Taking into account the factor of uniformity in organization of terminal transportation of fruit and vegetable products

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ABSTRACT

The article deals with the problems of organizing the production, collection, storage and distribution of fruits to meet the needs of the population. The analysis of the processes of product delivery and transport provision of the assembly and distribution terminals has been carried out. The calculation of the need for the number of vehicles for collecting and delivering products, taking into account the factor of unevenness, is proposed.

Keywords: Food Independence, Terminals, Uneven Collection And Distribution Of Fruits, The Required Number Of Cars.

Introduction.

The provision of the country's population with fruits and vegetables is an important factor in food independence and the health of the nation.

The population of the Republic of Uzbekistan in 2021 was 34,558.9 thousand people. According to the forecast, the volume of fruits and vegetables will be collected in the amount of 20321.4 thousand tons. Thus, a resident of the republic will have about 588.0 kg of various fruits and vegetables. At the same time, taking into account the average biological norms of consumption of fruits and vegetables per capita, which amount to 267.8 kg per year, we note that only 45.4% of the total production volume is required to cover the needs of the republic's residents (i.e., 9254, 9 thousand tons) of fruits and vegetables. The rest of it in the amount of more than 11066.5 thousand tons (54.5% of the total production) can be exported to other states [21].

Analyzing the information presented in Table 1, we can conclude that the republic is a potential large exporter of fruits and vegetables. It is climatically justified that the most active in this process can be the Andijan, Samarkand, Bukhara and Fergana regions.

However, theoretical calculations need to be corrected, taking into account the actual situation. Statistical reports on the production, storage and processing of fruit and vegetable

products indicate that about 30% of it does not reach the consumer due to imperfect processing infrastructure, problems with the organization of collection, delivery and storage.

In this regard, the system of assembly and distribution terminals requires study and development, which, with their correct organization and accurate operation, will be able to solve the problems that have arisen.

The direction "terminalistics" that has emerged today is being actively studied by many authors who offer their own vision of this process.

So Rodnikov A.N. [10] proposes to consider “terminal transportation system (terminal technology) - dividing the process of cargo delivery into three interrelated elements: delivery of small consignments to the terminal and consolidation of small consignments at the terminal; inter-terminal transportation; disbandment of consolidated shipments into original small shipments and delivery to consignees. " Taking into account the opinion of the author, in order to substantiate the nature and structure of the assembly and distribution terminals, it is possible to single out the process of delivering small shipments, since the collection of fruits and vegetables from producers is carried out in this way.

One of the definitions of a terminal, indicated in [11], is the following: “Terminal (English terminal“ limit, end, end ”) is the final part of a certain system that provides a connection between the system and the external environment." However, this definition reflects only one of the aspects of the terminal in the modern concept.

The wiki dictionary [11,20] defines that "In transport networks, a terminal is a point ... of loading, unloading goods, as well as their buffer accumulation."

Analysis of the state of production of fruits and vegetables in the Republic of Uzbekistan

		Fruit and vegetable production volume, thousand tons	Population, thousand people on 01.01.21 y.	EPP production per capita, kg	Difference between POP production and medical standard, kg	The volume of potential exports of fruits and vegetables, thousand tons
The Republic of Uzbekistan		20321,4	34558,9	588,0	320,2	11065,7
The Republic of Karakalpakstan		584,9	1923,8	304,0	36,2	69,6
1.	Andijan	2964,7	3188,2	929,9	662,1	2110,9
2.	Bukhara	1630,8	1946,9	837,6	569,8	1109,3
3.	Jizzakh	891,1	1410,6	631,7	363,9	513,3
4.	Kashkadarya	1136,9	3334,5	340,9	73,1	243,8
5.	Navoi	652,9	1013,8	644,0	376,2	381,4
6.	Namangan	1629,2	2867,4	568,2	300,4	861,4
7.	Samarkand	3335,9	3947,4	845,1	577,3	2278,8
8.	Surkhandarya	1945,9	1681,0	725,8	458,0	1227,9
9.	Syrdarya	651,1	861,1	756,1	488,3	420,5
10.	Tashkent	1771,2	2994,0	591,6	323,8	969,5
11.	Fergana	2173,1	3819,9	568,9	301,1	1150,2
12.	Khorezm	1073,3	1893,1	566,9	299,1	566,2

* Compiled by the author based on information from the site www.stat.uz

Analyzing the opinion of the authors, we note that the concept of "buffer" should obviously mean the creation of conditions for "smoothing" the process of satisfying consumer demand in conditions of its unevenness.

