Comparative Advantage of Corn Cultivation in Iran (Case Study: Shaft, Guilan Province)

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ABSTRACT
Using field study and completing the questionnaires filled by 59 beneficiaries in the cropping seasons of 2014-2015, this research tries to study the comparative advantage of corn production in Shaft city, Guilan, Iran by using Policy Analyses Matrix (PAM). The results revealed that net social profit (NSP) at exchange rates of 30000, 35000, 40000, 45000 IR Rials was 68, 80, 92, and 104 million IR Rials, respectively. The results revealed that domestic resource cost (DRC) at exchange rates of 30000, 35000, 40000, 45000 IR Rials was 0.05, 0.04, 0.04, and 0.03 million IR Rials, respectively. Social cost benefit (SCB) at exchange rates of 30000, 35000, 40000, 45000 IR Rials was achieved 0.22, 0.21, 0.21, and 0.20 million IR Rials, respectively. The index of domestic competition (UCd) ability at exchange rates of 30000, 35000, 40000, 45000 IR Rials was revealed 0.09, 0.09, 0.09, and 0.09 million IR Rials, respectively. The ability of export competition (UCx) at exchange rates of 30000, 35000, 40000, 45000 IR Rials was 0.08, 0.06, 0.06, and 0.05 million IR Rials, respectively. This indicates the existence of comparative advantage in the production of corn in Shaft city. The calculation of support indices of NPCO, NIPC, and EPC showed that the intervening effects of government were detriment to producer, and finally the product's input and output market does not gain proper support.

Keywords: Competitiveness potential, net social profit, policy analyses matrix, resource cost, social cost benefit, support indices.

Abbreviations:

INTRODUCTION
The increasing growth of world's population constantly brings food production for human and requires quantitative-qualitative expansion of crops and agricultural products. Most of the world’s people live in a condition that can be considered as living conditions along with frustration in some cases. Although the science and technology of agriculture has the capacity of bringing affluence to all people of the world, but the fight against hunger should be continued for years and even centuries.
The world’s population at the beginning of 21st century exceeds six billion people and more than 700 million people suffer from food shortages, famine and starvation and over three billion people suffer from malnutrition (Aulnerg, 2002).
Corn is one of the major, strategic and important grains in feeding people around the world. In terms of area under cultivation, corn is at the third place of grains in the world after wheat and rice. Due to lots of characteristics, especially adaptation to various climatic conditions, cultivation of corn has spread all over the world very fast. The factors making irrigated corn to be important in the country and the world are: being important to human and animal feeding, its use to produce starch, its usage to produce alcohol, preparing food for poultry farms, producing dross and etc. (Arzani, 2005).
Due to the power and compatibility with many different climates, this crop has spread all over the world (Mir-Hadi, 2002).
The area under cultivation for this product in 2013 has been 184192053 hectares in the world and 425000 hectares in Iran. Also, the production rate of this crop in 2013 has been nearly 1016736092 tons in the world and 2540000 tons in Iran (FAO, 2013).
The area under cultivation of corn grain and corn fodder in Guilan Province is 200 and 300, respectively. It has good income because most people use this product (Ministry of Jihad-e-Agriculture, 2014).

Comparative advantage is one of the important measures of economic in planning for production, export, and import. In order to achieve the intended goal of this study, policy analyses matrix is used (Zare, 2008). The principle of regional comparative advantage in national economy, meaning that each region with other regions or product, tend to produce products that possess more advantages (Pirasteh and Karimi, 2006).

Comparative advantage defines based on its factors of production's potentials and the frequency of productivity level for each country or region, relatively. It indicates which country or region has some advantage in producing certain categories of goods. In the case of entering international trade, it can benefit from the export of such goods. Of course, comparative advantage can manifest its benefits from international trade when exposed to free and fair global market (Nasabian et al., 2010).

