

## Economic and Social Consequences of Changing the Cultivation Pattern in Golestan Province from Land Reforms until Now

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**Abstract:** The cultivation pattern refers to the determination of an agricultural system with a sustainable economic advantage based on the country's macro policies, the local knowledge of farmers and the optimal use of regional potentials by observing the eco-physiological principles of agricultural production in order to preserve the environment, which is of great importance. This study has been conducted with the aim of evaluating the economic and social consequences of changing the cultivation pattern in Golestan province from the land reforms until now. The present study is considered as a qualitative-exploratory study that uses the Delphi method and the group interview technique. According to the results of the self-interaction matrix, among the dimensions of economic factors, the variables of modern irrigation methods and production sustainability are assigned to level 1, the variables of economic well-being, infrastructure, land reforms, farmers' income to level 2, and the variables of labor productivity, the access to inputs, investment and employment to level 3. Among the dimensions of social factors, the variables of increasing the density of cultivation, reducing the negative environmental effects, sustainable rural development, improving organizational farming practices, reducing the pollution of personal natural resources are assigned to level 1, the variables of social prestige, changing the attitude towards agriculture to level 2 and variables of social trust, knowledge and awareness, modification of organizational water consumption pattern, change in the land-use type, social participation and cohesion to level 3.

**Keywords:** economic and social consequences, change of cultivation pattern, Golestan province, land reforms.

### Introduction

Agriculture, as the dominant activity of villages, has experienced countless structural transformations over time in the form of changes in cultivation operations, cultivation systems, cultivation types, and cultivation patterns. There are many definitions of the cultivation pattern, which seems to be the most comprehensive definition. is as follows:

"Cultivation pattern refers to the determination of an agricultural system with a sustainable economic advantage based on the country's macro policies, local knowledge of farmers and optimal use of regional potentials by observing the ecophysiological principles of agricultural production in order to preserve the environment" (Sabzevari et al., 2019) Cultivation pattern can be the basis of productivity and provide the necessary context to carry out productivity improvement operations (Pourniakan, 2019). Some studies have dealt with the effect of the optimal crop cultivation pattern on water productivity (Ghodspour et al. et al., 2018; Tabatabai and Shahidi 2017; Danshi et al., 2015; development of rural areas (Nosrati et al., 2021); agricultural transformation (Falsafian and Panahi, 2021); increasing the welfare of farmers (Parhishkari et al., 2015); environmental effects (Marzban et al., 2020); Nasabian et al., 2014; soil stabilization (Hosseini Shad et al., 2021); optimal productivity of water and soil resources (Omrani, 2015); employment growth (Hajinejad et al., 2014); Nasabian et al., 2014; Economic welfare and security (Pourtaheri et al., 2014); sustainable employment (Gash, 2018);

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income of villagers (Sharma and Dinesh, 2016); taxes (Rozane and Philippe 1, 2017), which indicate the many economic and social consequences of the type of cultivation pattern. In general, the economic and social consequences of changing the cultivation pattern can be expressed as follows:

