and legal support, as well as innovation management;

Promote the creation of a rational infrastructure used in the transfer of new technologies and information base from science to production, promote the creation of innovation technology promotion centres, the organisation of banks of scientific and technical innovation projects and proposals, including services for the dissemination and implementation of innovative achievements in grain production;

Encourage the creation of a specialised innovation fund at the federal and regional levels. For this purpose, it would be advisable to exempt financial resources from taxes and introduce preferential taxation to channel the funds concentrated in this fund into investment and innovation activities in the regions where cereal crops are cultivated.

Stable and sustainable development of grain production is possible only with the use of innovative achievements, which are based on the achievements of scientific and technological progress, continuous technical updating of the grain sub-sector.

At the same time, even the most outstanding achievements are not applied in practice, if they are not included in a particular technology. The main factor of formation of new technology should be the maximum progressiveness of all its elements, including the choice of the most productive hybrid or variety, the use of resource-saving technology, effective methods and optimal timing of sowing, the introduction of chemical means, the use of progressive forms of labour organisation and its stimulation, the safety of the agrarian ecological system. Consequently, it is advisable to direct the primary material support to the organization of scientific and technical system of grain production, the establishment of economic activity on the basis of pilot farms, which could implement the developed models of adaptive-landscape farming, progressive agricultural technologies and other advanced developments carried out by agrarian scientific centres.

At the same time, existing numerous problems of development of scientific and technical activity in grain production, require development and implementation of effective innovation system with the purpose of development of agriculture as the basic sub-branch of agriculture, including personnel, scientific, production and financial potential, use of the most modern

organizational and economic levers of scientific and technical process management. This can be implemented by creating regional scientific and technological sectoral complexes, which would coordinate the activities of all structures of the scientific and technological process, control the promotion of innovation from creation to application in the production process, organize training of highly qualified managers to manage innovative technologies.

The current economic conditions, when the financial possibilities of the state are limited, require a fuller use of forms and methods of activation of scientific and technical activity in grain production. At present, 75-80% of agricultural producers can implement innovations only with the help of an information and advisory service. However, no more than 5-7% of economically strong farms are covered by this service. Compared to countries with developed market economies, this is 5-7 times less. «In the Krasnodar region, the basis for scientific and technical activities in grain farming is

Prioritisation of scientific and technological processes as a basis for the effective development of the regional grain production. In accordance with a resolution of the regional administration, a department for innovation, technology and science has been formed. It has to coordinate activities of scientific, both state and commercial structures in agro-industrial complex;

To confirm existing decisions on organisation of scientific-technical activity in grain production. The management body responsible for coordination and expertise is the Scientific and Technical Council, which includes the directors of all sectoral research institutions. Its decisions must be implemented;

The integration of scientific, innovation and educational activities. Since it is very difficult to introduce the new in all categories of the regional economy at once, it is advisable to apply the so-called point technology in scientific and technical activity, which implies the concentration of innovations in specific areas, the creation of «points of economic growth», the centre of new technologies approbation base». [3].

Grain production includes certain, different from each other, closely interrelated stages, predetermining the action and coordination of a large number of factors of innovative progress in grain production for the purpose of its effective development in areas of high-quality grain production. Technical, technological, organizational, biological, economic and legal are basic and contain several directions of innovative progress, among which the most priority ones can be distinguished, which provide the growth of efficiency of grain crops cultivation and improvement of grain quality at various stages of grain production.

Conclusion

The most promising areas of innovation progress in the cultivation of grain crops in modern economic conditions can include development and adoption of resource-saving and environmentally safe technologies, since only a limited number of commercial grain-producing farms in the country, according to their economic capabilities, are able to use intensive technologies of grain crops cultivation. Due to the fact that the use of biological factor is still the least costly and more economical way to increase grain production, the use of intensive breeding process, engaged in creation of the newest varieties and hybrids of grain crops, using developed system of seed production in the region, corresponding to conditions of market economy, should be considered as primary and main direction of innovative progress development in grain production. However, the technological and biological factors will be fully realized only when the farms producing commercial grain will have a real financial and economic opportunity to update their machine-tractor fleet in a timely manner.

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Prospects for cooperation in training specialists in agribusiness

Abstract: The option of male-level education is required for the practical training of specialized specialists in the system of self-production.

Key words: personnel issue, training, education, science, innovation, educational programs, technology, developed countries, project, international cooperation.

Introduction

The state program of industrial and innovative development of the Republic of Kazakhstan (hereinafter referred to as the SPIID), developed in accordance with the long-term priorities of the Kazakhstan-2050 Strategy, has set the pace not only for transforming the country's economy. One of the priority issues of the SPIID is the personnel issue, its educational support.

With the advent of new industries in Kazakhstan, new specialists also appear, often in unique, previously non-existent professions. The personnel issue was identified among the priorities of the SPIID-2 at the stage of program development. It was industrialization that sharply outlined the existing gap between educational programs and the real needs of modern industries. And training is necessary even ahead of schedule. Industrial and innovative development has moved on to the next stage - "Industry 4.0", which provides for the digitalization of enterprises [1]. Since the beginning of 2017, the Ministry of Investment and Development, together with foreign experts, conducted a study of the readiness of enterprises in Kazakhstan to move to this stage.

Thanks to SPIID, in the country, in fact, the entire system of specialist training will be updated, both with professional special and university education.

Object and methodology

Since the training of specialists for the innovative economy of Kazakhstan is carried out in the context of global competition, within the framework of which radical changes are expected

in a large number of production sectors, a serious reorientation is necessary. Since these changes must go through the development of robotics, bio- and nano-technologies, artificial intelligence systems, information networks and integrated high-speed transport systems, agricultural production. Skills of network interaction, information exchange in the virtual space, project, synergetic approaches and system analysis come to the fore for qualified specialists.

Research results

Improving the competitiveness of the economy and Kazakhstan becoming one of the world leaders is determined by the efficiency of innovative development of production, which in turn depends on the modernization of the higher technical education system, systematically interacting with science, generating new knowledge and modern technologies, and with production [2]. Today, the potential of universities is determined not only by the quality of educational services provided, but also by the entire chain of interaction "education - science - innovation".

To solve the problems of training innovative personnel, the following basic universities have been identified: Eurasian National University named after L. Gumilyov (ENU), Kazakh National University named after Al-Farabi (KazNU), Kazakh National Research Technical University named after K. Satpayev (KazNITU), Kazakh National Agrarian University (KazNAU), East Kazakhstan State Technical University named after D. Serikbayev (EKSTU), Karaganda State Technical University (KSTU), South Kazakhstan State University named after M. Auezov (SKSU), Pavlodar State University named after S. Toraigyrov (PSU), Kostanay State University named after A. Baitursynov (KSU), Kazakh Agro Technical University named after S. Seifullin (KATU), Kostanay Engineering and Economics University named after M. Dulatov (KEEU). All of them are actively involved in a new sphere. So, the training of modern practice-oriented specialists is carried out on the latest laboratory equipment, the selection of which corresponds to the developed educational programs, and its expertise was carried out by experts from leading foreign universities and leading employer enterprises. At the basic universities, in the first year of the program, 24 new laboratories were created, mainly of an interdisciplinary nature: construction, research and testing in the areas of training, innovative technologies in mechanical engineering, ferrous and non-ferrous metallurgy, advanced mining technologies, food safety, and the synthesis of herbicides and insectofungicyls, high-tech products for the processing of hydrocarbon raw materials and chemotology, for the production of chemicals for industry and agrochemistry, etc. other.

To qualitatively improve the practical training of specialists in the higher education system, the task was set of developing dual training, creating modern centers of applied qualifications to overcome the shortage of personnel. In dual training, the principle of the relationship between theory and practice is implemented, therefore such education is as close as possible to specific production needs, while employers themselves will participate in the training of specialists of the required level.

To date, according to the Ministry of Education and Science, 47 new multidisciplinary laboratories are already working in basic universities and 2 collective laboratories in 2 medical universities. On their basis, practical and laboratory classes are held, diploma and master's, scientific works of students are carried out.

At the same time, the ministry notes that the applications of basic universities for conducting research in the framework of grant funding projects for the results of scientific and scientific-technical activities have increased. If in 2016 there were 86, then in 2017, basic universities filed 244 applications, in 2018 - 771.

According to the results of a sociological study conducted in 2018, 98.5% of the surveyed employers noted that graduates of the SPIID work at their enterprises and praised the compliance of educational programs with production requirements. 81% of the graduates surveyed believe that their educational level has increased significantly as a result of training on the basis of established modern laboratories.

The modernization of agricultural education in the CIS is in full swing.

In the innovative development of the agro-industrial complex, a large role is given to the development of scientific developments and research. In this regard, an important place is occupied by the Council of Rectors of the leading agricultural universities of the CIS. The Council coordinates the work in the field of advanced training and retraining of personnel, organization of interaction of educational and methodical associations of leading agricultural universities of Kazakhstan and Central Asian countries, inter-university cooperation through interaction with other international organizations.

Today, in the context of Kazakh-German economic cooperation, a special place is occupied by productive cooperation in the agricultural sector, where projects related to the transit of technologies and techniques in the development of organic farming, veterinary medicine and livestock are gaining momentum.

The population must be provided with healthy and safe foods in sufficient quantities. Achieving this goal is possible only through international cooperation and the unification of our specific advantages. Kazakhstan has huge agricultural potential, and Germany is the world market leader in the production of modern agricultural equipment. The fruitful interaction between the two countries will double the potential in production. Cooperation should always be beneficial for both parties, only then it can be stable and honest. After all, together you can roll mountains. The development of international relations follows this principle.

What measures are being taken by Germany to bridge the systemic, technological and other gaps between EU agricultural production oriented towards external and domestic markets?

It should be noted that the quality of products produced by European agricultural enterprises is very high, regardless of whether these products are intended for their own market or for export. At the same time, a high level of food safety and plant health is ensured through private and state control. In addition, enterprises are naturally obliged to comply with the requirements of those countries to which they export their products. This is established both by the “Agreement on the Application of Sanitary and Phytosanitary Measures” (SPS) of the World Trade Organization (WTO), and by the provisions of the current EU legislation. In case of special questions and problems, partners exchange information with third countries about the requirements and advocate for the adoption of appropriate decisions. Of particular note is the harmonization of technical standards and the conclusion of equivalence agreements.

A practical element of cooperation between Kazakhstan and Germany is the international internship exchange program. This process has been supported for several years. The accumulated experience in this area indicates that the efforts of the Kazakh and German sides can contribute to the development of long-term and very effective cooperation. Every year, specialists from Kazakhstan undergo practical vocational training at various agricultural enterprises in Germany. In parallel with this, they have the opportunity to get acquainted with the country and, of course, people.

German farmers have gained good experience working in cooperatives and with other types of cooperation. The requirements of the legislation in this area are very detailed. The Ministry of Agriculture of Kazakhstan used the experience of Germany in preparing the law on agricultural cooperatives. But the fundamental principle is the principle of voluntariness. Germany will be able to promote education by creating joint platforms for the exchange of experience between farmers from Kazakhstan and Germany.

Currently, the agro-industrial complex of the EU countries has faced new historical challenges, which, first of all, are associated with the expected sharp intensification of competition in the global food market. In this regard, one of the priorities of the modern economy and the most important condition for the sustainable development of agricultural enterprises is to increase the economic efficiency of their functioning, as well as the production of competitive products. This can only be achieved if high-quality, practice-oriented training of future agricultural specialists.

Recent trends observed in the global economy have forced higher education institutions to train specialists who are able to make an informed decision in the shortest possible time to get

out of a non-standard situation. A graduate of a higher education institution must not only perfectly know the subjects in the specialty and be able to put them into practice, but also have an understanding of the modern production capabilities and technologies used both in domestic practice and in the advanced technologically developed countries of the European Union.

The highest level of self-sufficiency of the European Union by the most important types of agricultural products is determined, first of all, by the efficiency of production in the agricultural sector [3].

The Union annually provides over 1/5 of world grain production, more than 1/3 of milk and 1/6 of pork, and the association is unrivaled in the production of sugar beets and barley.

An even more vivid picture is formed by productivity in agricultural sectors. Productivity is that synthetic indicator that reflects the current level of implementation of the achievements of scientific and technological progress, technologies related to the traditions of the development of industries in each individual country. A grain yield of 100 kg / ha has long been an unprecedented indicator for France, the southern lands of Germany, the Netherlands, Belgium and Denmark.

The same can be safely attributed to beet growing, where in some regions, farmers receive 120 t / ha with a yield of pure sugar up to 10 t, and to potato growing, where a yield of 450 c / ha in many EU regions is the norm. At the same time, one must not forget about the highest and most stringent environmental requirements in production areas, which forces manufacturers to use chemical fertilizers, pesticides and other artificial growth regulators in a very prudent and enormously effective way.

Significant successes were also noted in such a synthetic indicator of the development of animal husbandry as milk yield per cow.

The level and structure of agricultural production costs is an important indicator that largely determines the profitability of the farm sector in the EU. The main components in the cost structure are the costs of feed, fuels and lubricants and chemicals. It is on these items, over the past 10 years, an increase in spending.

In this regard, the use of resource-saving technologies is becoming an absolutely necessary tool to increase the efficiency of farm production. Of course, in the framework of our project, an analysis of the main parameters of the EU agricultural sector does not allow us to fully track and reveal the deep trends of its transformation, but the following should definitely be noted.

Transformation of the experience of managing the agricultural business of the European Union, effective regulatory and financial support for the functioning of the agricultural and food system of the European Union, a high level of education of specialists will allow Kazakhstan and Central Asian countries to become equal players in the agricultural sector, to achieve the highest level of food independence [4]. Naturally, the processes of globalization and the crisis in the global economy dictate their rules of the game to European farmers. But the solid foundation that has been achieved over the past decades promises the European agri-food system, especially amid the aggravation of the world food problem and growing demand, solid prospects.

Leading agricultural universities of the post-Soviet space have experience of cooperation in the system of agricultural education.

Under the agreement on cooperation and two diploma education with the University of Applied Sciences Weihenstephan (Department of Triesdorf), Germany, undergraduates are preparing the educational program "Agricultural Management".

In the 2018-2019 academic year, teachers of agricultural universities from Ukraine, Russia, Uzbekistan, Kazakhstan, Armenia, and Azerbaijan were invited to the internship. The internship was carried out in the disciplines of the magistracy.

The internship program included training sessions, practical exercises with calculations and visits to the Brown / Schindler basic subsidiary farm, where information was collected for economic calculations.

The program included such sessions as the training content of the module “Cost and Benefit Structure for Agricultural. enterprise "," The calculation of the operation of agricultural. technicians ”,“ Planning methods PP1, PP2, BEP, MAX ”,“ Calculation of a multi-period investment project (MPI) ”.

It is necessary to pay attention to the fact that the calculation methodology presented for implementation in the educational process in Kazakhstani universities can be used only in the presentation of theoretical material, because the reporting forms used as a whole in our country are significantly different and contain less information than in reporting documents of German farmers.

In our country, such thorough calculations are not carried out on the costs of maintaining various types of animals and feed, which complicates the use of this calculation method in practice.

Nevertheless, this technique is of interest, and we, in the framework of the cooperation agreement, will use it in the process of practical training.

The basic farm keeps accounting records and carries out calculations according to the methodology developed by the university, which provides professional training for students and undergraduates. Farmers have a certificate for the implementation of practical training of students.

The dual education system has long been introduced into the educational process of German universities. This system allows the interaction of education and business, as a result of which the efficiency of training qualified specialists is increased.

Dual training is a chance to gain independence, painlessly adapt to modern business conditions, learn to perform specific duties in the specialty, and form the professional competence of the student.

A positive aspect in the dual education of Trisdorf is the presence of farms located directly on the territory of the university, which provides students with the opportunity to go on an internship without having to go outside the educational institution, directly carrying out the production process on these farms three days a week.

Undergraduates studying on grants receive a scholarship in the amount of 750 euros per month, which stimulates them to master the programs of training courses in a quality and conscientious manner.

Graduates of Weihenshtephan University successfully find jobs, including students from CIS countries.

The issue of obtaining a double diploma worries not only our university. Most partner universities have a German diploma only. In this regard, at a meeting of rectors of partner universities, the issue of issuing a diploma to undergraduates in Germany after the completion of the educational process in a domestic university was resolved. And it is right. Then the problem of two graduate studies will be solved.

The educational process in Trizdorf is provided with various software products, and the base enterprises are provided with a mechanized process for the production of livestock and crop production.

Conslusion

European education sees its task in developing the individual abilities of the student, global cooperation, removing barriers between formal and informal learning, which is possible with the help of competent teachers who are able to develop and implement ambitious educational programs.

Education should not be limited to traditional classrooms. It should maximize the potential of the digital revolution, which will increase the attractiveness and effectiveness of the use of educational resources and massive open online courses.

A change in the educational paradigm has led the political structures of Kazakhstan to realize the need to develop digital (electronic) educational content that meets state standards and higher education curricula.

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Analysis of the economic efficiency of existing power plants in Turkmenistan

Abstract. The article provides a general idea on economic efficiency, as well as a detailed analyses of the economic efficiency of existing power plants in Turkmenistan.

Key words: Electro energy sector of Turkmenistan, diversification, energy park, economic efficiency, prime cost, export of electro energy, innovational technology, energy conversation.

Introduction

Turkmenistan, rich in natural resources, is confidently demonstrating rapid growth of the national economy, with the electricity sector as the backbone industry. Currently, the electric power industry of Turkmenistan is successfully developing and undergoing radical modernization, creating a solid foundation for the country's social and economic development. Comprehensive and systematic development of the fuel and energy complex, widespread introduction of innovative technologies, increase in generating capacity and diversification of gas exports are the priorities of Turkmenistan's energy policy.

In order to modernise the electricity sector and save energy resources, state Programmes and Concepts have been adopted and approved in the country. Thus, such presidential Programs and Concepts as «Concept of Development of Electric Power Industry of Turkmenistan for 2013-2020», «Program of President of Turkmenistan for Social and Economic Development of the Country for 2018-2024», «State Program on Energy Saving for 2018-2024», etc. became the main milestones of reforms in the electric power sector. The implementation of these Programmes and Concepts is directly under the responsibility of the Ministry of Energy of Turkmenistan and employees of the energy sector [1].

Object and methodology

As we know, the problem of efficiency is the most important problem in economics. The concept of 'efficiency' means to carry out a process with minimal cost, effort and loss. Economic

efficiency is an indicator defined by the ratio of the economic effect (result) and the costs that generated this result.

In other words, the lower the costs, the greater the value of the result of the economic activity, the higher the efficiency. To assess the effectiveness of the economic system, indicators of the level of economic development of the country are used: total national production, sectoral structure of the national economy, production of major products (electricity, food, and durable goods), etc.

So, at present, the structure of the energy system of Turkmenistan includes 13 power plants. These power plants have 51 turbines installed. Of these, 12 are steam turbines, 36 are gas turbines, and 3 are hydro turbines.

Consequently, most of the heat and electricity in Turkmenistan is generated at thermal power plants, condensing power plants, and gas turbine power plants [1].

The first Gindukush power station was built in 1913 with three hydro-turbines. The capacity of each hydro turbine was 400-kW. Within the Ministry of Energy of Turkmenistan, the largest power plant is the Mary State Power Plant.

These power stations account for 27.13 % of the energy capacity of our country. It was constructed and commissioned in 1973-1987. The Turkmenbashi power plant has 2 steam turbine power units that were commissioned in 1984-1986.

There are two steam turbines in operation at the Seydi heat centre. They were commissioned in 1992-2004. The total combined capacity of these plants is 8.81%. The remaining power plants are operated with natural gas. The total aggregate capacity is 64.06%. The information about the operating power plants in Turkmenistan is also shown in the first table [3].

Table 1 - Types of operating power plants in Turkmenistan and their indicators

T/b	**Type of power plants**	**Power plants**	**Total capacity of power plants, MW**
1	Combined heat and power plants (CHP)	Turkmenbashy CHP	420
		Seydi CHP	160
2	Condensing power plants (CPP)	Mary CPP	1786
		Gindukush CPP	1,2
3	Gas turbine units (GTU)	Avazinskaya GTU	254,2
		Akhal GTU	648,1
		Balkanabat GTU	380,6
		Ashgabat GTU	254,2
		Dashoguz GTU	254,2
		Lebap GTU	149,2
		Darvazinskaya GTU	504,4
		Vatansk GTU	254
		Bezmeinsk GTU	246,6
		Mary GTU	1199,7

The total installed capacity of the existing power plants in Turkmenistan is 6512.4 MW. The Ministry of Energy of Turkmenistan is carrying out large-scale work to increase the export

of electricity to other countries. Accordingly, the «Concept of development of the electric power industry of Turkmenistan for 2013-2020», the amount of exported electricity in 2013-2020 should increase by 5 times.

It is planned to export electricity to such countries as Uzbekistan, Tajikistan, Afghanistan, the Islamic Republic of Iran, Turkey, and Armenia.In this case, cooperation between the countries and Turkmenistan will rise to a new level of strategic partnership and open up wide opportunities in economically profitable relations.

Research results

The analysis of changes in the cost of electricity produced by 100 MW/h in different power plants is carried out.

In accordance with the analysis of the cost of production of the CPP compared to the CHPP is 1.5 manats less, in the CPP it is equal to 1.3 manats. That is, in the CHPP, the main production costs are fuel. Changes in the cost of a CHP plant occur due to changes in market prices for fuel. And this in turn affects the quality of the fuel used. In GTU, the cost of energy produced in comparison with CPP is 0.90 manat less than the price of electricity produced.

This article analyzes the current and future state of the electric power industry in Turkmenistan.

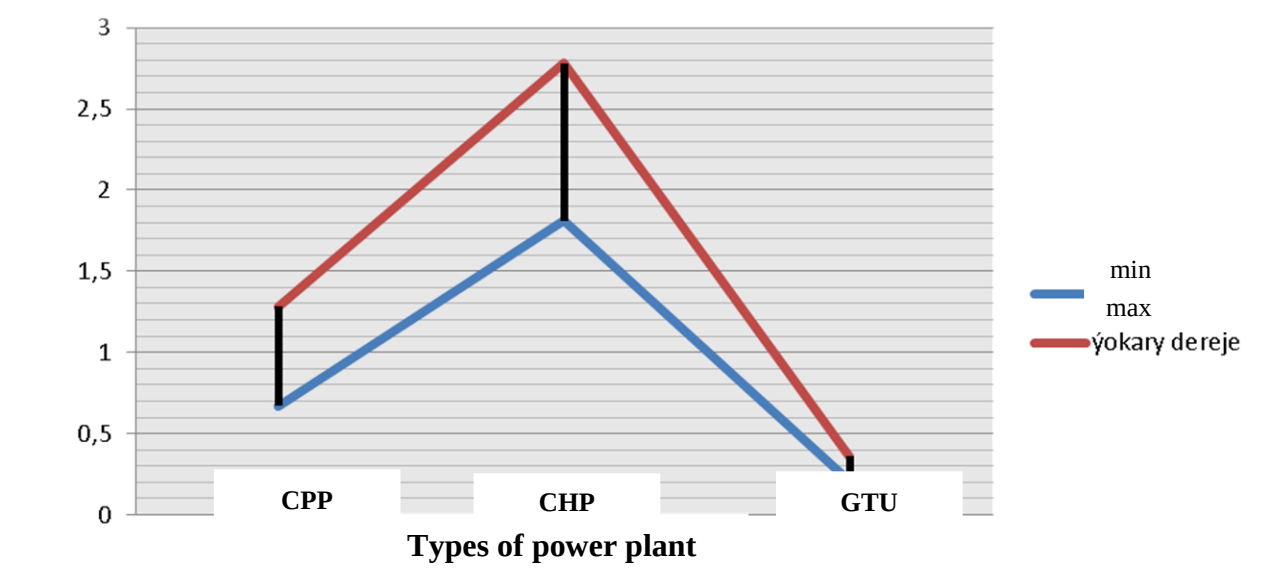

Figure 1 – Analysis of changes in the cost of electricity produced by 100 MW/h in different power plants

Large-scale modernization of energy facilities based on presidential Programs and Concepts are designed to increase the volume of export supplies, improve the reliability of the energy system and ensure further socio-economic development of Turkmenistan.

