

**ICEST 2021**

**II International Conference on Economic and Social Trends for Sustainability of Modern Society**

**INFLUENCE ON THE LEVEL OF CONCENTRATION  
EFFICIENCY AND DEVELOPMENT OF ECONOMIC SYSTEMS**

N. A. Simchenko (a), G. Mabilia (b)\*, E. V. Romanyuk (c), A. I. Voloshin (d)

\*Corresponding author

(a) V.I. Vernadsky Crimean Federal University, Simferopol, Crimea, Russia, solnce.hp@gmail.com

(b) V.I. Vernadsky Crimean Federal University, Simferopol, Crimea, Russia, gilmabilia@mail.ru

(c) V.I. Vernadsky Crimean Federal University, Simferopol, Crimea, Russia, rommania@rambler.ru

(d) V.I. Vernadsky Crimean Federal University, Simferopol, Crimea, Russia, alexvl77@mail.ru

**Abstract**

The essential characteristic of the concentration of production in the formations of economic activity has been scientifically investigated. The theoretical and methodological aspects of the efficiency of economic systems and their components, subsectors of agricultural production in general, and gardening in particular are generalized. Depending on the general trend of development of specialization of production, identified the forms and types of concentration of production and to define its parameters. It offered evidence-based practical solutions to improve the efficiency of production as a determinant of long-term revival of horticulture sub-sector of the Crimea on the basis of a systematic study of the main trends of its activities. The basic factors of the state of efficiency of production and concentration of fruit production. Refined processes and mechanisms to ensure the improvement of the sub-sectors of horticulture of Crimea. The concentration of production is characterized by the concentration of types of resources (land, material, technical and human) in enterprises. Production of fruits profitability (59.1%) in enterprises with 120 workers per 1000 hectares of agricultural land, the yield of 41.1 quintals and profit 21823.32 rub. hectare fruit-bearing plants. It stressed that significant reserves of increase of efficiency of production concentration in the sub-sectors of the economy achieved through increased specialization.

2357-1330 © 2021 Published by European Publisher.

*Keywords:* Horticultural subsector, level of efficiency, innovative foundations of intensification of production, material and technical resources, optimal structure of production



## **1. Introduction**

In the modern reintegration of the sectoral systems of the Crimea in the all-Russian economic space, the concentration of production acquires significant relevance, since it significantly affects the scale and efficiency of production and its further development on an innovative basis. Meanwhile, the problem of concentration in the sectors of the economy has not been sufficiently studied; a number of aspects of this topic require in-depth generalization based on the latest data on trends in changes in the volume of consumption of types of resources of formations and in absolute gross production. Therefore, an in-depth study of this problem requires a detailed disclosure of the theoretical foundations of concentration, the identification of various approaches to its interpretation. Since the concentration of production is a complex multidimensional process of the development of agriculture in general, and agrarian formations in particular, it is worth identifying the forms of concentration of production depending on the nature of its development. This will provide an opportunity for an in-depth analysis of the impact of concentration on the economic efficiency of agricultural enterprises.

## **2. Problem Statement**

The problem of systematization of absolute and relative parameters of an objective assessment of the state of fruit production efficiency needs to be clarified. It is necessary to generalize the system of indicators of the effectiveness of the concentration of production in agricultural formations. The transition to modern economic conditions has caused a number of complex organizational and economic problems. Insufficient knowledge of the problem of increasing the efficiency of fruit production determined the relevance of the selected research topic. The development of sectoral markets in general, food markets in particular, and our own fruit-growing production is one of the priority socio-economic tasks of regional long-term agricultural strategies. It is based on the need to increase the level of concentration of production and ensure an adequate level of efficiency in the functioning of industry markets. The development of strategies for the effectiveness of sectoral markets should be based on an analysis of the current state and identified trends in industries. The successful implementation of the problems of this article is the result of determining its object "Modern processes of forming mechanisms for increasing the economic efficiency of fruit production in agricultural enterprises" and its subject "A set of theoretical and methodological approaches to the formation of mechanisms for increasing the economic efficiency of concentration of fruit production", emphasizing the scientific position that significant reserves for increasing the efficiency of concentration of production in economic systems is achieved by deepening industry specialization.

## **3. Research Questions**

The main objective of the economic component of industrial production systems, horticulture is the steady strengthening of the base capacity (land, logistics and labor). Achieving this goal requires the solution of contemporary problems of the sector by improving production efficiency. Therefore, priority is to ensure the continued growth and persistence industry specialization, is an important source of increased efficiency of concentration.

#### 4. Purpose of the Study

The purpose of research is to develop practical proposals to improve the efficiency of the production of fruit and horticultural sub-sector development of Crimea in the near future. Achieving this goal is the result of generalization of theoretical and methodological aspects of the formation and development of the horticultural industry market; system analysis of current trends the state horticultural sub-sector in the Crimea.