Regional economy researchers use various methods to determine regional comparative advantage. Between them the most important ones are: domestic resource cost (DRC), social cost and benefit (SCB), revealed comparative advantage (RCA), soft system methodology (SSM) and location quotient (LQ). The RCA measure is used to determine certain product’s comparative advantage or determining global position of a product and its changes over time (Pirasteh and Karimi, 2006). Serin and Civan (2008) revealed comparative advantage (RCA) and comparative export performance (CEP) by using the comparative advantage of exporting tomato, olive oil, and Turkish juice and the changes of these indices during 1995-2005. The results indicate the existence of export comparative advantage for juice and olive oil while exporting tomato have no comparative advantage.

Burianova (2010) investigated the competitive commercial process of agricultural products of Czech after the country joined European Union. In the mentioned study, using revealed comparative advantage (RCA) and Michaely, he calculated export comparative advantage for agricultural products. The achieved values indicate the presence of comparative advantage during 2004-2008.

In Mohanty et al.’s study (2002), they investigated the competitive condition of producing cotton in India through policy analysis matrix and suggested that in Maharashtra, the second province in India that produces cotton. They revealed that cotton is not produced efficiently and sugar cane and peanuts have higher comparative advantage. Economists claimed various and appropriate theories on comparative advantage but practically and based on statistical evidences, some of them cannot be used easily. Therefore, we should seek for scales capable of measuring this advantage. Various measures have been expressed by economic science researchers including net social profit (NSP), social cost benefit (SCB), domestic resource cost (DRC), revealed comparative advantage (RCA) and RSAC.

DRC is one of the most important ones which for the first time is established, based on Richardo’s theory, by Michael Bruno (Rezaei et. al., 2010). In a study, Kijne and Tuong (2002) investigated the possibility of establishing food security through improving productivity of water for agricultural products. The research results indicated that by improving agricultural water productivity and saving consumed water in agriculture, we can plant high economic efficiency products.

In this study, three groups of indicators include comparative advantage, crop protection and competitiveness have been investigated for corn and other physical characteristics associated with the use of irrigation water for the mentioned product has been evaluated.

**MATERIALS AND METHODS**

Essentially, policy analysis matrix is an additional accounting technique that briefly provides budgeting Information of on-site and off-site activities. This solution derives from social cost-benefit analysis discussions and international trade theory in economy. The policy analysis matrix framework for each product and in each region can be presented as below (Shuji Yao, 1997) (Table 1).

<table>
<thead>
<tr>
<th>Calculation Basis</th>
<th>Income</th>
<th>The Cost of Inputs</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tradable</td>
<td>Non-Tradable</td>
</tr>
<tr>
<td>Private (Based on market prices)</td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>Social (Based on shadow prices)</td>
<td>E</td>
<td>F</td>
<td>G</td>
</tr>
<tr>
<td>The difference (The effect of policy)</td>
<td>I</td>
<td>J</td>
<td>K</td>
</tr>
</tbody>
</table>
In general, policy analysis matrix consists of two accounting unions. The first union indicates the relationship of profit and can be achieved through the difference between income and cost based on market and shadow prices (the left column), and the second union shows the difference between observed values and the values in which there is no disorder and market failure, the last row of matrix (Agricultural Economic and Planning Research Institute, 2003).

**Domestic Resource Cost:**

The DRC indicator is the cost of internal resources which is used in production activity in order to obtain one unit of foreign exchange or being economized in a foreign exchange (Bruno, 1972). If DRC is lower than 1, then it means that the net obtained exchange is higher than domestic input shadow cost. Therefore domestic production would be cheaper than importing. In this circumstance foreign exchange savings has been realized. Thus, the production should be substituted with import.

If DRC value is higher than 1, the net obtained exchange will be lower than shadow cost of domestic inputs in manufacturing the product. In this case, due to lack of exchange savings, import is more economical than domestic production. When DRC is equal to 1, then the net obtained exchange equals to shadow cost of domestic inputs.

According to policy analysis matrix approach, the DRC equation can be as below (Safavi and Ahmadi, 2005):

$$DRC = \frac{G}{E - F}$$  \hspace{1cm} (1)

While G is non-tradable input costs with shadow price, F indicates tradable input costs by production price, and E is earning based on shadow price. The value of this parameter indicates compensation or decompensation of domestic costs in manufacturing the product by production revenue minus external input costs. Because of using shadow prices, this method is considered as forward-looking.

