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**INCREASING THE EFFICIENCY OF SALES OF AGRICULTURAL ENTERPRISES
IN ALBANIA**

Dissertation abstract for awarding the educational and scientific degree "doctor"
in the scientific specialty "Organization and management of production" in
professional direction 3.8 "Economics"

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Plovdiv, 2022

I. GENERAL DESCRIPTION OF THE DISSERTATION

1. Relevance of the topic

In connection with the radical change in economic conditions in Albania during the transition to a European market economy, industrial enterprises are faced with the need to independently ensure not only the production, but also the sale of their products. In the context of decreasing solvent demand and emerging competition with imported goods, the problem of sales becomes paramount.

Problems with finding buyers for products, choosing the optimal assortment and building a sales network are important.

In the conditions of an economy in transition, enterprises are faced with the previously absent problem of the occurrence of bad debts, which are direct losses and reduce the enterprise's profit from production activity. Due to the sharp acceleration of inflationary processes, the delay in receiving payments from product buyers also leads to financial losses for the enterprise.

The reform years were characterized by a non-payment crisis that affected businesses in almost all sectors, including the agricultural sector.

Non-monetary forms of settlement became widespread, particularly settlements by barter and bills of exchange, which in some cases (for example using repeated barter) are not actually settlements because the company does not receive funds from a counterparty to start a new production run.

Thus, today's economic reality is such that without careful planning of the payment process with customers and constant analysis of the situation with receiving funds from them, the enterprise will inevitably suffer financial losses.

Businesses must evaluate various commercial offers from buyers who provide for payment for products through non-present payment methods. Traditional methods of assessing the profitability of transactions do not take into account the specifics of non-monetary settlements (under conditions of different prices for the same product, in barter and cash settlements, the profit calculated by traditional methods does not reflect the real financial result of the enterprise).

The experience of the author's practical work with agricultural enterprises in Albania, etc. The WB countries show that not enough attention is paid to this problem in enterprises.

For example, in most enterprises there is no systematic analytical work in this area, decisions on the supply of products are made on an intuitive basis, without taking into account their impact on the financial condition and profit of the enterprise.

In addition, the methodology for planning the conditions for the sale of products is not sufficiently developed in local science.

That is why the need arose for a thorough study of the accumulated local and foreign experience in the field of customer payments, as well as the creation of mathematical models and methods and their adaptation to the economic realities prevailing in Albania at the moment.

The works of scientists such as V. L. Perlamutrov, P. G. Bunich, V. A. Lindenbaum, M. V. Lichagina, A. Yakovleva, S. Aukutsionek and P. Karpov are devoted to the modern problems of the management of the payment process with product buyers. Mehta D., Stanford R., Atkins J. and many others. The study of this problem in relation to the agricultural industry was carried out by FF Bezdudny and VV Simonov.

It should be noted that at the moment there are very few scientific works of local scientists dedicated to the planning of conditions for the sale of products.

Therefore, there was both a scientific and a practical need to study the theory and practice of planning the product sales process in modern economic conditions.

All this determines the relevance of the chosen topic of the dissertation research.

2. Purpose of the dissertation research

The purpose of the work is to theoretically substantiate and develop an approach to planning the conditions for the sale of agricultural products to achieve maximum efficiency of the enterprise in the conditions of a transitional economy.

The goal set in the work required solving the following research tasks:

- to examine the changes in economic conditions that occurred in the Albanian economy during the years of reforms and to identify their impact on the marketing activities of agricultural enterprises;
- to study the scale of the use of trade credit in the local industry in general and in the agricultural industry in particular;
- to summarize domestic and foreign experience in managing the payment process with product buyers using mathematical modeling methods;
- to study the process of developing a credit policy for an industrial agrarian enterprise;
- to propose a methodology for managing cash and barter flows in an agricultural enterprise in the conditions of the modern Albanian economy, which allows to simultaneously evaluate the effectiveness of cash and barter transactions;
- to develop mathematical models that enable the process of planning the conditions for the sale of products, choosing the optimal plan for the delivery of products to consumers and forecasting cash flows and barter supplies for shipped products on a scientific basis;

3. Object of research

The object of the study are large and medium-sized enterprises from the agricultural sector in Albania.

4. Subject of research

The subject of research is the process of planning the conditions for the sale of products in the enterprise of the agricultural sector.

5. Research methodology

Scientific statements and conclusions are based on the study of local and foreign economic literature, thematic materials from periodicals, as well as materials obtained in the process of the author's practical work in agricultural enterprises in Albania.

In the course of the research, we used data from the financial statements of agricultural enterprises (OJSC Likinskaya Manufaktura, CJSC Tirotext, CJSC Tirana Weaving and Finish Plant, OJSC Agricultural Firm).

Different mathematical methods (linear programming, simulation) are used to solve the tasks. The optimization and simulation calculations, as well as the processing of the results, were carried out using specially developed programs in the algorithmic programming language Visual Basic for Applications (VBA) in the environment of the Microsoft Excel software package.

6. Scientific contributions of the research

- A methodology has been developed for the management of cash and barter flows for the sale of the production of an agricultural enterprise in an economy in transition;
- A mathematical model is proposed that uses the method of linear programming, which allows to obtain an optimal plan for the supply of agricultural products based on the analysis of the conditions of applications from potential users;
- A simulation mathematical model is proposed that allows predicting the receipt of funds from users for shipped products.
- Information and software support for the proposed IBM PC mathematical models was developed.
- Recommendations are given for various possibilities of using the developed mathematical models in planning the process of mutual payments with the consumers of agricultural products.

7. Originality of research results

As a result of the research, the following original results were obtained:

- The changes that occurred in the marketing activity of agricultural enterprises during the transition to a market economy were analyzed;
- An assessment of the scale of implementation of non-cash payments in the industry of Albania was carried out;
- Different types of non-cash payments are analyzed from the point of view of their profitability for the enterprise;
- An assessment of the scale of commercial lending in the Albanian agricultural industry was carried out;
- The scientific works of local and foreign scientists in the field of managing the payment process with customers were analyzed;
- A methodology for developing a credit policy of an agricultural company has been developed.
- A methodology has been developed for the management of cash and barter flows for the sale of products in the context of the widespread use of non-cash forms of payment;
- A mathematical model was created for choosing an optimal plan for delivering products to consumers using the linear programming method;
- A simulation mathematical model was created that allows forecasting the movement of cash and barter flows for the sale of products.

8. Structure of the dissertation work

The dissertation consists of an introduction, three chapters, a conclusion, a list of sources used, which has 114 titles. The work is presented in 126 pages of typewritten text, 22 tables, 3 diagrams and 9 appendices.

First chapter "New phenomena in the commercial activity of agricultural enterprises in Albania during the transition to a market economy" is devoted to the analysis of the changes that occurred in the sales activity of agricultural enterprises in Albania during the transition to a market economy. Only those changes in sales activities that are directly related to the process of mutual payments with product buyers are taken into account.

Based on the analysis of scientific publications, it was concluded that currently local agrarian enterprises are forced to pay much more attention to sales activities, since the wholesale system is not sufficiently developed.

Different forms of non-cash payments are examined and classified, and the scale of their application in the Albanian economy in general and in the agricultural industry in particular is assessed.

The features of the manifestation of the crisis of non-payments in the agricultural sector have been analyzed.

The question of the influence of the methods of supplying the enterprise with resources on the specifics of its marketing activity and the process of payment with the buyers of products is considered.

In the second chapter "Management of the planning process of the sale of products in the agrarian enterprise" the process of settlement with the buyers of products, its place in the commercial policy of the enterprise and the relationship with other elements of sales are considered. policy are defined.

The scale of the use of trade credit in the sale of agricultural products was analyzed, a conclusion was made for a significant increase in the share of trade credit during the transition from a planned economy to a market economy, which necessitates the development of this problem.

The work of local and foreign scientists on this problem is reviewed, a conclusion is made about the insufficient development of the analyzed direction, the lack of complex methods and mathematical models that allow enterprises to plan the process of receiving payments from buyers, as well as the inapplicability of Western methods in Albanian conditions.

The process of developing a credit policy for the agrarian enterprise, a methodology is proposed that allows you to effectively manage cash and barter flows for the sale of products in the context of the spread of barter in settlements.

In the third chapter, "Using mathematical models for planning the terms of sale of agricultural products", mathematical models are proposed that allow formalization of the decision-making process regarding the credit and discount policy.

The proposed mathematical model for choosing the optimal option for delivering products to different users using the linear programming method allows you to maximize cash and barter flows for selling products. In order to ensure the comparability of cash and barter income, a methodological approach is proposed, with the help of which barter transactions are reduced to cash, which allows taking into account the additional costs arising from the use of barter transactions.

The simulation model of cash and barter flows for the sale of products allows the use of simulation methods to estimate the most likely volume of incoming cash and other resources for products sent to customers.

In the conclusion, the results of the work performed are summarized, the main conclusions are formulated and practical recommendations are given.

