ASERS

Journal of Environmental Management and Tourism

Quarterly
Volume XII
Issue 2(50)
Spring 2021
ISSN 2068 – 7729
Journal DOI
https://doi.org/10.14505/jemt

ASERS Publishing

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Volume XII
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ASERS Publishing
http://www.asers.eu/asers-publishing
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DOI: https://doi.org/10.14505/jemt.v12.2(50).03

Development of the Organizational and Economic Mechanisms of Greenhouse Industry in the Republic of Uzbekistan

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Suggested Citation:

Durmanov, A. *et al.* (2021). Development of the Organizational and Economic Mechanisms of Greenhouse Industry in the Republic of Uzbekistan. *Journal of Environmental Management and Tourism*, (Volume XII, Spring), 2(50): 331 - 340. DOI:10.14505/jemt.v12.2(50).03

Article's History:

Received 12th of December 2020; Received in revised form 10th of January 2021; Accepted 4th of February 2021; Published 29th of March 2021.

Abstract:

The goal of the article is to analyse the improvement of the organizational and economic mechanisms of the glasshouse industry in the Republic of Uzbekistan. The following methods were used in the study: comparative analysis, statistical method, estimation method, economic analysis of the results. Results of the study: the use in the greenhouses of the Republic of Uzbekistan of innovative new generation greenhouses with energy-saving technologies will reduce energy consumption, save resources and reduce the cost of vegetables. The scientific importance is the development of innovative technologies in agriculture in the Republic of Uzbekistan, and the practical importance is ensuring the efficiency of agricultural development.

Keywords: Republic of Uzbekistan; innovation; innovative greenhouses; energy-saving technologies; energy-saving greenhouses.

JEL Classification: P18; Q40; D21; Q01.

Introduction

Nowadays there is a need to increase the productivity of greenhouses in the Republic of Uzbekistan. The increasing population's need for vegetable products (Agriculture goes, 2019) should be satisfied in severe natural conditions such as a limited area of open grounds, high cost of energy and other resources used in greenhouses (Agriculture goes, 2019). Also, according to A.R. Bakiev (Bakiev *et al.* 2015), the country's greenhouse productivity directly affects the level of export of fruits and vegetables.

Today there are 31297 greenhouses with a total area 7175 ha in the Republic of Uzbekistan (Agriculture goes, 2019). According to the State Statistics Committee (https://stat.uz/ru/), in January-October 2019, the export volume of fruits and vegetables was more than 1,159.7 thousand tons in physical terms and 1,051.9 million US dollars in monetary terms. Moreover, the growth rate compared to the same period last year amounted to 113.4% and 142.2%, respectively. This can be considered as a positive trend. At the same time, the GDP of Uzbekistan in 2019 increased by 5.8%, amounting to 6.64 million soums (https://stat.uz/ru/). In addition, in the sectoral structure of GDP, the share of agriculture, forestry and fisheries decreased from 27.3% to 24.3%. Nevertheless, according to the results of January-June 2019, an increase of 2.1% is observed in agriculture, forestry, and fisheries (Uzbekistan's GDP, 2019).

1. Literature Review

In the hard conditions of the Republic of Uzbekistan, where, according to D. Tajibaeva (2015), more than a half of the population lives in rural areas, the agricultural sector has always placed a leading position in the country's economy. One of the most promising industries is represented by vegetables growing under cover (World and Russian greenhouse vegetable growing trends, 2018; Agriculture goes, 2019). However, today, due to environmental changes in nature, the limited traditional energy sources in existing greenhouses and their high prices, energy costs are about 50% of the production cost value (Autonomous generation for greenhouses, 2018).

All these factors restrain the development of the agricultural sector. Therefore, the world experience of the leading countries that pay special attention to energy-saving technologies, non-traditional and renewable energy sources should be adopted (World and Russian greenhouse vegetable growing trends, 2018; Innovative technologies in greenhouses, 2018; Agriculture goes, 2019). And this is the reason for considering the energy-efficient greenhouses as a priority for industry development. In other words, there is a need for the construction of new greenhouses using modern technologies that make it possible to achieve increased vegetable crop yields with minimal energy consumption.