Conclusions

1. At different stages of the production of the electric power industry, costs and costs are characterized by percentages.
2. In this article, all power plants and their types are divided into three groups.
3. The 100KWh produced is shown in the chart and currently the profitability of the GTU is higher than the others.
4. In our development of electricity savings will provide an opportunity to increase electricity exports.

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Features of overhead line installation according to local conditions

Abstract. Studying the types, the establishment of supports used in overhead power lines, the necessary information about them is collected. In the scientific work, the local climatic conditions of Turkmenistan were deeply studied, the corresponding calculations were carried out to ensure the reliability of overhead power lines, and favorable solutions were proposed that correspond to the technical conditions.

Key words: system reliability of supply, reliability of the line, particularities of the montage of the line and handhold, ice formation, breakage of wires and cables.

Introduction

Power transmission lines have a special function in the electricity system. Overhead and cable lines are used to transmit electricity over distances.

The most important task of a transmission line is its reliable operation.

Depending on the location, sudden power line outages for various reasons are defined.

Overhead power line wires operate in severe climatic conditions: electric currents flow under high voltage; they are exposed to various climatic influences (changes in ambient temperature, wind exposure, as well as the formation of ice on the lines).

Object and methodology

Wind, temperature and ice cause the wires to deform (stretch or shrink) and become heavy.

As a result, there is a risk of breaking wires and cables. In special cases, when the mechanical load from the ice increases the design load falling on the wire, which leads to its breakage.

The main damage to wires is caused by overlapping or sagging wires and cables, thawing ice and, due to the mechanical load from ice, the load is unevenly distributed between adjacent supports.

The entire territory of Turkmenistan is divided into districts according to the thickness of ice, which is presented in Figure 1.

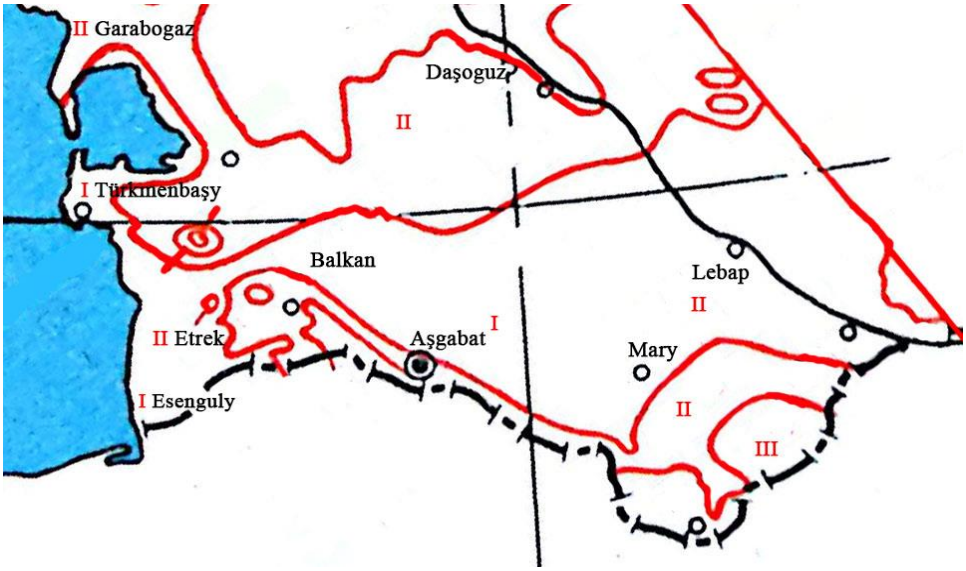

Figure 1 Map of the zoning of Turkmenistan territory according to ice thickness

$$\gamma_{(c50)}=P_{(50)} \cdot 10^{-3}/F = \frac{400 \cdot 10^{-3}}{50} = 0{,}00834 \text{ Н/м} \cdot \text{мм}^2$$

2) Allowable maximum sag:

$$f = h_{n-з} - \lambda - h_r,$$

where λ=1,3 м – isolator length; h_r=7м – allowable span.
a) for span with metal supports distance with wires of brand AC-150:

$$f_{(150)M} = 19{,}0 - 1{,}3 - 7 = 11{,}7 \text{ м.}$$

distance with a cable brand C-50:

$$f_{(C50)M} = 31 - 0 - (7+2\cdot4+4) = 12 \text{ м;}$$

б) for span with reinforced concrete supports

$$f_{(150)DB} = 13{,}5\text{-}1{,}3\text{-}7 = 5{,}2 \text{ м;}$$

$$f_{(C50)DB} = 26\text{-}0\text{-}(7+2\cdot 3 + 3{,}0) = 10 \text{ м.}$$

3) Determination of the center of load of wires on supports, depending on the location:

For anchor supports of a line with AC-150 wire:

$$h_{g(\text{AC}-150)} = \frac{\sum_{i=1}^{m} hi}{m} - \lambda - \frac{2}{3} \cdot [f] = \frac{(19+(19+4+4))\cdot 2}{6} - 1{,}3 - \frac{2}{3} \cdot 11{,}7 = 13{,}9 \text{ м}$$

For AC-150 wires with the same height of the supports, the calculations made will depend only on the types of supports. Therefore, the height for the anchor supports will be equal to:

$$h_{g\,(A)} = \text{hg (AC-150)} = 13{,}9 \text{ м}$$

The height for the intermediate supports will be equal to:

$$h_{g\,(A)} = \frac{(13{,}5 + (13{,}5+3) + (13{,}5+3+3)) \cdot 2}{6} - 1{,}3 - \frac{2}{3} \cdot [5{,}2] = 11{,}7 \text{ м}$$

4) Calculation of specific loads with the weight of ice on the wire:
For the selected supports with the AC-150 wire, the value k_i=1.0 is taken then:

$$\gamma_{2m(150)} = 3{,}14 \cdot 0{,}9 \cdot 10^3 \cdot 1 \cdot 0{,}92 \cdot 5\,(17{,}1 + 1 \cdot 0{,}92 \cdot 5) = 0{,}0018 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}$$

where $\gamma_0 = 0{,}9 \cdot 10^3 \frac{\text{даН}}{\text{м}^3} = 0{,}9 \cdot 10^3 \frac{daN}{\text{м}\cdot\text{мм}^2}$ – density of ice, b=5 mm – ice thickness for district I

Estimated specific load due to icing

$$\gamma_2 = \gamma_{2n} \cdot \gamma_{nw} \cdot \gamma_f \cdot \gamma_d = 0{,}0018 \cdot 1{,}3 \cdot 1{,}2 \cdot 1{,}3 \cdot 1{,}5 = = 0{,}0018 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}$$

where y_nw = 1,3 is the reliability coefficient for the two chain line; y_p = 1,2 is the location coefficient; y_p = 1,3 is the ice reliability coefficient for the I and II districts.

5) Total specific current of wires depending on weight and ice:
For AC - 150 wires:

$$\gamma_{3(150)} = \gamma_{1(150)} + \gamma_2 = 0{,}004 + 0{,}0018 = 0{,}0058 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}$$

6) during periods of absence of ice under the influence of wind on the wires the nominal specific load:

$$\gamma_{4n} = \alpha_w \cdot k_l \cdot k_w \cdot C_k \cdot \text{w} \cdot \text{d} \cdot 10^{-3}/\text{F}$$

где α_w – coefficient that takes into account the uneven influence of wind;
w=50 $\frac{daN}{\text{мм}^2}$ – wind pressure;
k_l =1,0 – a coefficient that takes into account the change in wind depending on the location and height of the line.
For wires AC-150:

$$\gamma_{4n(50)} = 0{,}71 \cdot 1 \cdot 1{,}2 \cdot 50 \cdot 1{,}71 \cdot 10^{-3}/50 = 0{,}00485 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}$$

According to the NEC, the territory of Turkmenistan is divided into regions according to the speed of the wind head, which is shown in Figure 2.

7) Under the influence of wind, when the wires are iced, a normal specific load occurs:

$$\gamma_{5n(150)} = \alpha_w \cdot k_l \cdot k_w \cdot C_X \cdot W_g \cdot (\text{d} + 2k_i \cdot k_l \cdot k_d \cdot \text{g}) \cdot 10^{-3}/\text{F}_{(150)} =$$
$$= 0{,}7 \cdot 1{,}2 \cdot (0{,}25 \cdot 50) \cdot (17{,}1 + 2 \cdot 1 \cdot 0{,}92 \cdot 5) \cdot 10^{-3}/150 = 0{,}0013 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}$$

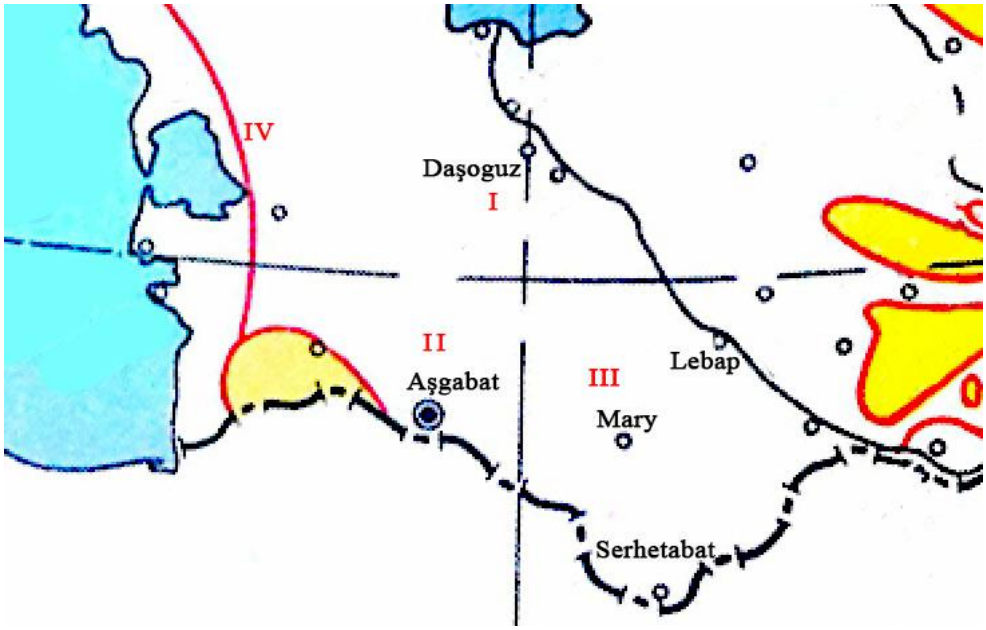

Figure 2 - Map of the zoning of the territory of Turkmenistan
by high-speed wind pressure

8) In the absence of ice, the falling specific load on the wire from the wind:

$$\gamma_{4n(150)} = \gamma_{4n(150)} \cdot \gamma_{nw} \cdot \gamma_p \cdot \gamma_{f\text{ş}} = 0{,}00485 \cdot 1{,}3 \cdot 1{,}2 \cdot 1{,}1 = 0{,}0083 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}$$

9) During the period of ice, the affecting specific load due to wind:

$$\gamma_{5(150)} = \gamma_{5n(150)} \cdot \gamma_{nw} \cdot \gamma_p \cdot \gamma_{f\text{ş}} = 0{,}0013 \cdot 1{,}3 \cdot 1{,}2 \cdot 1{,}1 = 0{,}00257 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}$$

10) Calculated specific load on the wire from its own weight and wind during periods of absence of ice:

$$\gamma_{6(150)} = \sqrt{\gamma_{1(150)}^2 + \gamma_{4(150)}^2} = \sqrt{0{,}004^2 + 0{,}0083^2} = 0{,}009 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}.$$

11) Calculated specific load of wires from their own weight and wind in icy conditions:

$$\gamma_{7(150)} = \sqrt{\gamma_{3(150)}^2 + \gamma_{5(150)}^2} = \sqrt{0{,}0058^2 + 0{,}0022^2} = 0{,}0062 \frac{\text{даН}}{\text{м}\cdot\text{мм}^2}.$$

Research results

The calculations in this research work to limit mechanical loads on the wire is offered in the areas of suspension on insulators to hold the wire in the form of a loop.

Conclusion

In order to improve the installation of overhead power lines in local conditions, based on the results of the research work carried out, in order to ensure the reliable operation of the power line, the following measures are proposed:

1) When installing a power line in intermediate supports, it is proposed to use crossbars on both sides;

2) In order to limit the vertical dance of wires in the places of suspension of insulators, use a wire in the form of a loop;

3) In connection with the improvement of agriculture and animal husbandry in Turkmenistan, it is proposed to increase the height of the suspension of the wires of the power transmission line by 1.5 m.

Local application of these measures will lead to reliable operation of the power line.

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Geochemistry of the mineral quartz in relation to deep cleaning of Karakum barchan quartz sand from impurities

Abstract. Today it is impossible to imagine the production of the semiconductor system without silicon. Silicon is basically composed of thoroughly purified quartz sand. The objective of this analysis is to determine the strategy of the nanostructure change of the natural quartz sand in the direction allowing separating silica from the atoms of the admixtures and obtaining quartz raw materials of high standard.

Key words: quartz sand, nanostructure change, thorough purification, geochemical properties of silicon, structure of quartz sand, minerals.

Introduction

Quartz (SiO_2) is a widespread mineral, which is an essential component of many rocks, as well as mineral deposits of the most diverse genesis. The most important quartz minerals for industry are quartz sands, quartzites and crystalline quartz. At the same time, special attention is paid to highly pure quartz with an index of at least 99.95 SiO_2.

The creation of a fundamentally new technology for enrichment of natural quartz sand to a purity of 99.95 wt% or more requires a systematic analysis of published data on the mineralogy of quartz and silicates obtained by numerous studies using geochemistry, X-ray diffraction, spectral analysis, crystallography and microphysics.

Object and methodology

Pure and highly pure quartz is widely used in industry. It is used to obtain optical glass, as well as transparent quartz glass and products from it. Quartz is also consumed for the production of synthetic quartz, which has piezoelectric properties, radiation resistance, high optical uniformity and other valuable properties. High-purity quartz is also used for the

production of quartz crucibles required for growing monocrystalline silicon from fused quartz, chemical glassware is made, which is distinguished by fire and acid resistance, as well as transparency to ultraviolet light.

In addition to the above-mentioned areas, the global industry uses ultrapure quartz for tungsten halogen and mercury lamps. Technologies have been developed for processing high-purity quartz to produce solar grade silicon (for solar panels). As the Hi - Tech industry grows, the demand for high-purity quartz will naturally increase. We have to understand that the 21st century is the age of fibre optics, which requires huge quantities of high-purity quartz to produce fibre optic fibres.

The high price in the market of high-purity quartz is explained by the fact that currently there is no effective and environmentally friendly technology for deep purification of natural quartz sand from impurities.

Modern traditional quartz refining technologies are based on conversion of the mineral into a liquid state and its separation from impurities by multiple distillations.

For this purpose, the initial quartz raw material (SiO_2 plus impurities) is converted, using, for example, chlorine, into volatile chemical compounds: silicon tetrachloride $SiCl_4$ and trichlorosilane $SiHCl_3$, which have a low boiling point. These low-boiling liquids are repeatedly distilled in special distillers. Condensed pure $SiCl_4$ and $SiHCl_3$ are again chemically converted into high-purity silicon dioxide (more than 99.95 wt%).

However, silicon chlorides have a pungent odor, very chemically active liquids that interact with organic compounds. In terms of environmental hazard, they can be classified as chemical warfare agents.

Based on the above, it is necessary to find a way to refine natural quartz sand using a method that excludes the use of environmentally dangerous chemical compounds.

Quartz - SiO_2 is one of the most common minerals in the Earth's crust. Physical properties of quartz are: hardness 7; density 2650 kg⁄m^3; melting point 17130Ñ, it forms quartz glass at solidification.

The coefficient of linear expansion is 0.57·10-6 cm⁄ _(0_C) . Synthetic quartz crystals have stable piezoelectric properties, radiation stability, high optical homogeneity.

Acids, except hydrofluoric acid, have no effect on SiO_2. In alkaline solutions, quartz slowly converts to silicic acid salts. Alloying SiO_2 with oxides, hydroxides and carbonates of alkali metals leads to so-called «liquid glass».

The geochemical properties of silicon are related to the structure of its nucleus and electron shells, especially to the structure of the outer shell. The interaction of protons and neutrons in the Si nucleus is caused by the mutual compensation of their magnetic fields, so the nucleus is surrounded by an electric component of protons only, and it represents a point charge in the form of a globular electrostatic field with the strength equal to the sum of charges of the 14 - and protons in the nucleus and obeying the Coulomb law.

Therefore, the electron shell around the silicon nucleus consists of three spherical space-shaped layers embedded in each other, containing 2, 8 and 4 - e electrons. Each electron has both electric and magnetic moments. The inner 2 and 8 - and electron shells are at the lowest stable energy level because their electric fields are neutralised by the charge on the nucleus and their magnetic moments are neutralised by the pairing of the electrons in these shells.

The outer electron layer of the silicon atom consists of four electrons. These electrons are unpaired and the silicon atom loses them relatively easily in the process of high-temperature oxidation ($Si + O_2 \rightarrow SiO_2$) and converts to the quadrivalent cation Si4+. The temperature ionisation energy of the silicon atom $Si^0 \rightarrow Si^+ \rightarrow Si^{2+} \rightarrow Si^{3+} \rightarrow Si^{4+}$ is 8.15; 16, 34; 33, 46 and 45, 13 eV, respectively. In this case, silicon ion Si^{4+} «sits» on its energetically stable 8 - and electron shell, and four electrons of outer shell «rent» one each to surrounding oxygen atoms, placing them around its nucleus in the spatial shape of tetrahedron (see Fig.1) with the angle 109o28'.

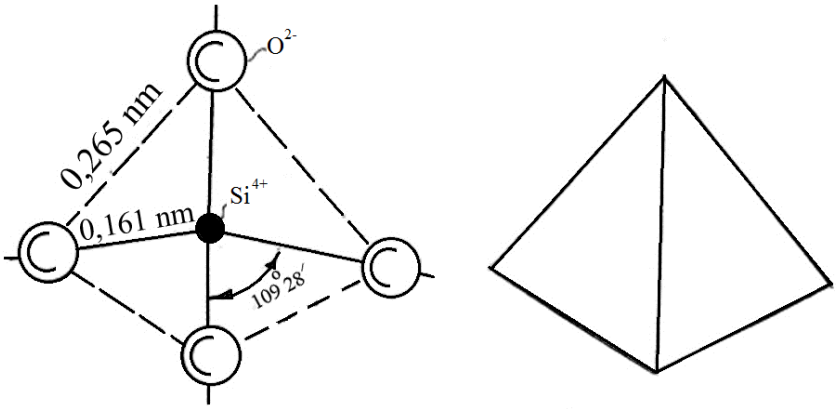

Figure 1 - The SiO_4 silica-oxygen tetrahedron is the basis of the crystal structure of the mineral quartz: In the centre is a silicon atom; on the outer electron shell are 4 unpaired electrons at an angle of $109^0 28'$ and are connected with oxygen atoms

In combination with O^{2-} oxygen anions, silicon forms energetically stable SiO_4^{4-} quartz anions. The negative charge of the anion is due to the fact that silicon neutralises only one negative charge from oxygen.

A second negative charge is provided by an oxygen atom to another silicon atom (Fig. 2), forming the spatial lattice of quartz. The combination of tetrahedrons creates all the known variety of silicon oxides and silicate mineral radicals in space.

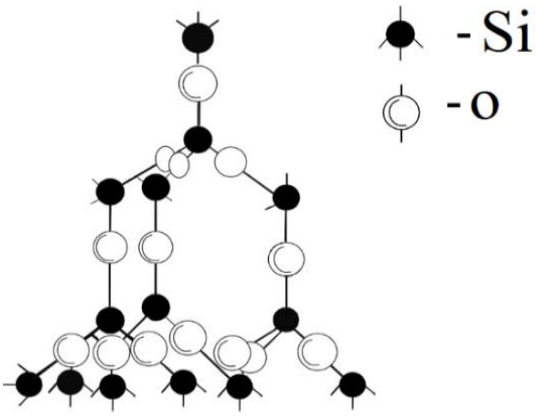

Figure 2 - Spatial model of the quartz crystal lattice (fragment): connection between SiO_4 tetrahedrons through oxygen «bridges»

The two negative charges of oxygen are due to the fact that it has 6 electrons on its outer electron shell, four of which are paired, and two electrons are unspaired and «need» two outer electrons to form an energetically stable 8 - and electron (4 - x pair) shell in the form of O^{2-} anion, in which the magnetic component of the field of each of the two electrons will be cancelled out.

If the silicon atoms are attracted to both sides of the O^{2-} anion and their outer electrons pair with each other, conditions for bulk polymerisation arise, where two unpaired electrons become «bridges» between the silicon atoms. The bond between the Si and O atoms is covalent, where two atoms possess two paired electrons at a time.

However, with such a way of bonding tetrahedrons through oxygen «bridges», the symmetry between real orientation of SiO_4 tetrahedrons in space and general symmetry of the Bravet cubic crystal lattice is broken (Fig. 3). As a result, as we see, the internal packing of tetrahedrons in the cube is loose and contains many voids and channels at the nanoscale.

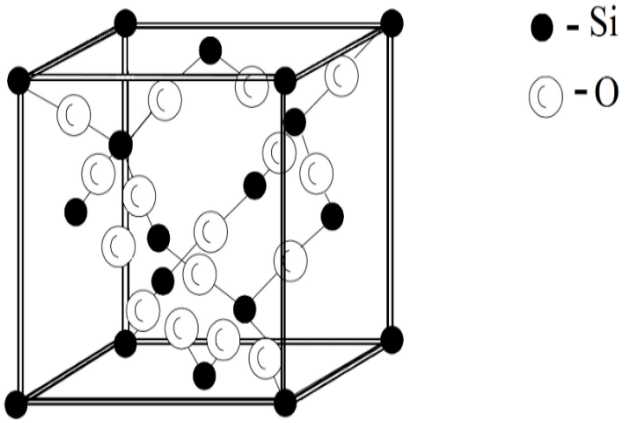

Figure 3 - Arrangement of SiO_4 tetrahedrons in the cubic quartz cell

From the above it can be assumed that the volumetric crystal lattice of quartz consisting of tetrahedrons of quadrivalent silicon SiO_4 should have a more energy stable layered configuration of SiO_3 type, similar to the layered lattice of graphite (Fig. 4).

In this regard we can predict that the elements which have three electrons in the outer electron layer must have a layered crystal lattice.

These elements include B, Al, Ga, In, Te. Indeed, in boron-oxygen compounds the crystal lattice consists of BO_3 planar flakes (Sassolite mineral).

The boron atoms are surrounded by three oxygen atoms at a distance of 0.135 - 0.136 nm. The layers are bound together by Van der Waals forces and interact weakly with each other.