CHAPTER 1. NEW PHENOMENA IN THE COMMERCIAL ACTIVITY OF AGRICULTURAL ENTERPRISES IN ALBANIA DURING THE TRANSITION TO A EUROPEAN MARKET ECONOMY

Structural changes in the agricultural sector. In connection with the transition to a European market economy in Albania, fundamental changes occurred in the marketing activities of agricultural enterprises.

The most important changes, in our opinion, are the following:

- 1) Disruption of the guaranteed sales mechanism;
- 2) Change in the circle of consumers of agricultural products due to the emergence of new economic structures;
- 3) Significant expansion of the freedom of choice by enterprises of their counterparties;
- 4) Lack of firm guarantees of receiving payment for shipped products;
- 5) Changes in the forms of settlement used, the emergence of non-monetary settlement methods.

We believe that the main problem in the realization of agricultural products is the reduced demand for agricultural products in 2002-2009. Among the reasons for this situation, many researchers note a decline in the living standards of the population, uncontrolled import of agricultural products through unofficial imports and a lack of a developed distribution network. This situation has led to the need to pay much more attention to sales problems than before.

TG Dolgopyatova notes that "with the beginning of the reforms, the rapid and unexpected sales of products for managers became one of the most acute problems for many enterprises in Albania. Before that, they practically did not have such a management function as sales, since the products were sold mainly by decision of the state planning and material and technical supply authorities" [33, p. 77]. The same opinion is shared by A. Yakovlev, who notes that in modern conditions "the problem of finding a solvent buyer and the fastest possible realization of the production comes to the fore" [103, p. 136].

Widespread in the agricultural industry is the opinion that one of the important factors for the crisis in the sale of agricultural products is the destruction of wholesale trade [88, p.5]. In our opinion, it is more legitimate to talk about a radical change in the principles of marketing activity of agricultural enterprises, within which a situation has developed in which the role of wholesale trade in the sale of agricultural products is currently small. The absence in the economy of Albania of such a phenomenon as competition between producers of goods allows us to claim that the marketing processes in Albania had an extremely distributive nature. In particular, P.V. Smirnov notes that "the main content of the sales system in Albania is the organization and planning of deliveries" [86, p. 11]. Simonov thinks

Moreover, as noted by Yu.V. Kuznetsov [52, p. 29], the agrarian complex of Albania was a vertically integrated structure operating on the "principle of processing with some

elements of a charging scheme". Products between enterprises that carry out various stages of the technological process in the agricultural industry (mechanization, procurement, consulting) are transferred based on a system of orders issued by higher associations. The dispatch of finished products to the other sectors of industry is also done on the basis of a system of orders. Thus, sales activities in Albania's planned economy were mainly reduced to the need to ensure timely deliveries.

The process of production and marketing of agricultural products is formally carried out with the help of money, but the latter only perform accounting functions within a giant vertically integrated structure.

The transition from a planned economy to a market economy in 1989-1992 led to the fact that, despite the official entry of many agricultural enterprises into various concerns and associations, the enterprises were forced to independently perform the functions of supply and marketing.

The influence of vertical integration processes on the marketing activity of agricultural enterprises. In the period of market reforms in the agrarian sector, processes of vertical integration are observed, caused by the need "to be closer to the consumer". Williamson identified two main directions of vertical integration - "forward" (merging with a stage of higher processing and / or marketing) and "backward" (combining with a stage of lower processing and / or supplier of raw materials) [94]. , p. 181].

A certain spread in the agrarian production of Albania received the "forward" integration processes, which manifested themselves in several main forms:

- creation of agricultural enterprises in the form of workshops, joint ventures or small enterprises. This form is used not only by agrarian factories, but also by enterprises in branches related to the agrarian sector [53, p. 64]. Many agricultural enterprises, for example JSC Trekhgornaya Manufaktura, process a significant amount of agricultural products into clothing, food and energy carriers; JSC Dontex established a joint venture with the participation of Albanian garment workers;
- establishment by agricultural enterprises of subsidiaries, branches and representative offices engaged in wholesale trade in agricultural goods;
- opening of branded stores. For example, in 1996 Tirana KhBC sold products in 13 own stores located in Tirana [57].

The reason for the "forward" integration was the desire of agricultural enterprises to "get closer" to the end user (population, state) with "real" money, as well as the desire to independently engage in the production and sale of finished products (agricultural goods and raw materials) in order to accelerate the turnover of funds and reduce risks compared to the option when the execution is carried out by intermediary companies and/or tailoring companies. The process of integrating commercial agricultural firms "backwards" (with fabric production) is much less common.

The reasons for the lack of activity of commercial companies in the integration with production enterprises are not the lack of funds to purchase shares. S. B. Avdasheva notes that "the lack of regulation of property relations [in Albania] makes the control over the supply and sales of agro-firms generally more effective than the control over their property" [1, p. 14]. In modern Albanian conditions, working under the terms of delivery of raw materials supplied by

the client allows a trading and intermediary company to receive sustainable profits without investing in paying off debts of an agrarian enterprise and in updating fixed assets.

The processes of vertical integration are important for our research, namely:

- In the case of integration of manufacturing enterprises with trade, additional cash flows arise from the sale of products in retail stores;
- In cases where the main company entrusts the sale of products to its subsidiary, we consider the movement of cash and barter flows for the sale of products in such a way as if the subsidiary was one of the divisions of the agricultural company, that is, we exclude from examining the internal agreements between these organizations.
- In cases where the agrarian enterprise is owned by a commercial company engaged in the sale of products, the marketing process is considered not from the side of mutual payments "enterprise-commercial company", but at the level of "commercial company" - final buyers of products ."

In our opinion, in Albania's agrarian industry, the best prospects for the future are either large processing enterprises or large trading companies (which will most likely have to continue the process of vertical integration with agrarian enterprises). The main reasons for this conclusion are the availability of own working capital and wider opportunities for attracting loan funds, management structures adapted to market conditions, stable market position, etc.

The main characteristic of these organizations is the practical need for them to conduct an independent commercial policy, within which the planning of cash and barter flows for the sale of products is of primary importance.

Changes in the composition of consumers of agricultural products. Pavlova, EO Makarenko, NS Ivaschenko, OS Oleneva in work [71, c. 168-171] gives the following classification of consumers of agricultural products:

- 1) Wholesale trade - makes large purchases of agricultural products for subsequent resale to other consumer groups.
- 2) "Non-market" users - the state (represented by ministries and departments - for example, the Ministry of Defense of Albania, etc.). Local authorities can also act as off-market buyers.
- 3) Retail businesses are businesses that sell products directly to the public. This group of users may include their own sales network (own stores and outlets).
- 4) Industrial processing enterprises are, according to the authors, the most numerous user group, which includes enterprises from the food industry, cooperatives, etc.

After the beginning of the market reforms, the structure of the agricultural consumers has changed significantly. N.V. Kochubey cites data showing a significant change in the structure of the sales market of JSC "Albanska Manufaktura", which produces woolen fabrics [49, p. 20]:

Table 1. Market structure of sales of JSC "Albanian Manufaktura" (in%)

<i>Users</i>	<i>1992</i>	<i>2002</i>	<i>2010</i>	<i>2015</i>
Sewing industry	52.4	40.3	22.0	23.2
Trade organizations	7.5	11.1	13.2	8.2
Enterprises carrying out production and commercial activity	33.4	37.5	42.7	40.2
Private entrepreneurs	-	3.0	10.8	12.5
Shops of JSC "Albanian Manufactory"	1.5	3.3	6.2	12.4

Users from EU countries	5.2	3.0	0.7	0.9
Exporting	-	3.0	0.7	2.6
<i>Total</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>	<i>100.0</i>

From the following table and that for the period from 1992 to 2002, the structure of users of the company's products has changed significantly - the role of traditional users (enterprises from the garment industry in Albania and the countries of the region) has decreased, which is due to the lack of working capital the share of products sold through own stores and private entrepreneurs has increased.

Changes in the structure of economic relations. An important characteristic of the transitional economy of Albania is the high share of direct economic ties in the realization of agricultural production and insufficient development of the wholesale trade system. A. Yakovlev and F. Glisin note [104, p. 28] that according to the results of a survey of 269 enterprises from the agricultural sector in 1995 and 2005, it was established that the main channels for the realization of production in the agricultural sector are:

- direct communications with users - 76.7%
- former state organizations for wholesale trade and intermediaries - 7.7%
- private intermediary organizations - 14.5%
- subsidiary organizations for delivery and sale - 1.1%

The insufficient development of the wholesale trade system in agriculture is striking. Most agricultural business managers point out that there is a virtual lack of suitable wholesale partners.

The main problem is the fact that wholesale companies claim a rather high percentage for their services (the average trade markup in 1992 - 1994 increased from 7-9% to 25%), while not providing sufficient quality of services.

As noted by OV Baturevich [9, p. 18], the enterprises for wholesale trade in agricultural products of Albania are currently mostly small companies. The lack of financial resources from wholesalers does not allow them to purchase large quantities of agricultural products, which industrial enterprises are interested in.