#### 5. Research Methods

The theoretical and methodological basis of this article is the use of traditional research methods and techniques, such as: dialectical and analytical methods of understanding the essence of the phenomenon, statistical and mathematical methods, as well as a systematic approach to the analysis of empirical data and dynamics of fruit production, scientific works of agricultural economists, in which the theoretical and practical aspects of the efficiency of fruit production are revealed. A significant contribution to the creation and development of the theoretical and methodological foundations of the efficiency of fruit production was made by such domestic and foreign researchers as: (Abdilayyp, 2014; Agirbov & Mukhametzyanov, 2012; Belikova, 2011; Ergin et al., 2017; Jardot et al., 2010; Morrison-Paul & Nehring, 2005).

To calculate the level of concentration in horticulture and its sub-industry market, it is necessary to identify the corresponding systems of indicators, the main of which are the parameters of analysis of variance (Table 1), statistical regression analysis (Table 2), trends in the efficiency of production of fruit and berry products (Table 5 and 6). The calculation of the parameters of the level of concentration of production and their impact on the economic efficiency and the degree of development of the sub-branch of horticulture was carried out on the example of 22 specialized horticultural formations.

In addition to the estimated indicators of production efficiency, formulated in Table 1, there are systems of natural and cost indicators of economic efficiency, differentiated in objective-logical groups, planned-actual, single-group indicators, etc. (Morrison-Paul & Nehring, 2005). At the same time, the use of an adequate system of indicators made it possible to conduct an objectively meaningful analysis of the concentration level and economic efficiency of agricultural production, identify the prerequisites for the placement of gardening, increase the efficiency and development of fruit production (Khabirov & Sitdikova, 2008).

In this regard, it is necessary to revise the traditional system of indicators of economic efficiency (R) and formulate a different conceptual approach to its calculation. The original efficiency formula is as follows:

$$R = \frac{\prod_{i=1}^n \equiv \left( (\sum_i^n \rho_i \delta_i) - ((\sum_i^n \omega_i \varphi_i) + \tau) \right)}{\prod_{i=1}^m \equiv \left( (\sum_i^n \omega_i \varphi_i) + \tau \right)} \quad (1)$$

where  $\prod_{i=1}^n$  - Parameter of the aggregate subsector effect;  $\prod_{i=1}^m \equiv$  - the parameter of total costs required for the formation of a subsector useful effect;  $\rho_i \delta_i$  - criteria for the aggregate "cash flow"

from the sale of marketable products in the sub-industry;  $\omega_i\varphi_i$ - criteria for the total cost of production and sales of commercial products (with a marketability level of at least 50%) and  $\tau$  - the cumulative overhead parameter.

The existing methods of agroeconomic research refer to the toolkit for the calculation and analytical substantiation of models for organizing production according to reasonable parameters and standardized values of parameters, the practical application of which represents a meaningful image of the fruit growing industry (Dalgatova & Kazibekova 2013).

When assessing the level of concentration and its impact on production efficiency in the horticultural sub-industry, we were guided by the fact that, in accordance with the accepted methods, it is necessary to use data on the costs of funds, labor and productivity indicators of plantings for at least 4-6 years of marketable fruiting. To identify the factors of high profitability of some horticultural enterprises and low productivity of others, we used various conceptual approaches (Agoshkova & Agoshkova, 2014; Hadley et al., 2013).

The level of economic efficiency of concentration of production largely depends on the degree of specialization and intensification of production. Forming our own position on the essential characteristics and methodological approach to the identification of factor determinants of efficiency in the sub-sectors of the agro-industrial complex, we proceeded from the contradictions put forward by agricultural economists (Kushniruk, 2012; Khabirov & Sitdikova, 2008; Trunov et al., 2013). Criteria of economic efficiency and the positive dynamics of its indicators is manifested in a systemic decrease in direct labor costs and production costs, in an increase in gross output, gross and net income, which accompanies an increase in the level of cost recovery and profitability of all activities (Ilyasova, 2012; Sokolov et al., 2016).

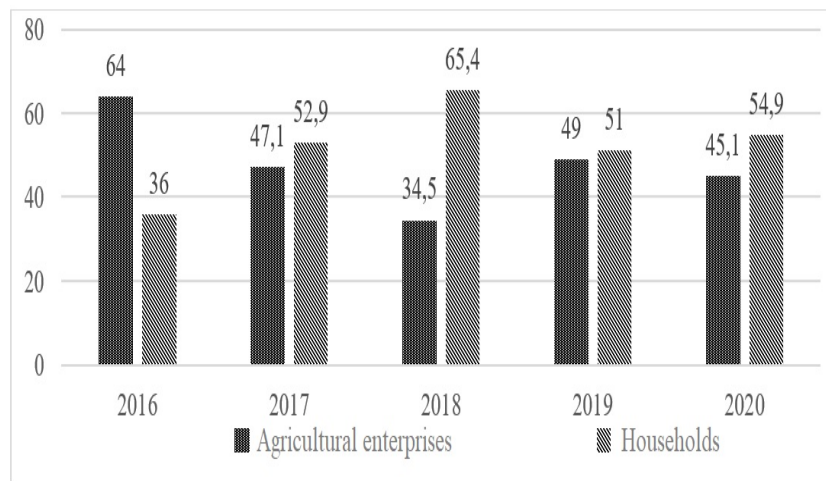
Speaking about the criteria for the efficiency of concentration of production, they should, in its absolute and relative indicators, characterize the efficiency of the use of types of resources. And, we will consider effective the production system that will ensure, in Crimea, an increase in fruit production by 20-30%, that is, by 80-90 thousand tons of fruits, an increase in consumption by 1.5 times of marketable products, that is, 1311 kg fruits and berries annually.