**Social Cost Benefit:**

This measure calculates profit obtained from manufacturing product through shadow prices of product and external-internal production inputs. SCB index is a relation of net social profit (NSP). SCB same as DRC, liberates NSP from unit and enables the comparison of advantage indices of various products more easily (Najafi and Mirzaie, 2003).

After the formation of PAM matrix, SCB can be calculated as below (Safavi and Ahmadi, 2005):

$$SCB = \frac{F + G}{E}$$  \hspace{1cm} (2)

While F is tradable input costs, G is non-tradable input costs based on shadow prices, and E indicates the shadow earnings. The values in the range of 0 to 1 indicate the advantage and profitability of production and exporting the intended product while the higher values suggests the lack of advantage and profitability of production and export. Equality of SCB value to 1 means the overlapping point. Because of using shadow prices, this method is considered as forward-looking.

**Net Social Profit:**

This measure calculates profit obtained from manufacturing product through shadow prices of product and external-internal production inputs. There is comparative advantage in manufacturing the product if NSP is higher than 0, otherwise the production activity lacks social profitability and comparative advantage (Mohammadi, 2004):

$$NSP = (E - F - G)$$  \hspace{1cm} (3)

While E is the earning based on shadow price, G is non-tradable input costs based on shadow price, and F is tradable input costs based on shadow price. Values higher than zero indicate the social profitability of manufacturing the product while negative values suggest unprofitability of production and product’s export at free competitive condition. Because of using shadow prices, this method is considered as forward-looking.

**Nominal Protection Coefficient Index of Input:**

This measure shows the price difference of tradable shadow inputs with market prices. The Nominal Protection Coefficient Index (NPCI) measure determines how to support tradable inputs. If the market price is less than the shadow price of inputs, the input market is supported in favour of input’s consumer (manufacturer). The nominal protection coefficient can be calculated as below through PAM matrix framework (Thagheb, 2005):

$$NPCI = \frac{B}{F}$$  \hspace{1cm} (4)

In the above equation, B is the cost of tradable inputs based on market price and F is the cost of tradable input based on shadow prices. If NPCI is more than the unit number, the manufacturer pays excise and if NPCI is less than one, indirect subsidies will be paid to the manufacturer in utilizing tradable input. The value of unit index also suggests the absence of any supportive policy in using tradable inputs.

**Nominal Protection Coefficient Index of Product:**

The index is derived from the ratio of market revenue to shadow revenue. The mathematical
The equation of NPCO based on PAM framework is as below (Thagheb, 2005):

\[ NPCO = \frac{A}{E} \]  \hspace{1cm} (5)

While A is the revenue based on the market price and E is the revenue based on the shadow price. If NPCO is higher than one, the market price was bigger than the shadow price and the production system enjoyed being supported and indirect subsidies will be paid to manufacturer. If this value is less than one, excise will be imposed to manufacturer and the production system and the market product will not receive any support. In the case that NPCO is equal to one, there is no deviation in the market caused by government’s intervention.

**Effective Protection Coefficient:**

This measure shows the goods production’s value added ratio, based on the market price, to the production’s value added, based on the shadow price. In other words, EPC indicates the effects of government intervention on inputs’ market and the product’s market simultaneously and can be calculated based on PAM framework as below (Thagheb, 2005):

\[ EPC = \frac{A - B}{E - F} \]  \hspace{1cm} (6)

In the above equation, A is the market revenue, B is the cost of market-tradeable input, E is the shadow revenue, and F is the shadow tradeable cost of input. If the EPC value equals to one, it means that the overall effects of government’s intervention in the product’s market and the input were neutral or the situation of the absence of government’s intervention is identical. The higher EPC value than the unit number indicates that the overall effects of government’s intervention in the product’s market and the input’s market are in favor of the manufacturer and the lower EPC value than the unit number reveals the intervention effects in detriment of the manufacturer.