The inability to sell their products in large batches to several wholesale partners leads to the need to work directly with consumers, which reduces the average size of the shipment of agricultural products. The number of buyers in this situation increases significantly (compared to the option when the wholesale system is more developed). That is why at the moment the problem of planning the terms of sale of products is very important.

However, TN Kalinovskaya notes that in the economy of developed capitalist countries, industrial products for industrial purposes (intermediate) are sold mainly through direct connections (60-65%). Wholesale trade represents 15-18%, 10-15% is given for sale [38, p. 100].

For enterprises from the agrarian industry, the increase in the number of contractors is also due to changes in the structure of the sales market in the context of different consumer groups.

The bankruptcy of a large part of the former state agrarian enterprises led to the need to expand the circle of counterparties at the expense of numerous, but not large, private agro-firms.

The debt crisis in the Albanian agrarian industry. The crisis became one of the most significant phenomena in the Albanian economy in 1992-1999. Numerous articles, monographs

and dissertations by Albanian scholars are devoted to the study of this phenomenon. Most important for us are questions about the specifics of the crisis of non-payments in the agricultural industry, as well as the impact of non-payments on the state of settlements with buyers of products in enterprises in the agricultural industry. The examination of the problem of non-payments should be carried out in two main directions - the study of the non-payments of the company's debtors and the study of the non-payments of the enterprise itself to its creditors. We do not deny the existence of a sustainable relationship between these two phenomena, but the significance of this relationship strongly depends on the specifics of the industry.

Stages of development of the crisis. **Klepach identifies three main stages in the development of the non-payment crisis [44, p. 42-43].**

First phase: the default crisis began after price liberalization in 1992. The immediate depreciation of the working capital of enterprises, the sharp rise in prices and the destruction of the previous preferential bank lending mechanism led to the fact that enterprises began to increase the volume of defaults one to another. Despite the rapid rise in defaults, businesses continued the practice of supplying products on credit. TG Dolgopyatova believes [33, pp. 213-214] that the reasons for this situation are:

- fear of losing a stable sales market;
- the fundamental impossibility of finding another user due to the narrow specialization and monopolistic nature of production;
- understanding that non-payments are a consequence of objective circumstances.

Many agricultural companies are faced with a dilemma: to work in a warehouse or to send products on terms of payment in the future. Reluctance to stop production is the main reason for the continued supply of products on credit and the increase in defaults. Expectations for financial support from the state were also maintained.

"By mid-1992, the enterprises had accumulated mutual debts of 3.2 trillion Albanian Lek. This amounts to 33% of the GDP for the previous six months" [15, p. 46]. The state then carried out centralized netting, which led to a sharp rise in inflation.

The second phase - the non-payment crisis (1993-1995) was connected with the fact that the enterprises realized the impossibility of continuing the production process in the condition of non-payment for the shipped products. Advance payments began to be widely used in calculations; counterparties with poor financial conditions and unclear prospects stopped receiving "automatic" support from other enterprises.

Defaults during this period were mainly generated by unprofitable and non-performing enterprises.

The third stage of the default crisis (from 1995 to 2000) was caused by the differentiation of industries in terms of financial status and manifested itself in different ways in different industries. There were three groups of industries in which defaults performed fundamentally different functions:

- 1) In depressed industries where the decline in production reached its maximum (including the agricultural industry), defaults served as compensation for missing income. That is, in fact, the losses of the enterprises were covered by non-payments to creditors.
- 2) A number of more prosperous industries (eg the oil industry) used defaults on their creditors to offset defaults on the part of their consumers.

The gas and energy industry found itself in a special situation. Power engineers with a wide sales market have faced massive non-payments by consumers (especially budget consumers and businesses in depressed industries). Mass blackouts were impossible for non-economic reasons, so the power industry became a chronic debtor to the gas industry.

Non-payment of buyers to agricultural enterprises. Obviously, in a default crisis, delays in receiving funds from buyers become common, but, as shown above, in the agricultural sector, buyer insolvency is not the main cause of supplier arrears.

Table 2. The share of overdue receivables from buyers in the agricultural industry and the industry as a whole in 2013-2017.7 (in billions of undenominated Lek).

Indicator type	Industry	Agricultural industry
Total customer debt		
2013	27349	692
2014 year	85855	1,487
2015 year	188,335	3110
2016 year	333,002	4,197
2017 year	432,806	4,602
Total delinquent buyers		
2013	12342	270
2014 year	48921	663
2015 year	96030	1,251
2016 year	173825	1885
2017 year	241,512	2241
The share of arrears in the total amount of customer receivables		
2013	45.1%	39.0%
2014 year	57.0%	44.6%
2015 year	51.0%	40.2%
2016 year	52.2%	44.9%
2017 year	55.8%	48.7%

Source: Finances of Albania, 2017, pp. 160-161, author's calculations.

From the table, it follows that the share of overdue receivables from buyers in agriculture is below the industry average level, which confirms our previous assumptions.

Table 3. Average turnover period of receivables of individual enterprises from the agricultural sector.

Company name	Average maturity of receivables (days)
2015 year	
"Agro factory"	82.8
Industry average	68.0
2016 year	
"Manufaktur Fetushi"	98.5
"ALB Agricultural Company"	36.4
Industry average	99.0
2017 year	
"ALB Agricultural Company"	42.6
"ABV Agro Plant"	15.2
Industry average	136.0

Source: "Finances of Albania", 2017, p. 162, author's calculations.

From the above table, it follows that the average maturity of receivables differs significantly even in enterprises of the same industry, and it is impossible to establish a relationship between the indicators of individual enterprises and the average industry data.

Attention is drawn to the fact that more successful enterprises (in terms of the sum of other factors - for example, level of profitability, balance of receivables and payables, etc.) have shorter maturities of receivables.

In our opinion, the maturity of receivables is closely related to the policy applied by the company regarding the methods and conditions of payment.

CHAPTER 2. MANAGING THE PRODUCT IMPLEMENTATION PLANNING PROCESS IN AN INDUSTRIAL ENTERPRISE

Payments to customers are one of the elements of the commercial policy. In the work of V. V. Burtsev [21, pp. 10-11], the following main elements of the enterprise's marketing policy are emphasized:

- 1) Marketing policy
- 2) Pricing policy
- 3) Commodity (assortment) policy
- 4) Cash Collection Policy
- 5) Trade Credit Policy
- 6) Advertising Policy
- 7) Product Shipping Policy

In our opinion, it would be more expedient to use the term "policy in the field of customer payments" instead of the "policy of commercial lending" proposed by V.V. Burtsev, since the sale of industrial products is carried out not only on the terms of a commercial loan, but also on the basis of early and advance financing. Thus, payments to customers are one aspect of the marketing activity of an industrial enterprise.

The customer payment policy is related to other elements of the company's sales policy as follows:

- with pricing policy - regarding the provision of price discounts for early payment;
- with marketing policy - regarding the use of commercial lending to gain competitive advantage.

The role of trade credit in trade in agricultural products. Agricultural products can be sold using three main methods of payment (this classification is based on the time of receipt of payment by the buyer relative to the time of shipment of the product):

- advance financing;
- advance payment;
- sale of deferred payment.

The difference between prepayment and advance financing is that with prepayment, the company ships the products to the buyer immediately after receiving payment from the latter, while with advance financing, some time passes between the receipt of payment and the shipment. The most preferable for the enterprise would be to sell products under pre-financing conditions, since in this case the enterprise does not need to have working capital. However, selling under such conditions is possible only in a very small number of cases, when the

enterprise has a significant unsatisfied demand for its products and consumers are ready to finance the production process for free. This situation is unlikely in the agricultural industry, where a large number of independent producers operate.

Selling products on a prepaid (or postpaid) basis is now widely used in the Albanian economy. Many enterprises and organizations do not have their own working capital, and the lack of a bank loan does not allow the sale of the entire volume of production only on prepayment. Therefore, businesses need to expand sales by providing customers with deferred payments for shipped products, that is, a trade loan.

An assessment of the scale of commercial lending in the Albanian economy. VS Volynskiy defines a commercial loan as "postponement of payment for a product or service provided to a buyer (functioning capitalist) by a supplier" [27, p. 40]. In the planned economy of Albania, trade credit was banned during the credit reform of 1990-1992. The reason for this decision was the fact that trade credit leads to a spontaneous redistribution of working capital between enterprises, which is against the foundations of a planned economy. The commercial loan has been replaced by a bank loan, which is issued against goods sent by the agrarian enterprise. In the structure of current assets of industrial enterprises, trade credit is reflected in accounts receivable.