## 6. Findings

Analysis of data on land use in Crimea indicates that the largest areas of orchards (77.5%) are concentrated in Krasnogvardeisky, Bakhchisarai, Nizhnegorsk and Simferopol districts. About 50% of more than 10.0 thousand hectares of the total area in industrial horticultural enterprises are capable of producing standard products. The Krasnogvardeisky, Dzhankoysky, Simferopol and Bakhchisaraisky districts account for a significant area of abandoned gardens (more than 80%). The replacement of old gardens with young ones is being implemented at a slow pace. Of the 1.5 thousand hectares of planting young plantations, according to the plan, only one tenth of the need has been planted, which is 1.5 thousand hectares. In the structure of the total area occupied by orchards, young plantings account for 14%, instead of 25% planned.

The most intensively to date the laying of young gardens are engaged in the Belogorsk, Bakhchisarai, Nizhnegorsk and Krasnogvardeisky districts. The share of young plantings is 95% of all young orchards. Positive trends are outlined in the Kirov and Simferopol districts. In some districts, such

as Saki and Sovetsky districts, young orchards have practically not been laid since the late 2000s. In 2020 compared to 2016 fruit production in specialized enterprises decreased by 30%, and in households - increased by more than 30%. The data presented in Figure 1 indicate that the private households of the population turned out to be not so vulnerable to a crisis situation.



**Figure 1.** Share of fruit and berry production in agricultural production in Crimea, for 2016-2020, %  
Source: compiled by the authors

Since the 90s, the area under fruit plantations has been reduced by 2.3 thousand hectares annually. Accordingly, there was a significant decrease in the gross harvest and fruit yield. In 2000, the orchards already occupied 39 thousand hectares, which was only 11% of the agricultural area. The yield decreased to 22.5 100kg/ha, and the gross yield amounted to 77 thousand tons. Against the background of the fact that the planting of young plantings has completely stopped, the uprooting of orchards was actively carried out - 4.3 thousand hectares.

An analysis of the overall productivity of orchards showed that in 2018 115.6 thousand tons of fruits were produced in Crimea. In recent years, this is the highest yield indicator. Despite the established positive trend, this volume of production is not enough to achieve the level of minimum demand that satisfies local consumers, vacationers, processing enterprises and is sufficient for contractual supplies or exports, which amount to 500-550 thousand tons.

Productivity of both pome and stone fruit crops in 2020 compared to 2016. increased by more than 2 times. Empirical data in the sub-industry for several years eloquently indicate that fruit growing has not overcome the recession and crisis phenomena in its development. If this situation is maintained for 5 years, the area of fruit plantations in Crimea will decrease to 12-15 thousand hectares. In the last three years alone, 12 thousand hectares of orchards have been removed from gardening. In Simferopol, Belogorsk and Dzhankoy districts, the difference in indicators is especially noticeable.

Significant differences in the level of productivity of orchards, the quality and cost of fruit and berry products cause a sharp fluctuation in the profitability of fruit growing for individual farms. At enterprises located in the most favorable natural and climatic conditions for the industry, the level of profitability is from 40% to 120%, and in those not favorable for fruit production, it is much lower and varies from minus

10% to plus 20%.

Previously, even at relatively low yields, high prices of fruits provide high profitability of horticulture. Studies show that at the actual level of prices for goods and other elements that form the cost of production and sale of fruits and berries, it is possible to achieve a high level of efficiency when the yield of orchards is equal to 150 kg/ha of high-quality seed crops and about 120 100kg/ha of fruits stone fruit crops (Didyulya & Katunina, 2017).

According to climatic and soil conditions, the territory of Crimea can be divided into three zones: southern - areas of Alushta, Sudak, Feodosia, Yalta (2 farms); foothill - Bakhchisarai region, Simferopol region, areas of Sevastopol (11 farms); steppe - other administrative regions of Crimea (9 farms). According to the research, it is obvious that among the regions of Crimea in terms of area and fruit production, the leading positions are occupied by the Nizhnegorsk, Simferopol and Bakhchisarai regions.

An empirical analysis of the production and sale of fruits has confirmed that in all farms of the Crimea and the industry, gross production is dynamically decreasing. The systemic reduction of areas and their replacement with low-cost types of agricultural activities, primarily grain production, excludes the desire of enterprise managers to make additional capital investments in uprooting old and laying new orchards. It is noted that from 2014 to 2020. The total area reduction was 220 hectares, that is, from 830 hectares to 610 hectares with an absolute reduction rate of 1.3 times. With such dynamics of land use, it is difficult to implement the policy of providing the population with the necessary volumes of fruit products and, thereby, entails a decrease in the remaining parameters of production and output from 1 unit of consumed resource potential. The dynamics trend of yield, gross harvest and area are presented in Table 1.