Dybskaya V.V. [4] by terminal transportation means “transportation of goods organized and performed through the terminal”. A number of other authors share the same opinion.

Research in the field of organizing the transportation of fruit and vegetable products revealed the following points: fruit and vegetable products are mostly produced by small businesses, therefore, small volumes are presented for transportation; fruits and vegetables are perishable goods and must be delivered in a short time; in the production and collection of fruits and vegetables, it is necessary to take into account the seasonality and unevenness of these processes.

B.A.Khojaev [14] noted that “the most expedient system for the transportation of small consignments (from a single or several separate places) is their concentration, that is, the goods dispersed at different points of departure are delivered to one collection point, where they are assembled according to directions and destinations ".

At the same time, Gorev A.E. believes that the transportation of small-lot cargo has distinctive features:

- assembly and distribution routes;
- rolling stock of different brands;
- strict adherence to schedules;
-Instability of freight traffic [2].

Considering that the transportation of fruits and vegetables can be carried out on an international scale, A.V. Kiricheno emphasizes that “to ensure the quality of transportation at the level of world standards, an important condition is the development of a system of forwarding services, including terminal facilities” [6].

In foreign literary sources [17] terminal systems, features and characteristics of distribution centers are investigated. In particular, Donald J. Bowersox notes that "the use of a single distribution center leads to a reduction in transport costs due to the partial elimination of counter deliveries" [1].

Johnson, James, in his study of the state of modern logistics, believes that "some public warehouses belong to distribution centers, thereby emphasizing the distribution function of storage in the warehouse, rather than stock creation."

At the same time, a group of authors [9] notes: "first of all, it should be noted the objective need for a radical change in the attitude only to one of the most promising technologies in the transport-terminal".

Summarizing the opinions of the authors on the need to organize terminal systems, terminals, distribution centers, let us single out the problem of collection, storage and distribution of fruits and vegetables. As noted above, the problem of providing the population with fruit and vegetable products is relevant and the development of its solution will bring maximum benefit.

The most effective form of ensuring the collection, storage, processing and delivery of fruit and vegetable products are assembly and distribution terminals.

Determining their organizational structure, let's highlight the basic elements:

- open and closed warehouses;
- refrigerating chambers;
- premises for cargo handling;
-park of rolling stock;
- loading and unloading equipment;

In today's economy, the agro-industrial sector of the APS plays an important role in ensuring food independence and meeting the population's demand for basic foodstuffs. The functioning of the agricultural sector is carried out with the help of private farms and dekhkan farms. However, the development of the economy does not stand still and the search for new ways to increase efficiency has revealed the motivation of partners for the formation of agricultural clusters.

The concept of "Cluster" means "node, connection" and this is very well reflected in the production, processing, storage and sale of fruit and vegetable products. Commenting on this statement, the opinion of Ellram and Krause should be cited in which they note that "a supply

partnership is an ongoing relationship between companies, providing for a long-term commitment to each of the parties and the presence of shared information, risk and revival resulting from this relationship" [19].

Of greatest interest is a cluster, which means a group of interconnected organizations, companies, corporations, banks, suppliers of products, components and specialized services, infrastructure, research institutes, universities and other organizations, which are mutually replacing each other and reinforce the specific advantages of individual companies and cluster as a whole.

Thus, with the economically competent implementation of the cluster, the opinion expressed by V.V. Dybskaya is put into practice: "the best business results are achieved by those companies that use the concept of integration in logistics and counterparties in the end-to-end management of commodity and information flows in the integrated structure "design-procurement-production-distribution-sales-service" .. "[4].

From the cluster structure presented above, we will single out the infrastructure that ensures the functioning of the entire system.

Singling out the process of transporting fruit and vegetable products from producers to consumers, one should pay attention to two problems:

1-correspondence of the available rolling stock to the transported cargo;

2-correspondence of the used loading and unloading mechanisms to the type of cargo, the type of container and the type of rolling stock that delivers the products.

Analyzing the delivery of fruit and vegetable products, we note that in this area, a special role is assigned to road transport. Gorev A.E. believes: "there is no alternative to road transport when transporting expensive goods over short and medium distances, in retail trade, in industry, in the systems of providing small business and servicing the agricultural complex" [2].