Greenhouse's development is important for the full realization of the agricultural potential, and the government has taken many measures (Agriculture goes, 2019). These include the state program "Year of development and improvement of the countryside" (Agriculture goes, 2019), measures to create favourable conditions for guaranteed and uninterrupted supply of the village with the necessary energy resources, as well as the creation of lightweight greenhouses in every rural area along with the use of alternative energy sources.

It is obvious that the problem of energy efficiency is one of the most serious in the greenhouse economy of the Republic of Uzbekistan (World and Russian greenhouse vegetable growing trends, 2018; Agriculture goes, 2019). However, despite the above measures, it has not yet been resolved, which means that these measures are insufficient. But the use of energy-efficient innovative greenhouses can affect the growth of economic efficiency of greenhouses by reducing the share of energy resources in the cost value of production and increasing the volume of the output through the application of backlighting technology, which, as you know, needs energy. All this, in turn, affects the total amount of exported product.

Thus, the hypothesis of this study is: the use of innovative energy-efficient greenhouses has a positive impact on the economic efficiency of greenhouses ensuring the country's food security, which guarantees not only the absence of imports but also the growth of exports from increased export operations of fruits and vegetables.

Many scientists devoted their work to increase exports in Uzbekistan. According to A.R. Bakiev (Bakiev et al., 2015), the horticultural market plays an important role in the concept of food market development in the Republic of Uzbekistan. These scientists are also convinced that the fruit and vegetable industry could become one of the first where the transition from import substitution to export expansion could be fully implemented. In another paper A.R. Bakiev with his co-authors (Bakiev *et al.* 2017) proposed several measures aimed at stable export of fruits and vegetables, including increasing the export of fresh fruits and vegetables, stimulating the integrated development of its production and export, expanding access for producers to credit resources, improving product quality, as well as the widespread introduction of the achievements of science and innovative

technologies. A.Sh. Durmanov (Durmanov *et al.* 2017) also considers the growth of fruits and vegetable export as one of the priority areas of the country's economic development.

There are few works devoted to the problems of elevation of the productivity in greenhouses, however, some aspects related to this have nevertheless been studied. For example, K.G. Zhannazarova (Zhannazarova *et al.* 2016) found that the potential of the fruit and vegetable industry of the republic far exceeds their contemporary production. The crop rise through the development of greenhouses is one way to open this potential. D. Tajibaeva (2015) noted an increase in the fruits and vegetables yield in recent years. This is correlated with the development of the greenhouse economy. According to A.A. Solekhsoda *et al.* (2016), the degree of agricultural development and the state of food imports are one of the main factors that ensure food security, which, in turn, depends on the increase of agricultural production, in other words, the effective use of land, ensuring yield. And the productivity in greenhouses is several times higher than at the open ground. Thus, the development of greenhouse farming can contribute to improving the food security of the country.

The problem of innovative technologies for increasing the productivity of horticultural crops is currently not receiving enough attention from Uzbek scientists and researchers, and yet this is a particularly important issue that needs to be studied. However, E.A. Belyaeva and A.A. Halmetov (2019) calculated the difference in efficiency from the use of water and infrared heating systems for greenhouses. K.A. Glukhov considered thermal destratification as one of the advanced methods of energy saving, which increases the yield of fruitful crops (Glukhov 2019). N.P. Pisanyy and V.R. Boev discussed and proved the effectiveness of the irradiators using to increase the efficiency of crop greenhouses, and, thus, their productivity (Pisanyy 2019). A.S. Dzheliev and S.Kh. Dzanagov studied the impact of using non-traditional fertilizers on the performance of greenhouses in winter (Dzheliev and Dzanagov 2019). According to I.P. Ivanova, the productivity in greenhouses is influenced not only by their technical characteristics but also by the choice of crops grown (Ivanova 2019). N.K. Yuldashev with co-authors (2018) studied the prospects for innovative development of agriculture in the Republic of Uzbekistan, which implies the introduction of innovations in the greenhouse economy. N.Z. Sayfullaeva (2016) called the increasing of the efficiency of land and water use, as well as modernization and technical and technological updating, among the priority areas of economic reforms in agriculture in Uzbekistan. And since innovative greenhouses will save land and water resources, and also fit into the framework of the planned technical renovation, the government has to direct efforts in this direction.