Minerals based on aluminium oxide Al_2O_3 are predominantly clays. There are three unpaired electrons on the outer electron shell of the aluminium atom.

When interacting with oxygen in the magma, aluminum atoms form together with oxygen atoms a flat polymeric layer of AlO_3 nanotriangles, which diverge in the form of parallel planes, forming a layered crystal lattice of clay (Fig. 4).

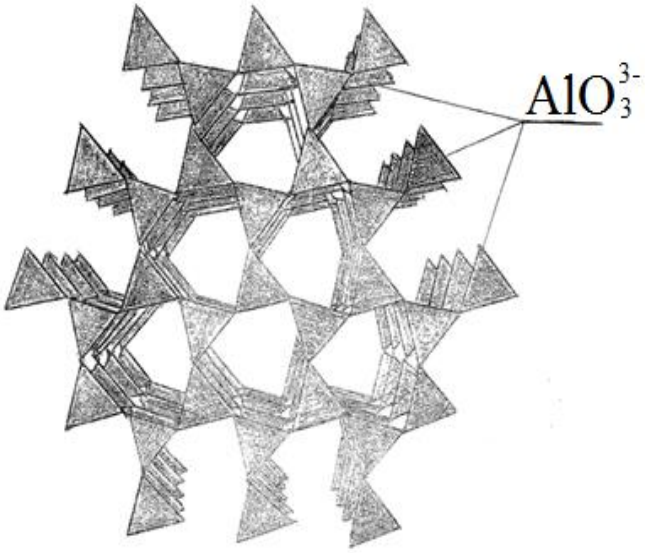

Figure 4 - Model nanostructure of aluminium oxide crystal Al_2O_3 (clay): layers of triangular AlO_3 elements arranged parallel to each other

The process of transforming quartz sand into «liquid glass» is known. This water-soluble glass is a sodium ($Na_2O{\cdot}nSiO_2$) or potassium ($K_2O{\cdot}nSiO_2$) silicate obtained by fusing quartz sand with soda (Na_2CO_3) or potash (K_2CO_3), and then dissolving them in water in autoclaves.

Thus, from the above materials in the article it became clear that the method of chlorine-free technology of deep cleaning of natural Karakum sand from impurities should be sought in hydrolysis technology based on obtaining «liquid glass», which apparently changes the bulk crystal lattice of quartz to a layered one, which like clay «spreads» in water and opens the possibility of removing impurities outside the boundaries of quartz

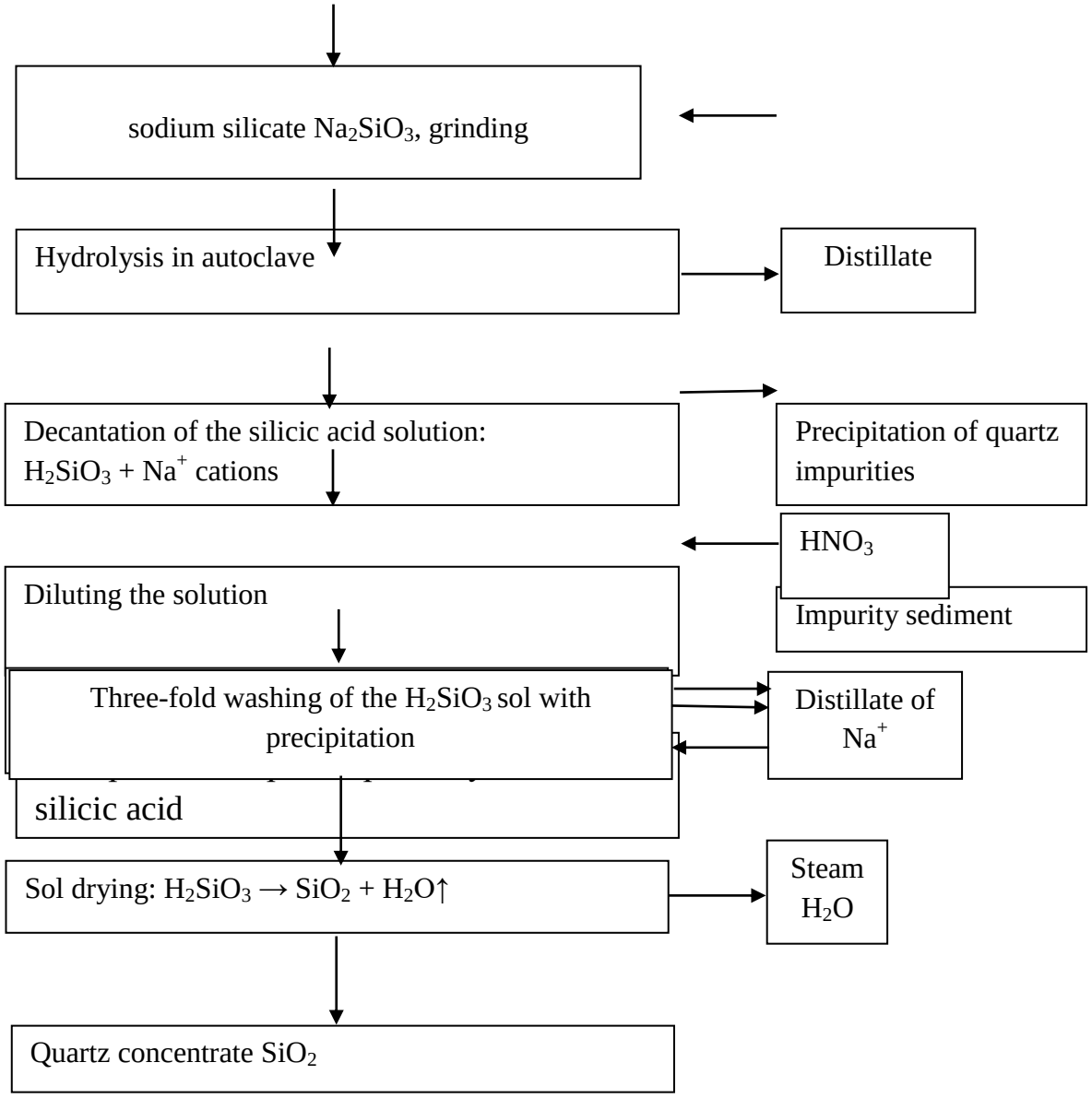

Figure 5 - Diagram of the hydrolysis stage of the experimental technology for obtaining high purity quartz

Research results

The technology for enrichment of quartz sand from impurities should include the following main operations:

1. Fusion of natural quartz sand with alkali metal carbonate in a furnace at a temperature of 1000^0 - 1100^0 C and obtaining tridymite motifs of an artificial sodium silicate mineral.Осуществление гидролиза измельчённого силиката натрия в автоклаве и получение коллоидного раствора кремниевой кислоты.

2. Acid treatment and 3-4 times washing of a colloidal solution diluted to a density of 1.25 g/cm^3, obtaining fine cluster structures of silicic acid free from impurity atoms.

3. Drying of washed silicon-oxygen clusters H_2SiO_3 with and obtaining a dry powder consisting of SiO_2 crystals. The resulting silica gel - silicon dioxide crystals have an average effective pore diameter of 20-150 Å (2-15 nm) and a specific surface area of 102-103 m^3/g.

4. Melting silica gel and obtaining quartz glass with a purity of 99.95 wt. %.

Conclusions

1. Analysis of the current level of enrichment and processing of natural quartz sands into quartz, which is especially pure in terms of impurities, shows that there is currently no environmentally friendly technology for mass production of the final product; and the corresponding chemical halogen technologies for the refining of silicon dioxide are environmentally hazardous and expensive. All this is reflected in the high price of high-purity quartz raw materials.

2. Turkmenistan has large deposits of quartz sands, including sand dunes, which, if the necessary refining technology is available, can be used for the production of semiconductor quality quartz.

3. The crystal structure of quartz consists of silicon-oxygen tetrahedra SiO_4, in the center of the tetrahedron is a silicon atom, and at the vertices there are four oxygen atoms. The number of oxygen atoms is exactly double the sum of silicon atoms, so the formula for quartz is SiO_2.

4. The long-range order of the volumetric crystal lattice of quartz is provided by spatial tetrahedral polymerisation in three-dimensional space. Quadrilateral translation of SiO_4 unit cell blocks is performed by the oxygen anion O^{2-}. Two electrons of its outer shell are oppositely oriented and bind silicon cations into a bulk crystal.

5. The impurity cations are deposited deep within this crystal structure. As a result, external access to them is virtually impossible.

6. The conclusion is that the extraction of impurities from quartz is possible only when its crystalline lattice is broken at the atomic level and impurity cations become available for acid extraction outside of silica.

7. The above results of studies of phenomena and processes occurring in the depth of minerals have led to the conclusion that destruction of the bulk crystal lattice of quartz is possible by restructuring its bulk-polymer crystal lattice into a layered one with weakened bonds between the layers.

8. The main initial condition for this technology is the creation of an artificial silicate with a layered structure instead of the original volumetric crystal lattice of quartz. This is mainly achieved by sintering quartz sand with alkali metal salts (Na and K) with subsequent dissolution of Na or K silicate in water in autoclaves.

9. Thus, the source of the technology for deep cleaning of Karakum barkhan sand from impurities should be sought in the hydrolysis technology for obtaining the so-called «liquid glass».

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Introduction of new innovative composite transmission line supports in Turkmenistan

Abstract. In composite materials for structural purposes, reinforcing elements provide the necessary mechanical characteristics of the material (strength, stiffness, etc.), and the binder ensures the joint work of the reinforcing elements and their protection from mechanical damage and environmental influences.

Key words: overhead power lines, composite handhold, climate features of Turkmenistan, dielectric properties of composite handholds.

Introduction

Composite overhead line towers are a relatively new type of mast structure, with a history of no more than 15 years. There is still little experience in their application, but the characteristics of modern composite materials give supports of this type a number of properties which are unusual for other types of support and which are of some interest in terms of reducing installation costs and increasing the operational reliability of overhead power lines.

The technology for installing overhead power lines on poles made of composite materials has been used successfully since the early 2000s in the USA and Canada.

Object and methodology

A composite material is a material which is produced from two or more constituent materials.

Currently, the terms "composite" and "composite material" are used more narrowly in relation to only reinforced polymer composite materials (PCM).

As reinforcing fillers, glass, basalt, organic and carbon fibers are now widespread (in descending order).

Organic and carbon fibers have a very high cost and are not used in large-scale mass products. Fiberglass plastics (FP) and basalt plastics (BP) are similar in their physical and mechanical characteristics (FMC) [1].

Research results

The specified features of the FMC FP and BP allow you to create ultra-light mast structures that are resistant to the effects of increased static and dynamic loads.

In addition, fiberglass and basalt plastics are dielectrics with very high insulating properties.

The main disadvantage of these materials is the rather high price. Therefore, their use is justified only on lines built in difficult terrain (mountains, swamps, etc.) or for the construction of high-reliability lines, the maintenance of which is difficult.

The high dielectric properties of the rack allow overhead lines (OHL) to remain operational in the event of breakdown or overlap of insulation, and also exclude the occurrence of stray currents or the death of birds [2].

Taking into account the aforementioned features of products made of composite materials, the design of a lightweight, high-strength, quick-assembly, complete composite intermediate support for 6-10 kV overhead lines has been developed.

In this regard, the following specific requirements are imposed on the design:

- the possibility of transporting at least 10 supports simultaneously by helicopter in the cargo compartment;

- the possibility of mass transportation by light all-terrain vehicles;

- the possibility of manual transportation of support sections in places inaccessible to equipment;

- the ability to assemble in the field using the simplest means;

- the possibility of installation in a drilled ground without the use of special equipment;

- resistance of supports and the entire line to extreme climatic loads;

- the ability to continue the line without shutting down in case of insulation violations;

- reducing the danger of overhead lines for the environment caused by stray currents and excluding cases of death of birds on overhead lines [3].

The proposed PK10-1 support design is shown in Figure 1.

The support is a free-standing “post” type of sectional design. In the variant for transportation by helicopter, all-terrain vehicle and by hand, the structure is divided into three sections (item 1, item 2 and item 3).

The weight of each section does not exceed 100 kg, diameter ranges from 165 to 350 mm, and section length does not exceed 5 m [3].

If there are no transportation requirements specified, the structure is of two-section construction. Traverses (item 4) or other elements for securing wires are made as structural elements of the upper section.

Each section is a composite cylindrical tube with variable wall thickness. The second and third sections (if any) have a tapered transition section at the bottom. The sections are connected to each other by a telescopic joint (Figure 2), secured by pins 6 and 8, interlocked by rings 7 and 9 [4].

The supports are supplied from the factory packed in a "matryoshka" configuration: the smaller section is placed inside the larger section. Beam elements, insulators and reinforcement (in case of complete delivery) are also placed inside the tower sections. In this way, the size of the support in the transport package does not exceed the size of the bottom section of the post.

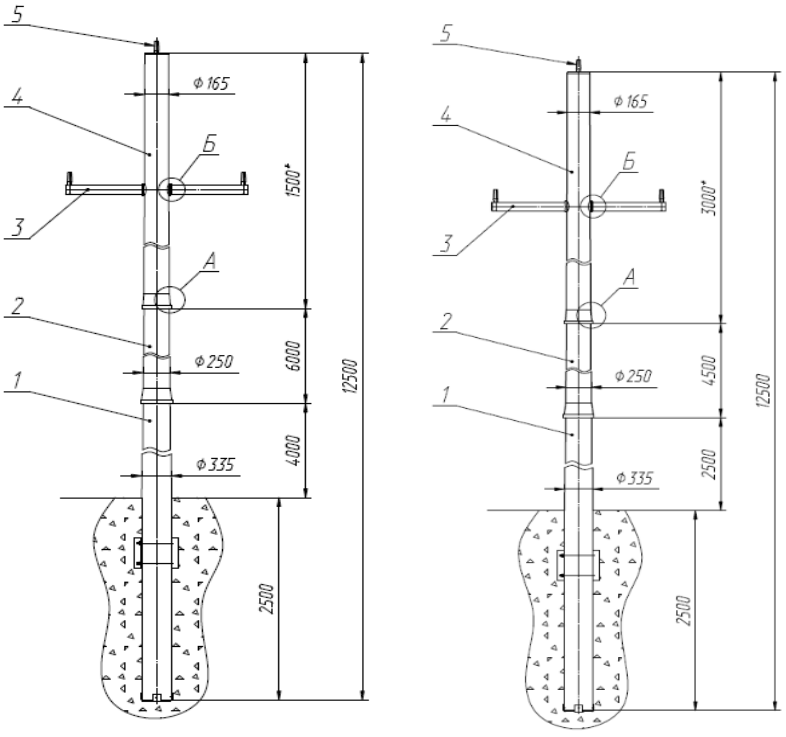

Figure 1 – Schematic diagram of composite support PK-10-1 in three-section and two-section versions

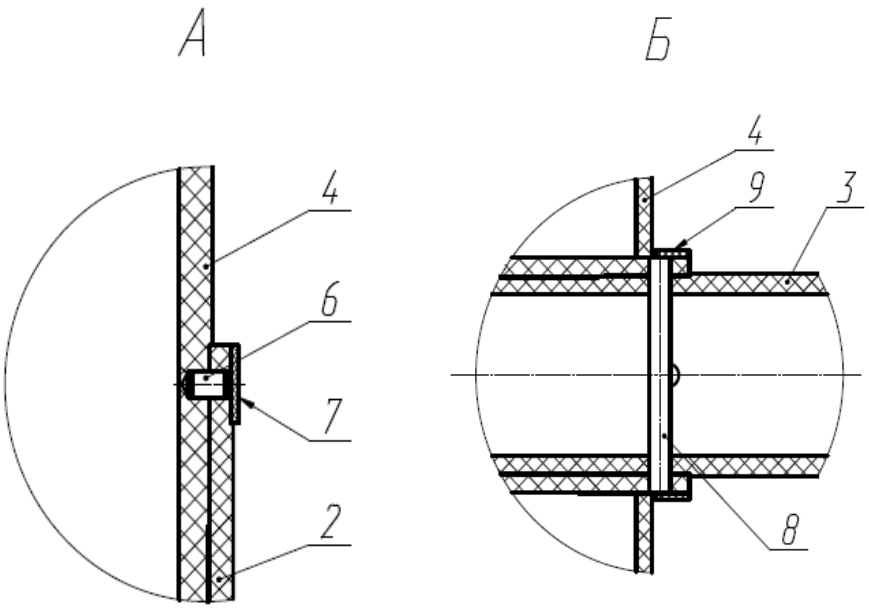

Figure 2 – Options for connecting the support to each other with a telescopic joint

At first glance, such a design is somewhat unusual, but it is optimized as much as possible for the features of the existing production technology, but at the same time fully meets the requirements for supports.

To date, the creation of specialized plants focused only on the production of composite poles for overhead lines is not economically feasible yet. But the production at the existing facilities for the production of fiberglass pipes is quite cost-effective. The use of a telescopic joint is also associated with the peculiarities of the production technology.

The special feature is that the inner cylindrical surface of the post section is formed on a high-precision process mandrel. The outer cylindrical surface of the post section in the telescopic joint area is machined with high precision. In this way, a fit with the calculated interference values is formed.

The joint is secured with pins (item 6) installed with interference, which are fixed in the holes by a thrown locking ring (item 7), also installed with interference on the outer surface. The resulting connection is strong, compact and eliminates relative section oscillation. The variable wall thickness ensures an equally strong and equally rigid construction.

The poles have a reduced stiffness compared to their reinforced concrete counterparts. This makes it possible to distribute the occurring local overloads safely over a number of overhead line elements during storm wind speeds or icing and significantly reduces the probability of wire and armature breakage as well as insulator breakage.

At the same time, the stiffness is quite sufficient to maintain the safe dimensions of the overhead line. At the same time, the structural strength of the tower is significantly higher than that of reinforced concrete towers and is not inferior to that of steel towers.

Therefore, the probability of support fracture is practically eliminated. The high dielectric properties of PCM make it possible to significantly reduce the insulation requirements and to operate the line safely for some time (before repair) in the event of insulator damage and avoid disconnections.

The latter is very important in hard-to-reach areas, where repair crews are not always able to reach the fault location promptly, especially in stormy weather. The reduced rigidity of the structure and its high dielectric properties will allow overhead lines on composite poles to remain operational in difficult weather conditions.

Turkmenistan has a continental climate, moderating on the Caspian coast and in the mountainous regions. However, the influence of the desert is noticeable even in the mountains, where the climate is dry, with a large annual and daily temperature amplitude, low air humidity, high evaporation and low precipitation.

Turkmenistan has long, dry and sweltering summers, cool wet autumns and mild winters with little snow. The winter period is minimal - one month in the far south and south-west, and more than 4 months in the far north and north-east.

The average temperature in January in the north-east is -5^0C, in the south-east and south-west it is $+4^0$C. In July it is $+30^0$C. In some years, the maximum temperature reaches $+45^0$C and the minimum reaches -22^0C.

Turkmenistan belongs to an area of insufficient moisture. In the plain area, annual precipitation does not exceed 150 mm, in the Aral Sea region and in Karabogazgol it is less than 100 mm, and in the mountainous areas it is 350 mm.

Under these conditions, artificial irrigation is the main method of farming.

The average annual rainfall in Turkmenistan is 220 mm. Turkmenistan is characterized by predominantly westerly and southwesterly winds of up to 4.3-5.7 m/s, with a peak of activity in March-June and a decline in September [5].

Considering the above, it can be said that dielectric properties of composite supports exclude stray currents in the ground and ensure safety for birds without the use of special devices.

Table 1 shows the characteristics of the composite intermediate support PK-10-1 in comparison with the supports of P10-1 type (based on CB-105 post), polyhedral steel support PM-10-1 and special steel support ELSI PS10P-6AM made of bent profiles.

Table 1- Characteristics of composite intermediate support PK-10-1 compared with type P10-1

Weight (with foundations and beams), kg	PK-10-1 [2]	P10-1 [3]	PM-10-1 [4]	ELSI PS10П-6AM [5]
Weight (with foundations and beams), kg	230	1250	377	282 (without foundation)
Weight of heaviest part, kg	120	1170	324	210
Dimensions in transport packaging, mm	360x5000	205x280x10500 (стойка)	310x11100	400x400x9000
Normal bending moment, kN*m	35	36	56	35
Maximum non-destructive bending moment, kN*m	at least 150	60	no data	no data
Ratio of tensile strength to modulus of elasticity of material, GPa/MPa	12	approx. 3	approx. 5	approx. 5
State of the support after application and removal of the excessive load	Restores the initial state	Breaks and collapses	receives residual plastic deformation and needs to be replaced	

The advantages of the new technology are also the low weight (together with all accessories not more than 1630 kg) and the small transport dimensions of the sections: up to 4

towers with all accessories can be transported simultaneously in a crane, which facilitates the transport of towers to the installation site. These advantages are especially relevant when performing emergency recovery work on overhead lines to replace damaged towers. Another advantage of composite poles is that there is no need to paint the structure. Experience in the use of such supports confirms the readiness of the equipment to extreme climatic conditions and aggressive environment, a special coating of epoxy resin provides UV resistance, and a fire protection coating provides protection against ground fires. The condition of the supports is monitored through annual inspections, with an experimental lifetime of 50 to 70 years according to the claim of the manufacturers.

Conclusion

In conclusion, it is worth noting that the composite support area is defined as a kind of experimental site. The following parameters should be taken into consideration during the survey: reliability of anchoring of composite pylons in the ground, deviation of pylons from the vertical axis due to ground frost heave; presence of wire damage in the clamps; presence of strut bottom delamination and surface quality The specialists of the Nanotechnological Centre of Composites believe that the application of composite supports will positively influence the reduction of the energy companies' costs when performing the construction and installation works due to the low transport weight of quickly mounted lightweight supports made of composite materials, simplicity and speed of assembly (disassembly) on the installation site, possibility of multiple use, provision of reliable operation of the supports as part of the overhead power line. The application of composite supports will lead to an increase in the reliability of power supply to consumers and a reduction in operating costs for maintenance of the overhead power transmission lines.

In addition, the issues of ageing resistance under the influence of solar radiation and alkaline soil were solved. The result is an industrially realised design of an especially lightweight quickly assembled, quickly mounted GRP support for 6-10 kV overhead lines of increased reliability. The support successfully passed the tests with mechanical loads. Repair of power lines with the use of new technological supports made of composite materials will make it possible to solve the problem of prompt replacement of defective supports that have exceeded their service life.

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5 Otchot po pokazateliam po bioraznobraziyu Turkmenistana v ramkah komponenta MONECA proekta FLERMONECA- Ashgabat,2006

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Biogas production from animal residues as an alternative method for environmental protection

Abstract. In the result of the work of the agricultural enterprises and in the process of pasture of animals manure is formed, which in the event of ingress into water creates unpleasant odors in the atmosphere and pollutes drinking water. In the present article, production of biogas with the use of the agricultural waste is described.

Key words: agricultural waste, unpleasant odors from the animal manure, protection of the environment, biomass, biogas, bio fertilizer.

Introduction

As the world's population grows, the need for food, clothing and energy increases every day. And as a result of human activity, huge landfills have already formed in some countries. As the waste decomposes, unpleasant odors and greenhouse gases are released from agricultural and industrial waste, which lead to environmental pollution and climate degradation.

To eliminate these harmful effects, a special technology for processing manure is needed, that is, a technology that will increase the concentration of useful nutrients in manure, and at the same time will eliminate unpleasant odors, pathogenic microorganisms and reduce the content of carcinogenic substances.

