MANAGEMENT OF ECONOMIC SECURITY OF HORTICULTURAL ENTERPRISES IN UKRAINE

Oksana Zagorodniuk[1], Maryna Gomeniuk[2], Liudmyla Maliuga[3]

Abstract. The current state of economic security of horticultural enterprises in Ukraine, functioning in the agro-industrial complex of Ukraine, indicates the presence of a large number of internal and external threats that arise in the process of their financial and economic activities. Most horticultural enterprises have an insufficient level of economic security. *The purpose* of the study is to substantiate the algorithm of economic security management of horticultural enterprises of Ukraine. *Methodology.* During the study the following methods were used: analysis and synthesis (to critically comprehend the theoretical provisions of economic security); system analysis (to substantiate the economic security management system of horticultural enterprises and its subsystems); expert method (to determine the weights in the integral index of internal economic security of horticultural enterprise); methods of statistical (correlation and regression) analysis (to check the sensitivity of horticultural enterprises of Ukraine to changes in macroeconomic and other indicators); graphic and tabular methods (to visualize the results of the study). *Results.* The authors pay special attention to the presence of internal and external threats to the economic security of horticultural enterprises. The authors have developed a protocol for managing internal and external economic security of horticultural enterprises as a set of successive stages, which will ensure the achievement of the target level of economic security. The article substantiates the methodological approach to the assessment of internal economic security of horticultural enterprise on the basis of relative indicators, which are combined into five components. The article substantiates methodological approach to the assessment of external economic security of horticultural enterprise on the basis of four macro-indicators. *Practical implications.* The proposed protocol of economic security management of horticultural enterprise can be used as a technology of enterprise management to ensure its stable development. The proposed method for assessing internal and external economic security can be used by a horticultural enterprise. *Value/originality.* Improved the theoretical and applied bases of the study of economic security of agricultural enterprises on the example of horticultural enterprises. The methodological foundations of internal and external assessment of the economic security of enterprises were developed. The protocol of economic security management of horticultural enterprise is developed for the first time. The protocol includes interconnected and sequential stages and is adaptive to modern conditions of financial and economic activity of horticultural enterprises.

Key words: economic security, horticultural enterprise, internal economic security, external economic security, agricultural sector of Ukraine.

JEL Classification: Q12

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1. Introduction

The current state of economic security of horticultural enterprises in Ukraine, functioning in the agro-industrial complex of Ukraine, indicates the presence of a large number of internal and external threats that arise in the process of their financial and economic activities. Most horticultural enterprises have an insufficient level of economic security. The threat of loss of economic security of horticultural enterprises is fixed in the state documents: without transformative measures on the part of state and industry structures to revive and intensify the development of commercial horticulture in 7-8 years Ukraine could lose commercial horticulture and put the domestic market of fruits and berries in a strong dependence on imports.

In 2013–2019, horticultural enterprises reduced the profitability of the main activity by 9.6 times (including medium enterprises by 11.3 times, small enterprises by 3.6 times), the profitability of all activities by 4.4 times (including medium enterprises by 3.5 times, small enterprises by 4.6 times) (Ponomariov, 2000). Another threat to the economic security of horticultural enterprises is the low level of profitability of horticultural enterprises (in 2019 – 7.4%) compared to the Ukrainian economy (10.2%), agriculture (19.2%) and certain types of agriculture, such as grain farming (22.2%), vegetable farming (9.1%), plant reproduction (14.9%), animal husbandry (10.4%).

In 2013-2019, the number of employees in horticultural enterprises decreased by 42.01%, which amounted to 11,470 people, planted areas – by 15.53%, which amounted to 20 thousand hectares (State Statistics Service of Ukraine, 2021). Key performance indicators for horticultural businesses show that businesses need economic security management updated to respond to the increasing volatility and uncertainty of the external economic environment in light of the COVID-19 pandemic.

Considering all of the above, it is necessary to develop and implement a science-based management of economic security of horticultural enterprises.

Scientific information about the problem of economic security management of horticultural enterprises is absent in Ukrainian and world economic literature. At the beginning of XXI century in the Ukrainian economic scientific literature for the first time appeared a general theory of management of economic security of enterprises (Kiriienko, 2020; Ponomariov, 2020). However, these works were not devoted to the economic security of agricultural enterprises. Only since 2009 in fundamental scientific publications began to consider the problems of formation of economic security of agricultural enterprises (Boiko, 2012; Yaremova, 2012) and ensuring the economic security of agricultural enterprises (Kovalenko, 2009). The subject of reasoning in the management of economic security is a set of its elements (components), taking into account the activities of agricultural enterprises, including horticultural.

