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**ORIGINAL ARTICLE**

# The Effect of Supportive Policies on the Products of Iran Agricultural Sector (Applying a Computable General Equilibrium Model)

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K E Y W O R D S

Policy,
Support for producer;
Agricultural sector;
General;
Equilibrium

A B S T R A C T

The present study aims to examine the effects of economic adjustment policies in the agricultural sector. In this regard, to achieve the goals of this study computable general equilibrium models and accounting matrix 2016 were used. The results obtained from this research indicated decrease in the prices and a increase in the production in the agricultural sector to which economic adjustment is related on the other hand increase in the prices and a decrease in the production on other sectors were observed. The overall results of the study show a decrease in prices and an increase in production in the agricultural sector, which has been subject to economic adjustment; in contrast, other sectors are witnessing an increase in prices and a decrease in production. Given that the welfare of the producer is directly dependent on the price and quantity of production, and in the agricultural sector, despite the decrease in prices, the welfare of the producer has increased, the reason for this can be considered to be the greater increase in production than the decrease in prices, which, as a result, has led to an increase in the welfare of the producer in the basic state.

## Introduction

Agricultural growth of Iran had peaks and through over the past two decades reflecting the peaks and through of the economic growth of this country. However, this case is related to the agricultural plans despite macroeconomic growth and considerable government support. Therefore, choosing the appropriate policies and tools is one of the important concerns which is widely discussed in macroeconomics in order to eliminate imbalance and establish the economic stability (Pineiro *et al*, 2020). The recent studies on economic cycles have been confirmed by other researchers (Borawski *et al*, 2018). According to the recent studies, the agricultural production cycles in economics have been limited by habitat and ecological limitations, but they have been benefited from the rapid economic and social

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development in this country as well as globalization. Historically, it has been shown that the agricultural development is a non-linear process which progresses in for steps: growth maturity, collapse and transition. Adaptive renewal cycles act as a base for this concept. The performed studies showed that the agriculture had a positive Long-term effect on the cultural ecosystems, and it had a significant effect on the cultural service assets. Contrary to the cyclic fluctuations in the economy, agricultural economies have evolved and developed in a response to a variety of economic policies and structural reforms change in the government policy is the source of agricultural diversity (Kubitza *et al*, 2020). Agricultural economy is vulnerable to the cyclic fluctuations which is partially related to institutional factors.

In this regard many developing countries have followed the supportive policies over the last decades. Iran has also put some policies in this direction in the forms of global communications and structural issues. As a result of choosing such policies, different economic sectors are affected by especially agricultural sector (Julia Esfandabadi & Fammanesh, 2021).

These effects can exist both in the labor and capital production factors market and in the agricultural products market. On the other hand, considering the rapid globalization of the economy and forming the world Trade organization (TWO) and food and agriculture organizations of the United nation (FAO), the pre-requisites for it have increased the importance and effects of these policies on the agricultural economy are member and non-member countries for Iran which imports and exports some agricultural products is necessary (Pineiro *et al*, 2020).

Therefore the purpose of this paper is to analyze the supportive policies of the agriculture the objective of this study is to determine the lessons from the government policies and plans which have tried to change the agriculture production, whether it means the policies for increasing production, substitution induction of a product are changing to another employment. Specially, our goal is to 1) present a typology of the applied policies to affect the agriculture production, 2) we present an overview of the methods for evaluating this effect. It should be noted that in this study, we have focused on nut products. While eliminating dependence on oil revenues has been emphasized by the country's authorities for years and the focus of development programs, the nut and dried fruit industry can, by strengthening its position and overcoming challenges, considering its popularity in the market and encouraging consumers to buy Iranian nuts, affect the promotion of non-oil revenues in a way that significantly increases Iran's insignificant share of the $40 million global turnover of this sector. Experts and marketers believe that, given the increasing daily demand for these products and the need for innovative and quality products, this industry is about to become one of the macro-economic sectors; but along with countless opportunities, this industry is also facing challenges and issues that could affect its bright future in the competitive global market. Climate change, price fluctuations, health and safety issues, product quality, high volume of waste and impurities, employment threats and shortage of skilled labor, resistance of industry activists against industrialization and transition from the traditional stage, commercialization of products, and introduction of Iranian visions to the global market are just some of the problems and challenges facing the nuts and dried fruit industry. Thus, the nuts and dried fruit industry faces numerous challenges and opportunities, but given the need for various types of support policies, this industry can contribute to the country's economic growth and progress with the support of the government.

***Subject literature***

Agriculture productivity has been considerably taken concern as a result of globalization therefore, the agricultural products for export, on one hand, have

considerably improved access to the agricultural goods in unfriendly environments (Antle and Diaggana4, 2003). On the other hand, as result of these factor countries around the world have increased the production of their export-oriented products. The agricultural products are both sensitive as a result of the simultaneous process of trying to manage the demand for these items as well as confront instability in the market. (Foguesutto & Dessimon Machado5, 2018).

In this regard, comparing the supportive levels in the agriculture sector in different countries indicates that despite some differences in the type and extent of the enforced policies, most countries apply a high level of support which can be seen in the European union common agriculture policy and US new agriculture law.

The main supportive policies in the European union common agriculture policy are pricing policies, indirect income payments (interest rate production inputs factors), tax reduction, direct income payments (natural compensation)and other government expenditures for research, advertising and marketing (Sevinc *et al*, 2019). According to the US Near agriculture law, the performed supports include subsidy, agricultural, protection of resources, price supports, product insurance, and export subsidies. (Nowrozi *et al*., 2020). The supportive policies in Iran agriculture sector can be introduced in three general groups which can be mentioned as tax exemption, barriers and import tariffs and preferred rates for credit banks, water and fuel and other privileges.

The second group is subsidies which are openly paid from the general budget of the government and include two main parts: Consumption subsidy and production subsidy. The consumption subsidies are paid to provide consuming basic goods such as wheat, oil, sugar, dairy products etc. The third group of the supportive policies which can be introduced as general services of the agriculture sector is a budget payment which is paid to develop the agricultural infrastructures, research and promotion, protect the environment and other construction activities of the agriculture sector. (Ehsani *et al.,* 2021).