D. Bowersox expresses the opinion that "transportation can be organized in three main ways. First, a private vehicle fleet can be used. Secondly, it is possible to contract a specialized transport company (and even more than one). Thirdly, it is possible to combine different types of means of transportation that provide different transportation services, which allows you to meet the individual needs of customers (methods-private, contract, general cargo transportation) [1]. In addition, the author [6] believes that "in logistics, the efficiency of transportation is determined by three factors: costs, speed and continuity."

Analyzing the above opinions of scientists and determining the possibilities of their adaptation in practice, we can summarize:

-today logistics is being introduced and actively used in all areas;

-the role of logistics in the functioning of the agricultural sector is important;

- the formed structures of agroclusters in interaction should contribute to obtaining the best result.

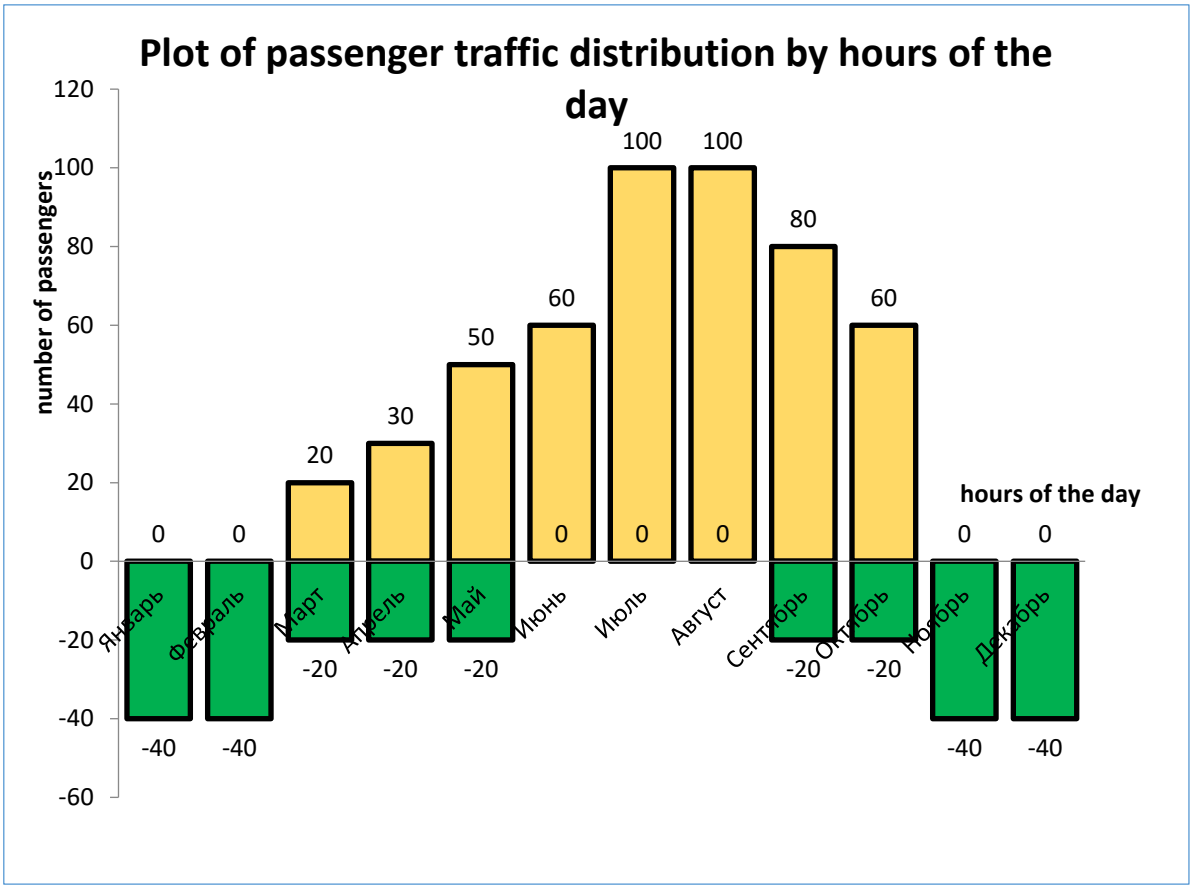
The infrastructure of the agrocluster is a complex system, but in its functioning the key role is assigned to road transport as the established executor of the processes of collection and delivery of fruits and vegetables.

As noted, the assembly and distribution terminal may have its own fleet of rolling stock. The efficiency of transport operations will depend on such coordination of orders, which will ensure the full utilization of transport capacities.

Methods.

The research method manifested itself in the use of an appropriate algorithm.