There are such approaches to determine the items (components) of economic security of the agricultural enterprises: biological, investment, social, organizational, political and legal, innovative, marketing, technological, financial, environmental, foreign economic (Zhurakivskiy, 2015), personnel, market, financial, technical and technological, legal, informational, production, environmental, energy (Tkachuk, Yaremova, 2019), organizational and managerial, financial, personnel, technical and techno-logical, legal, informational, environmental, power, investment, market and interface, and additional, such as insurance and organizational and managerial (Shumkova, 2017); investment, production, scientific and technological, raw materials, financial, energy, personnel, legal, environmental (Duyunova, 2019); financial, personnel and intellectual, production and technological, political and legal, security of decision-making and information security, environmental, investment and innovative, social, marketing, resource and technical, energy, production, transport, foreign economic (Utenkova, 2020); financial, intellectual, personnel, technological, legal, informational, environmental, power, energy components (Shumkova, 2019); financial, social, resource, ecological (Ulyanchenko, Vasylishyn, Bochulia, Herasymenko, Gorokh, 2021). According to the authors, to the components of the economic security of agricultural enterprises scientists refer components that do not characterize the economic relations of the enterprise with other economic entities. For example, legal, power and energy components.

Therefore, *the purpose of this work* is to substantiate the algorithm of economic security management of horticultural enterprises in Ukraine.

2. Materials and methods

During the study the following methods were used: analysis and synthesis (to critically comprehend the theoretical provisions of economic security); system analysis (to substantiate the economic security management system of horticultural enterprises and its subsystems); expert method (to determine the weights in the integral index of internal economic security of horticultural enterprise); methods of statistical (correlation and regression) analysis (to check the sensitivity of horticultural enterprises of Ukraine to changes in macroeconomic and other indicators); graphic and tabular methods (to visualize the results of the study).

Integrated index of internal economic security of horticultural enterprises (IES) is calculated taking into account weight coefficient of each component,

determined by the expert method and Fishburne's formula (formula 1). Fishburne's formula is designed to determine the significance (weighting) components of economic security:

$$r_i = \frac{2(n-i+1)}{(n+1)n} \qquad (1)$$

where r_i – weighting of components of economic security;

n – total number of components of economic security,

i – number (rank) of components of economic security.

3. Results

The management of economic security of horticultural enterprises is proposed to understand the totality of actions of subjects of management of economic security of enterprises to achieve the interests of owners and the target level of economic security. Management of economic security of horticultural enterprises should be developed and implemented only systematically. Achieving the target level of economic security is possible only through a systematic approach of management and accounting for all components of internal economic security (financial, industrial and environmental, personnel, market) and external economic security (monetary, tax, insurance, climate, state protectionism, etc.).

Thus, the protection of the general theory of systems and system approach (Jenkins, Youle, 1968; Mockler, 1968; Tan, 1998) in the management of economic security of horticultural enterprises should be the key to an effective and efficient system of economic security. It solves the problem of ensuring the economic security of the enterprise in conjunction with its internal and external components, achieving its sustainable development, achieving the goal of its activities and ensuring food security of the state or region.

Management of economic security of horticultural enterprises combines a set of system components, which are the controlling subsystem and the controlled subsystem, as well as principles, tools, tasks, etc.

Managing subsystem of economic security management of horticultural enterprises is represented by internal and external authorized subjects. The hierarchy of subjects of economic security management of horticultural enterprises is proposed as follows: the first level is the highest governing bodies of the enterprises (general meeting of shareholders (for private/public joint stock company), general meeting of participants (for limited liability partnership, additional liability partnership) and supervisory board), the second level is middle governing bodies of the enterprises (director, general director, management board and board of directors, accountable to

general meeting of shareholders (participants) and supervisory board), the third level is lower level of entities of economic security management of the enterprises which includes supervisory services (internal audit service, group for internal revision) and other services (departments, division, including economic security service).

Managed subsystem of economic security management of horticultural enterprises is the level of economic security of the enterprise as a whole and its components in particular.

Protocol for managing the economic security of horticultural enterprises. The formation of the protocol of economic security management of horticultural enterprises is proposed to consider as a set of interrelated and sequential activities that meet the requirements of systemic and process approaches. The developed protocol meets the requirements of consistency and causality, and is adaptive to modern conditions of financial and economic activity of horticultural enterprises. The economic essence and nature of threats to the economic security of horticultural enterprises require their division into internal and external, i.e. (1) threats created at the level of the horticultural enterprise, and (2) threats created at the state and regional level, including environmental threats. In this study, the authors will examine threats arising at the state level, although they agree that there are also regional threats, and there is a need to use cluster analysis.

The foreign economic security management protocol of horticultural enterprises is shown in Figure 1.

Management of economic security of horticultural enterprises, both in terms of internal and external components, is advisable to begin with the creation of the highest management bodies of the enterprise development strategy (stage 1), which will take into account the requirement of economic security at a sufficient level with a tendency to improve. Stage 2 involves the substantiation of economic security indicators of horticultural enterprises and the creation of an integrated index model or the use of scientifically based indicators of economic security of horticultural enterprises.