It should be noted that it is the latest greenhouses used by the advanced countries of the world that can become one of the significant ways to increase yields in greenhouses in Uzbekistan. Today, Asia accounts for 36.3% of the world's greenhouse areas (World and Russian greenhouse vegetable growing trends, 2018). China and Japan are recognized leaders among Asian countries, especially in terms of the use of innovative technologies in greenhouses (Agriculture goes, 2019). They rely on energy-saving technologies, the use of non-traditional sources of energy (geothermal water and solar radiation), intensive farming, hydroponics, heat preservation technologies, lighting, even special vegetable factories and other technologies that save resources and increase the yield in one way or another (Innovative technologies in greenhouses, 2018; Agriculture goes, 2019).

The scientific importance of this study is the proof of the relevance of the development of innovative technologies in the agriculture field in the Republic of Uzbekistan, and the practical significance is the ensuring the effectiveness of agricultural development.

2. Methodology

The following methods were used in the research:

- comparative analysis method;
- statistical method;
- estimation method;
- economic analysis of the results.

The comparative analysis was used to analyse various aspects of the activity of ordinary and innovative greenhouses, namely:

- purchase value;
- maintenance cost;
- greenhouse productivity in terms of income differences;
- the difference in saving resources.

Using the statistical method, the following data were collected:

- the purchase value of ordinary greenhouses and the most common innovative fifth-generation greenhouses Active Climate and Ultra Clima in the Republic of Uzbekistan;
- tariffs for electricity and heat for farms in the Republic of Uzbekistan;
- electricity consumption by an ordinary greenhouse;
- output (in this case, tomatoes) from 1 hectare per year;
- the difference in energy consumption and output between conventional and innovative greenhouses;
- reduction of all of the above monetary amounts to one monetary unit (US dollar), areas - to hectares, electricity - to kilowatts;
- calculation of all indicators for a 4-hectare greenhouse based on the business plan for the construction of an ordinary greenhouse presented on the official website of the Agency for Attracting Foreign Investment of the Republic of Uzbekistan.

Based on the data presented, the following indicators were calculated using the estimation method:

- the cost of a conventional and innovative greenhouse in US dollars per 1 hectare, as well as the difference between the percentage and US dollars;
- the level of energy consumption in kilowatts, as well as the energy consumption of conventional and innovative greenhouses in US dollars per year, the difference between the percentages, kilowatts and US dollars;
- the number of tomatoes in kilograms per year, as well as income per 1 hectare from a conventional and innovative greenhouse in US dollars, the difference between the percentages, kilograms and US dollars;
- annual income from 1 hectare in US dollars and 4 hectares in thousands of US dollars from ordinary and innovative greenhouses, as well as the difference between the percentage and US dollars;
- net income from 4 hectares in hundreds of thousands of US dollars from a conventional and innovative greenhouse, as well as the difference between percentages and US dollars;
- annual energy savings in the Republic of Uzbekistan subject to the introduction of fifth-generation innovative greenhouses.

All data are summarized in a table, as well as analysed by the method of economic analysis. The basis for the selection of the above methods is the structure of the methodology.

For the precision of the compared results, this study examines the most similar climatic zones in Uzbekistan, the same period and the same variety of fruit and vegetable crops, in this case, tomatoes.