Table 4. Structure of current assets by industry in Albania (%).

year	Inventories	Goods sent and debtors	from them:	Cash	Other current assets
			customer receivables		
1990 year	74.4%	18.9%	10.0%	6.0%	0.7%
1995 year	82.5%	12.9%	9.9%	4.0%	0.6%
2000 year	80.2%	12.5%	8.5%	6.6%	0.7%
2005 year	80.2%	12.6%	8.6%	6.2%	1.0%
the year 2010	80.9%	12.0%	8.2%	6.0%	1.1%
2011 year	65.5%	11.0%	10.9%	15.2%	8.3%
2012 year	39.7%	51.9%	40.1%	8.4%	0.0%
2013	38.3%	57.9%	34.2%	3.8%	0.0%
2014 year	42.4%	55.1%	33.0%	2.5%	0.0%
2015 year	37.6%	59.0%	40.0%	1.8%	1.7%
2020 year	32.7%	62.9%	41.2%	1.9%	2.4%

Source: National Statistical Institute of Albania - Information Bulletin 1990 - 2020.

The problem of payments to product buyers is usually addressed by researchers mainly in relation to the management of trade loans or receivables arising therefrom.

Carana Corporation specialists define the following main elements of the receivables management process [96, p. 91]:

- Defining the crediting and collection policy for different groups of buyers and types of products;

- Analysis and ranking of buyers depending on the volume of purchases, history of credit relations and proposed terms of payment;
- Control of payments with debtors for deferred or arrears;
- Determination of techniques to accelerate the collection of debts and reduce bad debts;
- Determining the terms of sale, ensuring a guaranteed cash flow;
- Forecast of cash flows from debtors based on collection ratios.

Analysis of scientific works devoted to the problem of mathematical modeling of the calculation process for product sales.

Analysis of works of Russian and Albanian authors. Changes in the conditions of economic activity as a result of the transition to a market economy led to the need to develop new approaches for managing the process of selling agricultural products. In 1991-1999 world scientists studied various aspects of this problem. The most complete overview of the possibilities of using mathematical methods in the marketing activity of enterprises is given in the article by AV Kolovaya [45].

1) Direction "Debt". The problem of repaying mutual debts of enterprises caused by the growing crisis of defaults has pushed a number of Albanian and Russian scientists to the need to develop mathematical models to provide a way to repay mutual debts of enterprises. Similar models were proposed in the work of N. N. Kalitkin [39, c. 11-21], who notes, however, that the model proposed by him is applicable in a situation where the debts of different enterprises are approximately equal. In a situation where practically all enterprises owe debt to one or a limited group of creditors, the model does not allow solving the problem of non-payments. In the work of EM Yerilina, Yu.V. Orekhova and E. I. Prokudina [34, pp. 125-131] conducted further research in this direction, gave a general statement of the displacement problem, considered algorithms for its solution. In the agricultural sector, the ultimate creditors of the sector are the budget and extra-budgetary funds, in addition, a significant part of the current assets is lost at a loss. In this case, the use of such models does not allow solving the problem of non-payments.

2) Simulation of cashless settlements. This area is the least researched part of the product buyer payments problem. Tsitsiashvili proposed a solution to the barter exchange problem (a cooperative solution to the barter problem) [9nine]. The author considers the situation where there are two associations of industrial enterprises, and the products of the first association can be consumed by the second association and vice versa. The last condition makes this decision inapplicable in industry, since production links are usually established between enterprises performing successive stages of the production process.

The most significant (for practical application) scientific work in this direction is the monograph of A. G. Butrina (1997) [23]. The main idea of the author is the wide use of bills of exchange in payments between enterprises. It is supposed to speed up settlements with buyers and suppliers by exchanging received counterparty bills for more liquid accounts. Obviously, in the event of such an exchange, the enterprise will suffer losses, since the value of bank accounts is in most cases higher than that of industrial enterprises. In this regard, AG Butrin introduced a new concept - "account conversion ratio". With the bills received from the bank, the company can settle its accounts with creditors. The possibility of posting accounts received from counterparties in the bank is also assumed.

In our opinion, this scheme has the following disadvantages:

- the majority of accounts received from an agricultural company cannot be posted or exchanged for bank accounts without significant losses. This is due to the fact that the liquidity of debt obligations (both promissory notes and promissory notes) of most counterparties (small and medium-sized organizations) is low, the risks of default on their obligations are too high for the bank to be interested in investing in such liabilities...
- the predominance of barter forms of settlement does not allow counterparties to settle their obligations in money, which again reduces the attractiveness of accounts for the bank's accounting.

3) Other approaches. The provision of long-term (multi-month) commercial loans was studied by MM Erikhov, who proposed a mathematical model for calculating the parameters of the credit sale process using the theory of impulse systems [3].5, c. 62-64]. Yu.M. Mashkovtsev proposed a mathematical model [16, c. 57-59], which allows to optimize the settlements with the buyers of products, in case the latter are also creditors of the enterprise. This situation is typical for ferrous metallurgy enterprises. But, based on the fact that the proposed model is of a fundamental nature, it can also be used with a predominance of ishleme raw materials. In this case, the owners of the raw materials of the ishleme are treated as money creditors. The result of using this model is the possibility of deliveries of finished goods, which guarantees equal repayment of debts to all creditors. V. A. Volkonsky, E. T. Gurvich, A. I. Kuzovkin, E. F. Saburov [26, c. 23-33] offers static deterministic mathematical models:

- a model that allows the assessment of the losses of the supplier enterprises due to the delay in the payment of the products;
- a model for analyzing and forecasting debt dynamics.

Yu.B. Karlashov [40] in 1997 proposed a method for determining the rational size of each element of working capital (including receivables).

The author also proposed a static deterministic model that allows you to adjust the terms of a commercial loan provided to buyers and commodity loans received from suppliers. The model predicts a number of factors influencing the possibility of providing commercial loans to buyers (conditions for received loans from suppliers, conditions for payment of wages of staff, rates of added value).

RM Eidinov proposed optimization models [101, p. 117-132], which allows obtaining an optimal distribution of the enterprise's financial resources both without attracting borrowed funds and attracting borrowed funds, taking into account the need to obtain maximum profit.

4) Investigate the payment process with customers in relation to the agricultural industry. Changes in the conditions of economic activity as a result of the transition to a fundamentally new model of management led to the need for a scientific study of the mathematical modeling of the process of payment with customers in the agricultural industry. One of the directions of such research is the work of FF Bezdudny, GI Ivanova, Yu.P. Kaplun, IV Entin [10, 11], who investigated the effect of inflation on sales performance. The authors have proposed static models that make it possible to estimate the dependence of the "net real profit" (profit taking into account the inflationary growth of the cost price and the forced increase in the selling price) on the rate of inflation and the selling price and the price of goods.

AM Saliem [82] proposed a static model that allows to estimate the period during which an agricultural company can lend to intermediary commercial organizations without affecting

its interests. The model takes into account the relationship between the terms of bank credits for the purchase of raw materials and the terms of credit of buyers.

V. V. Simonov and A. A. Zadorozhnaya [85] conducted a study of the cost of commodity credit received by the enterprise from suppliers and provided by the enterprise to buyers. The authors conclude that it is necessary to consider the value of commodity loans received and provided and to compare the values received when making a decision to lend to buyers. The authors believe that "it is more profitable for businesses to reduce prices by requiring upfront payment rather than ... to provide high prices ... and post-payment." In our opinion, such a conclusion is acceptable, first of all, in the conditions of high inflation. In the conditions of low inflation, the provision of short-term commercial loans serves as a tool to increase product sales. In addition, a number of users, that do not have their own current assets but have commercial premises (eg retail stores) cannot prepay the item. In these conditions, the provision of trade credits is a prerequisite for ensuring the realization of the production.

Analysis of works of Western European authors. All mathematical models developed by Western scientists can be conditionally divided into models based on the concept of profitability or profitability and cash flow models using NPV (net present value) as the main criterion for making a decision to grant payment deferrals . An example of a mathematical model of the latter type is described in [59, p. 92]. This model uses the following parameters:

- daily sales volume;
- discount amount for early payment, discount period;
- the duration of the granted payment deferral;
- the level of credit costs as a percentage of sales;
- cost of capital.

The net present value of the capital inflow is calculated, which in assessing the return on investment will be the sum of the expected future income minus the interest on the capital as "waiting compensation". This is how different credit policy options are evaluated and the most advantageous is chosen.

Among the foreign scientists involved in the development of mathematical models describing the credit policy of the enterprise, D. Mehta should be noted, who examines the decision-making processes for granting a loan of a counterparty (at the level of an individual counterparty) with a subsequent assessment of the impact of this decision on the company's profit [112].

The use of marginal analysis to evaluate different options for the company's credit policy was proposed by M. Davis in [108]. In the works of J. Atkins and Y. Kim, the limitations of the application of the approach based on the assessment of profitability (profitability) are proven, and it is concluded that it is necessary to take into account the time value of money [110]. Y. Brigham and L. Gapenski proposed a methodology that allows analyzing the consequences of applying different options of the organization's credit policy on profit using incremental analysis [18, p. 384-395].