Object and methodology

An ecologically safe and economically profitable solution is to obtain biogas in a biogas plant, by processing waste and manure anaerobically.

Through the use of renewable energy sources, one of the waste-free, self-sustaining technologies is organic waste, i.e. obtaining biogas by processing the manure of farm animals and birds, plant waste, agricultural waste. The oxidation of organic waste in the absence of air (anaerobes) produces biogas.

Biogas is a complex of gases. Its basic composition consists of methane (CH_4) - 55-70%, carbon dioxide (CO_2) - 28-43% and in very small amounts, other gases (sulphur hydrogen (H_2S)).

The average decomposition of 1 kg of biological organic matter produces 0.18 kg of methane, 0.32 kg of carbon dioxide, 0.2 kg of water and 0.3 kg of insoluble residues. For stable combustion, a methane content of 55 to 85 % is required.

By recycling agricultural waste, industrial and organic waste in modern biogas plants, negative impacts on soil, water and air salinity are reduced.

Once submerged in the plant, the waste is recycled and harmful bacteria and viruses are eliminated, unpleasant odours are reduced and a local source of energy is used.

In addressing the issue of environmental protection, the use of anaerobic digestion technology for the treatment of agricultural and industrial waste is very advantageous.

The main objective of this technology is to prevent the harmful effects of waste on human health and the environment.

Waste recycling is, first of all, a rapidly self-sustaining and profitable technology, i.e. when processing waste, biogas and fertilizer are simultaneously generated in large quantities. Due to the short self-sufficiency period of the biogas plant, the raw materials used in it are free; the energy (electrical, thermal) consumed by the plant, depending on the automation, is very low.

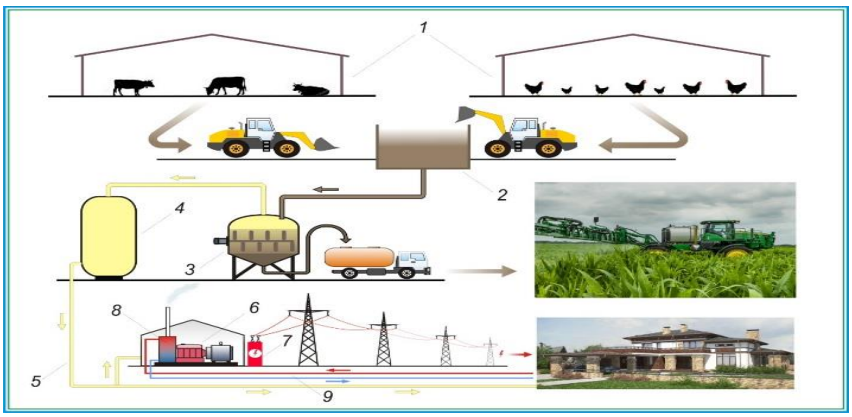

Figure 1- Scheme of biogas production

For processing, cheap agricultural waste is used as raw material. These include: animal manure, bird manure, straw, tree remains, weeds, household waste, organic waste, etc.

Research results

In the research and production center "Renewable Energy Sources" of the State Energy Institute of Turkmenistan, a solar-powered biogas plant was developed, which is shown in Fig.2.

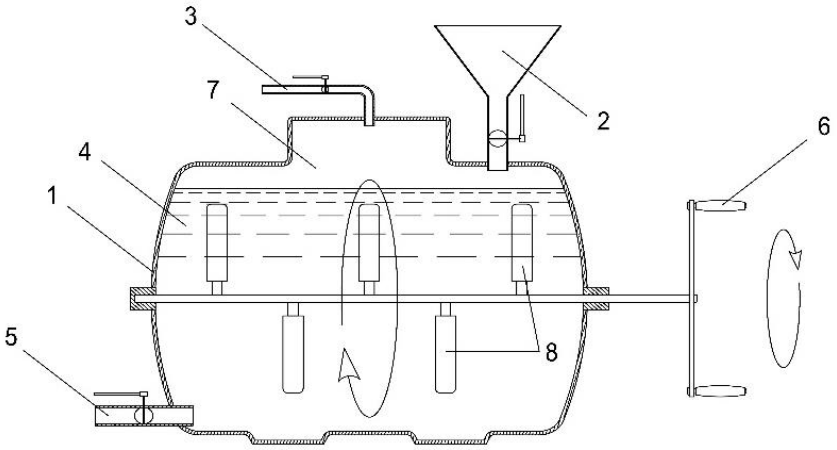

Figure 2 - Biogas production plant
1-biogas plant, 2-waste filling funnel,
3-biogas outlet pipe, 4-biomass, 5-biofertilizer outlet pipe,
6-agitator handle, 7- space for biogas accumulation,
8- mixing paddles

Biowaste is first poured into the biogas plant using a special funnel. Special paddles are installed in the biogas plant to mix the solution.

Different fertilisers have been used to produce biogas. With the results obtained, it was found out that the most effective is the combined one, i.e. mixed; the results obtained are shown in table 1.

Table 1 - Results of the obtained biogas

Methane	Hydrogen	Nitrogen	Argon
86,4%	10,3%;	3,0%;	0,1%;

Waste (biofertiliser) processed in a biogas plant serves as a high-quality fertiliser for plants. Because in the biogas plant as a result of airless oxidation process nitrogen, phosphorus,

potassium are converted into a finished product for plant use, as pathogenic bacteria that occur in the manure and weed seeds are destroyed.

Conclusions

1 Obtaining biogas from waste is very important for the environment, as the use of waste to produce biogas leads to a reduction of litter in the area, which in turn leads to a reduction of greenhouse gases, unpleasant odours in the air.

2 Considering the fact that on livestock farms, where manure and other organic waste is an utilisation problem, these biogas plants can provide these farms with electricity and heat in the future.

3 The organic mass obtained after processing serves as a high-quality harmless fertilizer for plants. When using biofertilizer, the physical and physical-mechanical character of the soil improves. The process of soil metabolism also increases, biological activity increases, for example, when using biofertilizer, the yield increases significantly: winter wheat by 15-20%, sugar beets up to 20%; corn up to 20-30%, potatoes up to 30%.

4 The use of biogas technology is of great importance for the protection of the environment. As a result of airless processing of food and animal waste, large quantities of greenhouse gases are prevented.

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Evaluating the effectiveness of solar collectors for domestic hot water supply in Turkmenistan

Abstract. Nowadays, people have a higher demand in hot water. Literally, every year, people spend more and more of the precious drinking water for their needs (warm water is used for showering, washing the dishes, cooking, etc.). Taking into account the growth of prices of the fossil fuels, it is necessary to research an alternative i.e. ecologically friendly method of obtaining hot water.

Key words: hot water supply, solar collectors, calculation of effectiveness of the use of solar collectors, the principal scheme of connection of the solar collector, economy of natural gas.

Introduction

An alternative and environmentally friendly method of producing hot water is - Solar energy, i.e. the conversion of solar energy into thermal energy.

For solar collectors to work more efficiently, several conditions need to be met: optimum angle of inclination, southern orientation, open terrain, type of collector and, of course, the level of solar insolation. Based on calculations and many years of research, it has been proven that for Turkmenistan (city of Mary) the optimum inclination angle is 36^0 [2].

Object and methodology

If we assume that 5 people live in the flat, the average demand for hot water per day for one person will be approximately 50-60 litres with a temperature of up to 60 degrees, for five people approximately 250-300 litres per day, in this scientific work for the calculations we took 300 litres [1].

We will make a calculation for heating a given volume of water by electricity.

The necessary amount of heat to be expended for water heating in the boiler is determined by the following expression:

$$Q = G \times C_{spec} (t_{out} - t_{in}) \quad (1)$$

where Q – amount of heat required to heat the boiler, kWh
G – Hot water consumption, l.
V_b = 0,3 m3/day
$C_{spec.}$ – Specific heat capacity of water, Aver. = 1.161 kW/kg · ^oC [3]

$Q = 0,3 \cdot 1,161 \cdot (60 - 10) = 17,4$ kWh/day

To evaluate the efficiency of solar collectors, pre-select a flat solar collector of the Logasol SKN4.0 series [4]

Useful area of each collector F1 = 2,25 $м^2$ [4]

Collector optical efficiency $\eta_0 = 0,77$ [4]

The efficiency of solar collectors in a first approximation can be calculated using the following formula [3]:

$$\eta = \eta_0 - \frac{k1 \times \Delta T}{E} \quad (2)$$

where η - estimated efficiency, η_0 - nominal (optical) efficiency of the plant under normal conditions, k_1 - coefficient depending on the type and thermal insulation of the collector, ΔT - temperature difference between the heat exchanger and the ambient air (°C), E - insolation (Вт/м^2).

$$\eta = 77 - \frac{3{,}216 \cdot 50}{7000} = 76{,}9$$

Then we find the required area of the helio field:

$$F_{сум} = Q / (q \times \eta) \quad (3)$$

where q - average monthly radiation level, kWh/ м^2/day [2]

$F_{сум}$ = 17,4 / (7 ·0,769) = 3,2 м^2

Number of solar collectors required:

$$n = F_{сум} / F_1 \quad (4)$$

n= 3,2 / 2,25 = 1,4 » 2 units

The amount of heat Q generated by the collector is determined by the formula:

$$Q = q \times F_{сум} \times \eta \quad (5)$$

where - $F_{сум}$ – the total area required to install the collectors, in our case we have decided to install two collectors of 2.25 м^2 each, hence the total solar field area is 4.5 м^2

To prevent overheating, the system should be calculated for the summer peak, i.e. take the maximum value of the monthly radiation level for the year. In this case in Turkmenistan it is from May to August months, in June this value reaches up to 7 kWh/ m^2/day [2].

In July, when two collectors were installed:

Q_2 =7·4,5·0,769=24, 2 kWh/day (L_2=417 litres/day)

In July, when installing one collector:

Q_1 =7·2,25·0,769=12,1 kWh/day (L_1=208,5 litres/day)

Now we carry out calculations for the minimum level of solar radiation. In Turkmenistan, in December, the level of solar radiation reaches its minimum, i.e. it reaches 2.02 kW · h / м^2/ day.

In winter, the efficiency of solar collectors will be:

$$\eta = 77 - \frac{3{,}216 \cdot 50}{2020} = 76{,}9$$

We will make calculations for the month of December when installing two collectors:

Q_2 =2,02·4,5·0,769=7 kWh/day (L_2=120 litres/day)

В декабре при установке одного коллектора:

Q_1 =2,02·2,25·0,769=3,5 kWh/day (L_1=60 litres/day)

Research results

During the summer period, the solar collector with a total area of 4.5 (2.25) м^2 in June will heat 417 (208) liters of water per day, which will save 5.3 (2.65) kg or 6.8 (3.4) м^3 of gas per day. In winter, the solar collector with a total area of 4.5 (2.25) м^2 in December will heat 120 (60) liters of water per day, which will save 1.54 (0.77) kg or 1.97 (0.98) м^3 of gas per day.

As can be seen from the calculations in winter, solar collectors can not provide the necessary amount of hot water, so if necessary, you can use boilers to get an additional amount of hot water as shown in Figure 1.

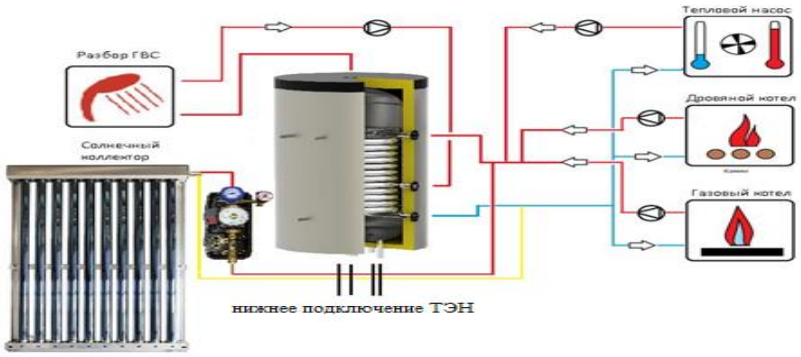

Figure 1 – Schematic diagram of the collector connection

In the research and production center “Renewable Energy Sources” of the State Energy Institute of Turkmenistan (Mary), research works are being conducted to study the effectiveness of the use of solar collectors of various types. As a result of the research, a whole system for the operation of the solar collector was created (Figure 2).

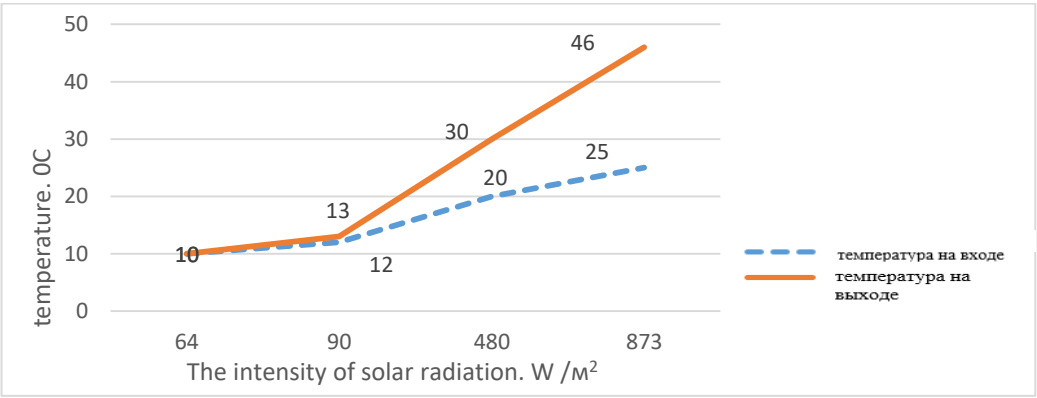

Figure 2 - Dependence of heat production on solar radiation intensity

As can be seen in figure 2, the efficiency of the solar collector is very low, this is because it has high heat losses due to poor insulation. All of this ultimately affects the environment.

Conclusion

As can be seen from the calculations, only two sets of solar collectors with a 350-litre battery tank are needed to provide one family with hot water. Under normal conditions, to obtain 350 litres of domestic hot water in summer, a family in Turkmenistan would spend 64 manats ($19), not forgetting that this would reduce greenhouse gas emissions into the atmosphere of the earth by 1.54 tonnes.

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Energy saving in the lighting system of industrial enterprises with the help of induction lamps

Abstract. The problem of energy saving in recent years has gained particular relevance. Great efforts are being made in the world to introduce innovative solutions and technologies to reduce energy consumption. So recently in many developed countries of the world there has been a gradual displacement of incandescent lamps.

Key words: modernization of lighting systems, energy saving, induction lamps, inert gas, electromagnetic compatibility.

Introduction

Due to the constant increase in the need of people to use artificial lighting, the question of high-efficiency light sources that could not only meet the demand for lighting, but also provide minimal energy costs is acute.

Currently, the topic of LED lights has become very popular. It is this direction in lighting that is considered the most promising. However, many of the advantages attributed to LEDs are not justified in practice.

The main argument against their mass introduction is considered only the high cost. But in addition to this, there are a number of disadvantages that LED manufacturers are silent about.

So one of the significant disadvantages of using LEDs for lighting is the need to remove heat.

Since an increase in the temperature of the p-n junction leads to a decrease in the brightness of the glow and a shift in the working wavelength. If the heat sink is insufficient, the crystal evaporates, i.e., it degrades.

Another drawback of LED light sources, which is not yet given due importance , is the impact on human vision. There is no information about the harmful effects of LEDs on the human eye, since no serious research has been conducted in this area.

Thus, the use of point light sources creates zones of bright luminosity, which, in turn, increases the indicators of blindness and discomfort [1].

Whatever techniques manufacturers use, it is not yet possible to achieve a uniform distribution of the luminous flux of LED light sources.

And the use of external lenses leads to a significant increase in the cost of the final product.

In addition, LED light sources have a large percentage of the ripple depth of illumination at a given point in the room when powered directly from the AC network. It is known that pulsating light not only leads to an increased risk of injury when working with moving objects, but also causes constant contractions of the ciliary muscle, which leads to the development of myopia.

Object and methodology

Currently, LEDs are positioned as environmentally friendly devices that do not require recycling [1].

But to date, no studies have been conducted related to the disposal of spent LEDs into the environment. And given the fact that in the future they predict an increase in the use of LED light sources, sooner or later we will face the problem of recycling LEDs.

Currently, LED light sources are mainly used for decorative, accent lighting, as they do not yet allow you to create a comfortable general lighting. Meanwhile, there are light sources that currently have better technical characteristics than LEDs and are about three times cheaper than them. These are mass-produced induction lamps (IL).

In this article, we have performed a comparative assessment of the main light sources according to the following indicators:

Service life of the light source; power consumption; load on the power grid; vibration resistance; ripple coefficient, environmental safety of the lamp, lamp weight, light source start-up time, operating temperature conditions during operation, power factor, color temperature, loss of luminous flux, warranty period, cost.

Also in this work, the electromagnetic compatibility of the LED light sources and induction lamps with the network is evaluated.

Currently, this is an urgent task, as it is expected to increase the share of electricity consumed both for LED lighting and for lighting with the use of induction light sources.

An induction lamp is an energy-saving light source, the principle of which is based on electromagnetic induction and gas discharge to generate visible light.

An induction lamp is an electrodeless lamp (no filaments, no electrodes), consisting of a flask filled with gas, the inner surface of which is covered with phosphor [2].

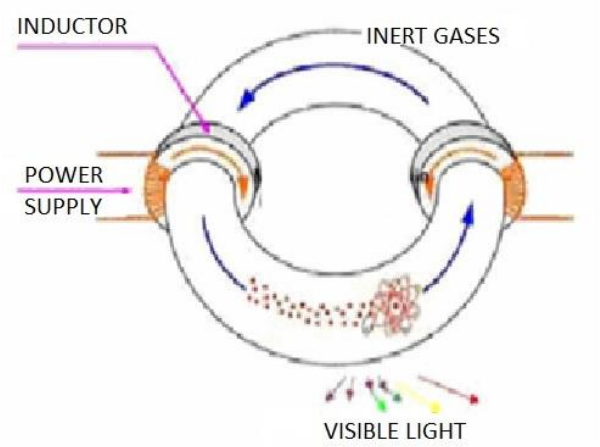


Figure 1: Principle of the induction lamp operation

The luminescence of the phosphor is due to electromagnetic induction. In these light sources, two physical processes are used to produce light radiation: electromagnetic induction and an electric discharge in a gas.

This is what significantly distinguishes these sources from conventional fluorescent lamps.

An electronic source generates a high-frequency current flowing through an induction coil on a magnetic ring or rod.

The electromagnet and the induction coil create a gas discharge in a high-frequency electromagnetic field, and under the influence of the ultraviolet radiation of the discharge, a phosphor glow occurs.

Structurally and according to the principle of operation, the lamp resembles a transformer, where there is a primary winding with a high-frequency current and a secondary winding, which is a gas discharge occurring in a glass tube.

The direct saving is not only the energy saving of electricity, but also the service life of energy-saving lamps [3].

The absence of electrodes in the lamps (which are an integral element of all types of gas-discharge lamps) made it possible to achieve a service life of 100,000 hours, which is 6-10 times longer than the durability of fluorescent lamps, mercury-arc lamps and HPS lamps.

Table 1 - Comparison table of the main light sources

Comparison parameters	**Lighting fixture with 80 W induction lamp**	**Lighting fixture with mercury-arc-250 lamp**	**Lighting fixture with HPS-250 lamp**	**LED Light Fixture 85 W**
Service life of the light source (light-emitting element), hour	60 000 - 100 000	up to 10 000	up to 10 000	50 000 - 100 000
Electricity consumption, W	up to 85	up to 280	up to 290	up to 100
Light output, lm/W	104	40	79	102
Ripple ratio	0	7,3	4,9	0,1
Environmental safety of the lamp	up to 25 mg amalgam	the lamp contains up to 100 mg. mercury vapor	the lamp contains sodium mercury amalgam and xenon	unknown
Lamp weight, kg	max. 8	10-12 (without lamp)	10-12 (without lamp)	max. 16
cosφ	0,99	0,74-0,9	0,74-0,9	0,8-0,9

Research results

After analyzing the data in the tables below, we can conclude that induction light sources are not only much cheaper than LED light sources, but also exceed them in some characteristics: they have a longer warranty period, greater light output, a higher power factor, lower electricity consumption, more pleasant and natural light and, not least, the complete absence of ripple.

As well as induction lamps are available in a wide range of capacities in all conventional forms for any lamps with cartridges E14, E27, E40 and special ring lamps.

Undoubtedly, the use of LED light sources provides a significant reduction in power consumption.

This is due to the fact that LED light sources represent a non-linear electrical load with the non-linearity of the characteristics of the LED light sources themselves and the use of electronic converters as a power source for LEDs.

The total effect of such loads is expressed in the distortion of the current curve consumed from the network, and the flow of higher harmonics into all elements of the general network. This negatively affects all equipment that receives power from a common source.

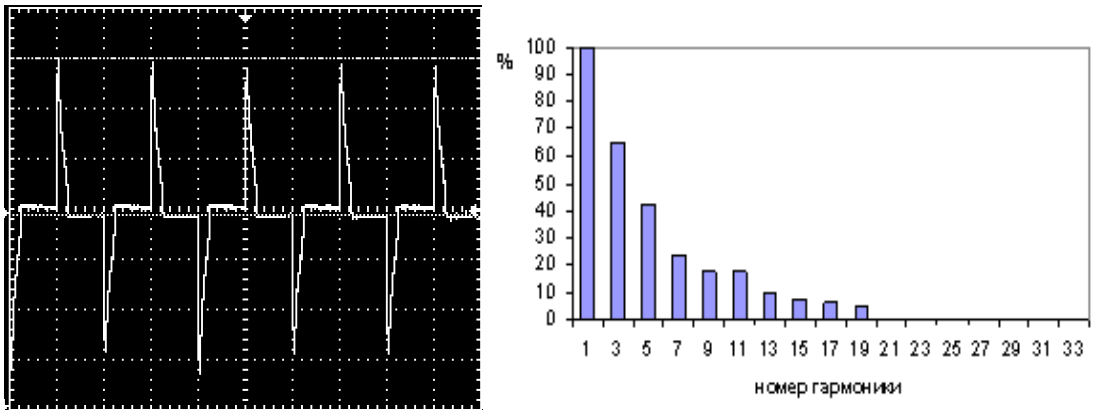
The problems caused by harmonics:

- additional heating and failure of capacitors, transformers, electric motors, fluorescent lamps, etc.
- false alarms of circuit breakers and fuses;
- the presence of the third harmonic and its derivatives 9,12, etc. in the neutral may require an increase in the cross-section of its conductor;
- harmonic noise (frequent transitions through 0) can cause incorrect operation of control system components;

- damage to sensitive electronic equipment;
- interference of communication systems.

To assess the degree of distortion introduced by LED light sources into the network, as well as the need to take them into account when constructing lighting installations based on LED light sources, experimental studies of the current curves consumed by LED light sources from the network were conducted.

As light sources, LED light sources such as SDK-27 and SDP-27 with and without PWM were used. The voltage curve iL=iC is shown in Fig. 2 for both types of lamps.



a) b)

Figure 2 – Harmonic composition of the current curve of a light device of the SDP-27-W type with PWM (KNS=85.87 %)

As an induction light source, a hanging lamp of the 03-022 type with an induction lamp with a power of 150 W was used. The effective values of the voltage Ul and current Il on the lamp were measured using a digital oscilloscope OWON SDS 8202.