3. Results

The innovative greenhouses (the fifth generation) called the Active Climate cost 55 euros/m^2 (Turnkey construction of industrial greenhouses, 2019), or 609600 US dollars /ha, and Ultra Clima greenhouses are sold in bulk for 53 US dollars/m^2. (Industrial greenhouses in the Republic of Uzbekistan, 2019), which is equal to 530,000 dollars/ha.

Thus, the most common fifth-generation innovative greenhouses in the Republic of Uzbekistan on average can be bought in bulk for 569,800US dollars/ha, which is 197% of the cost of ordinary greenhouses.

As for the purchase price of greenhouses, today the wholesale price of ordinary (film and glass) greenhouses is on average to 2,758,000,000 soums/ha (Greenhouse in Tashkent, 2019), which at the current exchange rate is equal to 289,200 dollars per one hectare.

Next, we should move on to the issue of maintaining ordinary greenhouses. Savings in energy costs, according to the application of manufacturers of innovative greenhouses, is 25% compared to conventional greenhouses (Turnkey construction of industrial greenhouses, 2019). At the same time, an ordinary greenhouse consumes an average of 1 MW of electricity and 2 MW of heat per 1 hectare of area per day (Autonomous generation for greenhouses, 2018) (109.5 kW per year).

The tariff for electricity and heat for today for farms in the Republic of Uzbekistan is 450 soums/kW (Electricity tariffs in Uzbekistan, 2019). Thus, the innovative greenhouse consumes 109.5 kW/year per 1 hectare, which in monetary terms means saving 450 soums * (10950 - 8212.5) = 1231875 soums (129.16 US dollars per year).

As for income from ordinary and innovative greenhouses, the innovative ones increase the output to 30% (Turnkey construction of industrial greenhouses, 2019). An ordinary greenhouse gives from 90 to 135 kg tomatoes per year (Growing tomatoes in a greenhouse, 2019), that is on average 113 kg from 1 m^2 or 1,130,000 kg/ha, the innovative greenhouse gives 1,130,000 * 1.3 = 1,469,000 kg from 1 hectare.

Table 1. The difference in resources using of a usual and an innovative greenhouse

Index	Usual greenhouse	Innovative greenhouse	Difference, %
Cost, US dollars/ha.	289,200	530,000	+197
Energy costs from ha per year, US dollars	51,664	38,748	-25
Income from ha per year, US dollars	1,695,000	2,203,500	+30

Since the wholesale price of 1 kg tomatoes in the Republic of Uzbekistan is on average 1.5 US dollars (Tomatoes in bulk in Uzbekistan, 2019), the economic effect of using innovative greenhouses compared with the ordinary ones will be equal to 1.5 * (14690 - 11300) = 5085 US dollars per year. Table 1 shows the cost-effectiveness of an innovative greenhouse compared to a conventional one.

Based on the calculations presented in table 1, it is advisable to calculate the cost recovery and net profit for each type of greenhouses. These calculations will be based on a business plan for the greenhouse construction, proposed on the official website of the Agency for attracting foreign investment of the Republic of Uzbekistan (Construction of a greenhouse using hydroponics, 2019). It presents an ordinary greenhouse with an area of 4 hectares, which will pay off in 3 years and investments in which are equal to 3830 thousand US dollars. Calculations of the difference in resource use for different types of greenhouses with an area of 4 ha are presented in Table 2.

Table 2. Productivity of conventional and innovative greenhouses

Index	Usual greenhouse	Innovative greenhouse	Difference, %
Cost, thousands US dollars / 4 ha	1156.8	2120	+197
Energy costs from 4 ha per year, thousands US dollars	206.7	155	-25
Other maintenance costs	2466.5	2466.5	-
Total costs	3830	4741.5	+23.8
Income from 4 ha per year, thousands US dollars	6780	8814	+30
Net profit per 1st year, thousands US dollars	2950	4072.5	+38.1

All things being equal the innovative greenhouse will pay off more than after 3 years, but in the first year, its net profit will be 38.1% (1122.5 thousand US dollars, 4072.5 $ versus 2950 $).