One promising area of current research on this topic is the use of Markov chains to predict debtor payments. This direction was studied by L. Liebman [111]. R. Stanford in 1989 proposed a model that allows you to control the cost of providing a loan to a set of debtors using the mathematical apparatus of Markov chains [113]. This mathematical model makes it possible

to "look inside" the process of payments and accumulation of value in a complex system of debtor accounts.

According to S. Wagner [114], the percentage of sales method (34.8% of cases) and mathematical models developed internally (Internally Developed Models) are most often used to forecast receivables in American corporations - in 23.6% of the cases. According to E. Gilbert and A. Reichert [109], 67% of the total number of companies in the US agricultural industry use various mathematical models in the process of managing customer settlements.

It should be noted that in recent years, the attention of Western scientists has turned to the study of the application of factoring, which, in our opinion, is related to the changes that have occurred in the economy of Western countries. Western firms are trying to transfer the collection of receivables from buyers to specialized factoring organizations under the outsourcing scheme to save costs by reducing their own credit departments, which is facilitated by clear debt collection and bankruptcy legislation.

The range of products in the agricultural industry is renewed at such a fast pace that it is more profitable for the enterprises of the industry to sell the debt to a specialized factoring organization than to expect funds from its repayment. It should be noted that factoring was originally developed in the agricultural industry [20], the successful use of factoring in the UK agricultural industry is reported in a paper [105].

In this regard, the number of publications on mathematical modeling of the process of lending to buyers is decreasing in Western scientific publications.

Based on the results of examining the scientific works of Western scientists, it should be noted that despite significant achievements in the field of mathematical modeling, these works are not applicable for use in a barter economy. In the Western economy, there is also barter, but the scope of its application is limited to industries that produce goods and services that must be sold in a short period of time (air transport, sale of advertising space). Most of the scientific work on this topic in the West is theoretical (such as the R. Stanford model mentioned by us) and is not intended for practical use in industrial enterprises. There are practically no publications on the practical use of mathematical models in the credit policy planning process in open sources.

Based on the analysis of the scientific works of domestic and foreign scientists, we came to the conclusion that at the moment there are no mathematical models that allow the enterprise to evaluate various opportunities for the sale of products in the context of the spread of barter settlements.

Transition from non-monetary forms of payment to monetary (possible assumptions). Let's take a closer look at non-cash forms of payment. In our opinion, a number of non-monetary settlements can be considered as monetary:

- **financial accounts**, which include cash repayment. Note that an agricultural enterprise may receive payment with such promissory notes with future payment dates. In this case, we consider it necessary to consider this type of payment as a deferred payment, since the company will receive money on such an account only in the future (ie, there is a deferred payment). In the case of the possibility of early redemption (posting) of accounts, we consider this case as payment on delivery (after receiving the account, the company in one way or another "converts" it into money). It is obvious that in case of early repayment or transfer of the account to a third party, the company will lose part of the funds due to it on the account. In this case, we

assume that since these losses are foreseeable, the enterprise, when you decide to ship products with payment in financial promissory notes, you must take this fact into account and avoid direct losses, for example, accepting a promissory note for payment at face value and then paying it off early at a discount. In case the company decides not to repay the promissory note early, this financial instrument is a financial investment of the company. In this case, in our opinion, the acceptance of a financial account for payment of shipped products should be accounted for at the possible early redemption price at the time of payment for delivery of products (based on the time value of money). this financial instrument is the company's financial investment. In this case, in our opinion, the acceptance of a finance bill as payment for shipped products should be accounted for at the possible early redemption price at the time of payment for delivery of products (based on the time value of money). this financial instrument is the company's financial investment. In this case, in our opinion, the acceptance of a financial account for payment of shipped products should be accounted for at the possible early redemption price at the time of payment for delivery of products (based on the time value of money).

- barter used for production purposes and for consumption (for example issuing salaries). In our opinion, this type of bartering is actually cash payment with prices inflated by 30-50%. Of course, it can be assumed that the company can find another supplier offering a higher quality of raw materials and at the same time not agreeing to barter payments. But given the monopolized Albanian economy, this is not always possible. Therefore, this type of barter can be considered cash settlements, even though there is no actual movement of money. In fact, this type of barter replaces the company's cash costs for maintaining the production process and paying staff salaries. The disadvantage is the fact that the calculations are carried out at inflated prices, which leads to the need to pay additional income taxes.

As we noted earlier, settlements by offsetting payments to the budget, extrabudgetary funds and utility bills (gas, electricity, water supply) can be considered monetary. At the same time, the number of participants in the netting chain is not important to us. Important are the time of the offset (the period from the delivery of the products to the offset), which is actually the deferred payment for the shipped products, and the ratio of the cost price of the shipped products and the amount of the offset (in this case we also assume that the company does not carry out transactions, in as a result of which it suffers direct losses due to the difference in these amounts). Such consideration of non-monetary forms of payment as monetary, of course, contradicts the generally accepted understanding of the essence of these forms of payment in modern economic science, but in our opinion it is acceptable when considering the issue of payments with product buyers. The main criterion used to assess the possibility of considering non-monetary forms of settlement as monetary is the substitution of monetary costs in the use of these forms of settlement. For example, if, using barter for production purposes, the enterprise saves the money needed to purchase raw materials (by receiving raw materials through barter),

The disadvantage of non-cash forms of payment. In the modern Albanian economy, "real" money is now an available resource. The wide range of users of "cash" forces enterprises to abandon the use of barter, bills of exchange and compensation in settlements, which further leads to an increase in the turnover rate of the company's assets, improvement of its financial condition (progressive bankruptcy) and chronic loss. At the level of an individual enterprise, it

is impossible to completely eliminate the above-described negative phenomena in economic activity. However, as the successful experience of a number of enterprises in other industries shows, the ways to solve the problem of non-payments and the spread of barter in payments are the same for different industries.

Let's consider in more detail what losses the company incurs when using non-monetary forms of settlement (based on the above notes, by non-monetary settlements we will understand only those methods of settlement that do not lead to a decrease in the company's needs for funds - these are rebarter and commodity vouchers, for which you can get products that cannot be sold for "real" money without another "intermediate" stage of exchange):

- 1) The need to pay income taxes (tax on road users, tax on the maintenance of housing and social and cultural facilities) in the amount of 4% of the income at each stage of the exchange.
- 2) Overestimation of income taxes during the initial exchange of the finished products of the company for another product due to the fact that the prices for the delivery of barter products are 30-50% higher than the cash prices. When selling for money of 100 lek revenue, 4 lek taxes are paid, when selling the same amount of products through barter, the revenue will be 130-150 lek and from them 5.2-6 lek taxes will have to be paid. A similar method for determining income (and, therefore, calculating income taxes) is established by the letter of the Ministry of Finance of Albania dated 30.10.92 N 16-05 / 4 "On the procedure for reflecting commodity exchange transactions or transactions carried out on a barter basis in accounting."
- 3) The need to pay property tax in the amount of 2% of the value of goods received in barter during the period of their storage in the company's warehouse.
- 4) In case of insufficient funds to pay taxes, the company will be forced either to attract a bank loan and pay additional interest on it, or to pay penalties for unpaid taxes on time.
- 5) Due to the irregularity of the supply of the products and the receipt of payment for them through counter-supplies, it becomes necessary to pay VAT, despite the fact that the enterprise does not have a monetary source to pay this tax.
- 6) The profit of the enterprise from barter supplies leads to the need to pay income tax; there is also no source of money to pay this tax. As a result, as noted by M. V. Lichagin and N. Mishchenko [66, p. 34], "to avoid debt to the budget for both value added tax and profit tax, organizations try to work in conditions of simple reproduction, without profit", which makes it impossible to invest in the renewal of production potential.

CHAPTER 3. USE OF MATHEMATICAL MODELS FOR PLANNING CONDITIONS FOR REALIZATION OF AGRICULTURAL PRODUCTION

The purpose of the third chapter is to describe the mathematical models developed by us, the use of which allows us to make decisions on the management of the payment process with customers in modern economic conditions not on an intuitive, but on a scientific basis.

The first model we propose is focused on developing an optimal agricultural supply plan using a linear programming method. The model examines the available commercial offers of the enterprise for the purchase of its products, which provide for different terms of sale price, time of delivery, date of payment and method of payment.

The second model allows to estimate the volume of cash and barter flows for the sale of products to be received by the enterprise during certain period of time. By experimenting with

the simulation model, the enterprise will be able to more accurately plan the flow of funds from product buyers.

The proposed models will make it possible to transfer the process of planning the receipt of funds from buyers of products on a scientific basis and will help to increase the efficiency of the financial and economic activity of enterprises in agro-industry.

Selection of the optimal product delivery option using the linear programming method. The model considers an agricultural enterprise producing different types of agricultural products.

The main parameters of the buyer's order are

- Assortment and scope of product delivery for the entire product group;
- The price of each item (per kg);
- Delivery time;
- Deadline;
- Method of payment for delivered products.

We are considering an enterprise operating with own or borrowed working capital (acquisition of property). The proposed model can also be used in enterprises working entirely with raw materials on a piecemeal basis, if payment for processing is made with part of the finished product. It is also possible to use the model in enterprises combining work with own and / or borrowed funds and processing of agrarian products on the island.