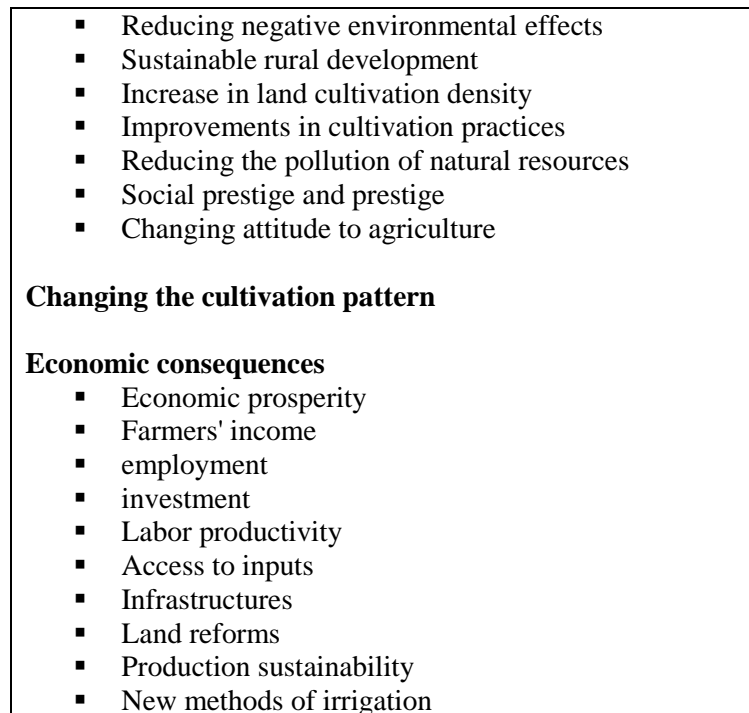
1. Increasing or decreasing the income of farmers, increasing or decreasing the level of need for labor and their wages
2. Changes in the price of land, encouraging or preventing side activities of agriculture such as animal husbandry
3. Changes in the exploitation systems, the level of participation and social cohesion, changes in women's participation in agricultural activities
4. Changing the attitude towards agriculture
5. Changes in irrigation methods and changes in farmers' awareness
6. The growth of some related industries and the stagnation of others, the destruction of some infrastructures (Schirmer & et al., 2018).

Golestan province has a high diversity in terms of crop production, so that this province has the first ranks in terms of the area under cultivation and production in the field of oil crops, especially soybeans and rapeseed, and is also considered as one of the most suitable areas for the production of rainfed and irrigated wheat as well as cotton and rice. This province has an area of about 21500 square kilometers, whose climate can be divided into three types according to the characteristics of temperature and precipitation, including humid, mountainous caspian temperate (temperate and cold), and semi-arid (semi-desert) (Dargahi et al, 2016). This province supplied a huge part of the cotton needed by the country in the past years and was considered one of the main poles of cotton cultivation, so that the cotton of Golestan province accounted for more than 50% of the cotton produced in the country in 1983-1989, and it was considered as the largest cotton producer in Iran. This share decreased from 40% to 20% in 1370s. Also, cotton cultivation in the province decreased regularly since 2013, so that in 2014, the cotton produced in this province reached eight percent of the total cotton produced in Iran (Hosseini and Amin Rawan, 2014), and currently it is responsible for a small share of the country's cotton production.

It is worth considering that as the area of cotton cultivation in the agricultural lands of this province decreased, the area of rice cultivation increased, and this problem caused pressure on the water resources of the province. Basically, traditional rice cultivation systems require high water consumption due to continuous flooding conditions, and this issue of sustainability of these systems results in a lack of water resources. Changing the cultivation pattern from the flooded system to dry sowning (aerobic rice) is a solution that can include this plant in the crop rotation of the region, because the economic, development and social factors in this region are suitable for rice cultivation. In the submerged rice cultivation system About 60% of the irrigation water for cultivation is often removed from the reach of the plant in the form of deep infiltration or waste water, which increases the efficiency of water consumption significantly by changing the planting pattern. Of course, before the expansion and promotion of this type of cultivation system. It is necessary to solve some agricultural problems, including weed control and identification of suitable cultivars (Kazemi et al. 2016). The present research examines the evaluation of the economic and social consequences of the change in the cultivation pattern in Golestan province from the land reforms until now, taking into account the importance of the type of cultivation pattern and the effects that the type of cultivation has on the social and economic life of farmers and residents of the province. Changing the cultivation pattern has social and economic consequences, each of which has sub-components. The conceptual model for presenting the model is as follows:

**Social consequences**

- knowledge and awareness
- Participation and social cohesion
- Modifying the pattern of water consumption
- Change in land use type



*Figure (1): conceptual model of research*

## **Research objectives**

### **General objective**

Knowing the economic and social consequences related to the change of cultivation pattern in Golestan province

### **Sub-objectives:**

1. Identifying and prioritizing the economic effects of changing the cultivation pattern in Golestan province
2. Identifying and prioritizing the social effects of changing the cultivation pattern in Golestan province