Thus, the calculations show the obvious cost-effectiveness of the innovative greenhouse compared to an ordinary greenhouse; the effectiveness will increase in the following years since the cost of the greenhouse itself will not be taken into account.

This is indicated not only by the net profit, but also by the energy efficiency of innovative greenhouses compared to ordinary greenhouses (387.48 US dollars/year versus 51664 US dollars/year from 1 hectare), and the output (1,469,000 kg/year versus 1130000 kg/year from 1 hectare).

4. Discussion

Nowadays the area of the greenhouses in the world is 497.8 thousand hectares. In recent years, the area of the protected ground in the world has grown by 24%. 90% of this area is represented by plastic greenhouses and 10% by glass greenhouses. Experts believe that the area of greenhouses will increase by 11% per year and will reach 750 thousand hectares until 2021.

It should be noted that Europe is the leader in the area of greenhouses. It has 210 thousand ha of greenhouses (42.2%). In second place is Asia (180.5 thousand ha, or 36.3%). Africa occupies the third place (45.3 thousand ha, or 9.1%), and North America is the fourth (31.8 thousand ha, or 6.4%). Middle East (14.6 thousand ha, or 2.9%), South America (14 thousand ha, or 2.8%) and Oceania (1.6 thousand ha, or 0.3%) are at the end of the list (World and Russian greenhouse vegetable growing trends, 2018).

International experience shows that 70% of vegetables grown are sold fresh, 5-10% is sent for processing, and 20-25% goes to waste or to feed livestock. However, the proportion of packaged and bulky vegetables varies in different countries. For example, about 85% of packaged vegetables are sold in Germany, 55% in England, 45% in Australia, and 25% in Russia. As for countries such as Mexico, Brazil, India and China, this indicator is less than 2% (Innovative technologies in greenhouses, 2018).

Also, a general global trend in the development of the greenhouse industry is an active increase in production. This was made possible thanks to the widespread transition to intensive technologies and methods of growing plants under cover, the use of new designs, energy-saving technologies and materials.

It is also obvious that innovation in the field of greenhouse vegetable growing is aimed at saving resources - area, light, energy, fertilizers, soil (replacing it with a substrate), which ultimately reduces production costs, and, thus, the cost of the final product. The trend of environmental friendliness, according to the assurances of manufacturers of greenhouses, also contributes to resource saving (Balas *et al.* 2008; Belyaeva and Halmetov, 2019).

Now we compare the features of the greenhouse economy of the Republic of Uzbekistan with those of the world-leading countries in this area (table 3).

Table 3. Comparative characteristics of greenhouses in the leading countries and the Republic of Uzbekistan (Agriculture goes, 2019)

Country	Advantages	Resources saving technologies	Technologies used	Governmental support
China	The largest number of greenhouses (80% of the global area). First place in the world for greenhouse mushroom production.	Placement of greenhouses in the south-west of the country.	Intensive use of the lands.	Assistance from the Academy of Agricultural Sciences.
Netherlands	One of the leading positions in the world in the area of protected ground and in the number of greenhouse products grown per 1 person.	Highly efficient use of greenhouse areas throughout the year, regardless of weather conditions.	Cheap products are obtained through the specialization of farms on a limited number of crops, the presence of a large number of greenhouses and the receipt of several crops annually in them. A high level of labour productivity has been achieved, and depending on the economic effect, a "regrouping of forces" is made in the truck gardening.	The program of long-term lending to farmers at a low interest 1.5-2.5% for up to 25 years.
Japan	The leader in the consumption of vegetables per capita (large domestic market).	Vinyl film (saving 20% heat consumption than the polyethylene coating used in Europe); the use of renewable energy sources (geothermal waters and solar radiation); the use of multilayer coatings for the greenhouse (saving 25-45%); the introduction of heat pumps, air conditioners, heating in the cold, and cooling in warm; the use of automated control over microclimate parameters.	Hard coatings of acrylic with a service life of 7 years. Special vegetable factories: small (60-80 sq.m.), fully automated hydroponic plants equipped with artificial year-round lighting, computer control, adjustable environmental parameters and rotary conveyor systems for moving trays. This system does not depend on weather conditions, the crop growing time is 2-4 times less, the yield is 21 times higher compared to open ground, and their products are of high quality and low nitrate content compared to vegetables grown in the same season in traditional greenhouses.	Governmental support for the construction of greenhouses.