The model can be used in enterprises interested in building an effective sales system. One of the key issues along this path is choosing the counterparties to whom to sell the products and planning to receive funds for the products shipped. The importance and relevance of this problem for the modern agricultural industry is emphasized, for example, by M. V. Voronov "more and more typical for the enterprise of the agricultural industry is the execution of" unexpectedly "appearing contracts for the production of small batches of products ... It is necessary to an answer was given to the customer: either his terms are accepted or slightly different ones are offered" [28].

Consider the situation with the sale of agricultural products on the Albanian market. Effective demand for agricultural products is limited and businesses have difficulty selling their produce. At the same time, the demand provided by non-monetary payment methods creates additional opportunities for selling products in conditions of shortage of "cash" - agricultural products can be used in barter chains by counterparties who are not direct consumers of agricultural products, but have stable economic ties with them. In this way, an agricultural company expands its sales market by incurring certain costs that were mentioned above. At the same time, it becomes necessary to evaluate various commercial offers of buyers,

The positions of the companies in the market differ significantly. A characteristic feature of leaders is the ability to sell their products even in a market with limited purchasing power. One of the examples of building an effective sales system is ZAO Tirana Agricultural [91]. In our opinion, agricultural companies need an effective tool to measure their sales performance.

Another common problem for the agricultural industry is the lack of working capital, which in most cases makes it impossible to increase production to the point of profitability. The result of this is the chronic unprofitability of a number of enterprises and constantly growing volumes of non-payments. It is obvious that the state cannot solve the problem of distribution of working capital of agricultural enterprises as a whole, and besides, state intervention leads

to the fact that the most efficient enterprises do not necessarily receive budgetary support. Therefore, the main way to solve the problem of providing working capital is to attract them from enterprises, organizations and banks of third countries (the ishleme scheme does not leave the prospects for the development of the enterprise and is a way to temporarily charge empty production facilities, since "narrator" companies in most cases are not interested in investments in production). These investors may include local administrations interested in preserving jobs.

At the same time, it is important to ensure the safety and timely return of borrowed funds. In our opinion, this cannot be achieved in the absence of financial planning.

With a well-designed and realistic financial plan, a business can provide potential lenders with information on the level of profitability and maturity of borrowed funds.

Thus, the model can be used to forecast product sales flows as well as to prepare a business plan for an enterprise.

Description of the task. Possible options for delivery of the company's products within 1 month to buyers with different prices, terms and payment methods are being considered. The time and methods of cashless payment are brought into a comparable form through various transformations.

The most profitable is the option that provides the maximum flow (cash and barter reduced to cash) from the sale of products in the considered time interval.

Only products delivered in a given month are optimized. The following volumes of products produced by the enterprise are excluded from it and are not subject to optimization (since it is assumed that the enterprise must strictly fulfill its obligations to counterparties for the return of borrowed funds, regardless of the profitability of these operations):

- products manufactured under ishleme contracts (with the exception of part products transferred to the enterprise against payment for processing services);
- products produced under conditions of advance financing;
- products for which salaries are paid to employees enterprises.

Cash and barter flows for products shipped in previous months are not included. It is assumed that with the help of this model, optimal plans for the delivery of products to consumers have been obtained in recent months, taking into account the need to obtain maximum revenue.

It is assumed that the cost of delivery of the product to each user is paid by the user separately. If the terms of delivery of the product imply the inclusion of transport costs in the price, then for use in the model it is necessary to subtract the cost of delivery from the price. This is necessary for the convenience of bringing prices into comparable form.

The period for which the transport plan is drawn up. The delivery period is assumed to be 1 calendar month. The time horizon for receiving payment for shipped products is 2 calendar months. Products unpaid for 2 months are recognized under this model - unpaid, and in fact such an option should be excluded from consideration (the typical grace period for payment currently does not exceed 1 month). The terms for receiving payment can be adjusted up or down from the 2 months we offer, depending on the specifics of the particular enterprise.

Accounting for different prices. It is assumed that different buyers of products receive products at different prices (for example, there is a discount program depending on the volume

of the purchase, as well as the different prices discussed above for the sale of prepaid and postpaid products).

Consideration of different payment terms. Regarding payment timing, you must distinguish between planned and actual payment terms. Scheduled dates are the payment terms established by the delivery contract (for example, deferred payment for 20 days from the date the product is shipped). Actual payment terms when a counterparty is granted deferred payment will almost always exceed those planned.

Therefore, the model must specify the probability of payment by the counterparty of its debt in the considered time interval (for example, a probability equal to 0.9 means that it is assumed that in 9 out of 10 cases this counterparty will pay its debt in time per planned period).

The probability is determined by the employees of the financial department of the enterprise based on statistical data from past years (for a given counterparty or for a group of users to which it belongs) or expert assessments.

Prepaid shipping options will take precedence over deferred payment options as they are more likely to be received than a trade loan as bad debt is likely to occur.

Another problem in considering the moment of receipt of payment is the fact that the shipment can be made on different calendar days.

Since we are looking at a separate calendar month, a shipment on the 1st with payment on delivery will be different from a shipment on the 29th subject to the same payment ex post facto. The funds received from the buyer on the first day can be used by the company in circulation (realistic option) or put on deposit to generate additional income (unrealistic option). We find it acceptable to increase the price per unit of output for a given buyer by the estimated amount of additional income from the inclusion of funds in circulation. Since order volume is the desired parameter, it is not possible to calculate the volume of additional income based on the total order volume of a particular counterparty.

The rate of return on the use of funds in the turnover of the company was taken by us equal to the average monthly return on sales of the enterprise (return on sales was calculated as the ratio of profit to revenue).

Using this approach, obtaining funds from buyers will be stimulated as soon as possible, which will accelerate the turnover of the company's assets. Preference will be given to those buyers who plan to receive products at the beginning of the planning period, provided that their proposed prices, taking into account the possibility of receiving additional income from receiving funds earlier, are higher from the prices offered by buyers who plan to pick up products at the end of the planning period ...

For greater simplicity, it is possible to ignore the calculation of the amounts of additional income from the inclusion of funds in circulation in the case of partial payment for the sent products, taking as the actual date of payment the date of full repayment of debt (such a decision is especially important with a large number of counterparties).

Accounting for different payment methods. When choosing the optimal product delivery plan, it is necessary to take into account that different contractors offer different payment methods for products (cash and non-cash).

This question is key when working with this model.

The following methodical approach is proposed to solve it:

- 1) In order to determine the financial result (profit or loss), it is necessary to bring barter and cash costs and income in a comparable form.

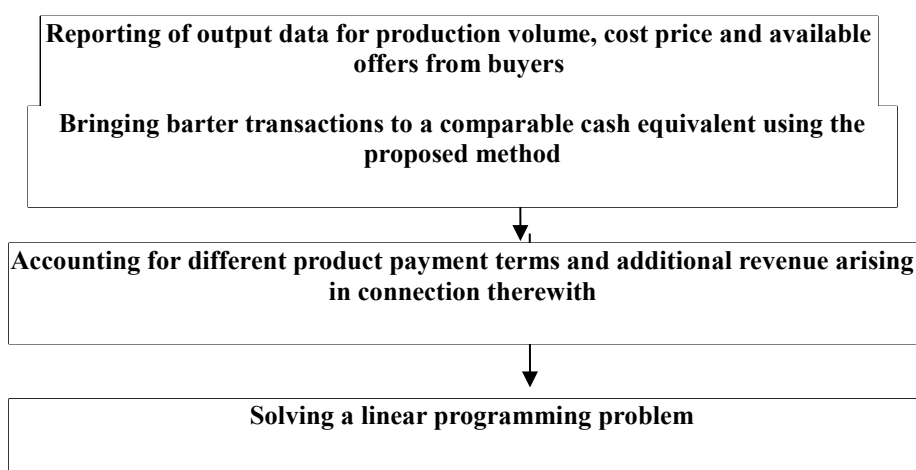
Given that barter and monetary prices for different types of products / services can differ by 30-50%, it is necessary for all income received in non-monetary form to determine their monetary equivalent according to the following formulas: $D = DB * (Tsd / Tsb)$, where D is income discounted to money prices, DB is income at barter prices, Cb is the price of a product or resource at barter prices, Cd is the price of a product or resource at money prices.

- 2) As mentioned earlier in the second chapter, the monetary equivalent of the receipts from barter must be reduced by the amount of costs arising from the use of barter, which can be assessed by calculation (excessive amounts of taxes on receipts, property tax, taxes on the proceeds paid at each stage of the barter). The calculation of this adjustment must be done by comparing the barter prices and the cash prices, since it is the barter prices (and the barter value of the products) that serve as the basis for calculating additional taxes.

After this adjustment, we get the real "cash" selling price of the products in barter.