A review of the scientific literature on economic security shows the lack of methods for identifying the state of economic security of horticultural enterprises. The authors have developed a system of indicators of economic security of horticultural enterprises, based on the characteristics of horticultural enterprises and combining five components: replacement of fixed assets:

I. Financial security: (1) absolute liquidity ratio, (2) leverage ratio, (3) current assets to equity ratio, (4) product profitability (*ROS*), (5) return on assets (*ROA*), (6) cash flow ratio.
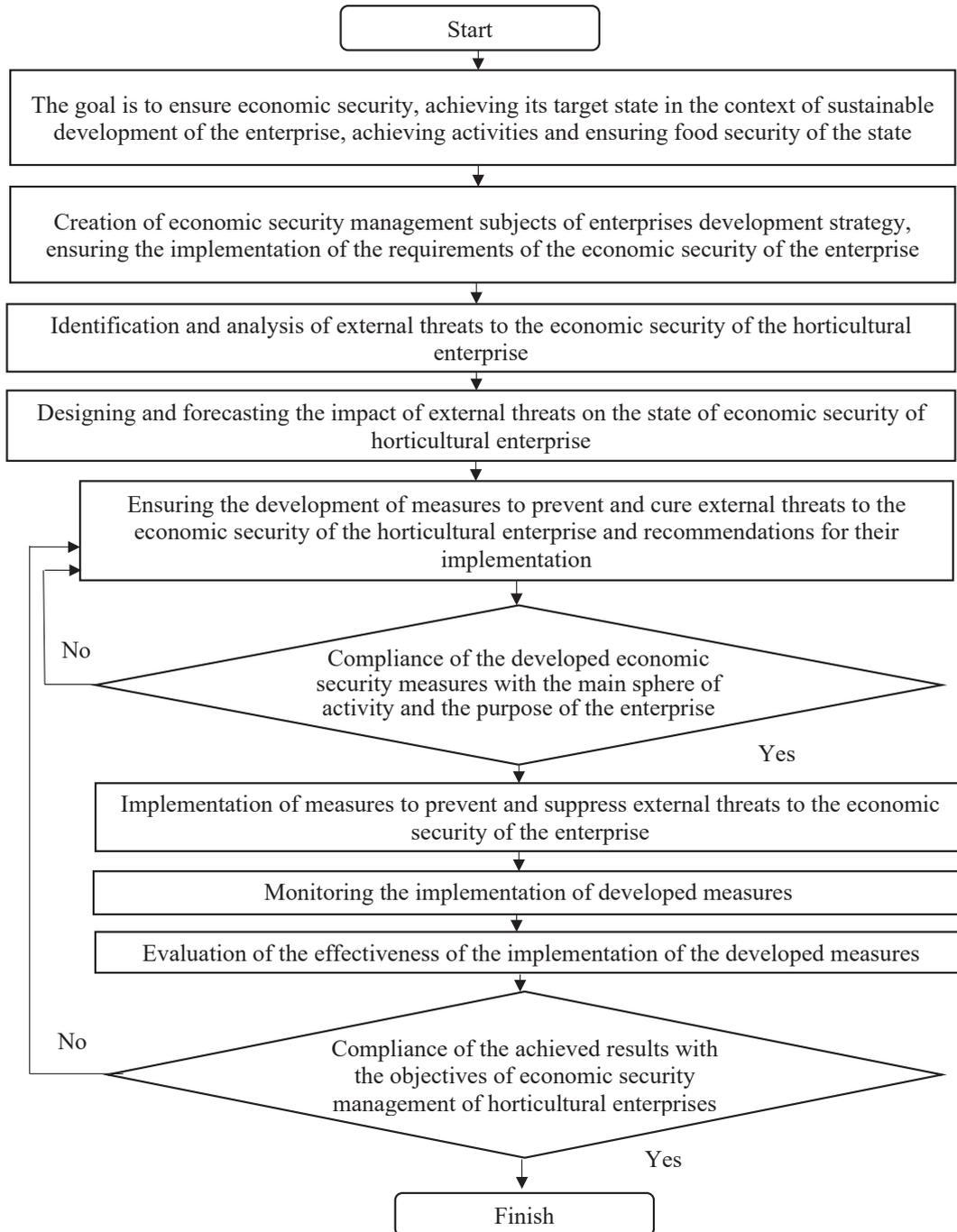
Figure 1. Protocol for the management of foreign economic security of horticultural enterprises

Source: the authors' development

II. Environmental and production security: (1) perennial crop yield, (2) plantation insurance ratio, (3) value level of fruit and berry sales.

III. Technological security: (1) yield on capital investment, (2) fixed assets depreciation ratio, (3) fixed asset replacement ratio (Smoliy, Zagorodniuk, Maliuga, 2017), (4) information security ratio, (5) digitalization ratio (Novak, Ermakov, Demiany-shyna, Revytska, 2020).