Picture 1. Algorithm of the research method for transportation of fruits and vegetables



Traditionally, the required number of cars is calculated by the formula:

$$An=\frac{Q}{q}; \text{ед} \quad (1)$$

where:

An-the required number of vehicles for the transportation of a certain cargo, units

Q- volume of cargo presented for transportation, T

q- carrying capacity of the vehicle used for the carriage of goods, T

In this case, the value q (carrying capacity) will be constant, and the Q-volume presented for the carriage of goods will be variable.

When forming the fleet of rolling stock for the terminal, the value of the average volume of transported products is used. However, it is well known that the process of production and ripening of fruit and vegetable products, and, accordingly, their collection and then delivery is uneven.

It was noted above that the transport process should be organized in such a way that the rolling stock is used efficiently. This means that in order to accurately and correctly predict the required number of cars, it is necessary to take into account the coefficient of uneven collection and delivery of fruits and vegetables. It is advisable to do this on a monthly basis. In addition, it is important to take into account the factor of the diversity of fruit and vegetable products, taking into account the periods of its ripening and collection.

When proposing to predict transportation processes, one should cite the opinion of D. Bowersox, who believes: “a forecast is a prediction of the value or number of units of products that will be produced, shipped or sold with a certain probability ...” [1]. A typical example of a logistics forecast is a

weekly or monthly forecast for a product from a distribution center. For analytical or reporting purposes, forecast data relating to different periods of time can be approximated ”[1].

The author [1] also emphasizes that "an accurate and reliable forecast is a product of the integration of forecasting techniques, appropriate information support and adequate management of all processes."

Thus, the forecast of the required number of vehicles for the collection and then delivery of fruits and vegetables must be carried out as two different processes.

Determination of the required number of rolling stock per month for harvesting fruits and vegetables is carried out according to the following formula:

$$x = \frac{Qc}{q*\delta} * К_{нсб;\ ед} \quad (2)$$

where:

An sat-the required number of vehicles for collection per month; units

Qc is the number of collected products per month; T

q is the carrying capacity of the vehicle; T

- the coefficient of using the carrying capacity;

$К_{нсб}$-coefficient of uneven collection of products in a given month.

При этом в данном прогнозе коэффициент неравномерности будем определять следующим образом:

$$К_{нсб} = \frac{Qфакт\ сб}{Qсред\ сб};\ ед \quad (3)$$

where:

$Q_{факт}$ -is the actual collection of fruits and vegetables in a given month; T

$Q_{сред\ сб}$ -average monthly collection of products, T

To forecast the required fleet of vehicles for the delivery of fruits and vegetables, the following formula is proposed:

$$Ап_{разв} = \frac{(Oc - Qxp)}{Q\ сред.сб} * Кразв \quad (4)$$

where:

An div. - the required number of vehicles for the delivery of fruits and vegetables, units

Qxp is the volume of products left in the terminal for storage, T

Kn raz-coefficient of uneven delivery of products in a given month.

The use of formulas (1 ÷ 4) to coordinate the work of road transport in the assembly and distribution terminals will make it possible to clearly plan the use of rolling stock within a month. If necessary, you can detail planning periods by weeks, days.

In logistics, the RP technology (Requirements / resource planning) is used in relation to forecasting resource needs. However, the concept of this technology can also be used to predict the need for rolling stock for transportation of manufactured products. In our example, for the collection and delivery of fruits and vegetables. The objectively existing unevenness in the production of fruit and vegetable products necessitates the presence of a reserve of rolling stock in the terminal for its “smoothing”. However, the concept of “reserve” can be commented as follows:

Fig. 2 Conceptual diagram of the characteristics of the rolling stock reserve.

The degree of overfulfillment of the plan (in our example, the collection of fruits and vegetables) can be and in fact is not the same. Successes in the use of production capacity in excess of the planned in any industry can be realized with benefit only if the supplying industries provide additional raw materials and fuel on time, the consuming industries can use an additional product, and transport can carry out additional transportation of raw materials, fuel and finished product. ... Consequently, the availability of reserves in related industries requires the availability of reserves in transport.

Thus, the proposed methodology for calculating the amount of car traffic required for the development of a given volume of car traffic will make it possible to determine a fairly accurate number of them, according to need, and to coordinate the work of the reserve fleet of rolling stock.

One of the most widespread logistics technologies in the world is the Just-in-time-JIT concept (just in time). Moreover, different authors call it differently: logistics technology, the principle of logistics, philosophy of inventory management, etc.