Realizing the relationship between the government policy and the agricultural supply requires using a multi-layer strategy. All guidelines and the agency regulations and the agency regulations and the international region, and also the local environmental factors and the national and local institutions heritage have effects on how the government deals with the agricultural issues in their countries. Government approaches to the agriculture are affected by the ideas related to the economic development and the economic benefits. We need to put this puzzle to properly realize how these components are effective on the agricultural production and policy-marking (Foguesutto & Dessimon Machado, 2019). These policies and plans are evaluated as to identify how they fit into the global political economy. The government policy has a direct and tangible (noticeable) effect on the agricultural productivity and it is one of the more direct and tangible effects on the agricultural products. (Foguesutto *et al*, 2020).

Another concern is food safety, which affects both the macro-economy and the micro-economy in a country. The agricultural affects both macro_ economy and micro-economy in a country. Since management and most countries are still in the beginning of the development and a significant part of population in the world has not developed yet, the economic growth has become as a popular topic in the global economy. (Baozhong *et al*., 2022). In 1946 it was seen that only accurately realizing inherent change processes in the economic growth can effectively guide the progress (development).

Mitchell and Bronze both are economists agreed with each other. According to agricultural surplus theory, a developed agricultural sector is essential to develop the other economic sectors.

Additionally, the current research shows that increasing the research costs and the agricultural development help accelerate economic growth. However, although financial costs for the agriculture

help develop the agricultural products, it has the potential to damage the quality the agricultural ecosystems. (Hanson, 2002). Protecting the environment, especially soil and water, has a significant effect on the per capita income of rural households. If we want agriculture prosper sustainably in Long-term, the rural economic system should be supported in terms of reforms and innovations.

However if the agricultural production increases rapidly the possibility of shock will also increase. In addition to the fact that the growth is gradual, the uncertainty associated with it is also small. There are certain spatial correlations in the economic cycles of the agriculture, which increase the economic fluctuations of the agriculture as a result of the cyclic spatial overflow so it creates synergistic effects in the economic cycles of the agriculture. From different perspectives, Technical and institutional achievements showed have more emphasis on sustainable development which considers the agriculture and environment instead of creating policy gods which are inconsistent and often incompatible (crane, 2019).

As a result of the government agricultural policies the farmers' incomes will be improved and the Long-term goods for food safety in the country will be also realized. On the other hand, these policies have led to a price difference between the domestic and international markets of the agricultural products, which has led to a considerable increase in import of the agricultural products and also reserving the resources. (Corral *et al.,* 2012).

A country like Iran can guarantee the food safety and countries to the agricultural growth by applying the lessons learned from the previous efforts to improve the agriculture by institutional reforms technical changes, market reforms and agricultural investment.

According to studies conducted, support policies (intervention in the product market and production inputs) for agricultural products for the period 1979-1989 have largely failed to have a positive and acceptable impact on production growth and create incentives to increase productivity in the production of agricultural products. In these studies, nominal support rates, implicit support, and effective support were used to analyze support policies, and in all studies, the coefficient related to these rates was negative, indicating the fact that practically no effective support has been provided to the agricultural sector in the field of production, supply, and export of agricultural products (except for chicken meat), and it is possible that hidden taxes have also been collected from farmers.

In studies conducted during the period 1999-2003 using the policy analysis matrix, they concluded that the protectionist policies were in favor of the domestic producer but did not contribute to the development of exports and foreign exchange earnings of agricultural products.

In relation to foreign exchange and trade policies when considered together, non-structural econometric methods, the Johansen and Granger method, and vector autoregressive methods were used to examine the long-term and short-term relationships, respectively. These studies for the period 1966-1999 showed that, in principle, trade controls imposed on the export of agricultural products were to the detriment of producers of exported goods and made the trade exchange relationship to their detriment. The depreciation of the national currency may have been in favor of the exporter in the short term, but it did not have an effect on exports in the long term. A policy such as encouraging and increasing exports has a negative effect on the growth of the agricultural sector in the short term, but in the long term it can cause the growth of the agricultural sector.

Studies that have examined the effects of exchange rate changes on agricultural sector exports have used exchange rates as an explanatory variable in export supply functions. And they have also used the Johansen method to estimate supply functions. In general, they concluded that exchange rate fluctuations and deviations from the real exchange rate have a negative effect on agricultural sector

exports and are considered one of the important factors in the instability of relative prices in the agricultural sector.

According to the previous discussions, it is clear that in general, support policies have not been able to have a positive effect on the growth of agricultural production and exports, and sometimes these policies have even caused farmers to collect hidden taxes. Therefore, to improve these policies and make them more effective, the following suggestions are presented:

1- Given the fact that the optimal combination of several policy instruments is at least more effective than each of these instruments individually, it is better to use a set of supports called a support basket, which can include guaranteed prices, credit prices, target prices, compensatory prices, marketing supports, export subsidies, border measures, risk insurance, income insurance, support for changing the cultivation pattern, and input subsidies. Of course, the most important issue is the diverse use of support instruments and the application of relevant support instruments in proportion to market disruptions and their functioning.

2- Exchange rate control and stabilization policies are an important factor in the stability of agricultural product exports.

3- Transparent information about the future trend of exchange rate changes can play an effective role in increasing exporters' income and maintaining Iran's position in global agricultural product markets.

4- The results show that tariffs as a protective tool have played almost no role in supporting imports. The increasing role of non-tariff barriers and the less effective tariffs show a move in the opposite direction of the WTO Agreement on Agriculture, which is not in line with the general policy of joining this organization. Therefore, tariffs should be used instead of non-tariff barriers for greater transparency of import policies. At the same time, serious attention should be paid to the requirements for converting non-tariff barriers into tariffs. In this regard, it is necessary to eliminate special tariff exemptions intended for individuals and different regions, because otherwise it will not be possible to regulate the market using tariff tools.

4- The results show that tariffs as a protective tool have played almost no role in protecting domestic goods against imports. In line with the WTO Agreement on Agriculture, non-tariff barriers (quantitative restrictions, import licenses, health restrictions, bans on the entry of some goods, etc.) should be converted into tariff barriers to calculate domestic support for greater transparency of import policies. Accordingly, the increase in the role of non-tariff barriers shows a move in the opposite direction of the WTO Agreement on Agriculture, which is not in line with the general policy of joining this organization. In this regard, it is necessary to eliminate special tariff exemptions intended for different individuals and regions, because otherwise it will not be possible to regulate the market using tariff instruments. Therefore, in this study, the effects of economic adjustment policies on the agricultural and non-agricultural sectors will be studied based on the latest social accounting matrix. Also, in the present study, the efficiency of these policies will be examined under different scenarios based on floating exchange rates and managed exchange rates. This policy also covers two time periods: before the coronavirus era and after it, i.e. its impact on the economy.