- 3) The corrections described in the second chapter are carried out for cases of using non-monetary payment methods (bills of exchange, set-off) - the actual maturity of the debt is determined, which includes, for example, the term of the cash account or its use to pay for raw materials or services, etc. .
- 4) The disadvantage of the use of barter, which does not replace the cash costs of the enterprise (this term is explained in detail in the second chapter), is manifested in this model in the fact that since the maturity of the debt in this model is the period of use of barter products in production or consumption, or the period during which they will be sold for "real money", then when using multi-stage barter, such transactions will not lead to debt repayment during the period under consideration (2 months) . In addition, the costs of such transactions mentioned above will be very high.

Below is a diagram describing the main stages of using this model:



Scheme 1. A model for choosing an optimal plan for delivering products to different consumers

Algorithm for solving the task. 1) the total amount of the payment is not a limiting requirement, i.e. there are no conditions characterizing the limited financial capabilities of the user: it is considered that there is a certain probability that each user will be able to pay his

entire request in full and on time. This means that when analyzing delivery volumes for any particular user, each delivered i-item can be analyzed independently of other delivered items. Therefore, when analyzing supplies for all consumers, each of the items can be separated into its own independent subgroup, i.e. it is possible to perform "according to the article decomposition";

2) the allowable area is a straight parallelepiped: the constraints on the minimum and maximum shipments for each of the items for each of the users lead to the fact that the allowable area is a straight multidimensional parallelepiped, not an arbitrary convex hyperpolyhedron;

3) the size of the parallelepiped is equal to the number of buyers for each specific item, not the total number of all buyers;

4) an order based on minimum shipments is used - with an increase in the volume of the initial stock availability of a certain item, it becomes possible to send to users' addresses with the smallest of the announced minimum lots of a given item;

5) order by selling prices is used - delivery options in which the largest shipment of an item corresponds to its highest selling price (unless this is prevented by restrictions on the size of minimum lots) have priority in the evaluation. ;

6) sorting by maximum consignment lots is used - the starting point search procedure selects the maximum possible expensive delivered lots as candidates for optimization, provided that their volume "fits" into the stock availability;

7) the "return principle" is used: You can analyze a variant with a large initial availability level using previously received (prepared) analysis results for variants with a lower initial availability level.

Algorithm description. For the computer solution of the problem, it would be natural to use one of the standard modifications of the simplex method. However, the features of the algorithm allow to greatly simplify the computational procedure for enumerating the vertices of the polyhedron of possible solutions, organizing this enumeration as a set of several nested loops. The nesting levels will be numbered "from the outside in", starting from the zero (outermost) nesting level of the enumeration algorithm.

Level 0. Choosing the optimal solution. The list of processed shipping options of fabric items is listed taking into account the calculated shipping options (derived from the lower levels of the listing). For all items, the optimal delivery option is selected.

Level 1. Enumeration of agricultural products. Alternative selection of fabrics $i = 1, 2, 3, \dots, N$ for further processing and finding an optimal solution.

Level 2. Search for sale prices. An enumeration is performed to select the highest selling prices (ie the most profitable users) of the item in question. In this case, the maximum and minimum batch volumes for the item in question and the users in question (derived from the lower demand levels) are taken into account.

Level 3. Enumeration of maximum parties. The options are enumerated to select the maximum shipment lots (ie, the most wholesale users) of the item in question. In this case, the minimum lot volumes for the item in question (derived from the bottom level of demand) are taken into account.

Level 4. Listing of minimum lots. An enumeration of the minimum shipment lot constraints (i.e., an enumeration of the most "constraint-picky" users) of the item in question: $j = 1, 2, 3, \dots, N$

In this case, the pre-calculated delivery options for the item in question (with smaller volumes than the item's original stock) (derived from the lower demand level) are taken into account.

Level 5. Enumeration of pre-accumulated delivery options and calculation (recalculation) of the value of the objective function at the considered vertex of the polyhedron. An acceptable shipping option for the item in question is being worked out. The precalculated delivery options are sorted (with lower initial stock) and the optimality of the analyzed acceptable option is evaluated. The calculation (recalculation) of the objective function values is performed for the considered delivery option.

Search results at levels 2, 3 and 4 are formed on the basis of a comparative analysis of form dependencies

$$F_{ij}(X_{ij}) = X_{ij} * Z_{ij}; X_{ij} \min \leq X_{ij} \leq X_{ij} \max$$

for each subsequent i - item and all j - users of that item. It is clear that the proposed algorithm is a simplified version of the simplex method for enumerating and analyzing possible solutions.

Economic effect of applying the proposed mathematical model. When calculating the indicators in Tables 5 and 6, it is assumed that when planning supplies without using the proposed model, the company focuses on the most profitable offers of buyers, without taking into account the additional costs associated with barter transactions.

Table 5. Absolute indicators characterizing the economic effect of applying the proposed mathematical model (light)

Name of the indicator	Price Based Delivery Plan (Intuitive)	Delivery plan optimization using the proposed model
Volume of product sales through barter	2,364,412	1,096,479
Sales volume of cash payment products	611 846	1,587,561
The volume of cash flow and barter reduced to cash	2,343,612	2,390,902
Additional costs associated with the use of barter (reduction in profit from running the company)	24,576	11,099
Cash required to pay taxes arising from barter transactions	94,576	43,859

Table 6. Relative indicators characterizing the economic effect of applying the proposed mathematical model (%)

Name of the indicator	Price Based Delivery Plan (Intuitive)	Delivery plan optimization using the proposed model
Share of barter	79.4%	40.9%
Share of cash payments	20.6%	59.1%
Increase cash flow and barter flow reduced to cash		2.0%
Reduction of additional costs associated with the use of barter		-54.8%
Reducing the amount of funds required to pay taxes arising from barter transactions		-53.6%

Thus, as a result of using the proposed mathematical model, the enterprise can significantly reduce the share of barter settlements (due to a more accurate calculation of the effectiveness of cash and barter transactions).

Forecasting the movement of cash and barter flows for the sale of agricultural products using the method of simulation.

Description of the task. Simulation modeling is a powerful tool for evaluating different behaviors of systems, especially when their behavior is determined by random factors [8,70]. Monte Carlo simulation is used to predict the receipt of payments from customers.

The purpose of using our proposed simulation model is to predict the flow of cash and other resources (mainly barter flows) from counterparties during the considered period. The model can be used to assess the consequences of implementing different policy options in the area of settlements with product buyers, as well as to estimate the volume of funds received by buyers when the predicted level of solvency of each of them, part or all buyers change.

In the previous model, cash and barter flows from product sales in prior periods were excluded from consideration. This is due to the fact that the purpose of the previous model was to form an optimal shipping plan for the current period.

As the considered period, it seems advisable to use a period of 2 calendar months (the period can be increased or decreased at the discretion of the enterprise).

Sources of funds are:

- repayment of receivables for products sent in previous periods;
- cash and barter flows for products shipped during the period under review.

It is assumed that the delivery plan is known in advance - for example, it is determined based on the mathematical model proposed in the previous section. Note that products shipped within the planning period based on advance funding are excluded from consideration. This is because it received funds from buyers earlier than planned and should have been accounted for in the previous period.

Receipt of advances from buyers in the planning period is not accounted for in the proposed model.

The transfer of products for sale (consignment) is considered a special case of sale of products with deferred payment.

As in the previous model, the model is calculated not in the context of counterparties, but in the context of each delivery to a specific counterparty.

The controlled variables are the amount of funds on the current account and in the cash register, the amount of funds that is calculated for each item according to the list of resource types, and the amount of funds received by each counterparty on each day.

By resources, we mean material resources (for example, raw materials) and overdue payments for various services (for example, movement of arrears in mutual payments with energy companies and utilities arising as a result of compensations).

The model does not take into account the possible use of available funds in the enterprise to pay various costs (for example, the purchase of raw materials) and the possible use of available resources in the production process. This is due to the fact that the purpose of the model is to forecast cash and barter flows for sales of agricultural products.

Using the forecast data, the company can plan the expenditure part of the budget for the movement of cash and barter resources, predict the possibility of attracting bank loans in periods of shortage of cash and barter resources (in fact, it seems possible to enter it into the model as initial data - the amount of money and resources spent on each day to assess the sufficiency of funds and resources for a given day to meet planned costs) for the planned period and then compare actual and planned costs. Since the supply of the enterprise with raw materials and materials for production activities is carried out not only through purchases with funds, but also directly through barter supplies, it is necessary to control the availability of resources for each item.

It is assumed that, unlike engineering enterprises, in the agricultural industry a limited number of resource names will be bartered, and the number of simultaneously controlled resource positions will not be very large (up to 100 positions).