**Product Cost Ratio:**

This measure shows the payment capability of the system to domestic inputs, considering the normal rate of return on investment. The lower is the PCR value, the higher competitive capability of the product would be. Using policy analysis matrix elements, this index can be calculated as below (Nouri, 2008):

\[ PCR = \frac{C}{A - B} \]  \hspace{1cm} (7)

This is the ratio of the cost of domestic inputs to value added based on market price. In this definition, value added is actually the difference between the product’s value and the cost of tradable inputs based on the market price. Maintaining competitiveness, meaning the breakeven point after deducting normal profit along with payment for domestic input, is the most important output achieved through this measure.

**Profit Coefficient:**

The PC measure indicates the change in the market profit than the shadow profit. The bigger value than the unit number indicates the transitional effect of policies in the increase of equality of the market profit compared to shadow profit. If the value of the measure is lower than one, it means that transitional effect of policies led to the reduction of market profit. The value of this measure can be achieved through below equation (Nouri, 2008):

\[ PC = \frac{A - B - C}{E - F - G} = \frac{D}{H} \]  \hspace{1cm} (8)

This index is rather more complete than EPC, because all-told considers the effect of policies.

**Domestic Competing Index:**

This measure establishes whether, at the current condition and despite the deviation in commodity prices and production factors, the manufacturer is able to compete in domestic market or not. It can be calculated as below (Najarzadeh and Rezagholizadeh, 2008):

\[ UC_s = \frac{B + C}{A} \]  \hspace{1cm} (9)

If the value for this index is less than one, the manufacturer possesses the capability of competing in domestic cost for producing its goods. But the manufacturer is not capable of domestic competing if the value is higher than one. In the case of the index being equal to one, the manufacturer is at the breakeven point in domestic markets.

**Ability of Export Competition:**

This measure expresses whether, at the current condition and consuming inputs based on domestic prices which can include subsidies and excises, the manufacturer is capable of competing in international markets or not. Below is the calculation method for Ability of Export Competition index (Najarzadeh and Rezagholizadeh, 2008):

\[ UC_s = \frac{B + C}{E} \]  \hspace{1cm} (10)

If the value for this index is less than one then the manufacturer possesses the ability of cost of export competition. When the index is bigger than one, we can infer that the manufacturer does not have the ability of cost of export competition. Finally, if the value is equal to one, the manufacturer is at the breakeven point in international markets.

**Shadow Price for Corn:**

The corn will be socially rated in terms of global prices. The calculation methods for shadow prices are different depending on whether the goods are
imported or exported. To calculate shadow price of imported agricultural products, the global price of corn is used. By considering importing price per one ton of corn and adding loading and transporting cost from border to consumption centres to it, we can achieve shadow price for corn at consumption centres.

About export cultivated corn in excess of internal need, global prices for corn play the role of shadow prices as a chance for selling corn. Therefore, the loading and transporting costs from border to consumption centres and from there to farmland will be deducted from the FOB price of each ton of export corn to achieve the shadow price of corn at the farm. Obviously, having shadow prices is enough for calculating the amount of revenue of corn per hectare. The average yield per hectare of corn will be multiplied to these shadow prices and the result will be summed to ancillary revenues of corn per hectare (Gholi-Beglu, 2005).

Shadow Prices of Tradable and Non-Tradable Inputs:

The production inputs can be categorized in two groups: Tradable and Non-Tradable. Tradable inputs are those resources and production factors which are traded in global markets on a large scale and our country, generally, imports such imports. These factors include chemical fertilizers, pesticides, and machineries. Non-tradable inputs are domestic inputs like labour, land, seeds, and water. In producing agricultural products, mostly non-exchangeable (domestic) inputs have greater share rather than exchangeable inputs. The shadow price of tradable inputs is their CIF price at Iran's border line plus all costs of transportation. Regarding non-tradable inputs (domestic), since these inputs are not going to be exchanged, indeed they do not have border prices for calculating shadow price. The shadow price of domestic inputs is actually equal to their opportunity cost; therefore, the shadow price of these inputs is equal to their value at their best usage condition (Pirasteh and Karimi, 2006).

The market price or the price which farmers pay for consuming water is affected by several factors such as the irrigation time and the kind of water supply. The cost of water consumption or the shadow price of water is the highest price which goes to the farmer through selling it in the absence of planting crops. In this study, the shadow price of consumed water for agricultural products is considered equal to the most expensive cost of water harvesting.