IV. Personnel and social security: (1) turnover rate of personnel, (2) employee discipline rate, (3) employee motivation rate, (4) rate of compliance of the actual workplace of the employee in accordance with the requirements of the Standards.

V. Marketing security: (1) advertising effectiveness ratio, (2) market share of fruit, and share of long-term sales contracts.

Table 1

Weighting coefficients of components of internal economic security of horticultural enterprises

	Experts					Average
	1	2	3	4	5	
Rank of components of internal economic security						
Financial	1	2	3	1	4	-
Environmental and production	2	1	1	2	1	-
Technological	4	3	5	4	3	-
Personnel and social	5	5	4	5	5	-
Marketing	3	4	2	3	2	-
Weighting of components of internal economic security						
Financial	0,33	0,27	0,20	0,33	0,13	0,25
Environmental and production	0,27	0,33	0,33	0,27	0,33	0,31
Technological	0,13	0,20	0,07	0,13	0,20	0,15
Personnel and social	0,07	0,07	0,13	0,07	0,07	0,08
Marketing	0,20	0,13	0,27	0,20	0,27	0,21
Total	1	1	1	1	1	1

Source: the authors' development

For export-oriented horticultural enterprises it is necessary to evaluate the efficiency of logistics processes studied in detail in the papers (Pitel, Alioshkina, Verniuk, Novak, Smoliy, 2019). The possibility of adapting Fishburne's formula to economic research was justified (Boiko, 2016; Kunitsyna, Britchenko, Kunitsyn, 2018; Sigal, Remesnik, 2021). The experts are the authors of this study. The rank and weight coefficients of the components of internal economic security of horticultural enterprises are calculated in Table 1.

Authors' integrated index of internal economic security of horticultural enterprises (IES):

$$IES = 0.25\ \text{FS} + 0.31\ \text{EPS} + $$
$$+ 0.15\ \text{TS} + 0.08\ \text{PSS} + 0.21\ \text{MS} \qquad (2)$$

where: FS – financial security index, EPS – environmental and production security index, TS – technological security index, PSS – personnel and social security index, MS – marketing security index.

The protocol of internal economic security management of horticultural enterprises is shown in Figure 2.

Integrated index of external economic security of the horticultural enterprise (EES) is calculated on the basis of sensitivity of the indexes of the enterprise to changes of macroeconomic and other indicators. Financing of innovation activity; volume of crediting of agrarian enterprises; credits issued by deposit corporations to residents; expenses per household on average per month; consumer price index – this is the list of factors influencing agricultural enterprises, which were proposed by Ukrainian scientists (Nepochatenko, Yermakov, Novak, Kuzina, 2020; Novak, Verniuk, Novak, 2016). The authors will use only some of them.

The sensitivity test of indicators of activity of horticultural enterprises (profitability of operating activity (Y_1), profitability of all activity (Y_2) and balance sheet currency (Y_3) are carried out in macroindicators (official USD exchange rate (F_1), consumer price index (F_2), the area of planted fruit and berry crops. (F_3), import and export of fruits $(F_4$ and $F_5)$, taxation $(F_6, F_7$ and $F_8)$, amount of fruit consumption by households (F_9), fruit price index (F_{10}), discount rate of the NBU $(F_{11}$, Table 2).

The correlation between the dynamics of profitability of horticultural enterprises' operating activities (Y_1) and macroeconomic indicators $(F_1$-$F_{11})$ in 2013–2020 was determined on the basis of the correlation and regression analysis technology. As the criterion for presence and density of the relationship the coefficient of determination (R^2) and the correlation coefficient (r) are determined.

According to Figure 3, we can conclude the sensitivity of the dynamics of profitability of operating activity of horticultural enterprises to USD exchange rate $(R^2 = 0.897, r = -0.947$, Figure 3, a); average sale prices for fruits and berries $(R^2 = 0.612, r = -0.782$, Figure 3, i), total tax burden $(R^2 = 0.867, r = -0.931$, Figure 3, f); single tax for perennial plantations $(R^2 = 0.955, r = -0.977$, Figure 3, g).

Similarly, the relationship between the dynamics of profitability of all the activity of horticultural enterprises (Y_2) and macroindicators $(F_1$-$F_{11})$ in 2013–2020 was checked. Dynamics of profitability of all the activity of horticultural enterprises is sensitive to USD exchange rate $(R^2 = 0.919, r = -0.958)$; total tax burden $(R^2 = 0.900, r = -0.949)$; single tax for perennial plantations $(R^2 = 0.948, r = -0.974)$; average sale prices for fruits and berries $(R^2 = 0.642, r = -0.801)$.