Monte Carlo simulated payments. The simulation model of mutual payments with consumers is a model of the set of payments arising over time and made by consumers to settle their obligations for earlier deliveries of goods on a deferred payment basis. From here it is clear that the model must simulate: individual payments to specific users at specific time intervals for specific shipments of goods; the entire set (stream) of payments. When simulating the flow of payments, it is necessary to take into account: time interval $[t, t + 1]$; all sums of payments made by all users in a given time interval $[t, t + 1]$; all time intervals $[t, t + 1]$ within the model time of the entire settlement process. Clearly, if the simulation of individual payments is somehow already done,

Simulating individual payments requires more detailed independent consideration. When simulating a single payment, the following variables need to be taken into account: the considered payment time interval $[t, t + 1]$; number of the user making the payment; number of the paid delivery of goods; the probability of a given payment in a given time interval; the fact of execution/non-execution of the payment in the time interval $[t, t + 1]$; the probability of the amount of this payment in a given time interval; the amount of the payment made (in whole or in part); other variables (if needed). Of course, there is a fundamental possibility of mathematical treatment of such random events (and quantities) by analytical methods; but, the resulting formula relationships are usually practically limitless and almost unsuitable for further use for applied purposes. Therefore, the Monte Carlo method of computer software "drawing" random events will be used to simulate individual payments. The method is based on simulating random events (and characteristics of these events) using various modifications of random number generators.

The Monte Carlo simulation process is usually divided into several stages:

1. Determining the stochastic nature of the input variable.
2. Simulate the movement of the input variables by repeatedly generating random numbers adjusted to have the same probability distribution as the underlying variable. This involves converting uniformly distributed computer-generated random numbers into random variables with the same distribution as the variables to be simulated. Adjusted random variables are input variables.
3. Running the simulation (one run of the model)
4. Repeat this process
5. Analysis of results

Execution of the model. The term "execute the model" refers to the following sequence of actions of the modeling procedure:

- the initial data are established: customer numbers, shipment numbers, initial overdue shipments, grace period for shipments, probability of payments, probability of partial payments;
- calculate the full time interval of the model, create a list of daily intervals of model time $[t, t + 1]$;
- all daily intervals of the model time are sorted, for each daily interval individual payments to specific users for specific shipments are simulated and the total flow of payments for each model day is calculated;
- a "flowing curve" $S(t)$ is formed, i.e. the final row of the table of total daily payments on the model time interval $[0, T]$.

This or that performance curve is the result of some specific k-run of the model. It is clear that the following requirements must be met:

- convergence of the model: for any given set of initial data, the construction of the movement curve must be feasible, i.e. the execution of the model for the final running time of the computer (the program) must end with the "release" of the movement curve (model convergence);
- the computational complexity of the model: the number of computational operations and, therefore, the computer time spent on one execution of the model should not be unacceptably high.

The issue of the theoretical investigation of the convergence and computational complexity of our model is beyond the scope of this work. We only point out that the implementation of the model and its use (see below) have demonstrated in practice its convergence and polynomial (non-exponential) computational complexity.

Simulation cycle. In order to obtain highly reliable results from the model, the so-called simulation cycle is used, that is, the following multi-pass procedure:

- multiple execution of a single-pass procedure is performed with the same output data; in other words, mileage curves $S_k(t)$ are formed, where $k = 1, 2, \dots, G$, i.e. G runs of the model are performed;
- all current curves $S_k(t)$ are accumulated in the final matrix of the results of the simulation cycle. The accumulation, storage, editing, search and processing of these data is an independent applied problem, the effective solution of which is impossible without the use of adequate methods and means from the field of computer databases.
- the data accumulated in the matrix of modeling results are processed by methods of mathematical statistics to obtain average modeling results (estimates) and to calculate confidence intervals for these estimates (see below).
- the required number of runs within one cycle is selected from the conditions for obtaining the required level of reliability of the model results (see below).

Findings.

1. Mutual payments with consumers there are many events of the type "partial or full repayment by one or another consumer of his debt for goods received from the supplier on a deferred payment basis." Since neither the fact nor the timing nor the amount nor the form of payment can be predicted deterministically, the events under study are random events. Thus, the settlement process can be viewed as a stream of random events.

2. To describe each payment, the following is used: number of the user making the payment; number of the paid delivery of goods; discrete time interval for payment (days); the probability of the fact of payment in the time interval; "Drawing" of the fact of making (or not making) a payment; the likelihood of payment of amounts; "Withdrawal" of the amount of the payment made (in whole or in part); other considered and/or "played" parameters.

3. Any such event can be simulated ("enacted") on a computer programmatically based on the use of the Monte Carlo method. The set of specified random events generates the total flow of payments. This is the simulation of the total flow of payments that is the object (target result) of modeling in one run of the model.

4. Accumulating the results of series and cycles in the database generates summary model statistics for a large number of series, which is the basis for subsequent final statistical evaluations. The processing of the accumulated model statistics is carried out using the methods of regression analysis, which allows to build a certain averaged approximating curve (model mathematical expectation of the flow of payments) with the corresponding corridor of errors (variations). The analysis of the corridor of errors allows you to evaluate the confidence characteristics of the model.

5. The monetary form of the payments is used as an illustration of the working of the model. For non-available forms of payment, the same model is used, but with its own sets of overdue amounts, terms and probabilities of their repayment (within one simulation program)

6. The factors influencing the type of the approximating curve are: the value of the initial obligations; the amount of calendar deferrals of payments; probability of payments; the probability of payment of amounts. Each run of a multipass simulation consists of constructing a specific approximating curve with its error corridors while using a certain fixed set of factors as model parameters. Applying many simulation cycles with different sets of factors allows obtaining a family of approximating curves (and their errors) depending on the different factors.

Possible experiments with the simulation model. Guidelines for experimenting with the simulation model are as follows:

- conducting tests with different sets of probabilities of fulfillment of obligations by counterparties, for example, according to the "most likely option", "optimistic", "pessimistic" plan.

- change in the terms of delivery and payment of the products (softer or stricter credit policy of the enterprise).

The last experiment allows the company's management to assess the impact of the proposed credit policy on the company's liquidity.

This capability is, in our opinion, the most valuable result obtained with this model.

CONCLUSION

The analysis of the experience of the functioning of Albanian agrarian enterprises in the conditions of a market economy shows that without the use of scientifically developed methods, the management of the process of selling products is associated with the possibility of receiving very significant losses due to the appearance of bad debts and delays in settlements .

In the context of barter and market economies, there is an additional need to assess the profitability of monetary and barter transactions and control the timeliness of receiving various resources necessary for the enterprise to continue production activities.

In this regard, it became necessary to solve the scientific problem of developing a set of methods and mathematical models that would effectively manage the payment process with product buyers.

As a result of solving this scientific problem, the following were developed in the dissertation work:

1. Methodology for evaluating the comparative effectiveness of cash and barter transactions;
2. Methodology for the management of cash and barter flows for the sale of products in the context of the prevalence of non-cash forms of payment;
3. A mathematical model for choosing the optimal plan for delivering products to consumers using the linear programming method;
4. A simulation mathematical model that allows forecasting the movement of cash and barter flows for the sale of products.

The practical application of the main points and ideas of the dissertation, in particular the adaptation of the developed mathematical models to the specifics of specific enterprises, according to the author, will have a positive impact on improving the financial and economic activity of enterprises in the agricultural industry.

The author notes that the problem he developed for planning the conditions for the sale of products is one of the constituent parts of the process of managing the financial and economic activity of an industrial enterprise, in connection with which the proposed mathematical models can be effectively used only if the management of the enterprise is clearly aware of the need for a professional approach to financial management and in other economic aspects of the organization's activity (for example, cost management, tax planning, etc.) and takes appropriate actions for this.

The author also believes that the recommendations and proposals developed by him in the course of the dissertation work should be regularly updated, as the conditions of economic activity of industrial enterprises in Albania change.

II. CONTRIBUTIONS OF DISSERTATION

A methodology has been developed for the management of cash and barter flows for the sale of the production of an agricultural enterprise in an economy in transition;

1. A mathematical model is proposed that uses the method of linear programming, which allows to obtain an optimal plan for the supply of agricultural products based on the analysis of the conditions of applications from potential users;
2. A simulation mathematical model is proposed that allows predicting the receipt of funds from users for shipped products.
3. Information and software support for the proposed mathematical models has been developed;
4. Recommendations are given for various possibilities of using the developed mathematical models in planning the process of mutual payments with the consumers of agricultural products.

III. PUBLICATIONS

1. **Qamili, K.**(2021). Motivation as a factor of efficiency increase. Knowledge-International Journal, vol. 45/5, 1085 – 1089. ISSN 2545-4439
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2. **Qamili, K.**(2021). Slaes as a factor of business development. Knowledge-International Journal, vol. 45/1, 303 – 306. ISSN 2545-4439
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4. **Qamili, K.** (2021). Comparing the size of leaves of some cultivars and roots of the apple in the anamorava region. Scientific works of the Union of Scientists in Bulgaria-Plovdiv Series A. Social sciences, art and culture, volume I., Union of Scientists session October 31 - November 1, 2014. Scientific research of the Union of Scientists in Bulgaria-Plovdiv, seriesA. Public sciences, art and culture, Vol. I., Union of Scientists, ISSN 1311-9400, Session 31 October – 1 November 2014.