## **Method**

The present study is considered as a qualitative study that was conducted with an exploratory approach using the Delphi research method. Group interview in order to get the opinion of experts and specialists has been used as data collection tool. In this regard, the focal group and the decision group consisting of 18 members of the university faculty and farmers in Golestan province were selected by snowball method, and group meetings were organized to discuss the desired topics and get their expert opinions in the form of methods Fuzzy Delphi. Fuzzy Delphi method is a powerful process based on group communication structure. Fuzzy Delphi method is mainly used with the aim of discovering creative and reliable ideas and providing appropriate information for decision making. MICMAC analysis was also used to analyze data in addition to using matrices.

## **Research findings**

### **Demographic description**

According to the results of the analysis of descriptive statistics, the decision team consists of 18 experts, of which 3 (17%) are female and 15 (83%) are male, of which 2 (11%) have a bachelor's degree and 5 (28%) have master's degree and 11 people (61%) have a doctorate degree, and the service period of 6 people (33%) is less than 11 years, the service period of 8 people (45%) is between 11 and 20 years, 4 people (22%) is more than 20 year.

### Qualitative findings of fuzzy Delphi

Fuzzy Delphi method is usually done in two and three stages. In this study, a two-stage fuzzy method was used. 15 items were removed. In the first stage, all the items were confirmed. Then, in the second stage, the results are listed in Table 2, also, according to the views presented in the second stage and comparing it with the results of the first stage, the definite average difference of the indicators between the two stages is less than the low threshold (0.1), therefore, the survey process is stopped and the members of the expert group agreed with all the indicators, and these indicators were accepted based on the fuzzy Delphi technique.

*Table (1): Dimensions and indicators*

Consequences	Effects	Source
<b>Social</b>	knowledge and awareness	Nosrati et al. (2021), Sawari et al. (2013), Pour Taheri et al (2014), Chimere et al. (2008).
	Participation and social cohesion	Nosrati et al. (2021), Riki et al. (2005), Chimere et al. (2008)
	Participation of villagers in the management of village affairs	Nosrati et al. (2021), Taheri Rikandeh et al (2017), Pour Taheri et al (2014)
	Social trust	Riahi et al. (2018), Sharifi et al. (2020)
	Correcting the pattern of water consumption	Tabatabai (2017), Jalil Piran (2012), Ehsani and Jenab (2017), Danshi et al., (2016), Shah Vali et al. (1394), Nasabian et al. (2014)
	Culture-building activities for the use of alternative crops	Riahi et al. (2018)
	Social prestige	Riahi et al. (2018)
	Changing attitude to agriculture	Chimere et al. (2008).
	Farmers' satisfaction	Sajasi Gheydari and Behrouz (2016)
	Change in land use type	Ghadimi et al. (2018), Jamalipour et al. (2015), Portahari et al. (2013)
	Destructing the natural environment or strengthening it in the direction of its sustainability,	Parhizhkari et al. (2014), Pourtahari et al., (2014)
	Reducing negative environmental effects	Marzban et al. (2019), Javalii et al. (2015), Nasabian et al. (2013)
	Sustainable rural development	Joulaei et al. (2015), Zhang et al. (2020)
	Increase in land cultivation density	Gash (2011), Riki et al. (2015)
	Improvements in cultivation practices	Marzban et al. (2019), Gash (2011), Riki et al. (2015)
	Reducing the pollution of natural resources	Shahin Rokhsar et al. (2017), Nasabian et al. (2013)
<b>Economic</b>	Economic prosperity	Nosrati et al. (1400), Riki et al. (2015), Zhang et al. (2020)
	Crop insurance	Sajjadi Ghidari and Behrouz (2016)
	Farmers' income	Nosrati et al. (2021), Sharma and Dinesh (2011), Chimere et al. (2008), Joulaei et al. Sajjadi GHIDARI and Behrouz (2017).
	Alternative products with less water requirement and higher economic efficiency	Danshi et al. (2015), Riahi et al. (2018), Nasabian et al. (2013)
	Employment	Pourtahari et al. (2013), Javali et al. (2015), Hajinejad et al (2013), Emami Far et al. (2014), Nasabian et al. (2014)
	Investment	Joulaei et al. (2015)
	Labor productivity	PourTaheri et al., (2008), Chimere et al. (2008)
	The opportunity to obtain loans and credits	Sajasi Ghidari and Behrouz (2016)
	Changes in land prices	Chimere et al. (2008)
	Production sustainability	Shirshahi et al. (2021), Mardani et al. (2021), Heydari