Similarly, the relationship between the total value of assets, equity and liabilities of the horticultural enterprises (Y_3) and macro indicators $(F_1$-$F_{11})$ in 2013–2020 was checked. Dynamics of the total value

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│  The goal is to ensure economic security, achieving its        │
│  target state in the context of sustainable development of     │
│  the enterprise, achieving activities and ensuring food        │
│  security of the state                                         │
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│  Creation of economic security management subjects of          │
│  enterprises development strategy, ensuring the implementation  │
│  of the requirements of the economic security of the enterprise │
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│  Formation of organizational (personnel, information)           │
│  subsystem of economic security management of                   │
│  horticultural enterprise                                       │
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│  Determination of indicators of economic security of            │
│  horticultural enterprises and the creation of an integrated    │
│  index model                                                    │
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│  Determination of the state of economic security of the         │
│  horticultural enterprise                                       │
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│  Ensuring the development of economic security measures of      │
│  the horticultural enterprise based on the results of the       │
│  identification and recommendations for their implementation    │
│  (identification of performers, setting deadlines)              │
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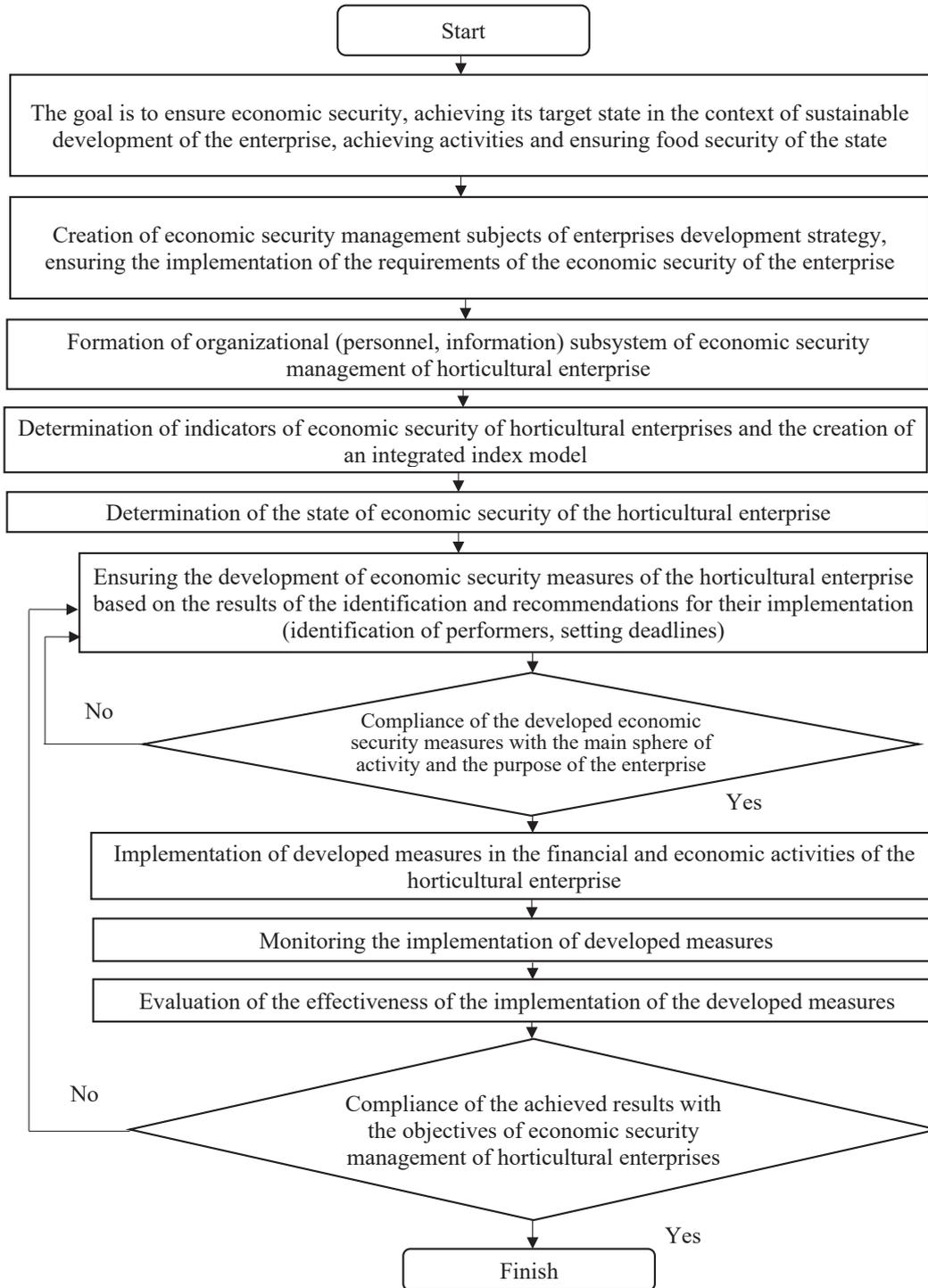
Figure 2. Protocol for the management of foreign economic security of horticultural enterprises

Source: the authors' development

of assets, equity and liabilities of the horticultural enterprises is sensitive to USD exchange rate ($R^2 = 0.444$, $r = 0.666$); consumer price index ($R^2 = 0.393$, $r = -0.627$); total tax burden ($R^2 = 0.467$, $r = 0.684$); single tax for perennial plantations ($R^2 = 0.680$, $r = 0.825$); average sale prices for fruits and berries ($R^2 = 0.374$, $r = 0.611$).