**Table 1.** Analysis of variance of fruit yield in the regions of Crimea

№	Years	Fruit yield, 100kg/ha		t0	ξt	ξ(i)- ξ̄	I ξ(i)-ξ̄I	(ξ(i)-ξ̄)^2	(ξ(i)-ξ̄)^22	
		Total yield, 100kg/ha	Average yield for n1 and n2, 100kg/ha						For n1	For n2
9	2016	81.95		2	163.9	26.5	26.5	701.5		429.0
10	2017	69.28		3	207.8	8.7	8.7	76.5		64.7
11	2018	91.34	61.24	4	365.4	25.7	25.7	662.2		906.1
12	2019	83.76		5	418.8	13.1	13.1	171.2		507.2
13	2020	50.19		6	301.1	- 25.6	25.6	653.2		122.1
Total	x	x	45,32	X	922.9	x	221.8	4576.4	733.7	4680.8

Source: compiled on the basis of data from the Federal State Statistics Service for the Republic of Crimea.

Initial and calculated data interactively systematize the instability of fruit production both in the district and separately by enterprises, in relation to the achieved average yield level (45.32 100 kg/ha) against the background of the actual picture 38.97 100kg/ha, 15.15 100kg/ha, 16.75 100kg/ha, 42.9 100kg/ha, 83.76 100kg/ha, 50.19 100kg/ha, and the total gross harvest is 133.5 thousand tons, 39.1 thousand tons, 125.6 thousand tons, 29.6 thousand tons, 115.6 thousand tons, 91.7 thousand tons.

Based on reasonable data, the indicators of which are distorted from the standard deviation (20.4 100kg/ha) with a coefficient of variation equal to 0.45. Mathematical manipulations and the performed calculations give grounds to reveal the degree of yield fluctuation depending on the area tendency. The

yield varies across the years of analysis in leaps and bounds, despite its flattening by a straight growing line with a growth rate of 5.071 and a conventionally average yield of 9.825 100kg/ha. This trend does not reflect the true state of affairs in the industry, since the intermediate indicators that we have substantiated reflect a different reality: from the calculation of the average yield, considering the criterion of frequency and the probability of its expected value occurring.

After analyzing, in the context of 22 enterprises in the regions of Crimea, the general dynamics of yield, we have compiled a Table of statistical analysis of the general dynamics of yield, considering the probability of its onset. In harmonizing the results, we have chosen the method of grouping enterprises in different regions according to the scaling of productivity. With this in mind, six groups are justified. With an average yield of 36.36 100kg/ha, individual group averages differ significantly and amounted to 9.5 100kg/ha, 43.9 100kg/ha, 71.1 100kg/ha, 110.6 100kg/ha, 119.3 100kg/ha. (Table 2).

**Table 2.** The results of the statistical and regression analysis of the dynamics of productivity by groups of enterprises in the regions of Crimea, for 2018-2020

Group of enterprises	Productivity, 100kg/ha	Number of enterprises	Average yield, 100kg/ha	Dispersion, 100kg/ha	Standard deviation	The coefficient of variation	T-test
I	1-28	13	9.5	56.0	7.5	±78.9	-
II	28-55	3	43.9	15.4	3.9	±8.9	7.6
III	55-82	3	71.1	15.4	3.9	±5.5	8.5
IV	82-109	0	0.0	0.0	0.0	±0.0	15.7
V	109-136	2	110.6	4.3	2.1	±1.87	43.6
VI	136-163	1	119.3	0.0	0.0	0	0.0

Source: compiled on the basis of data from the Federal State Statistics Service for the Republic of Crimea.

The question arises as to why and how such dynamics of the yield of fruit crops is determined by enterprises. The answer to this question is possible only with a systematic calculation of the indicators of means, variance and variation. In this substantiation, the yield variance was 1969.4 100kg/ha and the standard deviation was equal to 44.38 kg/ha and the coefficient of variation was ± 120.7%. Productivity is the main natural indicator of the efficiency of the industry as a whole, as well as its level in individual enterprises, and demonstrates how efficiently enterprises use the available resources.

The enterprises of the first (I) group, which had a yield equal to 10.8 100kg/ha, achieved losses in the amount of 37.5 rub/100kg, or 405.3 rubles/ha, as a result of the impact, from our point of view, such indicators as a low level of output per hectare, high cost (1193.1 rub/100kg), overhead costs and other costs outside the cost amounted to 77.7 rub. The presented indicators confirm the previously substantiated conclusions; to what extent they reflect the general state of fruit growing in the post-reform period (Table 3).

**Table 3.** Summary table of average natural and cost indicators of fruit production by groups of enterprises, for 2018-2020

Group of enterprises	Average yield, 100 kg/ha	Average cost			Average cost, rub/100 kg	Average selling price 100kg, rub.	Average profit (loss) per 100 kg, rub.	Average profit (loss) per hectare, rubles
		Production rub/100kg	full, rub/100kg	full, thousand rubles				
I	10.8	1193.1	1270.8	13792.2	77.7	1233.3	-37.5	-405
II	46.3	919.5	1261.8	57048.3	342	951.9	-309.9	-14348.4
III	71.1	606.3	820.2	58194.9	213.9	738.3	-81.9	-5823.09
IV	127.7	714.3	828.6	108386.7	114.3	1187.1	358.5	45780.45
V	169.3	294	384.3	62378.4	90.3	588.6	204.3	34587.99

Source: compiled by the authors.