***Mathematical relations of functions equations in the general equilibrium model***

***The prices of the imports***

$$PMc = (1 + tmc).EXR.pwmc\ c \in CM$$

Price [exchange rate (in currency)]. [Moderator agent (factor) including tariff]= [the imports prices (currency)] imports].

***The prices of the exports***

$$Pec = (1 - tec).EXR.pwec\ c \in, CE$$

Price]. [Exchange rate)(In currency]. [Moderator agent] = [export price (currency)] [exports.

In this study, the prices of the imports and export are exogenously considered. It means that Iran is a small country compared to the global markets. This hypothesis is known as small _ country hypothesis.

***Attraction***

Import price multiplied by amount] + [domestic sales price multiplied by domestic sales amount]) = Attraction level (of sales tax).

For every product, the domestic expenses spent for goods is Considered as a sum of the expenses spent for the domestic and import product (including moderator variable of sales tax) in the price level of the domestic demand – attraction level. It is resulted from hypothesis of linear homogeneity of composite supply function (Armington).The composite price PQC is paid by the domestic demanders (households, government, producers and investors). Therefore the mentioned price is replaced by Pc price in all related equations.

***Domestic production value***

PQc.QQc = [PDc€QDc + (PMc.QMc) (1 + tqc)] c €C

[Exports price multiplied by export amount] + [domestic

Sales price multiplied by domestic sales amount] = [producer price multiplied by domestic production].

For every product, Sum of domestic product value sold to domestically and expert value in currency equals to domestic production value in producer price. This equation shows that TEC function (transferring with constant elasticity) is homogeneity linear. It should be noted that in this model domestic production amount is expressed as CXQ.

***Production price***

PAa = S PXc. qac a € A

PXc.QXc = PDc.QDc + (Pec.QEc)

[Producer price x performance] = [production price]

***Added value price***

PVAa = PAa – S PQc. icaca

[Inputs casts per production unit] = [Production price] = [added value price].

***Goods and production equations***

The Imported and domestically produced goods

Form the domestically supplied goods that some of these goods are used during transferring process in producing other goods and finally, some of it is domestically sold and some is exported.

***Activity production Function***

QAa = adal. QF afa a € A

[Factor inputs] f = [Activity level].

***Production factor to demand***

[Final income resulted from production factor f in activity a] = [final cost of production factor f in activity a]

***Intermediate goods demand***

QINTca = icaca.QAa c €C, a €A

[Activity level] f = [intermediate goods demand].

***Product function (production)***

QXc = oac × QAa a€A C €C

[Activity level] f = [domestic product]

***Composite supply function (armington)***

QQ=aq.c (QM+ (1_&) (QD)

Composite goods are used by the domestic demanders. An incomplete substitution is shown using the whole function.

SEC (constant substitution elasticity) among the import and domestic Goods. In this function, there is a Composition of the domestically produced goods and the imported goods supplied in market. In this function, “input” is known as domestically imported and produced goods. The demanders’ preferences expressed as a SEC function among the import and domestic goods.

***Domestic goads demand rate to the imports***

$$\frac{QM_c}{QD_c}=\left(\frac{PD_c}{PM_c}.\frac{\delta_c^q}{1-\delta_c^q}\right)^{\frac{1}{1+\rho_c^q}} c\in M$$

The domestic goads demand rate to the imports: [imported goods price ratio to domestically produced goods price] f = [imported goods demand ratio to domestic ratio].

***Composite goods supply***

$$QQ_c=QD_c \qquad c\in CNM$$

[domestic consumption of domestic product] f = [Composite supply].

Armington function for goods that are not supplied by importing is substituted by above relation. This relation supplies between the composite goods and the domestically Produced goods.

***CES product transfer function***

$$QX_c=at_c.\left(\delta_c^t.QE_c^{\rho_c^t}+\left(1-\delta_c^t\right).QD_c^{\rho_c^t}\right)^{\frac{1}{\rho_c^t}} c\in CE$$

[Export amount, domestic consumption of domestic product If= [domestic product]

Relating to the incomplete transfer of domestically produced goods that are exported abroad and domestically produced goods sold in the domestic markets, there is an incomplete substitution between the imported goods and the domestically produced goods that are sold in the domestic market. Such a relation is shown in rhe above equation for exported goods, the used TEC Function is the same Sec function and in substitution elasticities, minus is only different.

According to conditonal use as (-1<P<∞), the same amount curve relating to the above equation is concave to the coordinate origin. If we want to state a difference between function and TEC function in the form of economic expressions. It should be said that relating variables in T E C are production factors whereas this variable in Armington function is production.

***Ratio of domestic supply export***

$$\frac{QE_c}{QD_c}=\left(\frac{PE_c}{PD_c}.\frac{\delta_c^t}{1-\delta_c^t}\right)^{\frac{1}{1+\rho_c^t}} c\in CE$$

[Ratio of exported goods price to domestically produced goods price] f [ratio of exported goods supply to domestic.

There is an optimal combination between the domestically produced goods and exports in the above equation. According to equations4, 14 and 15, this equation shows the first condition of cost minimization under condition of export and domestic prices and provided by TEC and a fixed amount of domestically produced product. There is an important difference between the export and import demand equation and export supply equation that the relationship between export amount and export price is Positive whereas the relationship between export amount and import price is negative.

***Converting the product in non-export goods***

QXc=QDc c€CNC

[Domestic product] = [domestic consumption of domestic product]

A Condition in non-export goods is equally applied between the domestic production and the domestically sold domestic product.

***Inputs equations***

Income obtained from production agents (factors)

[income obtained from Supply of agents produced by households] h = household income share]. [Income obtained from production agents (factors)].

$$YF_{hf} = shry_{hf} \cdot \sum_{a \in A} WF_f . WFDIST_{fa} . QF_{fa} \qquad h \in H,\ f \in F$$

***Household income***

$$YH_h = \sum_{f \in F} YF_{hf} + tr_{h,gov} + EXR.tr_{h,row} \qquad h \in H$$

[Income obtained from production agents]+ [revenue obtained from government transferred aid and abroad] = [household income]

***Household consumption demand***

$$YG = \sum_{h \in H} ty_h . YH_h + EXR.tr_{gov,row} +$$

$$\sum_{c \in C} tq_c . \left( PD_c . QD_c + \left( PM_c . QM_c \right)_{c \in CM} \right) +$$

$$\sum_{c \in CM} tm_c . EXR . pwm_c . QM_c +$$

$$\sum_{c \in CE} te_c . EXR . pwe_c . QE_c$$

[Household income composition price] f= [household demand for C goods].