		Sarban (2013)
	Transformation in the context of the village	Portahari et al., (2013)
	Construction of rural houses	Portahari et al., (2013)
	Access to inputs	Riahi et al. (2018), Gash (2011), Arjamandi and Mehrabi (2012), Sepherdoost and Emami (1396)
	Infrastructures	Chimere et al. (2008), Riahi et al. (2018)
	Access to new tools and machines	Marzban et al. (2019), Riahi et al. (2018), Danshi et al. (2015), Chimere et al. (2008)
	New methods of cultivation	Mardani et al. (2021), Marzban et al. (2008), Chimer et al. (2008), Heydari Sarban (2013)
	New methods of irrigation	Hosseini Shad et al. (2021), Mardani et al. (2021), Marzban et al. (2019), Riahi et al. (2018), Danshi et al. (2015), Chimere et al. (2008)

**Structural Self – Interaction Matrix (SSIM)**

According to the results of the previous step, the next step is to identify the pattern of causal relationships between the variables, from the point of view of experts, it is used to reflect the internal relationships between the main criteria. In this technique, experts are able to express their opinions more fluently regarding the effects (direction and intensity of effects) between the factors. The matrix shows both the cause & effect relationship between the factors, and the influence and effectiveness of the variables. In this step, the variables of the problem were compared in pairs and in pairs, and the respondents determined the relationships between the variables by using the symbols X, O, A, and V. The structural self-interaction matrix was obtained according to Tables (3) and (4) after asking the opinion of experts.

*Table (2): Relationships between variables*

O	X	A	V
Variable i has a significant effect on j.	Variable j has a significant effect on j.	Bilateral relationship	There is no relationship

*Table (3): Structural self-interaction matrix of social effects of changing the cultivation pattern in Golestan province*

No	Social effects	1	2	3	4	5	6	7	8	9	10	11	12
1	knowledge and awareness	1	V	V	X	X	V	V	V	V	V	V	V
2	Participation and social cohesion		1	X	V	V	V	V	V	V	V	V	V
3	Participation of villagers in the management of village affairs			1	V	X	V	V	V	V	V	V	V
4	Social trust				1	V	V	V	V	V	V	V	V
5	Correcting the pattern of water consumption					1	V	V	V	V	V	V	V
6	Culture-building activities for the use of alternative crops						1	A	X	A	X	A	A
7	Social prestige							1	A	V	V	A	A
8	Changing attitude to agriculture								1	O	X	A	A
9	Farmers' satisfaction									1	X	A	A
10	Change in land use type										1	A	A
11	Destructing the natural environment or strengthening it in the direction of its sustainability,											1	X
12	Reducing negative environmental effects												1

**Table (4): Structural self-interaction matrix of the economic effects of changing the cultivation pattern in Golestan province**

No	Economic effects	1	2	3	4	5	6	7	8	9	10
1	Economic prosperity	1	X	A	A	A	A	X	X	V	V
2	Farmers' income		1	A	A	A	A	X	X	V	V
3	Employment			1	X	X	X	V	V	V	V
4	Investment				1	X	X	V	V	V	V
5	Labor productivity					1	X	V	V	V	V
6	Access to inputs						1	V	V	V	V
7	Infrastructures							1	X	V	V
8	Land reforms								1	V	V
9	Production sustainability									1	X
10	New methods of irrigation										1