The farms of the fourth group (2 farms), with the greatest concentration of areas, retain their leadership among all the studied enterprises, in terms of area (20%), in terms of profit from sales of products per 100kg and per 1 hectare (358.5 rubles per 100kg and 45780.6 rubles/hectare, respectively).

Although, paying attention to the relatively low level of production costs per 100kg of fruit products and per hectare of plantations, relatively equal to the cost of enterprises of the third group, whose profit is lower to 81.6 rub/100kg or 5795.7 rub/ha with a prime cost of 820.2 rub/100kg. As for the enterprises of the second group, the natural influence of low yields and high costs on products systematizes unprofitable activities with a loss equal to 309.9 rubles for 100kg or 14347.5 rub/ha.

Here it is important to highlight the fact that in the horticulture of the Crimean regions, it is necessary to avoid too low and high concentrations of areas, which are a factor of low yields, average production costs and relatively low profits (204.3 rub/100kg or 34587.99 rub/ha) and profitability of production in comparison with a group of leading enterprises, for which these indicators are relatively the same, a comparative assessment and trend reflection.

A representation of the efficiency of fruit production by groups makes it possible to visually make sure that group I (13 farms) and II (3 farms) are in the area of the table reflecting the unprofitable activity. The reason for such a level of efficiency of the enterprises of the fifth group (PJSC "Vesna") lies in the results from the sale of fruit-growing products. To achieve maximum efficiency, farms in this group should consider our recommendations. The most optimal ratio of costs and effect, that is, the profit received per centner and hectare, has developed in group IV, the profitability of which reaches 43.3%. The group is represented by farms in Nizhnegorsk (PJSC Pobeda) and Simferopol (LLC Yarosvit-Agro) districts.

The most effective use of production factors aimed at stimulating labor employed in the industry will thus allow: to ensure high growth rates of indicators reflecting the efficiency of horticultural activities, further increase in labor productivity, qualitative transformation of material and technical support, accelerating the revival of Crimean horticulture, to numerous the factors of which we assigned those contained in the blocks.

The total area of fruit plantations in 22 studied enterprises of the Crimean regions and in farms of all categories on average for 2018-2020. amounted to 1452 hectares of fruit-bearing plantations, of which 42.9% are pome crops, 43.6% - stone fruits and 6% - berries. Over the past 5-10 years, the area has decreased by almost 20%. The average fruit yield in the studied enterprises is 3.63 t/ha, which is slightly



lower than the regional level of 4.53 t/ha. Both in enterprises and in the region, a low level of productivity is systematically observed, since in the best years, the productivity of fruit crops reached 9.13 t/ha. In order to identify possible reasons for the reduction in yield per hectare of a garden, it becomes important to study the dynamics of the areas of gardens and their ratio to the area of arable land.

Since 2000, the areas of fruit and berry plantations in enterprises have decreased by 5.2 thousand hectares, and from 2018 to 2020 from 15.2 thousand hectares to 11.5 thousand hectares, as a result of which their share has decreased by almost 24%. The rate of uprooting of old plantations is higher than the laying of young ones. That is why, in many specialized and specialized horticultural enterprises, there is a violation of the ratio between fruiting plantations and the proportion of old unproductive plantations remains high. The area in the households of the population has grown by almost 10% (by 50.6 thousand hectares).

Analysis of the data reflecting the proportion of fruiting plantations in the total area of plantations during the study period, we substantiated a seemingly non-standard situation, non-compliance by enterprises with production technology, the ratio of the areas of fruiting gardens to the total area of plantations, which should be at the level of 70%.

The increase in the provision of the population with fruits and berries can be carried out primarily by large fruit-growing agricultural enterprises and, unfortunately, at the expense of imports. Currently, over 22 such enterprises operate in Crimea. The share of fruit-growing products in the structure of marketable products of the Crimean industry on average over the past five years amounted to 42.4%.

Studies have shown that in the field of fruit storage, they are used irrationally. So, in LLC "Vesna" of the Nizhnegorsk region in 2019, only 95.6% of the gross harvest (4,177,900 kg) and the storage volume of products (182,700 kg) were sold fresh. Therefore, in the context of the directions of the formation of an effective horticultural sub-industry, we have drawn up an optimization structure of production, in which there are solutions that indicate the optimal production parameters.