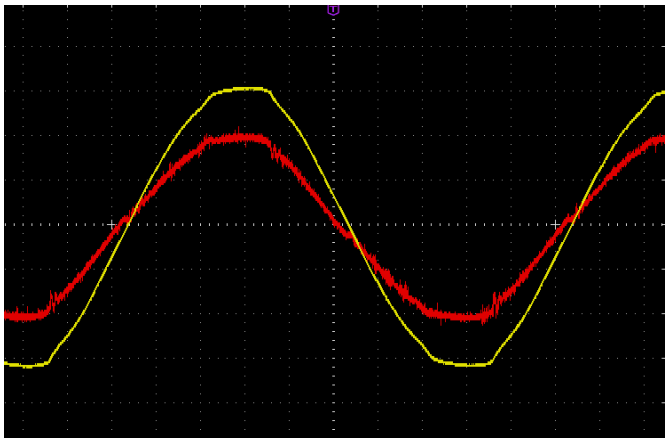


Figure 3 – IL current and voltage curve (using the OWON SDS 8202)

Conclusions

In accordance with [3]:

- for single lamps, the power of which does not exceed 25 W, the level of the higher harmonics of the current curve consumed from the network is on the verge of the established STB IEC 61000-3-2-2006;
- if the total power of lighting devices exceeds 25 W, then almost all lighting devices based on LED light sources do not meet the requirements.

In accordance with the above, it can be concluded that the use of LED light sources (especially if their total power exceeds 25 W) requires the use of special measures to reduce the level of higher harmonics. It is recommended to use LED lamps together with filter-compensating devices installed in the network on the side of the light sources after the introduction of the three-phase automatic machine [6].

After analyzing the results obtained when testing an induction pendant lamp of type 03-022 with an induction lamp with a power of 150 W, it can be concluded that this light source does not introduce significant distortions to the supply network.

After analyzing the results of the work carried out, it can be noted that induction lamps, in comparison with LED lamps, have a number of significant advantages.

The main ones are 2-3 times lower price, longer warranty period, no ripple, greater light output and more pleasant and natural light. In addition to all of the above, they almost do not distort the power supply network.

Today, LEDs are ideal for decorative lighting, for various design solutions, they can fully provide light advertising, traffic lights, etc.

But if we are talking about lighting (streets, workplaces, etc.), then LED technology still does not reach the quality at which labor productivity would not decrease, there was no sense of discomfort.

Therefore, at the moment, when choosing between LED and induction lamps, preference should be given to induction lamps.

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Measures to improve the reliability of photothyristor arc fault protection in 6-35 kV complete switchgear and switchgear units

Abstract. Their small overall dimensions generate the limited localization ability of complete switchgear devices with internal short circuits through an electric arc. This problem is aggravated by the fact that the complete switchgear, put into operation in the last century, as a rule, is not equipped with full- fledged high –speed protection against short –circuit arcs or their protection does not meet the current state of technology.

Key words: complete switchgears, short circuit, electric arc, protection relay, arc pole, thyristor arc protection.

Introduction

A short circuit accompanied by an electric arc is the worst emergency in the complete switchgear of electrical substations, primarily in terms of its destructive consequences.

Currently, the most commonly used complete switchgear cells include circuit breakers with a switching capacity of up to 31.5 kA. When an arc overlap with such currents occurs, the metal of the cell walls is burned through and the damage is transferred to neighboring cells. The increase in thermal resistance due to the thickening of the walls leads to an increase in price, weight and complicates the installation of cells.

When the arc burns intensively and large quantities of hydrogen are released, an explosive mixture (H_2+O_2) is generated in the cells, which can cause an explosion in neighbouring, undamaged cells [1].

The power of the arc discharge can reach several MW. In addition to losses of electrical equipment, an arc fault can lead to a significant break in the production cycle, which can reach several tens of hours. The use of arc-fault circuit interrupter reduces the forced downtime to 1-3 hours [1].

Bright arc radiation can cause temporary blindness. Taking into account the powerful sound of the arc discharge, there is a high probability of the onset of a shock state, which can cause serious consequences.

Object and methodology

The main causes of arc discharge in the complete switchgear are classified in the form of 3 main groups:

1) human factor (improper operation of electrical installations) - carrying out works in the wrong cell (erroneous), overstating the breakdown voltage of the 6-10 kV arrester installed in the given section, no earthing of the working area during works, no checking the presence of voltage in the working area during works, presence of tools left in cells by negligence after the works.

2) technical reasons (equipment faults) - defects, malfunctions or incorrect operation of the equipment, insulation degradation and wear of equipment, overvoltage, overheating, poor connection of wires or busbars, incorrect installation of the equipment.

3) other external factors - the appearance of animals and birds (rats, cats, dogs, birds) inside the complete switchguard, moisture, dirt and dust in the area of contacts and busbars, contamination and moistening of the surface of low-ribbed insulators or insulators previously burned by an arc, corrosion.

It is possible to construct an average dependence of the energy released by the arc, depending on the time of its burning (Fig.1).

Thus, it is necessary to take measures to improve the design of the equipment, observe safety precautions, but if an arc discharge occurs, the only way to prevent its consequences is to timely de-energize the corresponding circuit with the help of high-speed arc protection. The total

power and energy arc fault depends on the power circuit, the number of arcs in the system and to the types of circuit: single phase to ground, two-phase or three-phase. This power can reach many tens of MW [2].

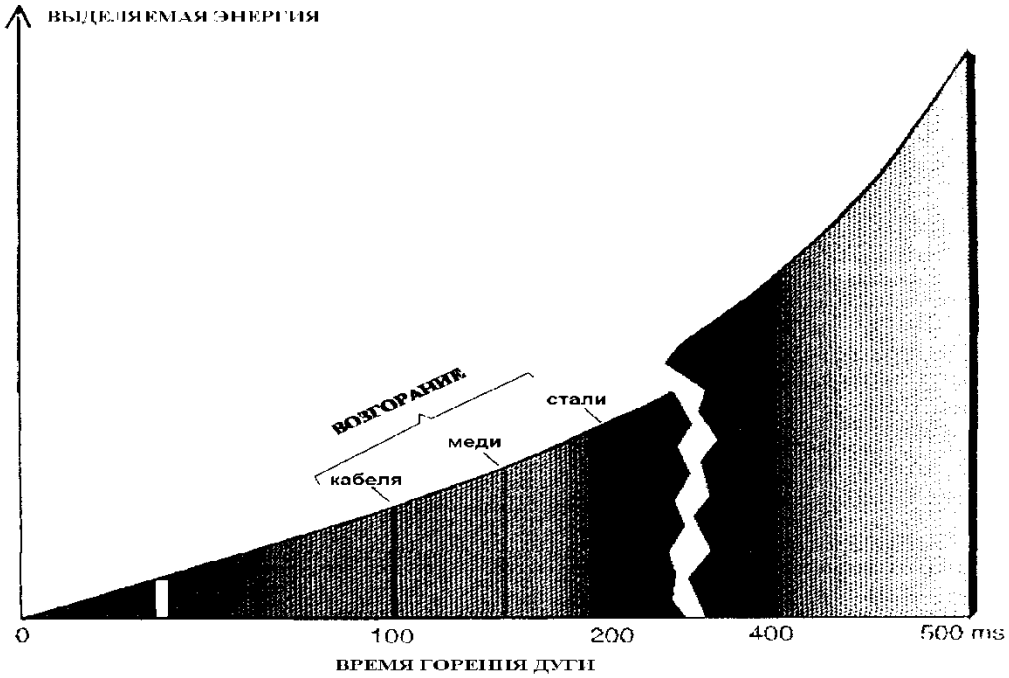

Figure 1: The average dependence of the energy released by the arc, depending on the time of its burning

Approximately 90% is converted into heat, causing abrupt heating of the air, structural and electrode materials (busbars etc.), their melting and evaporation, about 3% is consumed to create excessive pressure and 7% is due to the radiation of the arc [3].

Why the protection should be fast can be seen from the following classification of the resulting damage to equipment and damage from arc faults, as a function of arc time. Note that the arc burning time is understood as the total time required detecting the arc and tripping the switch:

- 35 ms: there is no damage to equipment or personal injury; the equipment can usually be put into operation after checking the insulation resistance;
- 100 ms: minor damage; requires, for example, cleaning the contacts of the switch, minor repairs are possible before subsequent commissioning;
- 500 ms: large damage to equipment and traumatic consequences for personnel, equipment is partially replaced;
- 1000 ms: The consequences of an arc discharge may not be predictable.

Consequently, the total time delay, i.e. the time from the beginning of the arc burning to the opening of the switch contacts, should not exceed 100 ms [2].

Research results

The arc pole is a low-temperature plasma: a mixture of atoms, ions, molecules, and fusion products occurring in the plasma. The spectral range of radiation is quite broad: from ultraviolet (fractions of an μm) to far-IR (units of an μm).

The type of arc emission spectrum depends on a number of components: electrode material, degree of contamination, plasma temperature. The arc spectrum can be represented as a superposition of continuous and linear spectra.

From the above it follows that when talking about the sensitivity of complete switchguard, it is necessary to stipulate the spectral bandwidth of the photodetector, which will

vary depending on the type of photodetector. Any photodetector of radiation can be described by a conversion function (current sensitivity):

$$R_\lambda = f(\lambda) = [A/W],$$

where [A/W]- SI dimension.

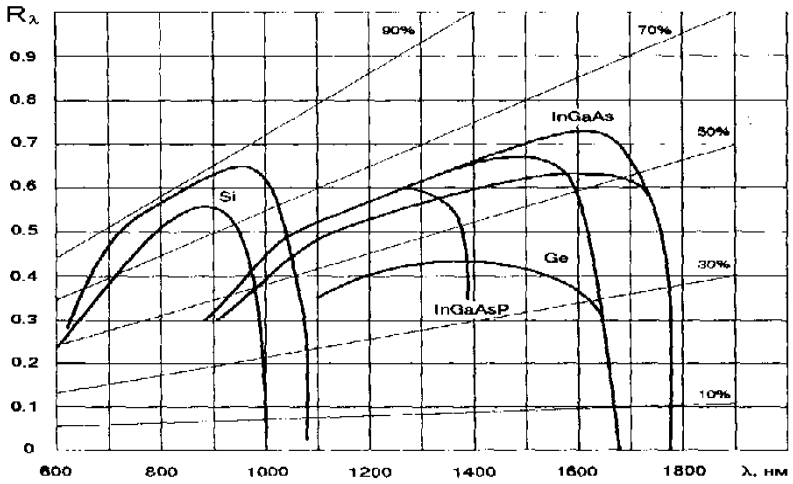

Figure 2: Spectral dependence of current sensitivity for photodiodes made of various semiconductor materials

One of the main parameters of radiation is the radiation flux, which is defined by the energy of radiation carried per unit time.

By adding appropriate lower indices to the designation of the radiation flux (F) it is possible to define this parameter as either energy flux or luminous flux. In this context "luminous" refers to the dimension in light or photometric units [2].

Energy luminous flux is measured in watts, luminous flux in lumens:

$$\Phi_e = [W]; \quad \Phi_\upsilon = [lm]$$

In the 19th century, the International Commission on Illumination introduced the concept of photopic luminosity function V_λ, known as the “ICI curve” (Figure 2).

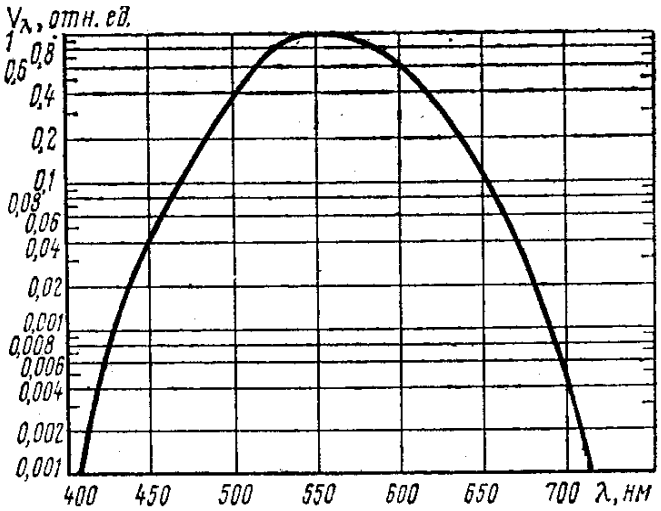

Figure 2 - Relative visibility function of the ICI.

At peak 1 W = 680 lm

This function is the average transmission spectrum of the human eye. Thus, the radiation of any source, expressed in light units, is obtained by passing the energy flux of the source radiation through a V_λ filter:

$$\Phi_\upsilon = 680\ [лм/Вт] \times \int_0^\infty (d\Phi_e/d\lambda)\cdot V_\lambda \cdot d\lambda,$$

where $d\Phi_e/d\lambda$ - spectral density of the energy flux of the light source.

Light units can be easily converted into energy units using luminous efficiency η - the ratio of luminous flux to energy

$$\eta_\upsilon = \Phi_\upsilon/\Phi_e$$

For green (λ = 550 nm) η_υ = 680 lm/W, for red (λ = 655 nm) η_υ = 60 lm/W.

If the spectrum of the arc discharge started from the near infrared range, then the use of the photometric approach in determining the sensitivity of the AFCI would be incorrect. However, the wide spectrum of the arc discharge, which is practically uniform in the visible range (if we do not take into account the narrow emission lines of various impurity centers), makes it possible to consider the photometric version as practically no alternative in determining the sensitivity of ultrasonic sounding.

Thus, the sensitivity of the AFCI, which is, in fact, the light illumination at the point of information pickup, is measured in lux (lx), where

$$1\ lx = 1\ lm/m^2$$

In the case of using light units when measuring the sensitivity of the AFCI, there is no need to specify the type of photodetector used.

There are a fairly large number of light sources that can act as a measure, that is, a driver with a known luminous flux of radiation in lumens. Thus, a 60 W incandescent vacuum lamp creates, like a point source of light, and emits a flux of 700 - 760 lm in a full solid angle of 4π steradian. Then, at a distance of r = 1 m, the illumination from the lamp will be $760/4\pi r^2 \cong 60$ lux, at a distance of 0.5 m, about 240 lux [3].

Arc illumination at the distance of 7 m with 20-30 kA reaches 9000 lx, then at 0,5 m it will be about 1,8 Mlx. Arc faults are accompanied by both changes in the parameters and characteristics of the electrical network (current, voltage, impedance) and a significant increase in temperature, pressure, electrical conductivity and thermal (light) radiation inside the switchgear compartments. These information features are used in protection, which must meet the following properties: high speed, absolute selectivity and high sensitivity.

The complete switchgear is protected by devices responding to:

1) Maximum currents (overcurrent protection);

2) Increased pressure at the shock wave front at the initial moment of arc fault (valve arc protection);

3) Increase in the degree of ionisation of gases in the arc pole channel (antenna-type protection with arc trapping electrode);

4) Radiation from the arc pole (photothyristor, photodiode, fibre optic protection).

We will consider in more detail the data of the security system.

1) Overcurrent protection is a fairly simple technical solution for protection against arc short circuits. Positive qualities: simplicity, high elemental reliability and low cost. The limiting factors for the use of overcurrent protection are relative selectivity and insufficiently high speed due to the need to coordinate with the protections of adjacent elements.

2) Valve arc detection (VAD) is a common protection system in switchgear panels today, which is triggered by an increase in pressure inside an airtight panel, which occurs at arc currents of approx. 3.5kA. This safety system is tripped by a temperature increase of between 2000 and 3000°C, which prevents cell explosion but not cell failure and must be repaired or replaced with a new one. The VAD as a mechanical device does not react to the arc, but to the effects of the arc, and will operate when the gas pressure reaches a level sufficient to trigger it, so it has disadvantages, in the lack of sensitivity.

In addition, valve arc detection has an unreliable control of serviceability, since the control uses not the working contacts of the limit switches, but another pair of this switch.

3) The system of sensors "Crab" and "Antenna", installed in a set to protect cabinets of any series from short-circuit arcs at currents from 3.5 kA. In this case, the "Crab" is mounted in a cabinet with a switch, protecting the cabinet, the switch and the outlet of the outgoing line (cable stripping), and the "Antenna" is installed in the busbar compartment. It protects the compartment, reserves the operation of the "Crab" sensors and provides, with some delay, arc protection of cabinets without switches.

The disadvantages of this type of protection include poor performance and low reliability.

4) Electro-optical arc protection (EAP)

Photothyristor arc protection, widely used in cells, also has serious disadvantages: limited space visibility, the presence of electronic components (photothyristors) in the area of possible arcing, the difficulty of monitoring the serviceability of photothyristors; possibility of false operation due to leakage currents in parallel connection of n - o number of photothyristors, when direct sunlight or light from lighting lamps of switchgear compartments.

Conclusion

Arc Protection Devices (APDs) based on fibre optic sensors (FOS) allow a wide bandwidth of the electronic path to be formed as well as to eliminate the influence of low-frequency variations in illumination. Unlike photothyristor protection, APDs based on FOS contains only a passive receiver of optical radiation - a lens or lens of FOS, connected to the electronic unit of the device by an optical cable in the arc area. But this type of protection also has the significant disadvantage of being the most expensive to equip and maintain. Note also that the DSP does not accurately activate when exposed to direct sunlight or when a 60W incandescent lamp is lit at a distance of less than 10mm [1].

Comparison of the methods for constructing arc-flash detections for complete switchgear shows that the most promising from the point of view of obtaining the maximum speed with absolute selectivity and the minimum number of information signs is the method of controlling the illumination (luminous flux) inside the compartments.

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Opportunities for the use of solar energy in agriculture of Turkmenistan

Abstract. This paper presents an analysis of the potential of solar energy in the region of Turkmenistan. On the basis of the spent calculations of solar radiation in region, the estimation of quantity of falling solar energy is received, accepted by the solar panels. Optimal orientation of the solar panels is defined and quantity of generated electric energy by solar panels.

Keywords: solar radiation, optimal orientation of solar panels, photoelectric solar station, generation of electric energy, independent power supply.

Introduction

According to the climatic conditions, structure and needs of agricultural development, Turkmenistan is one of the most promising regions, where the use of solar energy can and should find practical implementation. This primarily applies to the desert part of the territory, remote from the cultural zone, in which there are no energy and water sources. The potential of the desert area for agricultural development can be exploited by two methods: industrial and autonomous microcomplexes.

Most of the desert territory of Turkmenistan at present and in the future can only be used as pasture for cattle breeding, which is a large number of small consumers of energy and fresh water dispersed over a huge territory. In this regard, the development of new forms and methods of optimal use of the desert territory of Turkmenistan based on the achievements of scientific and technological progress is of great economic importance today. And here the primary role belongs to solar energy.

The economic feasibility of solar photovoltaic conversion technology is possible with a reasonable estimation of the generated and consumed power, as well as the optimal ratio of energy sources used for power supply of facilities and territories [3]. This can be predicted and implemented using reliable data on the solar energy potential in a given geographical point, taking into account the variability of its manifestation (in particular the arrival of solar radiation), as well as the multivariate location of the generation sources in the territory considered.

Reliable information about insolation can be obtained, for example, at meteorological stations, but it may be limited only to their location. In addition, the intensity of the solar radiation flux can be determined by calculation methods, but they are time-consuming and require additional verification of the results.

Therefore, for the initial assessment of the technical feasibility and economic feasibility of using the technology of photovoltaic conversion of solar energy, it is necessary to obtain reliable data on the intensity of solar radiation at each moment in time at a given location of the solar electrical installation.

Object and methodology

Solar energy has recently been used quite often to provide electricity to a variety of facilities located both in large cities and small rural settlements. This is primarily due to the need to reduce environmental pollution in the production of electric energy, as well as the emerging requirement to increase the share of local energy resources used. The resolution of the President of Turkmenistan dated February 21, 2018 approved the "State Program on Energy Saving for 2018-2024". The State Energy Saving Program contains a special appendix, the Action Plan (roadmap) for the implementation of the State Energy Saving Program for 2018-2024. The action plan (roadmap) for the implementation of the State Energy Saving Program for 2018-2024 can list the following items that are very important for the development of solar energy in Turkmenistan. For example, p1 "Prepare a draft law of Turkmenistan on renewable energy

sources and submit it to the Mejlis of Turkmenistan for consideration. Implementation period 2018-2020", p4 " Prepare proposals for the selection of the location of solar and wind power stations on the territory of Turkmenistan, develop a solar and wind energy cadastre and an assessment of solar and wind energy resources. Implementation period 2018-2021, p28 "Prepare proposals for the use of experimental solar stations in the regions of Turkmenistan. The deadline is 2024 " [1].

Methods for calculating the gross potential of solar energy, as is known, are based on a well-known principle: the data given for a horizontally located receiving surface for a point with certain geographical coordinates are recalculated according to empirical formulas proposed in the special literature on an arbitrarily oriented surface.

The choice of the calculation method depends on the available initial data and the operating conditions of the considered electric power plant [4]. Methods for calculating the gross solar energy resources at point A on a horizontal surface are divided into methods with limited information and with complete information. Each of them has its own advantages and disadvantages. In [5], a method that combines these approaches is proposed, presented in the form of a computer program for estimating the potential of solar energy at a given point.

In the calculations, we used this technique, which allows, based on a combination of the method of applying the daytime profile of the solar radiation input with an absolutely clear sky, and actinometric data from the NASA electronic database. Using this technique, the authors calculated the values of the intensity of solar radiation for cities in the regions of Turkmenistan.

If solar panels are installed at some angle β to the horizon, then the average monthly daily total amount of solar energy supplied to the inclined surface can be found by the formula [2]:

$$E_н = R \cdot E,$$

where E – average monthly daily total amount of solar energy supplied to a horizontal surface;

R – the ratio of the average monthly daily amounts of solar radiation entering the inclined and horizontal surfaces.

The conversion factor from horizontal to south-facing inclined plane is the sum of the three components corresponding to direct, scattered and reflected solar radiation:

$$R = (1 - \frac{E_p}{E}) \cdot R_n + \frac{E_p}{E} \cdot \frac{1 + \cos\beta}{2} + \rho \cdot \frac{1 - \cos\beta}{2},$$

where E_P – monthly average daily amount of diffused solar radiation reaching the horizontal surface; $\frac{E_p}{E}$ – monthly average daily fraction of scattered solar radiation; $R_п$ – is the average monthly conversion factor for direct solar radiation from horizontal to inclined surface; β – angle of the solar panel surface to the horizon; ρ – the reflectance (albedo) of the Earth's surface and surrounding bodies, usually taken as 0.7 for winter and 0.2 for summer.

Monthly average conversion factor of direct solar radiation from horizontal to inclined surface:

$$R_n = \frac{\cos(\varphi - \beta) \cdot \cos\delta \cdot \sin\omega_{зн} + \frac{\pi}{180} \cdot \omega_{зн} \cdot \sin(\varphi - \beta) \cdot \sin\delta}{\cos\varphi \cdot \cos\delta \cdot \sin\omega_з + \frac{\pi}{180} \cdot \omega_з \cdot \sin\varphi \cdot \sin\delta},$$

where φ – latitude of the area, degree; β - angle of the solar panel to the horizon, degree; δ - declination of the Sun (the angle between the line connecting the centres of the Earth and the Sun and its projection onto the equatorial plane) on an average day of the month, degree:

$$\delta = 23{,}45 \cdot \sin(360 \cdot \frac{284+n}{365}),$$

n – the consecutive number of the day after 1 January (the number of the average accounting day for each month of the year).