**Initial reachability matrix**

In this step, the structural self-interaction matrix is converted into a binary matrix, in this way, the initial access matrix is obtained, the structural self-interaction matrix is transformed into a binary matrix by converting the symbols X, O, A, V to zero and one for each variable, which is called the reachability matrix, the rules for transforming these symbols are as follows:

If the (j,i) entry is the intersection of row i and column j in the structural self-interaction matrix V, then in the (j,i) entry, one is placed in the initial matrix and zero in the (i,j) entry, if the (j,i) entry is in the structural self-interaction matrix A, then zero is placed in the entry (j,i) in the initial matrix and in the (i) entry j (one), if the (j,i) entry is in the structural self-interaction matrix X, then one is placed in the (j,i) entry in the initial reachability matrix, and one is placed in the (i,j) entry, and if the (j, i) entry in the structural self-interaction matrix is 0, zero is placed in the (j, i) entry in the initial matrix and zero in the (i, j) entry. According to the above explanation, the initial access matrix for the structural self-interaction matrix of the previous step is shown in Tables 5 and 6 is.

**Table (5): Initial reachability matrix of the social effects of changing the cultivation pattern in Golestan province**

No	Social effects	1	2	3	4	5	6	7	8	9	10	11	12
1	knowledge and awareness	1	1	1	1	1	1	1	1	1	1	1	1
2	Participation and social cohesion	0	1	1	1	1	1	1	1	1	1	1	1
3	Participation of villagers in the management of village affairs	0	1	1	1	1	1	1	1	1	1	1	1
4	Social trust	1	0	0	1	1	1	1	1	1	1	1	1
5	Correcting the pattern of water consumption	1	0	1	0	1	1	1	1	1	1	1	1
6	Culture-building activities for the use of alternative crops	0	0	0	0	0	1	0	1	0	1	0	0
7	Social prestige	0	0	0	0	0	1	1	0	1	1	0	0
8	Changing attitude to agriculture	0	0	0	0	0	1	1	1	0	1	0	0
9	Farmers' satisfaction	0	0	0	0	0	1	0	0	1	1	0	0
10	Change in land use type	0	0	0	0	0	1	0	1	1	1	0	0
11	Destructing the natural environment or strengthening it in the direction of its sustainability,	0	0	0	0	0	1	1	1	1	1	1	1
12	Reducing negative environmental effects	0	0	0	0	0	1	1	1	1	1	1	1

**Table (6): Initial reachability matrix of the economic effects of changing the cultivation pattern in Golestan province**

No	Economic effects	1	2	3	4	5	6	7	8	9	10
1	Economic prosperity	1	1	0	0	0	0	1	1	1	1
2	Farmers' income	1	1	0	0	0	0	1	1	1	1
3	Employment	1	1	1	1	1	1	1	1	1	1
4	Investment	1	1	1	1	1	1	1	1	1	1
5	Labor productivity	1	1	1	1	1	1	1	1	1	1
6	Access to inputs	1	1	1	1	1	1	1	1	1	1
7	Infrastructures	1	1	0	0	0	0	1	1	1	1
8	Land reforms	1	1	0	0	0	0	1	1	1	1
9	Production sustainability	0	0	0	0	0	0	0	0	1	1
10	New methods of irrigation	0	0	0	0	0	0	0	0	1	1

### Final Reachability Matrix

The final reachability matrix is formed after forming the initial reachability matrix by involving transferability in variable relationships, secondary relationships must be controlled for certainty. Transferability means that if variable A has a significant effect on B and B has a significant effect on C, then A must also have a significant effect on C; That is, if direct effects should have been included based on secondary relationships, but this did not happen in practice, the table should be corrected, and the secondary relationship should also be shown. In this matrix, the power of influence and the degree of dependence of each variable are also shown, the power of influence of a variable is obtained from the sum of the number of variables affected by it and the variable itself. The degree of dependence of a variable is obtained from the sum of the variables that it affects, and the variable itself. The final reachability matrix is obtained in Tables 7 and 8.