***Investment demand***

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} QH_{ch} + qg_c + QINV_c \qquad c \in C$$

[Base year capital x moderator factor]=[C goods investment demand].

***Government revenues***

[Export tax]+ [import tariff] [sales tax] + [transferring from other sectors in the world] + [direct tax] = [government revenue].

Government expenses:

$$EG = \sum_{h \in H} tr_{h,gov} + \sum_{c \in C} PQ_c . qg_c$$

[Government consumption]+ [aid transferred to household] = [government expenses].

***Production agents markets***

$$\sum_{a \in A} QF_{fa} = QFS_f \qquad f \in F$$

[Production agent supply]= [demand for production agent f].

There is a hypothesis in the production agent market that the prices are unique in activities of two sectors and in this sectors the capital amount in fixed and the capital is not transferred in these sectors.

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} QH_{ch} + qg_c + QINV_c \qquad c \in C$$

***Composition goods market***

[Composite demand including sum of intermediate demand households. Government and investment] = [composite supply].

***Equilibrium in current account of other sectors of the world (in foreign currency)***

$$\sum_{c \in C} pwe_c + QE_e + \sum_{i \in I} tr_{i,row} + FSAV = \sum_{c \in CM} pwm_c . QM_c$$

[Import cost] = [foreign saving] = [revenues transferred from other sectors in the world to the households and government] = [export revenue].

Between government foreign revenues and expenses by current account equation (in foreign currency) is supplied. The Current account Deficit is

equal to the foreign savings. If we carefully count the number of equations and variables, we will find out that Model the number of equations is one less than the variables. Therefore, there are two variables, foreign exchange rate (RXE) and foreign savings (VASF) for equilibrium in the current account.

$$\sum_{h\in H} mps_h.(1-ty_h)YH_h + (YG - EG) + EXR.FSAV = \sum_{c\in C} PQ_c.QINV_c + WALRAS$$

***Saving- investment equilibrium***

[WALRAS Dummy Variable]+ [investment costs] = [foreign

Savings] + [government savings] + [households savings]

In this model, according to the domestic currency foreign savings is used and if exchange rate or foreign are constant. They will not affect saving account investment because the saving amount determines the investment amount.

***Price normalization equation***

$$\sum_{c\in C} PQ_c.cwts_c = cpi$$

To implement the general equilibrium model in this research Social accenting matrix 2016 is applied. Goods and activities are classified to three groups, agricultural, industrial and service. Two factors, Labor and capital production are considered. Economic social agents in country are divided into two groups, households (private sector) and government (public sector); i.e. all incomes observed in the economy belong to these two groups and all domestic expenses spent by these households are divided into two sub-groups rural and urban households. Also, account unit in the used matrix is million rials in the current price. The model parameters presented in research method section were estimated using the calibration method based on social accounting matrix data 2016 and GAMS software and MCP Technique (Table 1). The results obtained from this estimation are (Table 2).

**Table 1.** Iran macro-social accounting matrix in 2016 (million rial).

| | Activities | Production factors | Inputs | Saving | Abroad | Total |
|---|---|---|---|---|---|---|
| **Activities** | 3744722627 | | 15423275859 | 2110793327 | 13599093535 | **11495605243** |
| **Production Factors** | 6209271377 | | | | 23802886.8 | **6233074264** |
| **Inputs** | | 6233074264 | 799316040.9 | | 495245.4071 | **7431735199** |
| **Saving** | | | 2543162960 | | | **26997734860** |
| **Abroad** | 1412387674 | 20267641.8 | 418835.834 | 496792564 | | **1935093400** |
| **Total** | 11366381679 | 6233074264 | 7431735199 | 2699734860 | 1935093400 | **29795242966** |

**Table 2.** The parameters of the General Equilibrium models

| | Agriculture | Industry and mining | Service |
|---|---|---|---|
| **Production Function efficiency parameter** | 2.22 | 2.97 | **2.31** |
| **Composite supply transfer parameter** | 3.35 | 2.05 | **0.710** |
| **Product Function transfer parameter** | 5.47 | 2.08 | **4.28** |
| **Production Function transfer parameter** | 0.79 | 0.6 | **0.88** |
| **Composite supply Function share parameter** | 0.05 | 0.18 | **0.006** |
| **Consumption subsidy rate** | 0.05 | 0.20 | **0.09** |
| **Production subsidy rate** | 0.05 | 0.006 | **0.0007** |

**Results**

In this section, quantitative results obtained from the simulation of the effects of reducing consumption

Subsides and production subsidies and also. Import tariffs in the agricultural sector, are presented. To show a better picture of unblocking consumption production subsidies and agricultural tariffs, these effects are studied in a full range from the condition before reduction to the complete elimination of support in the for the agricultural sector of the important macro-variables. The agricultural sectors. In this research, scenario named economic adjustment policies scenarios including consumption subsidy, production subsidy and also, import tariffs in the agricultural sector are planned. The scenarios relating to change in the consumption subsidy, production subsidy and also, the import tariffs in the agricultural sector are based on changes in the current situation which are defined as 20%, 40%, 60%, 80% and the complete elimination scenarios. By reducing the agricultural consumption subsidy, the urban and rural household incomes are also decreased.

Reduction in the agricultural consumption subsides can decrease payments to the production agents. Since the households are the owners of the production agents, reduction in the agricultural consumption subsidies can decrease payments to the households.

A 0.16% reduction in the urban households' incomes and 0.13% in the rural households is observed. Comparing the effects of the decrease in the agricultural consumption subsidies on the urban and rural households revealed that the decrease in the rural households is less than urban households indicating that the share of the rural households from the agricultural consumption subsidies is less than the urban households. Although the change in the incomes for the rural households is less than the urban households and incomes for the rural households is lower eliminating the agricultural consumption subsides have negative welfare effects on the rural households. Table 3 compares the effects of the reduction in the agricultural consumption subsidies on the urban and rural households.