Thus, different performance indicators of horticultural enterprises (Y_1-Y_3) are sensitive to different macro-indicators (F_1-F_{11}). Only macro indicators with which there is a very strong relationship (+.70 or higher (Rex S.& Rex A., 2018)) or strong relationship (+.40 to +.69 (Rex S.& Rex A., 2018)) are used to build the Table 3. The weight coefficients of internal

Table 2

Macro-indicators of horticultural enterprise development

Macro-indicators	2013	2014	2015	2016	2017	2018	2019	2020
Profitability of operating activity of horticultural enterprises, % (Y_1)	70,8	68,9	43,8	26,1	23,8	12,2	7,4	8,0
Profitability of all activity of horticultural enterprises, % (Y_2)	64,9	62,5	39,5	18,0	21,3	10,3	14,9	3,2
Total value of assets, equity and liabilities of the horticultural enterprises, million UAH (Y_3)	11309	11898	9307	13822	17470	17839	21755	19598
Official 100 USD exchange rate, UAH (F_1)	799,3	1188,7	2184,5	2555,1	2659,7	2720,1	2584,6	2695,8
Consumer price index, % (F_2)	100,5	124,9	143,3	112,4	113,7	109,8	104,1	105
The area of planted fruit and berry crops, thousand hectares (F_3)	253	239	235	224	226	228	260	219
Import of fruits, berries and grape (including canned and dried products counted as fresh), thousand tons (F_4)	1172	856	588	732	819	871	1050	1150
Export of fruits, berries and grape (including canned and dried products counted as fresh), thousand tons (F_5)	392	350	324	283	291	331	433	272
Total tax burden, % of GDP (F_6)	23,2	23,2	25,5	27,3	27,8	27,7	26,9	27,1
Single tax for perennial plantations, % of the tax base (F_7)	0,09	0,09	0,27	0,49	0,57	0,57	0,57	0,57
The duty rate on apples (from April 1 to November 30), %(F_8)	10	10	10	10	10	10	10	10
Amount of fruit consumption by households, kg per capita (F_9)	4,1	3,7	3,1	3,3	3,7	3,8	4,0	3,7
Average sale prices for fruits and berries, UAH per 1 ton (F_{10})	3010,8	2429,1	5894,5	5863,8	8766,6	5054	6494,4	9140,2
Discount rate of the NBU, % (F_{11})	7,0	10,2	25,3	17,7	13,2	17,1	17,0	7,9

Source: data of the State Statistics Service of Ukraine

Table 3

Weighting coefficients of components of external economic security of horticultural enterprises

Macro-indicators	Indicators of horticultural enterprises			Rank of internal economic security			Weighting in on internal economic security			
	Y_1	Y_2	Y_3	Y_1	Y_2	Y_3	Y_1	Y_2	Y_3	Average
Official 100 USD exchange rate, UAH (F_1)	0.897	0.919	0.444	2	2	2	0,30	0,30	0,33	0,31
Consumer price index, % (F_2)										
Planted area of fruit and berry crops, thousand hectares (F_3)										
Import of fruits, berries and grape, thousand tons (F_4)										
Export of fruits, berries and grape, thousand tons (F_5)										
Total tax burden, % of GDP (F_6)	0.867	0.900	0.467	3	3	3	0,20	0,20	0,17	0,19
Single tax for perennial plantations, % of the tax base (F_7)	0.955	0.948	0.680	1	1	1	0,40	0,40	0,50	0,43
The duty rate on apples (from April 1 to November 30), % (F_8)										
Amount of fruit consumption by households, kg per capita (F_9)										
Average sale prices for fruits and berries, UAH per 1 ton (F_{10})	0.612	0.642		4	4		0,10	0,10		0,07
Discount rate of the NBU, % (F_{11})										
Total							1,0	1,0	1,0	-