James R. Stock, analyzing the philosophy under study, emphasizes: “JIT links together such areas as procurement and supply, production and logistics” [18].

Richard German in his research gives a more in-depth characterization: "when working in JIT mode, transportation becomes one of the most important components of logistics". In this case, the requirements for the company's transport network become even more stringent and include: the need for short delivery times and stability of delivery times, better communications, working with fewer suppliers, establishing long-term relationships with them, the availability of efficient vehicles and equipment for material handling, and also use more sophisticated strategies when making decisions related to transportation [18].

Scientists researching the problems of transport logistics, in particular LB Mirotin, believe that for the delivery of goods "just in time" and with the least possible cost of resources, a single technological process should be developed and implemented based on the integration of production, transport and consumption.

Thus, the process proposed for the study should include the following elements: production of EPP-collection of EPP-transportation-CPT-storage-delivery of EPP.

Monthly irregularities in the collection and distribution of potatoes

Table 2

Months	**Fruits volume, prod, tonnes.**	
	collection	**distribution**
January	-	40
February	-	40
March	20	20
April	30	20
May	50	20
June	60	-
July	100	-
August	100	-
September	80	20
October	60	20
November	-	40
December	-	40
Total for the year	500	500

The results of the demand for rolling stock, taking into account the irregularity factor

Table 3

Months	**Apatr. To collect thousand units**	**Difference**		**Apotr for delivery, thousand units**	**Difference**	
		A lack of	**Simple**		**A lack of**	**Simple**
January	-	-	-	2,0	0,9	-
February	-	-	-	2,0	0,9	-
March	1,0	-	1,1	1,0	-	0,1
April	1,5	-	0,6	1,0	-	0,1
May	2,5	0,4	-	1,0	-	0,1
June	3,0	0,9	-	-	-	-
July	5,0	2,9	-	-	-	-
August	5,0	2,9	-	-	-	-

September	4,0	1,9	-	1,0	-	0,1
October	3,0	0,9	-	1,0	-	0,1
November	-	-	-	2,0	0,9	-
December	-	-	-	2,0	0,9	-
Total for the year	2,1	-	-	1,1	-	-

Calculation of the required number of vehicles for the collection and delivery of fruits and vegetables, taking into account the factor of unevenness.

Table 4

Months	Harvest, thousand tons	Storage volume, thousand tons	Delivery volume, thousand tons	K_N for collection	Kn for delivery	Ap for collection, thousand units	Ap for delivery, thousand units
January	-	20,0	40,0	-	1,82	-	2,0
February	-	20,0	40,0	-	1,82	-	2,0
March	20,0	20,0	20,0	0,48	0,91	1,0	1,0
April	30,0	20,0	20,0	0,71	0,91	1,5	1,0
May	50,0	20,0	20,0	1,19	-	2,5	1,0
June	60,0	20,0	-	1,43	-	3,0	-
July	100,0	20,0	-	2,38	-	5,0	-
August	100,0	20,0	-	2,38	0,91	5,0	-
September	80,0	20,0	20,0	1,9	0,91	4,0	1,0
October	60,0	20,0	20,0	1,43	1,82	3,0	1,0
November	-	20,0	40,0	-	1,82	-	2,0
December	-	20,0	40,0	-	-	-	2,0
Total for the year	500,0	240,0	260,0	-	-	-	-
Average monthly volume	42,0	20,0	22,0	-	-	2,1	1,1

* Note: the carrying capacity of the vehicle for the calculation is taken equal to 20.0 t; lifting capacity utilization factor = 1.0.

Conclusions

Based on the research performed, we can draw the following conclusions:

1. The demand of the population for fruit and vegetable products and their export can be fully met by the agricultural sector of Uzbekistan.

2. The process of terminalization is being actively studied today, since with the help of terminal systems, timely and full delivery of fruits and vegetables to the population is possible.

3. Production, ripening and collection of fruit and vegetable products occur in conditions of objective unevenness.

4. Coordination of the interaction of various participants in the supply chain of fruit and vegetable products should be carried out taking into account the coefficient of unevenness.

5. To ensure a clear interaction of the entire supply chain, it is proposed for the transport component to use the principles of JIT (just in time) and RP (just according to needs), which will increase the efficiency of the entire process.

6. The developed methodology, expressed in terms of the monthly collection, delivery of fruits and vegetables, as well as determining the need for rolling stock will allow in practice to coordinate the transport and technological processes occurring in the assembly and distribution terminals.

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