**Table 3.** Comparing the effects of the gradual decrease in the agricultural consumption subsidies the urban and rural households' incomes

| Changes in incomes | Urban | Rural |
|---|---|---|
| **20%** | 0.15 | -0.12 |
| **40** | -0.31 | -0.25 |
| **60** | -0.47 | -0.38 |
| **80** | -0.63 | -0.51 |
| **Complete elimination of agricultural consumption subsides** | -0.79 | -0.64 |

The first reaction of the market to the elimination of the agricultural consumption subsidies is to increase the prices for the agricultural products; because the government decreases the prices for the agricultural products using the consumption subsidies and transfer the goods and services to the different economic and social groups. So, by increasing the prices of the agricultural goods, consumption of these products will be decreased.

As reduction amount of the agricultural consumption for the urban households in the complete elimination of the consumption subside is 0.19%, and for the rural households is 0.64% compared to the current situation.

A reduction in demand due to a decrease in the agricultural products can affect importing the agricultural products so that reducing the demand for these products can also decrease importing the agricultural products. The results of this simulation

indicate that using the economic adjustment policies can decrease the households' demand. Fig. 1 shows the effects of a reduction in the agricultural consumption subsides on the import amount of the agricultural product.

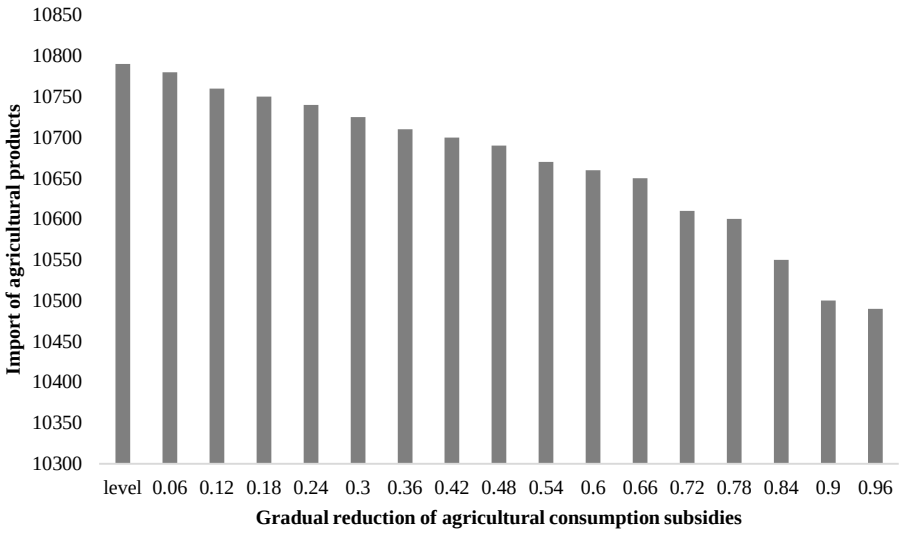


**Fig. 1.** The effects of reduction in the agricultural consumption subsides on the import amount of the agricultural product.

The Price increase at resulted from unblocking the agricultural product prices and also, a decrease in the consumption demand forces the producer to decrease the production; so that by the complete elimination of the agricultural consumption subsides, the agricultural production amount will decrease by 1.6%.

Fig. 2 shows the effects of the gradual decrease in the agricultural consumption subsidies on the agricultural production amount.

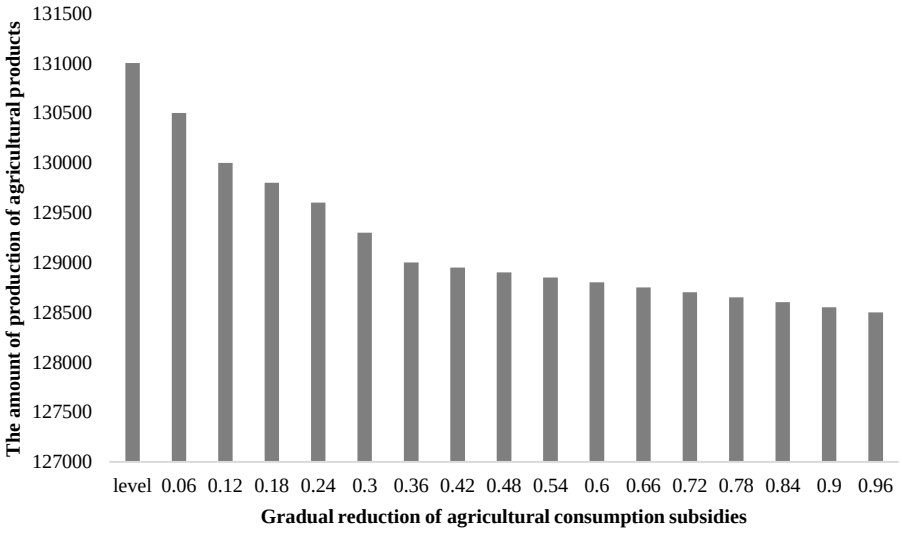


**Fig. 2.** The effects of the gradual decrease in the agricultural consumption subsides on the agricultural production amount.

Decreasing producing agricultural products can reduce employment in the agricultural sector. So this decision in the employment will be 2.6% in the complete elimination of the agricultural consumption subsidy. Fig. 3 shows a decrease in the agricultural sector in the decreased condition of the agricultural production subsidy.

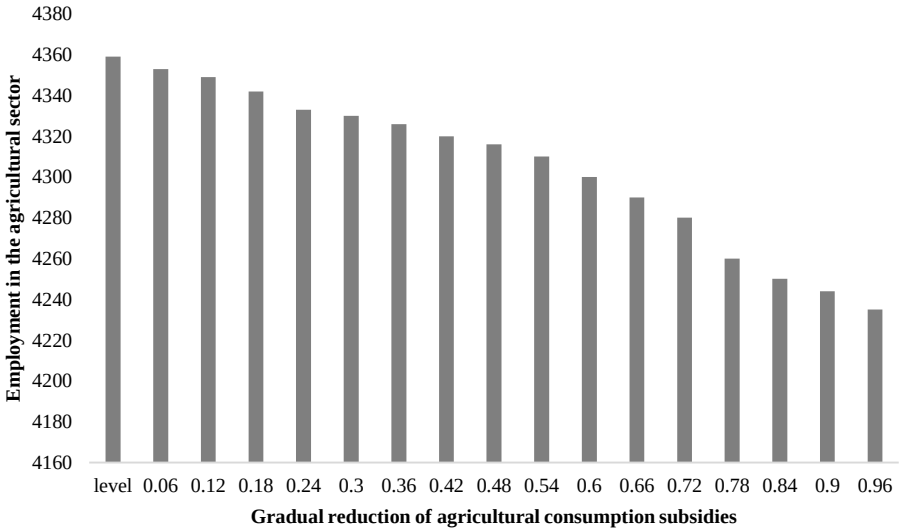


**Fig. 3.** The effect of the gradual depression in the agricultural consumption subsidy on the employment in the agricultural sector.