**Table (7): Final Reachability Matrix of the social effects of changing the cultivation pattern in Golestan province**

No	Social effects	1	2	3	4	5	6	7	8	9	10	11	12	Degree of influence
1	knowledge and awareness	1	1	1	1	1	1	1	1	1	1	1	1	12
2	Participation and social cohesion	1	1	1	1	1	1	1	1	1	1	1	1	12
3	Participation of villagers in the management of village affairs	1	1	1	1	1	1	1	1	1	1	1	1	12
4	Social trust	1	1	1	1	1	1	1	1	1	1	1	1	12
5	Correcting the pattern of water consumption	1	1	1	1	1	1	1	1	1	1	1	1	12
6	Culture-building activities for the use of alternative crops	0	0	0	0	0	1	1	1	1	1	0	0	5
7	Social prestige	0	0	0	0	0	1	1	1	1	1	0	0	5
8	Changing attitude to agriculture	0	0	0	0	0	1	1	1	1	1	0	0	5
9	Farmers' satisfaction	0	0	0	0	0	1	1	1	1	1	0	0	5
10	Change in land use type	0	0	0	0	0	1	1	1	1	1	0	0	5
11	Destructing the natural environment or strengthening it in the direction of its sustainability,	0	0	0	0	0	1	1	1	1	1	1	1	7
12	Reducing negative environmental effects	0	0	0	0	0	1	1	1	1	1	1	1	7
	The degree of dependence	5	5	5	5	5	12	12	12	12	12	7	7	

According to the figures listed in the table above, among the dimensions of social factors, the variables of increasing the density of cultivation, reducing the negative environmental effects, sustainable rural development, improving organizational cultivation practices, reducing the pollution of personal natural resources are at level 1, the variables of credibility and Social status, change of attitude towards agriculture is at level 2, and variables of social trust, knowledge and awareness, modification of organizational water consumption pattern, change in the type of use, participation and social cohesion are at level 3.

**Table (8): Final Reachability Matrix of the economic effects of changing the cultivation pattern in Golestan province**

No	Economic effects	1	2	3	4	5	6	7	8	9	10	Degree of penetration
1	Economic prosperity	1	1	0	0	0	0	1	1	1	1	7
2	Farmers' income	1	1	0	0	0	0	1	1	1	1	7
3	Employment	1	1	1	1	1	1	1	1	1	1	13
4	Investment	1	1	1	1	1	1	1	1	1	1	13
5	Labor productivity	1	1	1	1	1	1	1	1	1	1	13
6	Access to inputs	1	1	1	1	1	1	1	1	1	1	13
7	Infrastructures	1	1	0	0	0	0	1	1	1	1	7
8	Land reforms	1	1	0	0	0	0	1	1	1	1	7
9	Production sustainability	0	0	0	0	0	0	0	1	1		3
10	New methods of irrigation	0	0	0	0	0	0	0	1	1		3
	The degree of dependence	10	10	6	6	6	6	10	10	13	13	

According to the results listed in the table above, among the dimensions of economic factors, the variables of modern irrigation methods and production sustainability are at level 1, the variables of economic well-being, infrastructure, land reforms, farmers' income at level 2 and the variables of labor productivity, access to Inputs, investment and employment are at level 3.

### MICMAC analysis

The MICMAC analysis is based on the power of penetration (influence) and the degree of dependence (influence) of each variable, and provides the possibility of further examining the scope of each variable. The factors that are in the lower levels of the model are considered as leading factors because of their driving power, and the factors that are in the higher levels are considered as following factors because of their dependence on the leading factors (Azar et al., 2013). This method is used in the analysis of findings with the aim of identifying the degree of dependence and influence of system elements in structural analyzes. Thus, the row total of the number of relationships (both direct and indirect relationships identified for each component) in the final reachability matrix indicates the degree of influence of that component, and the column total of the number of direct and indirect relationships in the matrix of the aforementioned table indicates the degree of dependence of that component. The numbers obtained for each index have appeared in the diagram separately in the classification of system components in terms of power of influence and dependence.