Country	Advantages	Resources saving technologies	Technologies used	Governmental support
Israel	Climatic conditions, a wide variety of topographic and climatic conditions.	Climate control systems and a low-volume artificial substrate. For example, low-volume technology allows getting up to 500 tons of tomatoes per 1 ha, while the average crop in greenhouse is 200-300 tons per 1 ha, and in open ground - 80 tons per 1 ha. The modern greenhouse allows you to fully control most of the technological parameters, as well as maximize the use of areas and optimally distribute the cultivation of products during the seasons of agriculture.	Drip irrigation, responsive to the intensity of solar radiation, heat-shielding screens and sunshades, adjusting the light spectrum and affecting plant growth through increased photosynthesis, film, special mosquito nets that work during ventilation and reduce the need for chemical treatment. The result is a significant increase in production - Israeli farmers receive about 300 tons of tomatoes per ha per season, which is four times more than on the open ground.	Strong comprehensive government support
Uzbekistan	Climatic conditions, large areas of agricultural land.	Placement of greenhouses in suitable climatic conditions. Water-saving technology.	State-approved measures to increase the area of intensive gardens and greenhouses using modern resource-saving technologies, including drip and rain irrigation.	Decree of the President of the Republic of Uzbekistan "On measures for the further development of horticulture and greenhouse farming in the Republic of Uzbekistan" dated March 20, 2019.

Israel's innovation using gives results. Experts believe that today the Netherlands is the technological leader in the field of greenhouse vegetable growing. This country has been and remains the world leader in the implementation and use of greenhouse technologies (Innovative technologies in greenhouses, 2018). China has the largest greenhouse economy among other countries, and Japan has the largest domestic market, which increases the demand for greenhouse products, thereby developing it. Another important detail is that the leading countries have powerful state support for the greenhouse.

As for Uzbekistan, it has a good climate, but in terms of technology, it lags significantly behind world leaders. Much attention is paid to water-saving technologies and energy-saving technologies that, according to earlier calculations, can significantly reduce production costs and reduce production costs, even by at the state level so far bypass. Besides, government support for the greenhouse industry is an innovation for Uzbekistan, which indicates that it is only beginning to develop.

Nevertheless, in Uzbekistan, there are some advances towards innovation. For example, the Ministry of Agriculture and Water Resources of Uzbekistan, together with the Turkish Agency for International Cooperation and Development at the Research Institute for Mechanization and Electrification of Agriculture, in 2009 opened the first computer-controlled greenhouse with an area of 0.5 hectares. However, these greenhouses require the import of advanced equipment from Japan, France, Holland, Switzerland, Turkey, and the Republic of Korea, which means that they have a rather high cost. Also, they can only function with traditional energy sources or with a secondary heat source from industrial enterprises.

In addition, the Tashkent State Technical University is studying the issue of creating energy-efficient greenhouses heated by alternative energy sources. Also in Uzbekistan, the project "Testing and adaptation of energy-efficient greenhouses in Uzbekistan" was launched, implemented by the Chamber of Commerce and Industry with the support of the UN Development Program "Business Forum of Uzbekistan" project and the Global Environment Facility Small Grants Program. On March 20, 2019, the Decree of the President of the Republic of Uzbekistan "On measures for the further development of horticulture and greenhouses in the Republic of

Uzbekistan" was issued. It regulates the creation of the Agency for the Development of Horticulture and Greenhouse Management under the Ministry of Agriculture of the Republic of Uzbekistan with the relevant departments and sectors at the regional and district levels.