Although a decrease in the agricultural consumption subsidies can reduce the consumption and the demand for the agricultural products, decreasing the agricultural goods products will not support more goods for export. In other words, reducing the agricultural consumption subsidies will decrease the agricultural product exports. So that the complete elimination of the agricultural consumption subsidies, the agricultural products exports will be decreased by 0.82%. Fig. 4 shows the effects of a decrease in the agricultural Consumption subsidies on the products export.

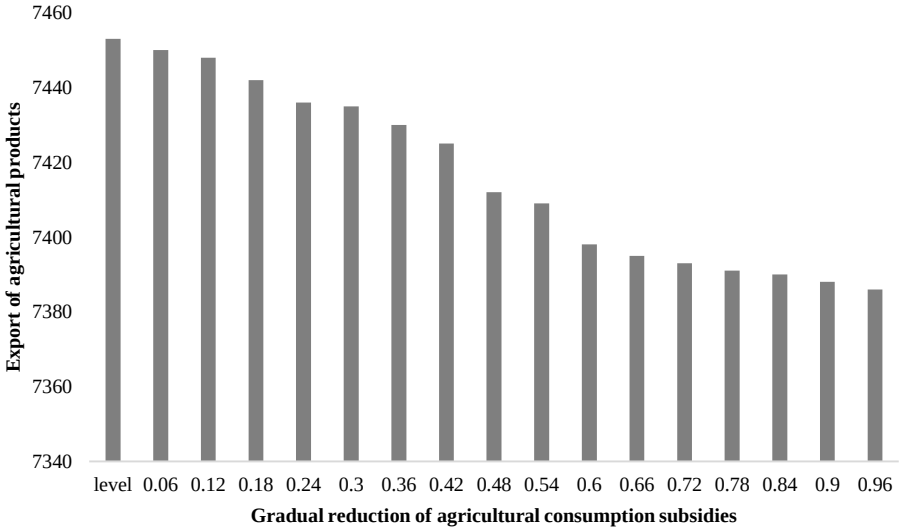


**Fig. 4.** The effects of decrease in the agricultural consumption Subsidies on the agricultural products exports.

In the following, all data for the base year were reproduced by numerically solving numerically the computable general equilibrium model, indicating the robustness of model calibration. The Calibrated, substitution elasticity's and transfer parameters which are Arrington and transfer functions respectively, are shown in table 4. The share of intermediate inputs shows the intermediation inputs and the production

factors ratios to each product unit. The intermediate input share of the agricultural activity shows that 0.21 units of the agricultural inputs, 0.38 units of the industrial inputs and 0.01 units of the service input produce each product.

According to table 4, the share of the production factors is more substantial than the intermediate inputs indicating the agricultural sector is capital; in other words, to produce each product unit the production factors are used compared to the intermediate inputs. The final linked index is the column sum of the intermediate inputs shares for a production activity. This activity shows that the agricultural sector needs 0.28 units of the intermediate productions per unit of the final product. The final industry and service indices are 0.12 and 0.11, respectively.

Comparing the indices amounts indicates that an increase in the agricultural production here is more effective on economics compared to increase in producing industry and service.

**Table 4.** Model elasticity's and parameters

| Function | Parameters | Agricultural | Industry and mining | Service |
|---|---|---|---|---|
| **Consumption** | The share of the good | 0.6139 | 0.1224 | **0.2569** |
| **Consumption** | Marginal propensity consume in household | 0.376 | 0.060 | **0.384** |
| **Added value production** | Transfer or efficiency | 1.826 | 0.423 | **1.903** |
| **Added production** | The share of capital | 0.290 | 0.113 | **0.343** |
| **Added production** | The share of the agricultural intermediator inputs | 0.711 | 0.887 | **0.657** |
| **Marginal product** | The share of agricultural intermediator inputs | 0.211 | 0.386 | **0.016** |
| **Marginal product** | The share of the industrial and mining intermediate inputs | 0.072 | 0.283 | **0.0313** |
| **Marginal product** | The share of the service intermediator inputs | 0.017 | 0.595 | **0.076** |
| **Marginal product** | The share of added value | 0.3014 | 1.0716 | **0.606** |
| **Arrington** | Substitution elasticity | 1.4 | 1.4 | **1.4** |
| **Transfer** | The share of the import | 0.032 | 0.161 | **0.252** |
| **Transfer** | Transfer | 1.642 | 1.976 | **1.515** |
| **Transfer** | Transfer | 1.2 | 1.2 | **1.2** |
| **Transfer** | The share of the export | 0.919 | 0.479 | **0.895** |
| **Transfer** | Transfer | 3.824 | 2.002 | **3.656** |

One of the main goods of using the general equilibrium models is simulation and scenarioization. The effects of the different policies can be analyzed quantitatively by scenarioization in the general equilibrium models. Therefore, to analyze the effects of the economic equilibrium policies on the agricultural sector five scenarios are also investigated. These amounts are considered to study the different states in the simulation of using the economic equilibrium policies on the agricultural sector. The percentage of the observed changes indicate how a shock or sudden change in the form of economic equilibrium policies can affect the agricultural sector in different scenarios.

The changes in the domestic production and producer prices can be also investigated by analyzing the effects of economic equilibrium policies on the agricultural sector. The amounts of the domestic production and producer price obtained from the effects of using economic equilibrium policies on the agricultural sector compared to the base scenario (complete elimination of policy) are shown in Table 5.