**Table 4.** Efficiency of fruit production in Crimean farms, for 2018-2020

Districts	№	Name of enterprises	The ratio of gardens to arable land	Rank	VP 100 hectares	Rank	Garden yield, 100kg/ha
	1	State farm-plant "Fruit"	4.24	16	476.67	11	15.44
	2	CJSC "Burluk"	4.43	15	861.3	8	2.52
Bakhchisarai	3	CJSC AF "Chernomorets"	1.69	21	1956.09	5	41.7
	4	CJSC Agrofirm "Crimea"	4.96	14	115.2	10	3
	5	agrofirm "Magarach"	13.81	9	606.93	6	7.81
Belogorsk	6	PE AF "Zelenogorsk"	45.87	5	380.88	19	16.15
	7	PE "Foothills"	4.17	17	43.92	20	2.9
Kirovsky	8	ChSP "Starokrymsky"	17.32	8	581.16	14	4.03
	9	PJSC "Vesna"	2.75	19	1262.22	3	108.57
Nizhnegorsk	10	Private Enterprise "Guardman"	8.29	12	519.09	17	7.9
	11	PJSC "Pobeda"	2.21	20	1627.98	4	119.3

Pervomaisky	12	SEC "Georgia"	45.51	6	864.63	12	76.04
Razdolnensky	13	JSC PZ "Slavnoe"	174.85	1	201.18	22	16.55
	14	LLC "Kronental"	3.18	18	373.35	21	26.36
	15	KS horticulture IP	13.07	10	134.55	18	66.44
Simferopol	16	LLC "Grape"	109.85	2	322.02	15	1.6
	17	LLC "Yarovsit-Agro"	1.24	22	2019.23	9	112.71
Soviet	18	CJSC "N-Pobeda" State enterprise	47.71	4	585	13	49.36
Alushta	19	State farm-plant "Alushta"	57.53	3	4494.3	1	15.87
Sevastopol	20	LLC "Kachinsky +"	6.25	13	2704.98	2	70.92
	21	SE Osipenko PJSC	8.52	11	1215.6	7	40.52
Sudak	22	"Solnechnaya Dolina"	38.8	7	2111.76	16	3.1

Source: compiled by the authors.

The main reasons for the reduction in the gross harvest of fruits and the fall in the volume of processed (VP) fruit and berry products: the absence of individual fruit-bearing crops in the structure of common fruit-bearing varieties of plantations; low productivity of plantations; low labor productivity in specialized fruit and berry farms; equipment wear, etc.

The above can be confirmed by the indicators of profitability of fruit production in the studied enterprises. During the studied period, we have determined the main indicators of the efficiency of fruit production, which shows that almost all enterprises are low-profit and ten of them are unprofitable. This state of affairs is determined by the reduction in the area of plantings and in the structure of fruiting, low yield of fruits in all unprofitable enterprises, the amount of profit per hectare of fruiting plantations of which ranged from -26707.5 rubles, -6035.67 rubles, -3308.25 rubles, up to -1070.82 rubles, 23632.35 rubles, 126,835.68 rubles, with a loss ratio of 37.5%, 16.7%, 81.8% to 2.5%, 159.6%, 58.7% respectively. One of the reasons for the deterioration of the situation in the industry is the violation of the ratio of fruiting areas in the structure of perennial plantings of enterprises.

Let's group them according to the criterion of labor resources. These tables reflect the number of enterprises that belong to each group, depending on the selected criterion. Thus, in the first group there are 13 enterprises, in the second - 5 and in the third - 4. At the same time, the number of workers in each group and per 1000 hectares of agricultural land is 41, 120 and 257 people.

**Table 5.** Efficiency of production of fruit and berry products, depending on the ratio of the area of orchards to farmland, for 2018–2020

Indicators	Groups of farms by the ratio of the area of gardens to agricultural land			The ratio of group indicators to III, %
	I	II	III	
	up to 45	from 45,1 to 90	over 90	
Number of farms	16	4	2	x
Per 1 hectare of garden, ha	6.41	49.16	107.83	5.94

Gross agricultural output produced, thousand rubles:				
- per employee	123.45	123.33	103.77	3.57
- per 100 hectares of agricultural land	1037.82	1581.21	261.6	11.91
Garden yield, 100kg / ha	39.58	39.35	9.08	4.36
Profit per 1 hectare of fruiting plantations, rub.	8207.82	118.05	27.24	x
Profitability level, %	26.76	0.53	0.99	x

Source: compiled by the authors.

Fruit production efficiency indicators indicate the output per employee 132.63 thousand rubles, 114.12 thousand rubles and 95.28 thousand rubles, respectively. The dependence of the profitability of fruit production on the level of yield is a direct indicator of the efficiency of horticulture and the data indicated in Table 8 differentiate all studied enterprises in five groups with clearly expressed low profitability.

The grouping of farms according to this criterion differentiates the studied enterprises into 5 groups. Group I includes 13 farms with a profitability of 1.64%. As for group II, with three farms that had actual loss ratios of 40.6%, 22.6%, 20.5%, now have a loss ratio of 17.9%, which suggests their abolition or liquidation.

An interesting fact is noted in the fourth group, since the total profitability will be 147.7%. For the third and fifth groups, the conditional profitability will be at the level of 3.9% and 9.6%, respectively. The grouping of the studied enterprises depending on the profitability of production indicates a different picture of the situation in the industry. At the same time, the formation of five groups is observed, one of which is monotonous and stands out as unprofitable (the fourth group, unprofitable 1.62%), containing one enterprise Crimean Horticultural Station.