The Agency established the Horticulture and Greenhouse Development Fund without the status of a legal entity, the funds of which are spent on the implementation of comprehensive targeted programs aimed at the sustainable development of horticulture and greenhouses. At the same time, it was established that state support for newly created gardens and greenhouses, which introduced water-saving irrigation technologies based on drip and rain irrigation, is provided at the expense of the Fund and the state budget in the form of subsidies. The State Fund for Supporting the Development of Entrepreneurship under the Cabinet of Ministers of the Republic of Uzbekistan provides guarantees to small businesses to create intensive gardens and greenhouses for loans from commercial banks in the amount of up to 50 per cent inclusive of the loan amount, but not more than 5 billion soums (Agriculture goes, 2019).

However, at a time when the whole world is already actively transitioning from open-field farming to greenhouse farming, new technologies are only coming to the greenhouse industry of Uzbekistan. It promotes the fast developing of the industry. This is also facilitated by investments by private investors in the construction of new energy-saving greenhouses as an effective method of profit.

Although the area of protected ground in developed countries is significantly higher than its area in Uzbekistan, the republic is still among the top ten countries in terms of the area of greenhouses. However, the yield in Uzbek greenhouses is 3-10 kg/m^2, and the greenhouses of developed countries have a crop up to 50-60 kg/m^2 (table 4) (Agriculture goes, 2019).

Table 4. Comparison of the areas under coverage of the leading countries and the Republic of Uzbekistan

Country	Area of greenhouses (ha)	Number of hectares per 1000 humans
China	1700000	1,271
Spain	52000	1,131
Japan	42000	0,33
Turkey	41000	0,565
Italy	20000	0,331
Netherlands	13000	0,782
Morocco	10000	0,314
France	8500	0,13
Uzbekistan	7175	0,243
Poland	6300	0,163
Israel	3000	0,396

Based on the data in table 4, it can be confirmed that, although Uzbekistan has more than double the Israeli greenhouse area, it significantly lags behind Israel in terms of export volumes. Israel is one of the leaders, and Uzbekistan has neither high export volumes nor large output volumes. It can be concluded that one of the most important success factors in greenhouses is innovation, which is also confirmed by the presence among the leaders of countries that pay great attention to technology.

In total, there are 31297 greenhouses in Uzbekistan with a total area of 7175 hectares (Agriculture goes, 2019). Taking this and the previous calculations into account, it can be confirmed that the use of innovative fifth-generation greenhouses gives energy savings equal to 717500 * (516.64 - 387.48) = 92672300 US dollars. Reducing energy tariffs for agriculture in the framework of state support can also contribute to energy savings.

Moreover, since the Republic of Uzbekistan has a favourable climate in many regions, the location of greenhouses there will allow saving even more resources due to a reduction in the cost of illumination. The experience of market leaders also confirms that due to new technologies and without an increase in space they can have results.

All of the above allows us to confirm the hypothesis that innovative greenhouses will save resources, reduce costs and increase the crop. This will reduce imports and increase the export of fruit and vegetable products, which, in turn, is positive to affect the food security of the country.

Conclusion

The Republic of Uzbekistan has significant resources in the form of a favourable climate and impressive areas of closed ground, which can serve as the basis for the development of greenhouses. At the same time, it is possible to improve the situation by saving resources, lowering production costs and increasing output through the use of

innovative greenhouses. It is especially important to use innovations aimed at saving energy resources because today they make up 50% of the production cost. This is the priority direction to act when introducing innovations in greenhouses of the Republic of Uzbekistan. The introduction of fifth-generation greenhouses in all protected areas in the Republic of Uzbekistan will save 92672300 US dollars annually. Besides, a reduction of energy tariffs for agriculture within the framework of state support can also contribute to energy savings. All this will reduce the import of vegetable products along with an increase in its exports, which, in turn, will strengthen the country's food security. Also, the experience of world leaders in the field of greenhouse management confirms that even with limited areas and not always favourable climate, but with using of new technologies, it is possible to obtain large volumes of output and achieve savings in various resources required for greenhouse management.