*Table (9): Numbers used in the design of influence-dependence chart (MICMAC diagram)*

0	1	2	3
It has no effect	It has a weak effect	It has a moderate effect	It has a strong effect

*Table (10): Influence-dependency table of the social effects of changing the cultivation pattern in Golestan province*

No	Social effects	1	2	3	4	5	6	7	8	9	10	11	12	Degree of influence
1	knowledge and awareness	1	1	1	1	1	1	1	1	1	1	1	1	12
2	Participation and social cohesion	1	1	1	1	1	1	1	1	1	1	1	1	12
3	Participation of villagers in the management of village affairs	1	1	1	1	1	1	1	1	1	1	1	1	12
4	Social trust	1	1	1	1	1	1	1	1	1	1	1	1	12
5	Correcting the pattern of water consumption	1	1	1	1	1	1	1	1	1	1	1	1	12
6	Culture-building activities for the use of alternative crops	0	0	0	0	0	1	1	1	1	1	0	0	5
7	Social prestige	0	0	0	0	0	1	1	1	1	1	0	0	5
8	Changing attitude to agriculture	0	0	0	0	0	1	1	1	1	1	0	0	5
9	Farmers' satisfaction	0	0	0	0	0	1	1	1	1	1	0	0	5
10	Change in land use type	0	0	0	0	0	1	1	1	1	1	0	0	5
11	Destructing the natural environment or strengthening it in the direction of its sustainability,	0	0	0	0	0	1	1	1	1	1	1	1	7
12	Reducing negative environmental effects	0	0	0	0	0	1	1	1	1	1	1	1	7
	The degree of dependence	5	5	5	5	5	12	12	12	12	12	7	7	

According to the figures listed in Table 10, among the social factors, no variable was placed in the first category (weak influence and weak dependence), the variables of reduction of negative environmental effects, sustainable rural development, increase in the density of land cultivation, improvement in cultivation methods and reduction of pollution of natural resources are placed in the second category (with low influence, but strong dependence), the variables of social prestige and change of attitude towards agriculture are placed in the third category (high influence and high dependence) and variables of Knowledge and awareness, participation and social cohesion, social trust, reforming the water consumption pattern and change in the land use type are placed in the fourth category (strong influence but weak dependence).



**Table (11): influence-dependency table of the economic effects of changing the cultivation pattern in Golestan province**

No	Economic effects	1	2	3	4	5	6	7	8	9	10	Degree of penetration
1	Economic prosperity	1	1	0	0	0	0	1	1	1	1	6
2	Farmers' income	1	1	0	0	0	0	1	1	1	1	6
3	Employment	1	1	1	1	1	1	1	1	1	1	10
4	Investment	1	1	1	1	1	1	1	1	1	1	10
5	Labor productivity	1	1	1	1	1	1	1	1	1	1	10
6	Access to inputs	1	1	1	1	1	1	1	1	1	1	10
7	Infrastructures	1	1	0	0	0	0	1	1	1	1	6
8	Land reforms	1	1	0	0	0	0	1	1	1	1	6
9	Production sustainability	0	0	0	0	0	0	0	0	1	1	2
10	New methods of irrigation	0	0	0	0	0	0	0	0	1	1	2
	The degree of dependence	8	8	4	4	4	4	8	8	10	10	

According to the figures listed in the table above, among the economic factors, no variable was placed in the first category (weak influence power and weak dependence), the variables of sustainability of production and modern irrigation methods were placed in the second category (low influence power, but strong dependence), the variables of economic welfare, farmers' income, infrastructures and land reforms were placed in the third category (high influence and dependence) and variables of employment, investment, labor productivity and access to inputs were placed in the fourth category (strong influence but weak dependence).