The value δ can be taken from Table 1.

Table 1 - Declination angle of the Sun

Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
n	17	47	75	105	135	162	198	228	258	288	318	344
δ, degree	-20,9	-13	-2,4	9,4	18,8	23,1	21,2	13,5	2,2	-9,6	-18,9	-23

$\omega_з$ – hourly angle of sunset (sunrise) for the horizontal surface:

$$\omega_з = \arccos(-tg\varphi \cdot tg\delta).$$

$\omega_{зн}$ – hourly angle of sunset for a south-facing inclined surface:

$$\omega_{зн} = \arccos\left[-tg(\varphi-\beta) \cdot tg\delta)\right].$$

Research results

Table 2 presents the following data: the geographical coordinates of cities in the regions of Turkmenistan and the corresponding annual values of the intensity of solar radiation arriving at the surface of the solar battery, which is inclined relative to the horizontal surface at the optimal β angle of inclination, as well as the optimal angles of inclination for the corresponding cities.

The data on the average annual values of the intensity of solar radiation falling on the inclined surface of the solar battery at various angles of inclination to the horizon for cities in the regions of Turkmenistan are presented in Figure 1.

Таблица 2

Region in Turkmenistan	City	Geographic coordinates, degrees		Optimal tilt β angle, degrees	Average annual intensity of insolation on the inclined surface of the solar battery, kW · h / m2
		Northern latitude	Eastern longitude		
Ahal	Ashgabat	37,9	58,3	36	1825,455
Mary	Mary	37,6	61,8	36	1897,407
Lebap	Turkmenabat	39,1	63,6	36	1875,814
Dashoguz	Dashoguz	41,8	59,8	31	1855,527
Balkan	Balkanabat	39,5	54,4	40	1819,882

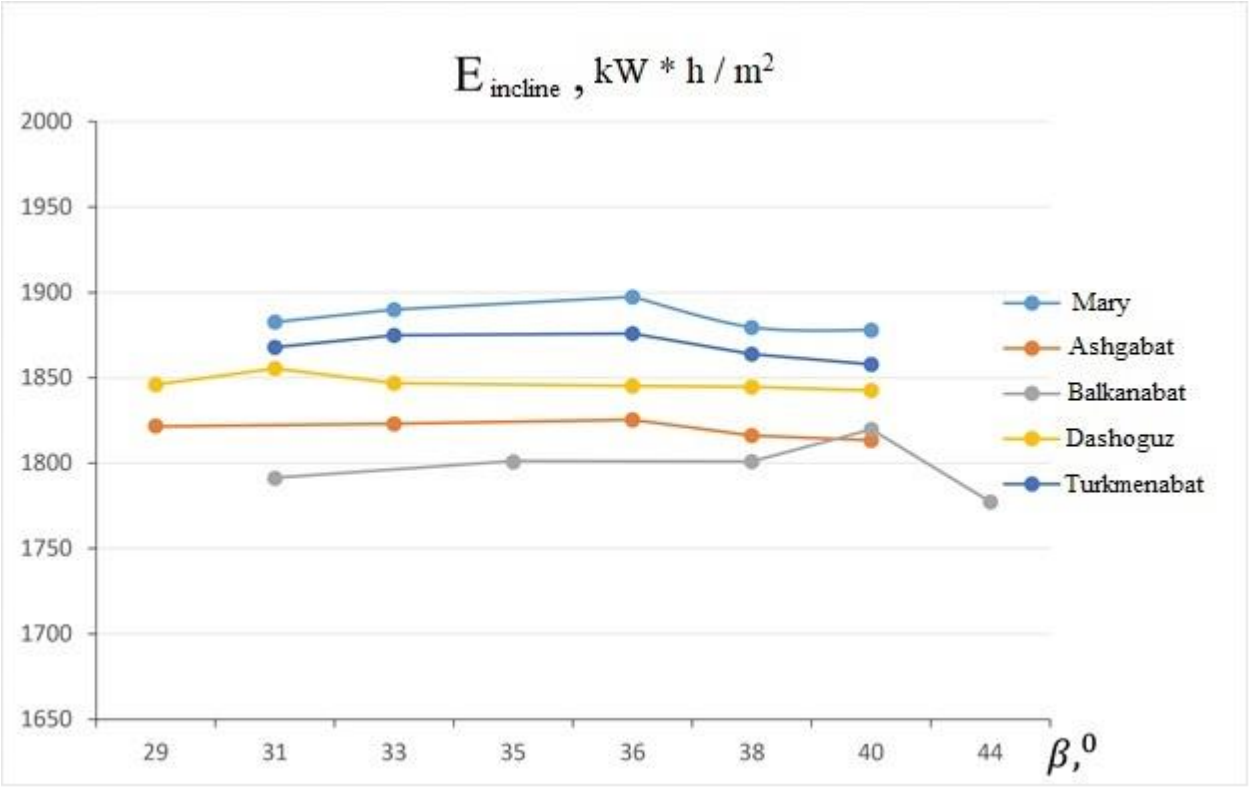

Figure 1 - Average annual values of solar radiation intensity falling on an inclined solar surface at different angles of inclination to the horizon for cities in regions of Turkmenistan

The intensity of solar radiation falling on the solar panel surface inclined to the horizon at an optimal angle of Turkmenistan varies from 1819,882 kWh/m^2 year for the city of Balkanabat to 1897,407 kWh/m2 year for Mary.

Conclusions

1. The proposed method was used to calculate the average annual intensity of solar radiation incident on the inclined surface of the solar battery at different angles of inclination to the horizon for cities in the regions of Turkmenistan and to determine the optimal angles of inclination.

2. The calculated insolation in each of them was compared, and the results of the calculation showed that the average annual intensity of solar radiation falling on the surface of the solar battery tilted relative to the horizon at the optimal angle in the territory of Turkmenistan varies from 1819,882 kWh / m^2 year to 1897,407 kWh / m^2 year.

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Innovative methods of vocabulary instruction for the students of technical fields

Abstract. Vocabulary is certainly recognized by linguists as one of the key components of the language learning process. High vocabulary proficiency is especially significant in the language learning process of students of technical fields because only with the knowledge of necessary vocabulary are the students able to understand such concepts as electrical meters, electromagnetic theory and relay, electromagnetic machines, etc. Working with students of various technical fields, we encounter some difficulties in teaching technical vocabulary. Therefore, we have developed a certain set of methods and techniques of teaching technical vocabulary to future engineers.

Key words: technical vocabulary, language instruction for engineers, using technology in a language classroom.

The significance of sufficient vocabulary knowledge cannot be undervalued. An average student needs to increase their vocabulary by 2,000 to 3,000 words a year (Beck, McKeown & Kucan, 2013).

Therefore, language educators have always researched the problem of efficient vocabulary instruction thoroughly. In practice, we have encountered problematic situations when during a language lesson a student is lost and does not understand the meaning of a concept because of a lack of vocabulary knowledge.

These kinds of situations made us reconsider and devise some methods and techniques, which would help teach technical vocabulary effectively.

- **Text-based teaching. Connection between reading and vocabulary.**

Text-based teaching has emerged over the past two decades from the growing interest in how English language learners can develop the knowledge and skills needed to comprehend texts used in different contexts (Burns, 2010).

The main concept of text-based teaching is that in daily life speakers and writers of a language engage in different types of communication, such as listening to news items, participating in business meetings or in our students' case in engineering practice when working with different devices.

Our curriculum is widely text-based because we find teaching vocabulary through texts, of course with assistance of different activities, highly efficient.

In learning a language, students need to be able to understand not only the structures and language patterns that make up the extended forms of communication, but also the concepts, which will be used in their professional life in practice, hence the name of our course – *Professional English.*

Fictional and nonfictional texts that occur frequently in writing are *narrative, recount, procedure, argument, discussion, information report and explanation* (Macken-Horarik, 2002).

The texts used in our textbooks are nonfictional texts in *information report* and *explanation* format (see *Figure 1*).

In *Figure 1,* we can see a text explaining the concept of electromagnetic relay. These types of texts are supplemented with exercises such as word and word combination translation, word formation, sentence completion exercises (see *Figure 2*).

Figure 1. Excerpt from a text explaining electromagnetic relay.

- **Indirect vocabulary instruction.**

The extent to which a student understands spoken or written text, i.e. their vocabulary knowledge, is directly proportional to how much the student reads. Therefore, the more the students read the more words they learn. Reading is the biggest, most effective tool in teaching

vocabulary. The students do not only learn new words when they read, but they also learn words when they are read to. Here, our practice of first reading the text to students ourselves can be mentioned.

Lesson № 3

ELECTROMAGNETIC RELAY

Electromagnetic devices called ***relays*** are widely used in various branches of industry.

The main parts of a relay are an electromagnet, a spring and an armature. When a current starts flowing in the electromagnet winding, the armature moves and the spring closes the contacts. The primary circuit of a relay is its electromagnet circuit and the secondary circuit is the one closed by the contacts.

When there is no current in the relay's primary circuit, the spring pulls the armature and the contacts open.

Fig. 1 shows how a relay is used to control the work of an electric motor. The relay is placed close to the motor, which is connected to its secondary circuit. The armature closes the contacts of the secondary circuit, and the motor starts operating; it will stop when the relay opens.

Without a relay, conductors with a large cross-section would have to be brought to the motor. This would be very uneconomical in a relay is tens and even thousands of times smaller than that used to power the motor. Therefore, the connecting wires can have small cross-sections.

Figure 2. Supplementary exercise to the text in Figure 1.

4. Complete the sentences using the correct variant.

1. The main parts of a relay are …	a) an electromagnet, a capacitor, and a spring. b) an electromagnet, an armature, and a spring.
2. When current starts flowing ...	a) the spring opens the contacts. b) the spring closes the contacts.
3. The spring pulls the armature …	a) when there is current in the primary circuit. b) when there is no current in the primary circuit.
4. The wires connecting the panel with the relay …	a) have a large cross-section. b) have a small cross-section.
5. Street lights are switched on and *off* ...	a) by means of relays. b) by means of electric motors.

5. Complete these sentences using *while*. Follow the model.

Model: *Resistors connected in series have the same value of current...*

Resistors connected in series have the same value of current ***while***

After the instructor has read the text, students read it. Here comes the helpful practice of in-context vocabulary learning. The teacher chooses key words meaning key concepts and asks if any of the students understand the meanings of those words. For example, in *Figure 3*, the teacher asks about the word *deflection* and if anyone has understood what it means. Whereas the students suggest the Turkmen and Russian translations of the word with which they have not been previously familiar. When the instructor asks how the students came to that conclusion, they explain that they have understood the meaning of the word from the sentence in which it is used (see *Figure 4*). The students explained, that because they are familiar with such words as *pointer*, *armature* and *scale* they were able to deduce that the Turkmen and Russian translations of the word *deflection* are *süýşürme, gyşartma* and *отклонение.*

Figure 3.

ELECTRICAL METERS

One of the important things that an engineer should take into consideration is "how much?" How much current is this circuit carrying? What is the value of voltage in the circuit? What is the value of resistance? In fact, to measure the current and the voltage is not difficult at all. One should connect an ammeter or a voltmeter to the circuit and read off the amperes and the volts.

Common ammeters for d. c. measurements are the ammeters of the magneto-electric system. In an ammeter of this type, an armature coil rotates between the poles of a permanent magnet; but the coil turns only through a small angle. The greater the current in the coil, the greater the force, and, therefore, the greater the angle of rotation of the armature. The deflection is measured by means of a pointer connected to the armature and the scale of the meter reads directly in amperes.

Figure 4.

circuit and read off the amperes and the volts.

Common ammeters for d. c. measurements are the ammeters of the magneto-electric system. In an ammeter of this type, an armature coil rotates between the poles of a permanent magnet; but the coil turns only through a small angle. The greater the current in the coil, the greater the force, and, therefore, the greater the angle of rotation of the armature. The deflection is measured by means of a pointer connected to the armature and the scale of the meter reads directly in amperes.

When the currents to be measured are very small, one should use a galvanometer. Some galvanometers detect and measure currents as small as 10^{-11} of an ampere per 1 mm of the scale.

A voltmeter is a device to be used for measuring the potential difference between

- **Importance of efficient dictionary use and knowledge of word parts.**

Even though the practice of making students find words in a dictionary, write down their definitions and memorize them has long been rendered least effective, the importance of using dictionaries in language classrooms cannot be stressed enough.

The students must use dictionaries, but they need to be familiar with the ways of correctly identifying the right definition for the word in the particular context in which they are using it, i.e. students must be taught how to effectively use dictionaries.

Following are some useful suggestions on how to choose the right definition (The Texas Center for Reading and Language Arts, 2002):

- Use background knowledge concerning the content

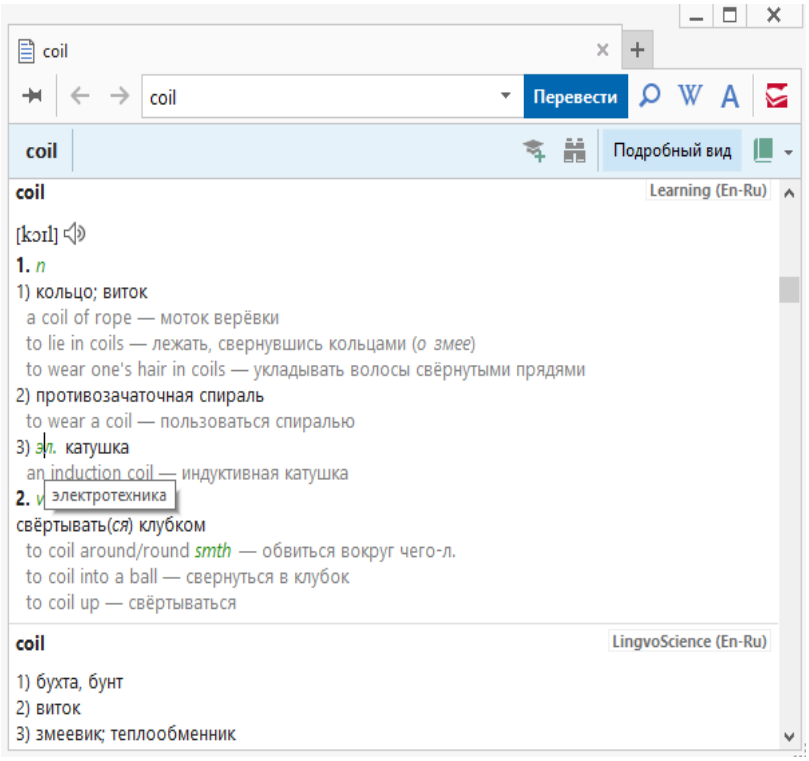
- Have a sense of grammatical use of the words in a sentence
- Read and understand each definition.

A suggestion we would like to add to these is *being able to read dictionary markers*, which point to which sphere the word belongs. For example, take the word *coil* from the text in *Figure 1*.

When entered into a dictionary, this word has many definitions and the one in which it is used in the present text. It is up to the instructor to teach the student to look for the markers identifying that definition.

In *Figure 5* as indicated, next to the word coil there is a marker *эл.(электротехника)*, meaning electric technology, which is exactly the sphere to which the definition of the word coil we have been looking for belongs.

Figure 5.



Another useful method of teaching technical vocabulary is familiarizing students with word parts or in other words morphemes.

In our practice, we have noticed that when students encounter unfamiliar words with familiar word parts, i.e. prefixes, roots, suffixes, etc. they try to guess the meaning of the word.

This can be put to good use in the learning process.

For example, the knowledge of the meaning of the word *meter*, which essentially means *person, who measures* in Middle English (Abby Lingvo Dictionary) can help the students understand such technical terms as *ammeter, voltmeter, galvanometer* and *potentiometer.*

- **Visual aids in teaching technical vocabulary.**

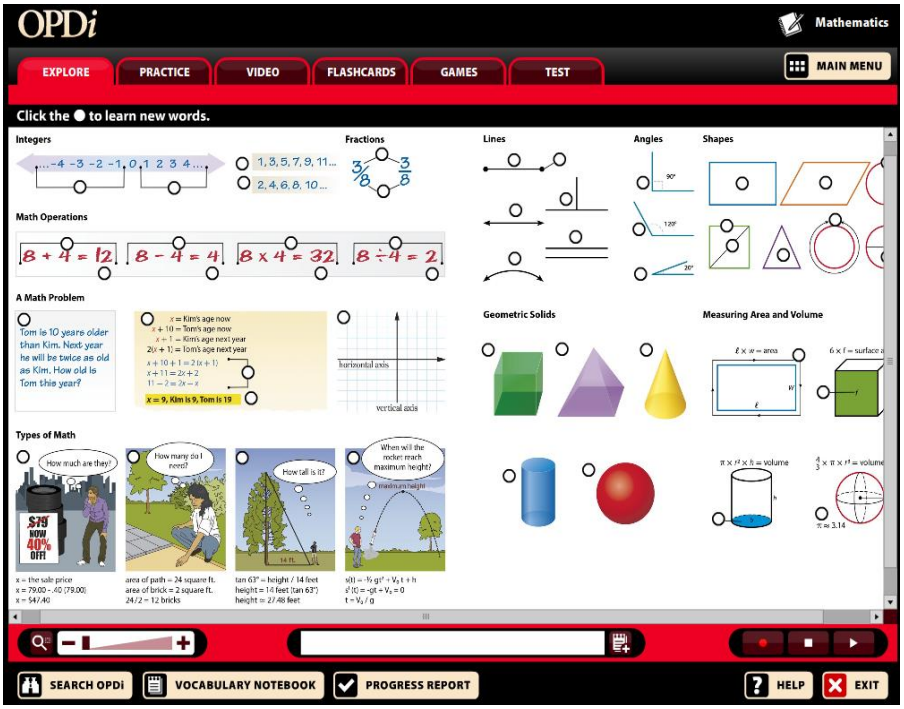
Nowadays visual aids are an essential part of the language learning process. The use of visual aids such as interactive software, videos, flashcards and the actual devices mentioned in texts improves the learning process greatly.

- **Interactive software**

We use the soft version of the Oxford Picture Dictionary to explain certain mathematical terms (see *Figure 6*).

When students see the pictures of the mathematical operations they understand the meaning of the words better, besides that, the resources such as tests, games, flashcards and videos, which this software provides help the students learn vocabulary individually.

Figure 6.

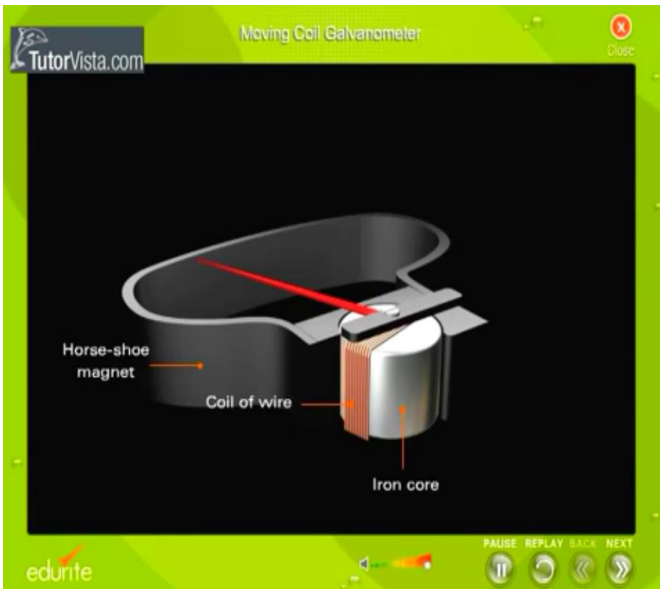


- **Videos**

The use of videos adds much entertainment to the learning process. There is a big gap between just reading a text and analyzing it, and reading a text, analyzing it and watching a video explaining the topic of the text explicitly. We have collected a set of useful short videos, which we use in the teaching process.

For example, after reading and analyzing the text *Electrical meters* (see *Figure 3*) one can show a video explaining the working principal of a galvanometer (see *Figure 7*).

Figure 7.



- **Devices mentioned in texts.**

Explaining concepts with the help of videos and software is certainly fruitful, but using the actual devices in class to teach and explain new vocabulary is much more rewarding. For example, in lesson *Electrical meters,* we used actual ammeters and voltmeters in class (see *Figure 8*). This way, the teacher can explain that ammeter must be placed in series with the circuit and the voltmeter must be placed parallel with the part of the circuit where the voltage is measured. We had students actually connect the measuring devices to the circuits and explain the working principle in English.

Figure 8.

- **Activities for teaching technical vocabulary.**

- **The hacky sack**

This, seemingly, children's toy can be a lifesaver in a language classroom. When students have to memorize 75 words for their homework, they are not the only ones who regret it. For a teacher, checking if all the students actually memorized all the 75 words can be quite difficult and boring as well. These kinds of situations are where the old classic toy hacky sack can be helpful (see *Figure 9*). Teacher can say the translation of the word and throwing the ball to a student ask them to say that word in English. This activity saves time, energy and makes the homework checking process more interesting and enjoyable.

Figure 9.

- **The visual representation of an act**

This activity is somewhat similar to the ones where a person would act out a verb to explain it. For example, to explain such *mathematical expressions* as *subtraction, addition, division and multiplication* the teacher can use apples and act out the words. Add one apple to

two and ask the students what just happened. This kind of activity can add fun to the process of learning technical vocabulary.

- **Defining concepts from cards**

Divide the class in two teams. Put the visual representation of concepts on cards and have students draw them and come up to the front of the class and define or explain these concepts in English. The teams must guess what is pictured on the card. The team, which guesses the most cards, wins.

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Development of alternative energy in Turkmenistan, results obtained and State programs for its development

Abstract. Development of the alternative energy sources is a priority direction in Turkmenistan, as Turkmenistan possesses vast potential of solar and wind energy. State programs are elaborated in the country on developing electrical power engineering sector, which includes the utilization of both traditional power stations and the utilization of alternative energy sources. Moreover, it should be taken into consideration that Turkmenistan also possesses vast reserves of natural gas and oil.

Key words: power engineering, alternative power engineering, State program on developing innovative technologies and scientific researches in Turkmenistan, training power engineers on renewable energy sources.

Introduction

A prerequisite for the development of alternative energy sources today has become such factors as the world rise in prices for energy resources and other fossil energy sources, the deteriorating climate on the planet, the increasing growth in energy consumption associated with population growth and industrial growth in many countries. Turkmenistan has adopted the State Program for the Development of Alternative Energy Sources, and their potential is being studied. Based on the results of research work carried out by Turkmen scientists, it is safe to say that

Turkmenistan has enormous potential in obtaining and using solar energy. Daily solar radiation ranges from 700 - 800 W/m^2 [2].

Object and methodology

At present, the "State Programme for increasing the efficiency of innovative technologies and scientific research in Turkmenistan for 2017-2021" adopted on 15 July 2016 and approved by the President of Turkmenistan, Gurbanguly Berdymukhamedov, is in force in the country. The programme includes a number of important activities, the implementation of which falls directly on the electricity sector, namely "Conducting work on saving fuel resources, inventing new technologies that generate electricity and allow the rational and efficient use of fuel resources, as well as preparing recommendations for their introduction into production during 2017-2020" [1].

In this regard, research work is being carried out at the State Energy Institute of Turkmenistan to investigate the potential for using solar modules with a total capacity of 2 kW, a wind power plant with a total capacity of 2 kW and a vacuum solar collector with a usable area of 1.6 m^2 to produce warm water for hot water production. All research work is carried out in a two-storey experimental house (Figure 1). Since the potential of alternative energy sources in Turkmenistan is estimated at 110 mld, tons of conventional fuel, where the potential of solar energy is estimated at 1.4 mld, tons of conventional fuel [2]. Environmental conditions and convenient geographical location of Turkmenistan gives a huge opportunity to use a renewable energy source in energy supply of remote settlements and reduction of greenhouse gas emissions.