**Table 5.** The amounts and percentages of the domestic and producer price se obtained from using the economic equilibrium policies – compared to million rial).

| Index | Scenario | Agricultural | Industry and mining | Service |
|---|---|---|---|---|
| **Domestic production** | base scenario | 1437945 | 1062570 | **3293164** |
| **Domestic production** | Scenario %20 | 1439973 | 1062057 | **3291256** |
| **Domestic production** | Changes percentage | 0.14 | -0.04 | **-0.05** |
| **Domestic production** | Scenario %40 | 1443013 | 1041290 | **3288395** |
| **Domestic production** | Changes percentage | 0.35 | -0.12 | **-0.14** |
| **Domestic production** | Scenario %60 | 1448273 | 1060016 | **3127126** |
| **Domestic production** | Changes percentage | 0.70 | -0.24 | **-5.04** |
| **Domestic production** | Scenario %80 | 1642961 | 1031109 | **3025142** |
| **Domestic production** | Changes percent | 0.82 | -0.36 | **-6.03** |
| **Producer price** | Base scenario | 0.48 | 0.67 | **0.49** |
| **Producer price** | Scenario %20 | 0.48 | 0.67 | **0.49** |
| **Producer price** | Changes percentage | -0.14 | 0.02 | **0.06** |
| **Producer price** | Scenario %40 | 0.48 | 0.67 | **0.49** |
| **Producer price** | Changes percentage | -0.35 | 0.05 | **0.14** |
| **Producer price** | Scenario %60 | 0.48 | 0.67 | **0.49** |
| **Producer price** | Changes percentage | -0.69 | 0.10 | **0.29** |
| **Producer price** | Scenario %80 | 0.48 | 0.37 | **0.49** |
| **Producer price** | Changes percentage | -0.61 | 0.12 | **0.33** |

Since the supply is a function of different goods which is supplied at different prices, mathematically the level between the price and the supply curve is producer surplus. The amounts and producer prices obtained from the base states and using a shock in different scenarios are explained.

According to data obtained from modeling, the domestic production in the agricultural sector in four scenarios is increased due to using the economic equilibrium policy in this sector, and in twenty, Forty, sixty and eighty percent scenarios the domestic production in the agricultural sector is increased by 0.1, 0.3, 0.7 and 0.8 percent, respectively. The change percent of the agricultural sector was descending due to devoting the economic equilibrium to the agricultural sector so, an increase in the production and decrease in the production costs in this sector was observed and therefore, the producer price was decreased by 0.1%, 0.3%, 0.6% and 0.7%, respectively. Since in modeling the complete employment was created and the capital and the labor were stable so, to increase production in the agricultural sector more production factors (agents) are required and this increase is compensated by transferring the capital and labor from the industrial and service sectors to the agricultural sector. Therefore; decreasing the production factors (agents, in these sectors can result in decreasing the domestic production by 0.04%, 0.12%, 0.24%, 0.36% in the industrial sector and 0.05%, 0.14%, 5.04% and 6.03% in the service sector. Since in the industrial and service sectors the production is decreased and the demand exists, so the producer price in the industrial sector is increased by 0.02%, 0.05%, and 0.12% and in the service sector this amount is increased by 0.06% 0.14, 0.29 and 0.33%. The results showed increases in the production percentage and decreases in the prices in the agricultural sector to which the

economic adjustment belongs whereas in the industrial and service sectors the production amount was descending. Also, if Iran joins the World Trade Organization, the Support of the agricultural sector will be decreased. Therefore, in this section, the effects of this decrease is studied and simulated using the social accounting matrix 2016. The mentioned matrix included 55 production activities, 3 added value accounts, 10 urban and rural households, 1 company account, 6 government accounts, 1 foreign account and 1 capital account. The government account was exogenous and other accounts are endogenous as shown in table (6), the total support for the agricultural in 2016 amounted to 102252 million rials which is more than 10%/ (26.3%) of total value of the for the agricultural products. Therefore, the supports for the agricultural sector include the descending commitments. So, during ten years the supports amounts should be decreased by 13.3%, i.e. 13600 million rails. If there is a shock with a share of each agricultural sector in each sub-sector for the added value (the support for this sector is decreased), it will have a significant effect on the agricultural sector, which the results are shown in Table 6.

From this table, the highest amounts of the shocks to these sub-sectors are related to the crops (276 million rials), other Crops (271 million rails) and wheat (182 million rails).Also, the amount of decrease in the agricultural activities incomes is about 1.47% of their total income. In term of the share, the highest decrease is observed in food products (0.9%) and types of fertilizers and pesticides (0.9%). Additionally, the direct effect of this decrease in support amounted 1360 million rials in the agricultural sector will cause to reduce the income obtained from the agricultural industrial and service activities to 2152 million rials. Decreasing the supports for wheat activity (43-7 million rials) and other Crops (36.1 million rials) is high and in other agricultural activities is less.

As it is clear, this effect is not very high.

**Table 6.** The effect of decrease in the support for the agricultural sector on this sector and the economic and social sectors.