### Discussion and conclusion

It can be concluded that there is a significant relationship between the changes in the cultivation pattern with the characteristics and environmental capabilities of Golestan province, for the cultivation and production of various crops. But, these capabilities has caused farmers to react even to the smallest changes. Changing the cultivation pattern is on the agenda of these farmers in most cases. In other words, if an agricultural product cannot meet the needs of farmers due to reasons such as the instability of the market or the lack of proper support from the government or its low price, farmers usually try to change the cultivation pattern. But, if the decision to change the cultivation pattern is made on a large scale will have significant effects on the social and economic conditions of the villages and this issue is very important. Cultivation of crops from a subsistence point of view became an economic point of view due to the formation of global trade and capitalism after the industrial revolution. This attitude made comparative advantages play an important role in changes in the cultivation pattern. According to this attitude, agricultural lands became economic units and people began to change the cultivation pattern based on costs and incomes and comparing them with other crops and crops. These changes in the cultivation pattern caused the formation of new economic conditions and relationships in these economic units, in such a way that it affected the economic conditions such as the amount of income, welfare, savings, investment and also social conditions such as unemployment, crime, migration, participation of villagers and farmers. In the village administration, quality of life, environmental destruction.

The implementation of the land reform policy and the shrinking of land in Iran led to an increase in decision-making regarding the type of cultivation among farmers, and this led to changes in the cultivation pattern. As a result, many industries related to crops were changed and related industries were closed and villagers were unemployed. On the other hand, urban attractions led a huge wave of migration to big cities due to the economic reforms of Mohammad Reza Shah and the expansion of urban industries. These immigrants were mostly settled in the outskirts of the cities, and this was the beginning of many social and economic consequences that this research seeks the causes of the changes in the cultivation pattern in Golestan province from the land reform until now and examines the consequences of these reforms.

In the last two decades, the lack of a suitable cultivation pattern plan considering the arrival and development of different crops in the region and the lack of agro-ecological zoning of the province to determine the areas prone to production of each crop according to the ecological characteristics of the environment has led to a decrease in the production of some crops, destruction of environment and

natural resources, pollution of water and soil resources, salinization of land, reduction of underground water table in this province. Therefore, in order to prevent and reduce these factors, it seems necessary to pay special attention to this agricultural area through agro-ecological zoning and formulating a suitable cultivation pattern along with the preservation and management of natural resources in line with sustainable and all-round development in Golestan province.

According to the results of evaluating the economic and social consequences of changing the cultivation pattern in Golestan province, based on the fuzzy Delphi analysis method, using the structural self-interaction matrix and determining the relationships and leveling of the indicators.

- ❖ Among the dimensions of economic factors, the variables of modern irrigation methods and production sustainability were placed at level 1, the variables of economic well-being, infrastructure, land reforms, farmers' income at level 2 and the variables of labor productivity, access to inputs, investment and Employment at level 3.
- ❖ Among the dimensions of social factors, the variables of increasing the density of cultivation, reducing the negative environmental effects, sustainable rural development, improving organizational farming methods, reducing the pollution of personal natural resources were placed at level 1, the variables of social prestige, and changing the attitude towards agriculture were included at Level 2 and the variables of social trust, knowledge and awareness, reforming the pattern of organizational water consumption, change in the type of use, participation and social cohesion at level 3.

According to the results of MICMAC analysis:

- ❖ Among the economic factors, no variables were placed in the first category (with weak influence power and weak dependence), the variables of sustainability of production and modern irrigation methods) were placed in the second category (low influence power, but strong dependence), the variables of economic welfare, farmers' income, infrastructures and land reforms) were placed in the third category (high influence and dependence) and the variables of employment, investment, labor productivity and access to inputs were placed in the fourth category (strong influence, weak dependent).
- ❖ Among the social factors, no variable was placed in the first category (weak influence and weak dependence), the variables of reduction of negative environmental effects, sustainable rural development, increase in the density of land cultivation, improvement in cultivation methods and reducing the pollution of natural resources were placed in the second category (low influencing power, but strong dependence), the variables of social prestige and status and change of attitude towards agriculture were placed in the third category (high influence power and high dependence) and the variables of knowledge and awareness, social participation and cohesion, social trust, reforming the water consumption pattern and change in the land use type were placed in the fourth category (strong influence but weak dependence).

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