Figure 1 Two-storey experimental dwelling house

The State Energy Institute of Turkmenistan is working in the following areas:

- The discipline "Fundamentals of Energy Saving" was introduced, which is studied in all specialties of the institute.
- In 2013, the Institute created a specialty "Unconventional and Renewable Energy Sources", 10 applicants entered this specialty in 2014, and in 2019 the first graduation of renewable energy engineers took place. The graduates began their working lives at the research and production centre.
- This year, 20 applicants have already entered the institute in this specialisation. In the 2019-2020 academic year, 64 students are studying in five courses of this specialty.

In addition to general educational subjects, students majoring in "Unconventional and Renewable Energy Sources" study such subjects as:

- Introduction to the specialty;
- Spec. Technologies;
- Theoretical foundations of unconventional and renewable energy sources;
- Design and operation of unconventional and renewable energy installations;
- Basic and supplementary apparatus of unconventional and renewable energy sources;
- The fundamentals of energy saving.

By the decree of President of Turkmenistan Gurbanguly Berdimuhamedov from January 29, 2019 - the Institute of the Sun at the Academy of Sciences of Turkmenistan was placed under the authority of the State Energy Institute of Turkmenistan and the Institute was established the scientific and production center "Renewable energy".

The research and production center conducts research in the following areas:

− in the laboratory of photovoltaic conversion technology (PV): Preparation of recommendations on the selection of a site for the introduction of solar power plants in Turkmenistan and the development of a solar cadastre, assessment of energy resources of solar energy, development of scientific foundations for the use of experimental photovoltaic solar power plants in all regions of Turkmenistan and preparation of recommendations for their implementation.

− in the Laboratory of Solar Energy Concentration (CSP) and Solar Engineering: Development of projects of air and water solar heaters for use in various sectors of the economy, development of projects of solar plants for dehydration of dried fruits from agricultural products, development of scientific basis for the use of solar thermal stations (CSP) in Turkmenistan, development of scientific basis for the use of solar collectors in hot water and heat supply systems.

− in Bioenergy and Biomass Processing Laboratory: Development of a non-waste bioenergy complex project using innovative technologies, development of waste processing technology for the use of biogas in steam turbines. Development of recommendations on implementation of biogas plants in various sectors of agriculture and industry.

− in a laboratory wind power plants: recommendations for the choice of the place of implementation of wind power plants in Turkmenistan, and development of wind energy inventory energy assessment of wind energy resources, development of scientific bases for the use of experimental wind farms in areas of Turkmenistan and the preparation of recommendations for their implementation.

− in the laboratory of electric energy storage technologies: Study of the technical and operational characteristics of electric energy storage systems in the conditions of Turkmenistan, development of scientific foundations of new electric energy storage technologies, research of the processes of obtaining electric energy from accumulated thermal energy.

− in the project department: Development of projects for a combined system of large capacity photovoltaic and gas turbine power plants.

Research results

The following results were obtained in a short time:

1. A method for cleaning SiO_2 quartz sand was developed;
2. A plant for the production of biogas from cow and poultry manure was developed, the methane content of which was 86.4%;
3. A solar-powered salt water desalination plant has been developed.

Taking into account the above, today the obstacles to the development of solar and wind energy in Turkmenistan are:

− obtaining silicon for the manufacture of solar panels is currently an expensive technology.

− electric and thermal energy produced at traditional thermal power plants is several times cheaper than at power plants using solar and wind energy. For example, today the price for household consumers for 100 kW * hour of electric energy is 2.5 manats (about $ 0.7).

On 12 April 2019, President Gurbanguly Berdymukhamedov issued a decree on the "Concept for the Development of the Turkmen Lake Altyn Asyr Region in 2019-2025". In accordance with this Concept, the construction of the largest complex is planned. This complex consists of a modern village and other industrial, cultural facilities. This complex is to be supplied with electricity from a combined solar and wind power plant with a capacity of 10 MW. The State Energy Institute of Turkmenistan, together with the Scientific and Production Centre "Renewable Energy Sources", has carried out technical and economic calculations for the design of the combined cycle power plant. On the basis of these calculations, a pilot construction project was proposed and the following results were obtained:

1. It is economically feasible to build solar power plants with a capacity of 8 MW; this station requires 32,000 pieces of solar panels with a capacity of 250 W each.
2. With the construction of solar power plants with a capacity of 8 MW, with a sunny day, on average, it will generate 35192 kW · hour of electric energy, per year 12.846112 million kW · hour (Figure 2).

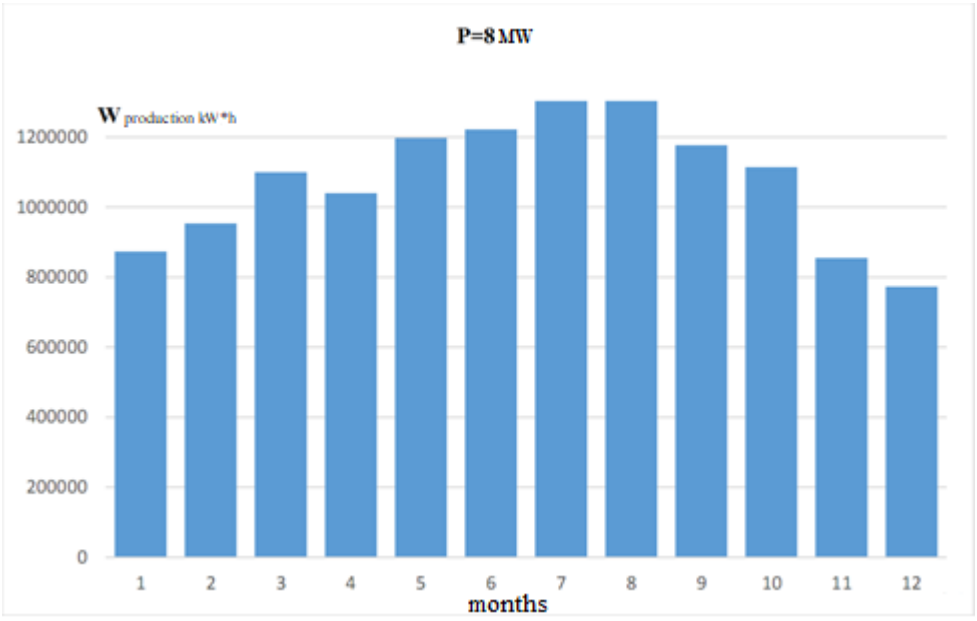

Figure 2 - Productivity of a solar power plant with a capacity of 8 MW during the year

3. The total area required for the installation of solar panels will be 52,160 m^2
4. It is economically feasible to build a wind power plant with a capacity of 2 MW; this station requires 4 units of wind generators with a capacity of 500 kW each.

Conclusion

The development of alternative energy sources will reduce greenhouse gas emissions, increase the export of fossil energy sources, and allow operating stations to get out of peak load moments with the lowest cost.

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Organic production in Europe

Abstract. The experience of European countries in the development of organic agriculture is quite interesting and useful for Kazakhstan.

Key words: organic products, organic agriculture, European Union, common agricultural policy of the European Union.

Introduction

With increasing prosperity, European countries have begun to implement ecologically oriented transformations. There is a gradual transition to an ecologically oriented agricultural policy and organic farming is becoming increasingly important. State support for organic farmers through incentives, subsidies and crediting is also of great importance in this respect. The experience of European countries in the development of organic agriculture is quite interesting and useful for Kazakhstan.

The EU member states, as sovereign states, can now implement their own agricultural policies, but the basic parameters of the policy must comply with the rules of the union. This feature is one of the most important differences between the EU CAP (Common Agricultural Policy of the European Union) and the policies of other states.

The EU CAP is structured in two sections. The first constitutes the production and trade framework and is needed to regulate support measures within the Common Market and direct support to farmers. This section is financed by the European Agricultural Guarantee Fund. The second section aims to address the challenges of integrated rural development and the competitiveness of the EU agricultural sector as a whole and is financed by the European Rural Development Fund and national regional budgets.

At the present stage, the main tasks of the CAP can be summarised as follows:

– EU food self-sufficiency and food safety;
– EU involvement in balancing the global food market;
– EU rural development;
– tackling climate change and improving the environment.

Object and methodology

Organic production is at the same time more sustainable than conventional production, causes less damage to the environment, is able to adapt to climate change and maintain a stable level of fertility over a longer period of time. The basic principles of organic farming established by IFOAM are:

– Principle of ecology: Organic farming should be based on the principles of natural ecological systems and cycles, working, coexisting with them and supporting them.

– The principle of health: Organic agriculture should maintain and improve the health of soil, plant, animal, human and planet as one and indivisible whole.

– The principle of care: Organic farming should be managed in a precautionary and responsible manner to protect the health and well-being of present and future generations and the environment.

– The principle of fairness: Organic farming should be built on relationships that guarantee fairness in view of the shared environment and life opportunities.

Research results

Organic farming in a general sense implies agriculture adapted to the environment and in harmony with nature. In other words, it essentially limits the use of pesticides, certain types of cultivation, excludes the use of readily soluble mineral fertilisers, limits the use of organic fertilisers, etc. Thus, it is clear that organic agriculture addresses several objectives of the Common Agricultural Policy of the EU.

In Europe, there are three categories of "organic" products:

– If a product consists of 95-100% organic ingredients, it is called organic;

– With 70-94% organic ingredients, the word "organic" can only be used in the list of ingredients;

– With less than 70% organic ingredients in a product, the word "organic" does not appear on the packaging at all.

Organic farming is being developed in almost every country in the world. However, the roots of organic farming are in Europe, where market development is stimulated by a developed base of suppliers and consumers who value the environmental and social benefits of organic agriculture.

The foundations of organic agriculture were laid in the 1920s and 1930s in Europe, and its intensive development began in the 1980s and 1990s, reaching over 200,000 enterprises by now. This industry is one of the fastest growing segments of the food market. The share of certified organic products in the European food market is on average between 3.6% (Germany, Italy) and 6% (Denmark). For certain types of food in Denmark, Austria, Italy, France, Germany the share of organic products is much higher and equals 10%-15% (vegetables, fruit, bread, juices, spices, seasonings).

At the end of the last century, many European Union countries developed national programmes for the development of organic agriculture, which were primarily aimed at increasing the area and number of enterprises producing organic products.

These programmes include annual subsidies for organic producers, public information campaigns on the benefits of organic food and healthy lifestyles, support for national associations of organic producers, and funding for scientific research. For example, out of the total EU budget for food security (€3.8 billion), €461 million was spent on research in 2014-2015. 461 million euros are allocated to research and development in the field of organic production.

Organic producers, according to new EU legislation, must use the official logo of the European Union. However, food safety standards are uniform for all foodstuffs and certification only concerns the production of organic products.

Europeans buy organic products either directly from farmers, from specialised shops or from traditional retail chains. Different sales channels dominate in the different EU countries. For example, in Germany there is a predominance of organic products sold by producers and specialised shops, while in the UK and Denmark supermarkets are the main distribution channel. The sale of organic products through supermarkets allows a faster development of the market for these products.

Let us look at the shares of individual EU countries in the organic market. According to FiBL-IFOAM, European countries are among the ten largest countries in terms of land area for organic production.

For example, Spain has 1.6 million hectares, Italy 1.3 million hectares, France and Germany 1.1 million hectares. In 2013, Italy recorded 46,000 organic producers and Spain 31,000 producers.

Italy is one of the European countries with the largest area of farmland under organic farming.

It is Italy that is the most important European supplier of natural food. More than 65% of organic farms in Italy are located in the Southern regions, which cover 41% of the country and where 37% of the population lives. A quarter of organic land is used for forage grasses, 20% for

grain crops, 15% for fruit crops, olives, vineyards. Most of the grain is grown in the north and center of the country. Horticulture and vegetable growing are more developed in the south of the country. Thus, the main products are fodder and livestock products (47%), cereals (19.5%), olives (8.7%), and fruits (5.6%). Cereals (wheat, barley, oats, and rice) account for up to 20% of the total production of organic agriculture. Fruits and vegetables are grown mainly in the southern regions.

Spain ranks second among European countries in terms of the total area of organic agricultural land. The first small organic farms appeared in the country in the late 1970s. Farmers entered into contracts for the supply of these products to France, Germany and the UK.

The bulk of Spain's organic land is found in the southwest of the country in the autonomous regions of Andalusia (34% of the country's total organic agricultural land), Extremadura (25%) and Aragon (about 10%). The maximum growth rates of the area of organic agricultural land are typical for the northern autonomous regions.

Germany is the third largest area used for the production of organic agricultural products. This country accounts for the largest share of the organic market segment in Europe. The annual sales revenue of this type of product is 5.8 billion euros. The most widespread organic farming is in East Germany, as farms there were more prepared for the transition to organic farming due to the lower use of chemicals and other technologies prohibited in organic farming.

Conclusions

Organic farming is second only to conventional farming in terms of production efficiency. Despite this, more and more foreign countries are developing organic production, as it has many advantages: maintaining soil fertility, the resulting products do not contain genetically modified changes and pesticides, contribute to achieving food security and provide simultaneous solution of several objectives of the Common Agricultural Policy of the European Union. Therefore, the importance of developing this area of agricultural production is obvious, not only abroad, but also in Russian conditions. It should be noted that in order to fully realise the potential of organic agriculture, it is necessary to raise it to the level of a priority direction of agricultural policy and to consider it as the main strategy.

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Agribusiness development issues in the Republic of Kazakhstan

Abstract. The article describes the existing problems in the agricultural sector of the Republic of Kazakhstan and possible recommendations for their solution.

Key words: agricultural economy, agribusiness, agricultural products, agricultural production, crop production, animal husbandry.

Introduction

Agriculture has become one of the most important sectors of the country's economy, providing the population with food products and raw materials for industry. The President's Addresses always pay special attention to the development of the agro-industrial complex, which is one of the most promising sectors of the Republic of Kazakhstan. The geographical location of the republic is favorable for the development of agribusiness. Among the CIS countries, our country was one of the first countries to focus on the development of agribusiness and the use of new technologies in this area [1].

Currently, four groups of industries are developing in the structure of agribusiness in our country:

1. Agriculture: farming and animal husbandry, forestry and fisheries.
2. Processing of agricultural raw materials: food industry, light industry related to primary processing.
3. Industry sectors: agricultural engineering, tractor and machine building, food processing and light industry equipment, land reclamation equipment, mineral fertilisers.
4. Infrastructure section - harvesting, storage, transportation of agricultural raw materials.

Analyzing the development of these areas, I would like to note that agriculture and animal husbandry are actively developing, as public policy actively supports these areas through subsidies.

Object and methodology

The processing industry is developing slowly. For example, in order to develop the meat and dairy industry, the number of sheep and cattle in the country has increased over the past decade. However, the issue of processing fur and skin of animals has not been resolved. Unfortunately. There are no procurement and processing organizations. Livestock breeders are forced to burn the fur and skin of animals. However, it can be a raw material for the development of light industry (production of fur and leather products and other areas). Based on such simple problems, the business community should help livestock breeders to use all their products efficiently.

As the President noted, Kazakhstan has every opportunity to create a brand “Made in Kazakhstan”. This brand will be engaged in the export of agricultural products around the world. We must strive to be a leader in this area and concentrate all resources on the production of environmentally friendly food products and stop importing agricultural products.

The Head of State also noted that in order to be competitive in the international market, we must move to the production of high quality products from raw materials. In this regard, it is necessary to develop the processing industry. State policy is aimed at supporting domestic producers. The people of our Republic want to buy goods under the “Made in Kazakhstan” brand.

During this period, grain production in Kazakhstan received favorable market conditions. Due to this, private investment was attracted. Equipment was upgraded and export potential was developed. Exports of the oil and meat sectors are also growing. Our country is a member of such organizations as the EAEU and the WTO. They, in turn, set their own high standards for competitiveness [2].

Therefore, the government pays special attention to this area. The development of grain production is impossible without the renewal of machinery. Specialised agricultural machinery and equipment are imported from neighbouring states – Russia and Belarus. State incentives for the development of the domestic agricultural machinery industry are needed to reduce the cost of our own grain products.

After all, a significant proportion of the final cost of grain is a cost item - the use of machinery. During the harvesting years, farmers have a good harvest and another problem arises: grain storage. There is a lack of granaries. Farmers are forced to sell their produce at unprofitable prices. There are other people who have saved the grain until the spring, and they have the opportunity to speculate. This raises the need for state regulation when it comes to the construction of granaries. This problem also exists for vegetable growers.

Research results

Thus, despite the active measures taken by the state, at present the agricultural sector of Kazakhstan can hardly be called sustainable and developing. The agro-industrial complex sector is not profitable and is highly dependent on seasonal and weather conditions. Therefore, it is necessary to develop insurance issues for agricultural producers. Our technological situation lags far behind the developed countries. But this is by no means the whole list of problems. It is not appealing to entrepreneurs because of the unfavourable conditions offered by the state [3].

A list of problems for the development of agribusiness can be drawn up from this:

1. Agribusiness insurance in the agricultural sector. As already mentioned, agriculture depends on seasonality and weather conditions. The climate of the country is sharply continental. Agriculturalists and farmers are always at increased risk due to unexpected drought, floods, autumn and late spring are rainy. Due to this, high material costs result in irreversible losses. Thus, the insurance mechanism for agricultural production requires absolute development.

2. Policy of business subsidies in the field of agribusiness. Over the past 10 years, the policy of our state is aimed at developing the structure of agribusiness through subsidies. In our view, it is necessary to strictly control the provision of subsidies. It is necessary to stimulate the development of underdeveloped areas. For example: the reception of leather and wool, as shown above. The state should not stop further stimulation of food production. But subsidy recipient entrepreneurs should develop the introduction of new technologies into production processes.

3. Consolidation of peasant and farmer households. Our republic is a member of the EEC and WTO. In this regard, competition among agricultural producers is intensifying. In order to reduce the cost of production and improve its quality, entrepreneurs should actively introduce progressive technologies. It is often difficult for private farms to improve the production process by implementing new technologies, because it is very expensive. However, the government has developed regulations for the establishment of agricultural cooperatives. There is also a system of subsidies, but, nevertheless, farmers, i.e. agrarians, are in no hurry to unite into cooperatives.

4. Shortage of highly qualified personnel. One of the important factors in the development of any direction is the availability of highly qualified specialists. Low wages and a lack of prestige in the agricultural sector hinder the training of specialists. As mentioned above, the development of agribusiness is impossible without the introduction of new technologies, which require personnel. Such personnel can now be attracted from abroad. But it is very expensive. This is a burden for independent entrepreneurs. Therefore, it is necessary to provide state support and continuous training of their specialists.

5. Problems of agribusiness development. This is one of the most pressing issues. Infrastructure needs to be developed – creation of large centers, construction of new roads. Entrepreneurs in the agricultural sector can not solve this problem on their own.

Transportation of a small amount of any cargo requires logistics. This is an independent industry that makes a significant contribution to the cost of the final product. In order to develop the competitiveness of the agribusiness sector, it is necessary to solve the current problem through the development of transport infrastructure and logistics.

Conclusion

In conclusion, agriculture is a sector of the economy that ensures food security of the country. The economic well-being of the country depends entirely on the agricultural sector. All developed countries develop the agricultural sector with government support, as it is economically low value added in this area.

Therefore, for the Republic of Kazakhstan to join the ranks of developed countries, it is necessary to develop the agricultural sector of the economy. The state has to pay more attention to the innovative development of the agro-industrial complex, because only through innovations can we use efficient technologies of production and processing of agricultural products, provide the state with improved crop varieties and animal breeds, new machines, progressive organisational and economic models, modern information technologies and other innovations.

Another solution to the problem is the allocation of funds from the state budget to increase the competitiveness of agriculture and ensure food security in priority areas.

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Logistics of support services for the agricultural sector and the formation of a market for material and technical resources

Abstract. The analysis of providing services of the agricultural sector of Kostanay region from the point of view of logistics is carried out. The criteria for forming the market of material and technical resources are considered.

Key words: material and technical base, resources, agriculture, logistics, organizational mechanism, equipment.

Introduction

The agricultural sector is the main consumer of the country's material resources: tractors, combines, trucks, fuels and lubricants, mineral fertilizers. The dynamics and rates of

development of agriculture are largely determined by the level of production in the industries that produce the means of production for it. In addition, the development of agriculture is closely linked to the efficient operation of industries and production that serve agricultural enterprises.

Object and methodology

The object of research in this article was the agricultural sector of Kostanay region, namely, the work of support services and the formation of the market of material and technical resources of the agro-industrial complex.

Research results

From 2015 to 2019, agricultural enterprises of the Kostanay region purchased about 1000 tractors, 1200 combines, 120 sowing complexes, 500 seeders.

As a result, during this period, the tractor fleet in the physical ratio was updated by 8%, the combine by 21%, and the sowing units by 18%. The updated equipment allows sowing complexes to sow about 60% of the entire area, and high-performance combines to remove up to 75% of the grain area.

Machine-building enterprises of the region “Agromash Holding”, “Agrotechnmash”, “Don Mar”, “Dormash”, “Agroengineering” LLP play a significant role in providing agricultural formations with modern equipment.

At the same time, the percentage of equipment updates on average in Kazakhstan does not exceed 3% per year, although according to the standards, a tenth of all machines need to be replaced. The Ministry of Agriculture plans to reach the minimum renewal threshold of 6-7% by 2022. To do this, they plan to subsidize leasing interest rates, help with the initial payment in the form of investment subsidies.

The specific features of the application of logistics tools in the economic sphere are revealed by the modern interpretation of logistics, based on a dual approach to the definition of its substantive part. In economics, logistics can be considered in two ways: on the one hand, as a set of means and methods of rational organization of material and information flows in business activities in order to improve its quality and reduce logistics costs; on the other hand, as a methodological basis for managing economic flows in complex economic systems. One of these systems is the agro-industrial complex.

The modern agro-industrial complex is a large network structure, which includes enterprises producing means of production and material resources (tractor and agricultural machine building, production of mineral fertilizers, crop protection chemicals, etc.), agriculture (farming and animal husbandry), processing industry (food processing and primary processing of raw materials for light industry), transport and information support of material flow movement, human resources support in Therefore, the use of the logistics concept makes it possible to improve the efficiency of enterprises and macro-logistic systems in the agricultural sector.

In this article we will look at specific unit - the support services of the agro-industrial complex.

Agriculture in Kostanay region is considered to be one of the promising sectors of the economy. Great attention is paid to the introduction of progressive technologies of crop cultivation into production.

Logistics activities in the agro-industrial complex are complex. In order to solve the critical problems associated with increasing the efficiency of agricultural production, there is a need for a deeper and more detailed scientific study of the functioning of the complex system "agricultural technology - logistics", which is largely determined by the optimal construction of the agroindustrial complex infrastructure and, above all, by the uninterrupted supply of agriculture with material, technical and financial resources, production services and qualified personnel. Therefore, the application of logistic approaches to agricultural production, taking into account the regional characteristics of enterprises and a broader study of logistics systems in the agro-industrial complex is an important problem for both science and practice.

The market of material and technical resources of the agro-industrial complex is mainly represented by goods that are used as means of production (tractors, cars, combines, spare parts,

various agricultural machinery and other consumables for it).