Source: the authors' development

economic security are determined by the Fishburn formula (formula 1). To calculate the average value of weight coefficients of internal economic security, macro-indicators, to which two or more indicators of horticultural enterprises activity are sensitive, are involved.
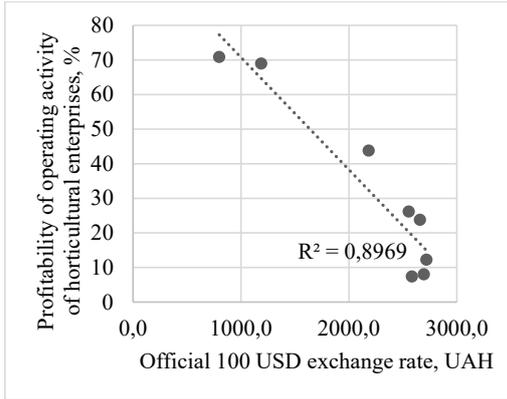
According to Table 3, we make a conclusion that economic security of horticultural enterprise is weak against the USD exchange rate (F_1), total tax burden (F_6), single tax for perennial plantations (F_7), average sale prices for fruits and berries (F_{10}). Authors' integrated index of external economic security of horticultural enterprises (EES):

$$EES = 0.31\,F_1 + 0.19\,F_6 + 0.43\,F_7 + 0.07\,F_{10} \qquad (3)$$
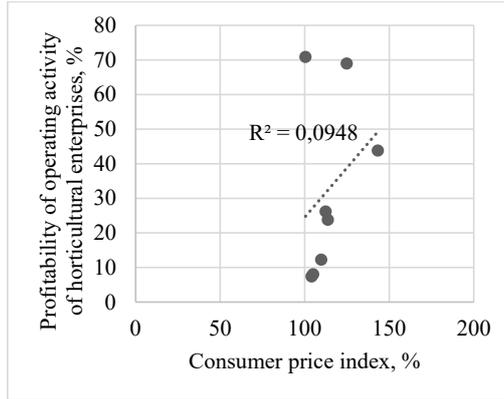
where: F_1 – official USD exchange rate, F_6 – total tax burden, F_7 – single tax for perennial plantations, F_{10} – average sale prices for fruits and berries.

Stage 3. Ensuring the development of measures of economic security of the enterprise and recommendations for their implementation (identification of performers, establishment of deadlines, expected results). In the framework of this stage the conformity of measures of economic security to the main directions of activity and purpose of the horticultural enterprise is checked.
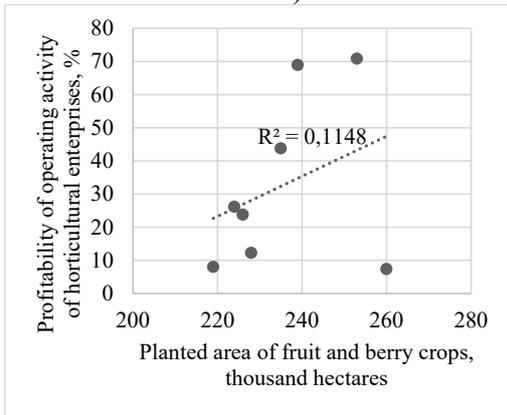
Stage 4. Implementation of measures to ensure economic security in the financial and economic activity of the enterprise.
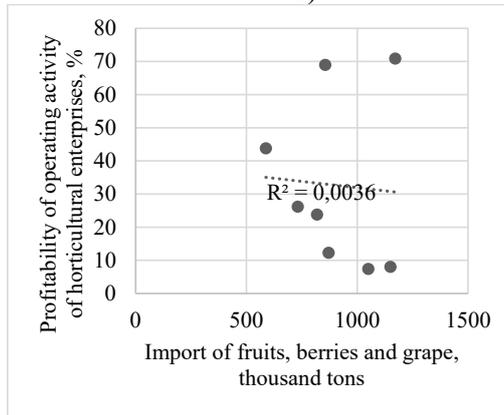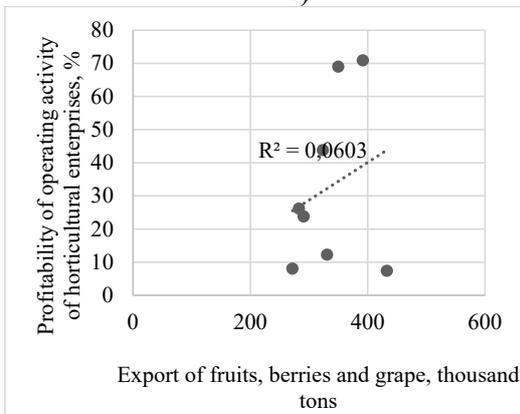
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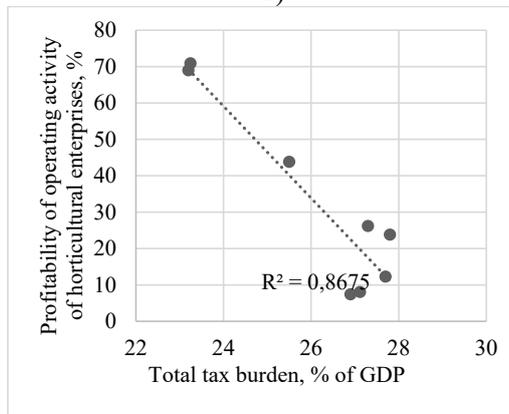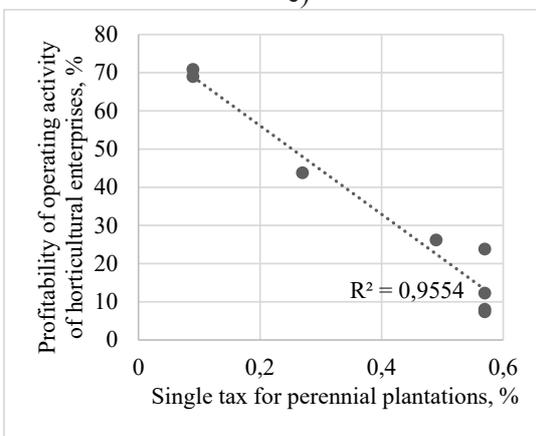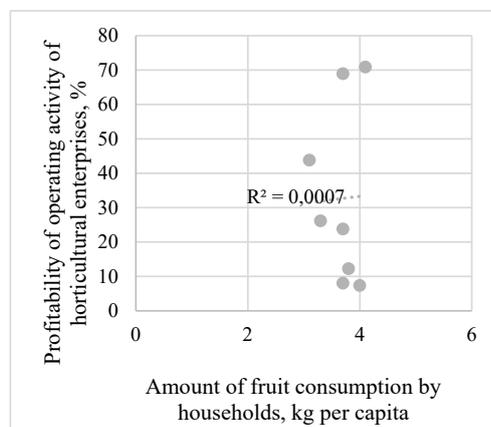