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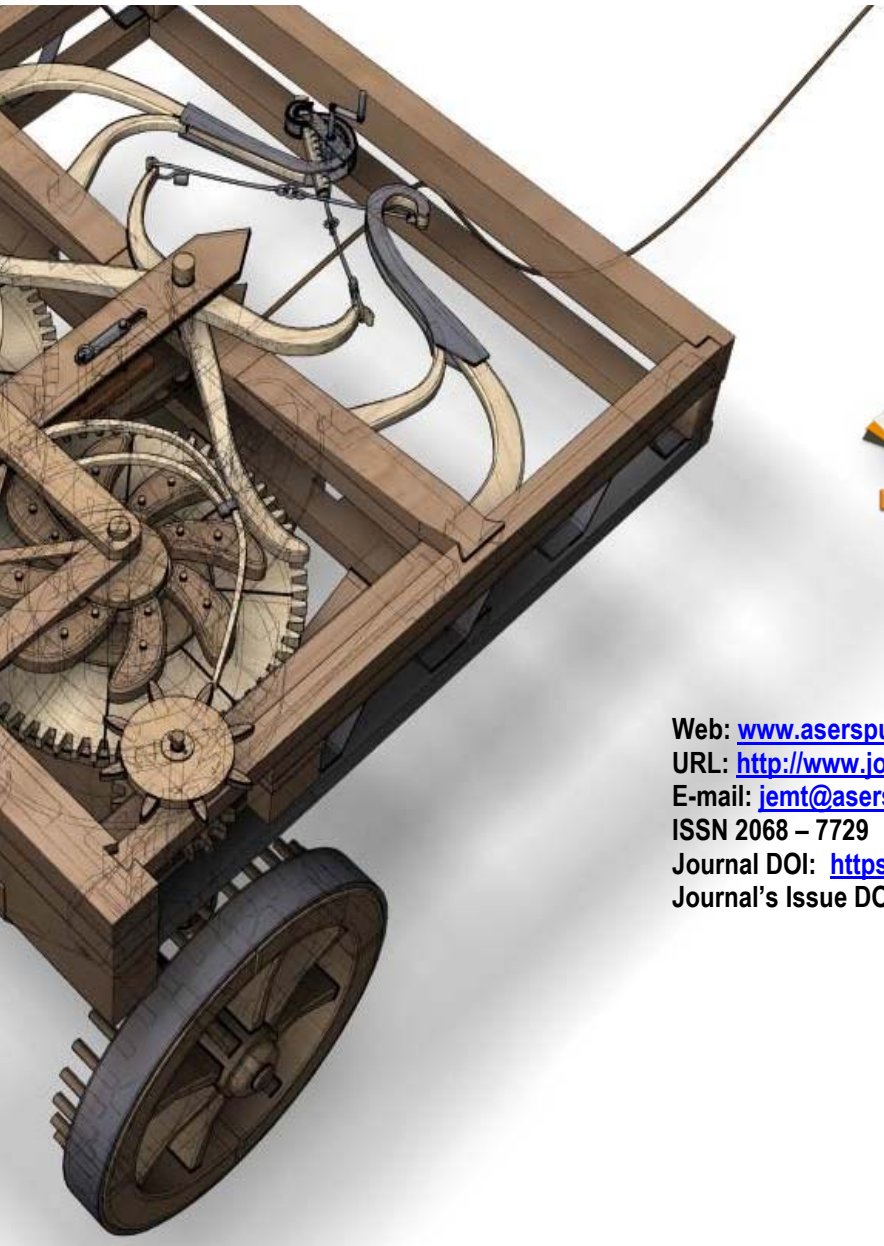

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Journal's Issue DOI: https://doi.org/10.14505/jemt.v12.2(50).00