Two groups are low-profit (group I - 0.99%, group III - 6.7%). The second group is defined as medium-profitable (group II), with an average profitability equal to 19.5%. The enterprises of the fifth group have the highest value of the profitability indicator, having reached the level of 76%.

In addition, having studied the dependence of the profitability of production on the level of production costs per 1 hectare, for 2018-2020, we substantiated that on the basis of which a number of conclusions can be drawn - starting from 2016, the production of apples, pears, plums become predominant in the sectoral structure of horticulture. and apricots, the share of which is over 50%, but with a high level of loss. However, in 2020. there was a sharp failure in this trend, the share of fruit growing in the structure fell to 49%. This trend was formed by specialized enterprises and farms.

**Table 6.** Efficiency of fruit production by groups of enterprises, depending on the availability of labor resources, for 2018-2020

Indicators	Groups of farms by the number of employees per 1000 hectares of agricultural land, people			Ratio of indicators of group I to III, %
	I	II	III	
	up to 80	from 81 to 150	over 151	
Number of farms	13	5	4	
Number of employees per 1000 hectares of farmland, people	41	120	257	15.7

Gross agricultural output produced, thousand rubles:				
per employee	132.63	114.12	95.28	139.2
per 100 hectares of agricultural land	516.12	1330.83	2522.37	20.5
Garden productivity, 100kg/ha	22.22	41.05	78.66	28.2
Conditional profit, rub. from 1 hectare	4207.38	21823.32	12036.21	x
Profitability level, %	30.19	59.05	21.97	x

Source: compiled by the authors.

The above data confirm the previously identified factors that worsen the state of affairs in the gardening of the Crimea. For 5-10 years, the growth rates of production have remained almost unchanged (the coefficient of variation was 2.3%), while in specialized enterprises there are very high variations in the growth rates, respectively 67.6%,  $\pm 45\%$ . The average yield was achieved with a soil quality of 70 points. With 100 points of soil quality, the average yield is only 69.3 100kg/ha. This means that the studied enterprises have different parameters of the soil quality level. The area of fruit plantations and gross harvests of fruits have dynamically decreased by more than two times, and this trend still persists (Agirbov Mukhametzyanov, 2012; Trunov et al., 2011).

This is manifested in the fact that the growth of fruit yields does not occur at the same relatively high rates as, for example, in the main fruit crops - apples, pears and peaches. Over the past 5–10 years, the increase in apple yield in Crimea amounted to 59.3 100kg/ha per year, and for pears - 68 100kg/ha, 2.6 and 3 times higher. The deterioration of indicators for peaches is explained by the fact that cultivated varieties and breeds react relatively weakly to an increase in the culture of agriculture and the use of intensive and modern innovative production technologies. To ensure more optimal use of equipment and labor resources in the flow technology of harvesting fruits, considering the experience of advanced enterprises, harvesting and transport teams should be created, with the ability of each team to serve from 200 to 400 hectares of fruit-bearing orchards with an average yield of 100-120 100kg per hectare.

## 7. Conclusion

Gardening Crimea is in crisis for the past 15-20 years. Receiving the development trend of the industry move in formations, and private farms of the population, the disintegration of large specialized farms, weak security of the material and technical resources, and more than the 70-80% depreciation of production assets sub-sector contributed over the past 15-20 years, and contributes to reducing the dynamic industry and building deterioration of the general condition of horticulture in Crimea.

The depressing situation in the Crimean fruit growing is reflected by the tendencies of a decrease in the area of plantations of fruit crops caused by an ill-considered policy of reforms in the industry, denationalization and privatization, a change in fruit growing in favor of low-cost and more profitable, at first glance, grain production. The general state of land use indicates that the largest areas of orchards (77.5%) are concentrated in Krasnogvardeisky (1.8 hectares), Bakhchisarai (2.1 hectares), Nizhnegorsk (1.3 hectares) and Simferopol (1.6 hectares) areas in which there is a systematic trend of a decrease in fruit production by more than 30% in 2020 compared to 2018.

Therefore, the restoration of fruit plantations should begin with a revision of existing plantings (only those gardens should be preserved and restored that are capable of recouping direct production costs):

conducting production in those plantations with a yield of at least 10 t/ha and observing for the future the following specific fruit and berry composition of pome crops (56.8%), stone fruits (32.6%), walnuts (4.8%), berries (5.8%).

In addition, in the structure of pome crops orchards, it is necessary to expand the share of apple and pear varieties of summer and early autumn ripening periods to 10% and 25%, respectively. An increase in the size of the plantings of these crops, as well as stone fruit and berry crops, will predetermine a decrease in the level of load when collecting fruits and a more systematic flow of funds.

An increase in the efficiency of fruit growing in general, and in particular the concentration of production in a sub-sector, can be achieved by assigning individual workers in the brigades of fruit planting enterprises for 5-10 years and combining it with other sub-sectors (for example, with vegetable growing), which has a relatively low labour intensity and high the level of commodity and business activity to cover the costs of fruit growing.