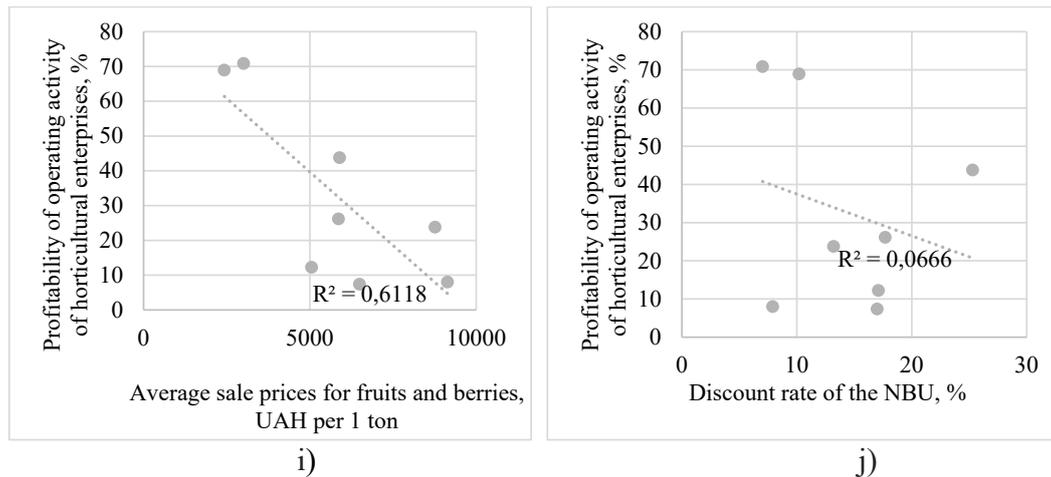e)

f)

g)

h)

i)

j)

Figure 3. Macro-indicators of horticultural enterprise development: correlation and regression analysis

Source: the authors' development

Stage 5. Monitoring the implementation of measures to ensure the economic security of the enterprise by the subjects of the first and second level and partially by the subjects of the third level, if any, in the organizational structure of the horticultural enterprise.

4. Conclusions

Management of economic security of horticultural enterprises is a set of actions carried out by the subjects of economic security of the horticultural enterprise, aimed at reducing or eliminating the negative impact of internal and external threats to achieve the target state of economic security. Management of economic security of horticultural enterprises solves such acute problems as ensuring economic security of horticultural enterprises as economic entities, ensuring food security, employment in horticulture, as well as in processing enterprises, rational use of land, development of rural areas, etc. The developed protocol of economic security management of horticultural enterprise includes interconnected and sequential stages and is adaptive to modern conditions of financial and economic activity of horticultural enterprises.

The approach developed by the authors to determine the internal economic security of horticultural enterprises involves the use of the weight of financial (0,25), social (0,25), environmental and production (0,31), technological (0,15), personnel and social (0,08), marketing (0,21) components of economic security of horticultural enterprises. The approach developed by the authors to determine the foreign economic security of horticultural enterprises involves the use of the weight of four macroeconomic indicators: the official dollar exchange rate (0,31), the total tax burden, (0,19), the single tax on perennial plantations (0,43), average sales prices of fruits and berries (0,07).

The main directions of our further research is to identify the main measures to ensure internal and external economic security of horticultural enterprises.

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