The shadow price of machineries is assumed as equals to the average price for cultivating one hectare of product. Machinery possesses twofold entity. A part of it is tradable and the rest are domestic. On the other side, the percentage share of tradable and non-tradable is not known in the country. Thus, according to the conducted studies in other countries, 64% of the machinery costs are considered as external and 36% are domestic (Najafi and Mirzaei, 2003).

The values for shadow price of land, seed, animal manure, and labour are equal to the market price and it is assumed that the price of mentioned items will be determined in a competitive market.

In the present research the amount of consumed chemical pesticides such as nitrogenous, phosphorus, and potash and chemical pesticides, herbicides, fungicides, and insecticides are considered in the calculations related to the shadow cost of tradable inputs. The import CIF price plus all the transportation costs from border to the farm field were applied in calculations as the shadow price for each mentioned inputs.

The Social Exchange Rate:

Exchange rate is one of the most important factors in comparative advantage and shadow price calculations. Absolute purchasing power parity methods were used and these shadow exchange rates were assumed: 3000, 3500, 4000, 4500 IR Rials.

RESULTS AND DISCUSSION

The investigation of sample items revealed that 20 ton of animal manure will be consumed per one hectare of field which the cost of each unit is 20 thousand IR Rials. Also the number of used labour in one hectare is 3 individuals per day which cost 1.5 million IR Rials. The machineries will be used for 8 hours per one hectare which costs 500 thousands IR Rials per each unit. 150 kg of the nitrogenous fertilizer will be used per one hectare which costs 1.5 million Rilas per each unit. 100 kg of the phosphorus fertilizer will be used per one hectare which cost 900 thousands IR Rials per each unit. 50kg of potash fertilizer will be used per one hectare which costs 200 thousand IR Rials per each unit. Fungicides will be used per hectare for grain corn. 0.5 liter of insecticides will be used per one hectare which costs 100 thousand IR Rials per each unit.

Production Quantity:

The results indicate that the highest frequency of corn grain production in Shaft city is less than one ton with 37.28 percent and the lowest frequency goes to 10 ton with 11.8 percent.

Policy Analysis Matrix:

In order to form policy analysis matrix these exchange rates were assumed: 3000, 3500, 4000, 45000 IR Rials. Tables 2, 3, 4, and 5 show the results obtained from policy analysis matrix.
Table 2. Policy Analysis Matrix based on dollar at the exchange rate of 30000 IR Rials (The numbers are in million IR Rials).

<table>
<thead>
<tr>
<th>Basis for Calculation</th>
<th>Revenue</th>
<th>Input Costs</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tradable</td>
<td>Non-Tradable</td>
</tr>
<tr>
<td>Private (Based on market prices)</td>
<td>75</td>
<td>4.33</td>
<td>2.74</td>
</tr>
<tr>
<td>Social (Based on shadow prices)</td>
<td>87.75</td>
<td>15.97</td>
<td>3.49</td>
</tr>
<tr>
<td>The difference (The effect of policy)</td>
<td>-12.75</td>
<td>-11.64</td>
<td>-0.75</td>
</tr>
</tbody>
</table>

Based on the calculated results at the exchange rate of 30000 IR Rials, regarding that the shadow revenue is bigger than the market revenue, an implicit tax is imposed to the corn grain in Shaft City. The costs of tradable inputs, based on the shadow values, were higher than the cost of tradable inputs based on the market values. The producer of corn grain in Shaft city purchases these inputs cheaper than the global prices. Regarding that the price of non-tradable inputs based on shadow values are higher than the price of non-tradable inputs based on the market price, the producer of corn grain in Shaft city faces the implicit and direct taxes in purchasing the inputs. The amount of profit, based on the shadow values, is bigger than the profit based on the market values. In the situation that government intervenes in the production of corn grain through its policies, the producer of corn grain in Shaft city earns lower profit rather than the free-trade condition and the government’s policies are necessary.

Table 3. Policy Analysis Matrix based on dollar at the exchange rate of 35000 IR Rials (The numbers are in million IR Rials).