The possibility of using the advantages of specialization and concentration of production, more efficient use of production resources based on their combination, the use of attracted investment resources for laying young orchards, wide opportunities for the use of innovative technologies for the production of fruits and berries contribute to the development of horticulture in large agricultural organizations. In Crimea, we propose to organize a horticultural holding on the basis of five specialized horticultural enterprises (State Enterprise Sovkhoz-plant "Plodovoe", CJSC "Burluk", PE Agrofirma "Zelenogorsk", PJSC "Pobeda" and PJSC "Vesna"), and, on their meringue, build fruit storages, freezing and processing complexes and trading companies. Thus, the efficiency of fruit production should be aimed at reorienting the horticultural agribusiness towards increasing production volumes based on: using the advantages of concentration, specialization and intensification; increasing interest in the production of capital-intensive fruit and berry products; formation of an effective infrastructure for sub-industry business in the near future.

## References

- Abdilayyp, W. O. (2014). Production efficiency: theoretical foundations, essence and content. *Sustainable development of science and education*, 5, 5-12. [https://www.elibrary.ru/download/elibrary\\_2754100162283608.pdf](https://www.elibrary.ru/download/elibrary_2754100162283608.pdf)
- Agirbov, Y., & Mukhametzyanov, R. (2012). The state of the world market for fruit and berry products. *International Agricultural Journal*, 1, 40-42. <https://elibrary.ru/item.asp?id=17712911>
- Agoshkova, N. E., & Agoshkova, N. N. (2014). Problems and prospects of innovative development of fruit growing in Russia. *Economic Development Strategy*, 17(254), 29-36. [https://elibrary.ru/download/elibrary\\_21436937\\_29141976.pdf](https://elibrary.ru/download/elibrary_21436937_29141976.pdf)
- Belikova, N. (2011). To improve resource-saving and innovative technologies in horticulture. *Agroindustrial complex: economics and management*, 8, 30-33. [https://elibrary.ru/download/elibrary\\_21436937\\_43266274.pdf](https://elibrary.ru/download/elibrary_21436937_43266274.pdf)
- Dalgatova, Kh. Z., & Kazibekova, N. A. (2013). Promising directions for the development of horticulture and viticulture in the Republic of Dagestan. *Economics and Law Issues*, 4, 110-113.
- Didyulya, L. V., & Katunina, S. V. (2017). Analysis of the efficiency of production and sale of fruits in the farms of the Grodno region. *Economy: economics and agriculture*, 7(19). <http://aeconomy.ru/science/agro/analiz-effektivnosti-proizvodstva-i/>
- Ergin, S. M., Mabilia, G., & Sidorenko, I. Ya. (2017). Economies of Scale and Provision of Technological Efficiency in Agricultural Complexes. *Atlantis Press. International Scientific Conference. Advances in Economics, Business and Management Research "Far East Con" (ISCFEC 2020)*, 128, 2342-

2348. <https://doi.org/10.2991/aebmr.k.200312.324>

- Hadley, D., Fleming, W., & Villano, R. (2013). Is Input Mix inefficiency neglected in agriculture? A case study of pig-based farming systems in England and Wales. *Journal of Agricultural Economics*, 64, 505-515.
- Ilyasova, S. S. (2012). Strategic directions for increasing the efficiency of fruit growing in agricultural enterprises. *Economic sciences: Bulletin of Zhytomyr State University*, 1(59), 113-115.
- Jardot, D., Eichhammer, W., & Fleiter, T. (2010). *Effects of economies of scale and experience on the cost of energy efficient technologies*, 3(4), 331-346. <https://doi.org/10.1007/s12053-009-9074-6>
- Khabirov, G. A., & Sitdikova, G. Z. (2008). Efficiency of production of horticultural products in agricultural organizations of the Republic of Bashkortostan. *Bulletin of the Orenburg State Agrarian University*, 12(53), 108-116.
- Kushniruk, V. S. (2012). Development trends and efficiency of horticulture in the region. *Collection of scientific works of Lugansk NAU. Ser. "Economic Sciences"*, 61(84), 298-303.
- Morrison-Paul, C. J., & Nehring, R. (2005). Product diversification, production systems, and economic performance in US agricultural production. *Journal of Econometrics*, 126(2), 525-548. <https://doi.org/10.1016/j.jeconom.2004.05.012>
- Sokolov, O. V., Neuymin, D. S., & Trunov, A. I. (2016). Problems of the development of horticulture and the market of fruit and berry products in the context of import substitution. Technologies for the food and processing industry of the agro-industrial complex. healthy food products. *Association "TPPP AIK"*, 15, 111-123.
- Trunov, Yu. V., Kashirskaya, N. Ya., & Tsukanova, E. M. (2011). The state of apple tree plantations in the Central Black Earth Region after exposure to stressors in 2010. *Gardening and viticulture*, 2, 5-6.
- Trunov, Yu. V., Zavrazhnov, A. A., & Eremeev, D. N. (2013). Improving the efficiency of Russian horticulture through the use of intensive types of orchards and machine technologies for their cultivation. Innovative technologies and technical means for intensive gardening. *Achievements of science and technology of the agro-industrial complex*, 4, 41-43.