An important niche is occupied by oil products, i.e. different types of fuel, oils and greases for internal combustion engines. This market has its own peculiarities of functioning.

The sale of resources acts as the final stage in the system of relations between market structures, their production - as the initial stage of movement towards the consumer.

Production feeds the market, filling it with goods, and at the same time depends on the market, on its capacity, determined by the solvency of the consumer.

Only what is produced can be on the market, and it is only sensible to produce what can be sold.

Particular importance is attached to quality, which has a direct effect on price. Quality is always evaluated by the market and ensures the competitiveness of the product.

These conditions for the functioning of the market for material and technical resources are realised only when the consumer of these resources is solvent. In a market economy, the need is always in the form of solvent demand.

An important feature of the market of material and technical resources in the agroindustrial complex is a specific local monopoly. It consists in the following: the sale of resources is usually carried out through intermediaries, because in this case it is practically impossible and inexpedient to maintain direct links between the manufacturer and the consumer. Any intermediary has a defined and largely controlled area of activity.

These zones were formed during the operation of the "Agricultural Machinery" system and were of an administrative and territorial nature. Currently, the territorial distribution of service areas has not lost its significance, for at least two main reasons:

– the existence of established relations of agricultural producers with organizations of material and technical supply and production and technical services;

– high level of transport costs during the expansion of the service area and the resulting competition.

The expansion of the market sales and services is hardly a real problem, since, in fact, happened for a long time its territorial distribution, and competition in its traditional sense has lost its importance in the organization of trade in resources services framework of agro-industrial complex.

In addition, this market is characterized by a significant economic stratification of buyers and an increase in their level of technical and economic literacy. Modern agricultural producers can be divided into a number of groups in descending order of their purchasing power.

Enterprises that is able to carry out the process of extended reproduction and produce timely updates of equipment. Such enterprises are an absolute minority.

They act in the market of means of production as buyers who have the right of free choice, because they acquire the most advanced equipment, provided with service in the warranty and subsequent periods. They see the market as quite saturated with domestic and foreign equipment, which allows them to choose their purchase options without being limited by the price. Enterprises which also carry out the systematic timely replacement of machinery, but select machinery on the basis of economic indicators, such as price and subsequent operating costs. They tend to buy less durable and cheaper machines so that they do not have to resort to debt financing.

This is a special group of enterprises for marketing services, because the market must adequately respond to their specific demand. This situation usually occurs when more expensive foreign and relatively cheap domestic equipment of the same purpose is available for sale. Enterprises that are in a difficult financial situation buy not only new, but also used equipment on the market of material and technical resources. The latter, at a relatively low price, allows you to somehow perform the necessary technological operations and temporarily allows the economy, without resorting to credit and other forms of borrowing, to survive difficulties in the hope of a subsequent improvement in the economic situation. Enterprises focus only on used

equipment, and sometimes sell their own in connection with the reduction in production volumes. According to official data, Kazakhstan annually sells agricultural machinery for a total of about 80 billion tenge.

However, there are less than half of domestic-made cars in this volume. For example, statistics show that the percentage of purchases of kazakhstani machinery in the total volume of harvesters is 49%, tractors-only 34%, and other equipment-about 20%. A large share is covered by imports, while many domestic enterprises are not loaded at full capacity.

However, farmers have their own views on the situation. Some say that domestic machinery should be much cheaper, but no less productive and of high quality. This is for small farms. Large farms, which are, in fact, the main buyers of machinery, have other requirements: quality, reliability, and price. This is the order of priorities. And more and more small farms are adhering to this principle.

On this basis, the logistics market places the following requirements on the machinery to be sold:

1. availability of the manufacturer's warranty, responsibility for the quality of machines and other resources;
2. uninterrupted supply of spare parts, components, aggregates;
3. uninterrupted supply of fuel and lubricants;
4. accessible technical service.

Conclusion

In conclusion, we can say with confidence that logistics has every opportunity to help agriculture, increase its efficiency and bring its products closer to consumers. To do this, the state's attention to this issue, engaging science to develop effective solutions and training in the field of agricultural logistics.

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On the issue of recycling of solar panels in the Republic of Kazakhstan

Abstract. The article presents a global perspective on the utilization of solar panels and the regulation of their processing.

Key words: Solar power plant, solar panel, "solar waste".

Introduction

In the Republic of Kazakhstan, the market for innovative energy-saving technologies is not yet very developed. Therefore, in the coming years, Kazakhstan must make an innovative breakthrough in the development and implementation of clean energy.

Used, expired solar modules are traditionally classified by regulators as electronic waste (e-waste). The annual global volume of e-waste in 2018 was 43.8 million metric tonnes (estimate). It is forecast to rise to 50 million metric tonnes in 2020. Photovoltaic panels today are just a fraction of a percent of global e-waste. Yes, solar power is a young industry and has not yet managed to make much of a mess. At the same time, we know how fast it is growing. In 2018 alone, around 100 GW of solar power plants were commissioned globally. Global installed capacity is growing exponentially.

Therefore, in 10-15 years, the problem of recycling solar panels will rise in full growth. As the prices of solar power plant components are constantly falling, the cost of dismantling facilities may have an increasing impact on the project economy, simply because their share of life cycle costs will increase. Therefore, an effective approach to the disposal of solar panels is also important from this point of view.

In 2016, a joint paper by IRENA (International Renewable Energy Agency) and IEA (International Energy Agency), “End-of-Life Management: Solar Photovoltaic Panels”, was published, which describes in detail the technologies and strategies for the disposal of photovoltaic modules. This rather voluminous (100 pages) report can be considered as a guide to our current topic.

The paper shows that by 2030, 1.7-8 million tons of photovoltaic waste will be generated in the world (accumulated total), depending on the scenarios considered (regular loss – the use of modules during the 30-year service life, early loss – the early end of the service life for various reasons, for example, the replacement of obsolete equipment with more modern). This amount of “solar waste” corresponds to 3-16% of today's annual volume of electronic waste. By 2050, the volume (accumulated total) of solar panels that have served their term will grow significantly – up to 60-78 million tons.

IRENA estimates that the annual amount of waste from spent solar panels in 2050 (5 million tons) will correspond to about 10% of all electronic waste generated on earth in 2014. That is, the projected amount of "solar waste" is significant, but it will still make up only a small percentage of all electronic waste (e-waste).

By the way, the paper predicts that the global installed capacity of solar energy will reach 4,500 GW by 2050 (against 400 GW today).

In most countries, solar panels are classified as general or industrial waste, and they are managed in accordance with the usual requirements for waste treatment and disposal. In addition to such universal regulation, voluntary and regulatory approaches are being developed for the special management of “solar waste”.

The European Union (EU) first introduced the rules of waste disposal solar power modules must be disposed of in accordance with the Directive on waste electrical and electronic equipment (WEEE) (2012/19/EU).

Since 2012, the provisions of the WEEE Directive was transposed into national legislation by the member countries of the EU, creating the first market where recycling of solar modules required.

In Japan, used solar panels fall under the General Waste Management and Public Cleansing Act (Waste Management and Public Cleansing Act). In 2015, a roadmap was developed to promote a scheme for the collection, recycling and proper handling of end-of-life renewable energy equipment.

In 2017, the Japan Photovoltaic Energy Association (JPEA) published guidelines for the proper handling of solar modules at the end of their service life (the document is of a recommendatory nature).

Additionally, the National Institute of Advanced Industrial Science and Technology (NEDO) are developing recycling technology. In China, there are no special rules for the disposal of solar modules. Within the framework of the National Scientific and Technical Program, research and development in the field of "solar waste" management was funded during the 12th five-year plan. Today, many manufacturers already offer services for the disposal of their solar modules and create specialized enterprises for their processing. Here, the principle of "extended-producer-responsibility" applies which goes beyond the sales and operation stages, and also covers the stage of handling the product after the end of its service life. As you know, in the hierarchy of waste management, the first place is the prevention of waste generation. In solar energy, this problem is solved by constantly reducing the specific material consumption of products.

In recent years, R & D projects related to solar module recycling technologies have been actively sponsored in Europe, China, Japan, the United States, and Korea, and significant patent activity has been registered in the same regions both in the field of crystalline silicon (c-Si) recycling technology and for thin-film photovoltaic modules. It is possible to divide "rough" processing (extraction of glass, aluminum, copper-materials that make up the bulk of the module) and fine processing (high-value recycling), which implies the extraction of almost all the chemical elements used in a photovoltaic panel. Due to the small volumes of "solar waste" today, the modules are mainly recycled in plants designed to recycle laminated glass, metals or electronic waste. The result is that only the basic (by mass) materials - glass, aluminium and copper - are separated, while the solar cells and other materials such as plastics are incinerated (or sent to landfill). That is, rough recycling is similar to existing laminated glass recycling technology in other industries and does not provide recovery of environmentally hazardous (e.g., Pb, Cd, Se) or valuable (e.g., Ag, In, Te, Si) materials.

Fine processing consists of three main stages:

1) Pre-treatment, including removal of the metal frame and junction box,

2) Delamination and removal of laminating film

3) Extraction of glass and metals.

Solar modules consist of glass, aluminum, copper, and semiconductor materials that can be extracted and reused. Conventional crystalline silicon panels consist (by weight) of 76% glass, 10% polymer materials, 8% aluminum, 5% silicon semiconductors, 1% copper, less than 0.1% silver, and other metals, including tin and lead. In thin-film modules, the proportion of glass is much higher — 89% (CIGS) and 97% (CdTe).

Conclusion

As you know, in 2009 it was adopted the Law "On support of renewable energy", and later, by decree of the President dated March 19, 2010 was commissioned to provide the organization of work and the development of the plan of placing objects on the use of renewable energy sources. And already in October 2010, during the visit of the President of Kazakhstan to France, an agreement was signed on the KagRU project on the creation and development of

silicon solar energy in the country. According to calculations, the Kazakhstan Solar Silicon plant is ready to produce 16.5 million photovoltaic cells annually. This is at least 60 megawatts of energy. As a result, all the final products — solar modules, produced since 2013 by the Astana Solar plant, are certified for both the domestic and foreign markets. The warranty period of the modules is a quarter of a century of uninterrupted operation. According to experts, the enterprises of the KazPV project have the potential to grow from the design 60 megawatts to 100 megawatts. Astana Solar LLP has already started production of modules with a total capacity of 7-8 MW. Today, waste from solar power plants is not a significant global problem, because its volumes are small fraction of a percent of the electronic waste (e-waste) generated on the planet every year. At the same time, in accordance with the saying "ready to sledge in the summer…", the task of efficient processing of solar modules at the end of their use period has already been thoroughly worked out.

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Features of operating tractors on twin wheels

Abstract. The article analyzes the selection criteria between competitive rail and road transport in the organization of multimodal transport.

Key words: tractor wheels, track, soil.

The traction characteristics of wheeled tractors are largely determined by the perfect design of their undercarriage. In agriculture, tractors perform a wide range of operations on different types of soil, including loose and sparsely bound soils. Consequently, the creation of tractor engines with high traction properties on different types of soils is one of the most important tasks of increasing the efficiency of tractor use in agriculture [1].

One of the ways to improve the traction properties of wheeled tractors is to install paired wheels. When installing paired wheels, the contact area with the soil increases. This leads to a decrease in the specific pressure on the soil, so that the tractor can be used in early spring work and on waterlogged soils. An increase in the contact area of tires with the soil has a certain effect on the fuel-economic and traction characteristics of the tractor. When driving on deformable

soils, due to a decrease in the depth of the track, the rolling resistance of the wheels decreases, therefore, this can lead to an increase in the traction force on the hook Fkr [2]:

$$F_{кр} = F_{к} - F_{f} \quad (1)$$

where $F_{к}$ – traction tangent on the clutch, N;

F_{f} – the force of rolling resistance, N.

However, in real operating conditions, it was noticed that when installing paired wheels, it is not always possible to achieve the desired result – an increase in the hook force, and in some cases, it decreases and fuel overruns occur.

To analyze this question, let us consider the scheme of forces and reactions acting on the axis of a tractor with paired wheels (Fig. 1).

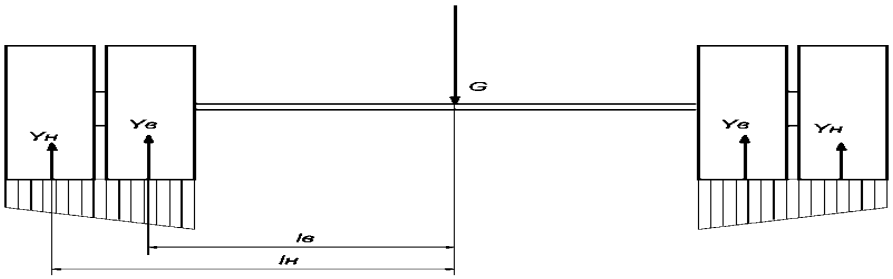

Figure 1. Diagram of the tractor axis and the forces acting on it

The analysis of the scheme shows that the normal reaction of the soil to the inner wheels in the spark is greater than the reaction to the outer wheels. Therefore, all other things being equal, according to formula (2), the radius of the inner wheel is less than the radius of the outer wheel $r_{в}<r_{н}$:

$$\Delta r = k \frac{Y^{0.75}}{1 + p_{ш}} \quad (2)$$

where Δr – deformation of the tyre, m;

k – the coefficient of deformation of the tyre;

Y – vertical load on the tire, kN;

$p_{ш}$ – tire air pressure, kg / cm^2.

Different radii of the wheels in a pair with equal angular velocities will lead to the appearance of a kinematic mismatch:

$$k_{нс} = \frac{r_{в} - r_{н}}{r_{в}} \quad (3)$$

Since the angular velocities of the paired wheels are equal $\omega_{в}=\omega_{н}$, and their radii are different $r_{в}<r_{н}$, then the circumferential speeds of the wheels will also be different $v_{в}<v_{н}$. At the same time, the translational speeds of the wheels are equal. The alignment of the translational speeds is possible under the condition of different amounts of slipping of the inner and outer wheels. A wheel with a larger radius will have a greater amount of skidding than a wheel with a smaller radius. Thus, the difference in the radii of the inner and outer wheels will cause additional power costs to slip the wheels $N_{\delta c}$:

$$N_{\delta c} = (v_{н} - v_{в})\varphi_{сц} Y \quad (4)$$

where $v_{н}$ – circumferential speed of the outer wheel in the coupling;

$v_{в}$ – circumferential speed of the outer wheel in the coupling;

$\varphi_{сц}$ – traction coefficient of the wheels.

The loss of power leads to a reduction in traction and fuel consumption. In addition, tyre wear will increase.

Note also that the traction properties of the inner and outer wheel will differ from each other due to the different ground reaction to them (Figure 1).

From the above it can be concluded that in order to reduce additional losses and to increase the traction properties when driving a tractor with paired wheels, it is necessary to determine the optimum radii of these wheels.

As the formula (2) indicates, this can be achieved either by redistributing the load between the paired wheels or by selecting the optimum tyre pressure. It is not possible to redistribute the load between the paired wheels. Therefore, the tyre pressure of the twin tyres is the only factor that can be varied to reduce additional losses in the propulsion system. However, there is no unequivocal answer to the question of what the optimum tyre pressure should be in the inner and outer wheel tyres. The difficulty lies in the fact that not only the tyres but also the ground deforms when travelling on deformable ground.

For this purpose a measuring complex was developed, containing a fuel flow meter, reed sensors of wheel revolutions, a reed sensor of the "fifth" track measuring wheel, and a 6-channel pulse counter (Figure 2).

This device has 6 channels, each of which is independently counting pulses generated by the reed relays connected to them. Magnets are attached to the wheels of the tractor and the measuring wheel, which, passing close to the reed relays, cause them to activate (Figure 3).

Figure 2: Six-channel pulse counter

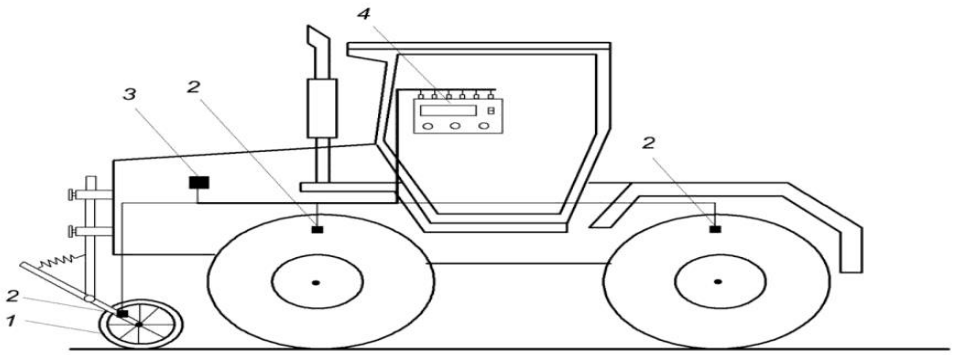

Figure 3. A measuring unit for selecting the optimum composition of a tractor-machine unit and its operating modes:
1 – “fifth” track measuring wheel; 2 - reed relay;
3 - fuel flow meter; 4 - 6-channel pulse counter

This measuring unit enables the tractor's slipping and fuel consumption to be calculated. An important advantage of the 6-channel pulse counter is the ability to compare current (operating) parameter values with reference parameter values (slipping, fuel consumption) obtained, for example, when driving at idling speed. As a result, the unit displays relative values of slipping and fuel consumption, on the basis of which it is possible to judge the efficiency of MTA operation and make decisions regarding adjustment of pressure in tyres of dual wheels.

This measuring complex was successfully tested on MTZ-1221 tractor (fig. 4).

Thus, with the help of this complex, it is possible to solve the problem of choosing the optimal tire pressure in paired wheels, at which the MTA will have minimum fuel consumption and an acceptable amount of skidding for specific operating conditions.

Figure 4. Measuring complex installed on MTZ 1221

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Efficiency of flax cultivation in modern conditions

Abstract. The article provides an economic substantiation of the project for organizing the cultivation of oil flax. With the help of technological maps, the costs of production are calculated. The financial results of the project have been determined. The assessment of integral indicators of the efficiency of investments in the project is given.

Key words: agribusiness, technology, costs, prime cost, efficiency, oil flax

Introduction

The formation of a developed system of agricultural food market is associated with the cultivation, processing and sale of various types of crops. The market of oilseeds is an important component and an integral part of the agro-food market, making it a relatively large segment in terms of both capacity and number of participants.

Object and methodology

Oilseeds and oilseed products are of great importance to both humans and the economy as a whole. This is also due to the increasing interest in oilseeds in recent years due to the high demand for oilseeds and oilseed products on the world and Russian markets [1].

Flax is a valuable technical culture of versatility. Flaxseed oil provides high-quality technical oils used in paints and varnishes, coatings, soaps, wipes, waterproof fabrics, linoleum and rubber surrogates, and in the leather and footwear industries. It is also used in metalworking, electrical and other industries.

Recently, the technology of food production from flax products (flour and protein) is developing rapidly. Flaxseed protein, which contains amino acids, successfully replenishes the insufficient protein of wheat flour, increases the value of bakery products.

Flax flour has appeared on the market for the production of bakery, confectionery and food concentrates, enriching products with protein, dietary fibres and polyunsaturated fatty acids. Flax flour-based instant porridge is also produced.

Research results

Flax is an ecologically clean culture. Its cultivation requires a minimum amount of chemical protection and fertilizers. Flax crops free the soil from heavy metals and radionuclides. There are no traces of radiation in flax seeds taken from infected areas.

Flax is a sanitary crop, after sowing it has the lowest number of pathogenic infections and pests. Flax can be sown after any culture, and it is a crop that grows well in crop rotation [2].

Flax-technological culture. Given the simple requirements, agricultural technology can give high economic results. Simple technology is used for its processing, as well as equipment used in cereals (seeders, stackers, combines).

The main global producers of this crop are Argentina, Canada, the United States, and India, where its main arable land is concentrated. In the CIS countries, oilseeds make up about 7-1% of the world's total crop. Interestingly, in the overall structure of flax cultivation in the world, its oilseed forms dominate - they occupy 84% of the total area and only 16% of the forms of flax grown for fibre production. In general, oilseed flax remains one of the most technically "versatile" crops. In some cases, the demand for its products is focused on the use of flaxseed and its derivatives, and in others - on the use of flaxseed oil and its components.

The shortage of vegetable oils will lead to an increase in demand for flax by oil companies. To meet the demand, the Kazakh market needs to export about 40%, which is about 1 million tons of vegetable oil.

An investment project has been developed to assess the economic efficiency of flax growing.

Calculations made in flow charts allow to determine production costs (Table 1).

Table 1 – Expenditures for the production of flaxseed oil, 33540 thousand tenge

Expenses	Project years		
	1	2	3
Salary Fund	2003,46	2731,27	3403,75
Seeds	2934,75	3913	4891,25
Fertilizers	4527,9	6037,2	7546,5
Pesticides	2825,74	3767,66	4709,57
Petroleum products	3280,77	4411,07	5513,98
Depreciation charge	4439,58	5919,81	7399,48
Equipment maintenance and repair	1332,1	317,7	2219,79
Cars	424,28	590,3	768,63
Total	21768,58	29146,26	36452,95
Other expenses	2176,75	2914,63	3645,24
ALL direct costs	23945,88	32060,89	40098,19
General business	3591,57	4809,08	6014,84
ALL production costs	27537,46	36869,96	46113,03
including: per 1 hectare of arable land	153934,4	92175,19	92226,61
1 centner of the main product, tenge.	3990,7	3840,89	3688,84

The largest share in the structure of production costs is occupied by the cost of fertilizers - 16.4%, depreciation - 16.1%, fuels and lubricants - 12%. In the first year of the project, the cost of production of 1 quintal of flax is 3984.12 tenge.

There is a positive trend in the reduction of crop costs in the future, given the expansion of arable land and crop growth. The project requires own funds in the amount of 11160 thousand tenge. The estimated selling price for 1 quintal of flax seeds is 7254–8370 tenge. The calculation of income is given in Table 2.

Table 2 – Planned sales revenue

The cost of the project	Year		
	1	2	3
Planted area, ha	300	400	500
Productivity per 1 hectare, c	23	24	25
Total, c	6900	9600	12500
Price for 1 centner, tenge.	7267	7267	7267
Income, thousand tenge	50142,3	69763,2	90837,5

The financial results of the project for the organization of oilseed flax production are given in Table 3.

Table 3 Financial results of the project, thousand tenge

The cost of the project	Year		
	1	2	3
Sales revenue	50142,3	69763,2	90837,5
The total cost	128,57	36869,96	46113,03
Gross profit	22604,84	32893,24	44724,47
Total costs	30928,35	41803,7	52821,59
Net income	19213,95	27959,5	38015,91
Profitability level,%	62,1	373,97	402,48

It is necessary to analyze cash flows to determine the payback period of the project for the organization of oilseed flax production [2]. The discount rate in the project is 15. The indicators calculated in the table allow to complete the assessment of project effectiveness.

Table 4 – Integrated performance indicators of the project

Indicators	Value
Net income, thousand tenge	91768,24
Net present value, thousand tenge	54948,02
Financing requirements, thousand tenge	11180
Project payback period, months	18,5
Discounted repayment period, months	18,6
Return on investment index	9,2

Conclusion

Net income from the production of oilseed flax can be 91768.24 thousand tenge. Investments in the project will be repaid in 18.5 months. The return on investment is 9.2, which confirms the effectiveness of the proposed project. The values of the indicators show that the project to organize the production of flaxseed will increase the level of profitability of the enterprise.

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