| | Shock amount | Total effect production/ Income | Share after shock | Changes in the numbers the labor | The direct effect | Open effect | Closed effect |
|---|---|---|---|---|---|---|---|
| **Wheat** | -182 | 261 | -1.4 | -5224 | 43.57 | 0.00 | -35.18 |
| **Rice and paddy** | -62 | -88 | -1.4 | -1759 | -6.90 | 0.00 | -19.47 |
| **Sugarbeet and sugarcane** | -18 | -25 | -1.4 | -493 | -2.3 | 0.00 | -494 |
| **Other industrial plants** | -3 | -43 | -1.2 | -868 | -2.77 | 0.00 | -6.02 |
| **Other Crops** | -271 | -425 | -1.5 | _8496 | _71.34 | 0.00 | -82.24 |
| **Horticulture products** | -276 | -345 | -1.2 | -6890 | -4.76 | 0.00 | -63.62 |
| **Caw and Buffalo, sheep, goat and other living animals except poultry** | -19 | -257 | -1.3 | -5138 | -19.60 | 0.00 | -38.32 |
| **Hen, chicken and other living poultry** | -108 | -156 | -41 | -3120 | -19.73 | 0.00 | -27.97 |
| **Domesticated and poultry animals products** | -15 | -227 | -1.4 | -4547 | -36.15 | 0.00 | -35.77 |
| **Honey, soft, silkworms and other products of bee honey and silkworm** | -5 | -7 | -1.3 | -136 | -0.16 | 0.00 | -1.58 |
| **Forestry and cutting the trees products** | -15 | -17 | -1.2 | -348 | -0.45 | 0.00 | -2.46 |
| **Fish and other fishing products** | -34 | -45 | -1.3 | -905 | -1.16 | 0.00 | -10.12 |
| **Natural gas** | | -2 | -0.2 | -3 | -0.27 | 0.00 | -1.16 |
| **Electricity and the related service** | | -40 | -0.3 | -67 | -10.28 | 0.01 | -2.9 |
| **Water and related service** | | -26 | -0.7 | -44 | -15.83 | 0.00 | -10.64 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Distributing the natural gas and the related service** | -10 | -0.3 | -16 | -1.32 | 0.00 | -448 |
| **Other mineral** | -28 | 0.0 | 47 | -6.12 | 0.01 | -21.61 |
| **Meat and products consisting of meat** | -109 | -0.3 | -12 | -2.14 | 0.00 | 107.32 |
| **Fish and other prepared and protected from corruption** | -4 | -0.4 | -7 | -2.2 | 0.00 | -1.76 |
| **Vegetables and other prepared fruit and their juice** | -8 | -0.3 | -13 | -0.26 | 0.00 | -7.63 |
| **Oils and vegetable and animal fat** | -1 | -0.3 | -29 | -1.51 | 0.00 | -16.07 |
| **Daily products** | -50 | -0.3 | -83 | -0.24 | 0.00 | -49.37 |
| **Flour** | -28 | -0.6 | -46 | -16.21 | 0.00 | -11.55 |
| **Types of bread** | -15 | -0.3 | -25 | 0.04 | 0.00 | -14.68 |
| **All types of cookies** | -10 | -0.3 | -16 | -0.15 | 0.00 | -9.60 |
| **Sugar and sweet** | -22 | -0.4 | -37 | -10.2 | 0.00 | -12.16 |
| **Macaroni and similar products** | -3 | -0.3 | -5 | 0.00 | 0.00 | -2.97 |
| **Tea** | -13 | -0.3 | -22 | -1.79 | 0.00 | -11.19 |
| **Other food products** | -55 | -0.9 | -91 | -41.57 | 0.00 | -13.05 |
| **Tobacco products** | -8 | -0.3 | -14 | 0.00 | 0.00 | -8.1 |
| **Carpets and rages and types of woven flooring mat** | -6 | -0.1 | -10 | -0.03 | 0.00 | -5.78 |
| **Leather and related products** | -2 | -0.2 | -3 | -0.14 | 0.00 | -1.90 |
| **Products produced from wood, cork, reed mat wearing materials** | -7 | -0.3 | -12 | -2.95 | 0.00 | -4.32 |
| **Gas** | -24 | -0.2 | -40 | -3.1 | 0.00 | -20.89 |
| **Kerosene** | -3 | -0.3 | -5 | -0.28 | 0.00 | -2.59 |
| **Gas oil** | -7 | -0.4 | -12 | -3.80 | 0.00 | -3.40 |
| **Mazut** | -3 | -0.1 | -4 | -0.8 | 0.00 | -1.81 |
| **Liquid gas** | -1 | 0.0 | -2 | -0.40 | 0.00 | -750 |
| **Types of fertilizers and pesticides** | -48 | -0.9 | -81 | -39.06 | 0.00 | -9.33 |
| **Agricultural machinery and the related ports** | 0 | 0.0 | 0 | -0.0 | 0.00 | -0.04 |
| **Other industrial goods** | -499 | -0.2 | -832 | -99.99 | 0.00 | -39.96 |
| **Wholesale and retail services** | -350 | -0.3 | -584 | -71.94 | 0.00 | -278.40 |
| **Cargo transportation service by railway** | -5 | -0.2 | -8 | -1.33 | 0.00 | -2.96 |
| **Road transportation service** | -127 | -0.3 | -212 | -49.03 | 0.00 | -78.07 |
| **Water transportation service** | -14 | -0.1 | -24 | -5.97 | 0.00 | -8.24 |
| **Aerial transportation service** | -17 | -0.3 | -29 | -0.32 | 0.00 | -16.70 |
| **Post and telecommunication service** | -28 | -0.3 | -47 | -1.60 | 0.00 | -26.81 |
| **Banking service** | -45 | -0.3 | -74 | -18.48 | 0.00 | -26.03 |
| **Other financial intermediation and side activities** | -10 | -0.3 | -17 | -4.03 | 0.00 | -6.06 |
| **Insurance service** | -6 | -0.4 | -10 | -1.19 | 0.00 | -4.81 |
| **Research and development service** | -2 | -0.3 | -4 | -0.49 | 0.00 | -1.86 |
| **Agricultural, hunting, forestry fishing and mining services** | -90 | -1.2 | -150 | -73.13 | 0.00 | -16.63 |

## Discussion

The country Iran is the most important aspect of a developing country which has changed from the taxation to supporting the agriculture. Recently, Iran's subsides and support has rapidly increased that is related to high production costs. The government increased price supports in order to motivate and help the purchase of the agricultural imports. Therefore, with respect to developing the agricultural support policies, the current study investigates the effects of the Supportive policies on the agricultural products in the term of computable general equilibrium models. Among the agricultural products, the share of nuts in Iran's agricultural sector can be examined and analyzed. Because the nuts and dried fruit industry is a profitable industry that has a significant impact on the global economy, and Iran and Khorasan Razavi also have a special place in the field of its production. Nuts and dried fruits are among the most important export products of Iran that directly affect the country's trade and foreign exchange earnings, and given the high quality of Iranian nuts and dried fruits, a valuable position has been created for Iran in the global market. Therefore, it is necessary to examine the impact of support measures on the production of these types of products.

In this regard, the obtained results of the research show a decrease in the prices and an increase in the production in the agricultural sector which is attributed to the economic adjustment; on the other hand, in other sectors, an increase in the prices and a decrease in the production is observed. Considering that the producer's welfare is directly dependent on the price and production amount in the agricultural sector despite the decrease in the prices the producer's welfare has increased due to the increase in the production compared to the decrease in the prices leading to increase the producer welfare in the base state. Decreasing the prices can be affected by using the economic adjustment Policy in the agricultural sector and finally, decreasing the production prices.

Additionally, in the industry and service sectors the same changes are observed. Since in the current research the economic adjustment is only related to the agricultural sector, a decrease in the prices is not observed in other sectors; Contrary to the agricultural sector, the prices are increased and in other sectors and on the other hand, production amount is decreased with a lower slope than the prices. Generally, changes in producer welfare in these sectors are positive, although the amounts of the changes is insignificant compared to the agricultural sector due to using the economic adjustment in this sector and change in the production amount compared to the other sectors. The findings of this study is consistent with the study performed by Demirdogen *et al*. (2016), Shikur (2020) and kian & *et al*. (2013). Because they found that the supportive policy for the prices played the most important role in determining the agricultural sector situation compared to the other economic sectors. Therefore, it is suggested that the country's authorities increase domestic so policy support for the agriculture cultural sector encounters competitive pressures due to integrating the policies. For the future research, analyzing the implementation of the enhanced domestic policies to support the agriculture is highly recommended.

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## Conflict of interests

The authors declare no competing interests.

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