<table>
<thead>
<tr>
<th>Basis for Calculation</th>
<th>Revenue</th>
<th>Input Costs</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tradable</td>
<td>Non-Tradable</td>
</tr>
<tr>
<td>Private (Based on market prices)</td>
<td>75</td>
<td>4.33</td>
<td>2.74</td>
</tr>
<tr>
<td>Social (Based on shadow prices)</td>
<td>102.37</td>
<td>18.42</td>
<td>3.49</td>
</tr>
<tr>
<td>The difference (The effect of policy)</td>
<td>-27.37</td>
<td>-14.9</td>
<td>-0.75</td>
</tr>
</tbody>
</table>

Based on the calculated results at the exchange rate of 35000 IR Rials, regarding that the shadow revenue is bigger than the market revenue, an implicit tax is imposed to the corn grain in Shaft city. The costs of tradable inputs, based on the shadow values, were higher than the cost of tradable inputs based on the market values. The producer of corn grain in Shaft city purchases these inputs cheaper than the global prices. Regarding that the price of non-tradable inputs based on shadow values are higher than the price of non-tradable inputs based on the market price, the producer of corn grain in Shaft city faces the implicit and direct taxes in purchasing the inputs. The amount of profit, based on the shadow values, is bigger than the profit based on the market values. In the situation that government intervenes in the production of corn grain through its policies, the producer of corn grain in Shaft city earns lower profit rather than the free-trade condition and the government’s policies are necessary.

Table 4. Policy Analysis Matrix based on dollar at the exchange rate of 40000 IR Rials (The numbers are in million IR Rials).

<table>
<thead>
<tr>
<th>Basis for Calculation</th>
<th>Revenue</th>
<th>Input Costs</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tradable</td>
<td>Non-Tradable</td>
</tr>
<tr>
<td>Private (Based on market prices)</td>
<td>75</td>
<td>4.33</td>
<td>2.74</td>
</tr>
<tr>
<td>Social (Based on shadow prices)</td>
<td>117</td>
<td>20.87</td>
<td>3.49</td>
</tr>
<tr>
<td>The difference (The effect of policy)</td>
<td>-42</td>
<td>-16.54</td>
<td>-0.75</td>
</tr>
</tbody>
</table>

Based on the calculated results at the exchange rate of 40000 IR Rials, regarding that the shadow revenue is bigger than the market revenue, an implicit tax is imposed to the corn grain in Shaft city. The costs of tradable inputs, based on the shadow values, were higher than the cost of tradable inputs based on the market values. The producer of corn grain in Shaft city purchases these inputs cheaper than the global prices. Regarding that the price of non-tradable inputs based on shadow values are higher than the price of non-tradable inputs based on the market price, the producer of corn grain in Shaft city faces the implicit and direct taxes in purchasing the inputs. The amount of profit, based on the shadow values, is bigger than the profit.
Based on the market values. In the situation that government intervenes in the production of corn grain through its policies, the producer of corn grain in Shaft city earns lower profit rather than the free-trade condition and the government’s policies are necessary.

<table>
<thead>
<tr>
<th>Basis for Calculation</th>
<th>Revenue</th>
<th>Input Costs</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private (Based on market prices)</td>
<td>75</td>
<td>4.33</td>
<td>2.74</td>
</tr>
<tr>
<td>Social (Based on shadow prices)</td>
<td>131.62</td>
<td>23.32</td>
<td>3.49</td>
</tr>
<tr>
<td>The difference (The effect of policy)</td>
<td>-56.62</td>
<td>-18.99</td>
<td>-0.75</td>
</tr>
</tbody>
</table>

Based on the calculated results at the exchange rate of 45000 IR Rials, regarding that the shadow revenue is bigger than the market revenue, an implicit tax is imposed to the corn grain in Shaft city. The costs of tradable inputs, based on the shadow values, were higher than the cost of tradable inputs based on the market values. The producer of corn grain in Shaft city purchases these inputs cheaper than the global prices. Regarding that the price of non-tradable inputs based on shadow values are less than the price of non-tradable inputs based on the market price, the producer of corn grain in Shaft city faces the implicit and direct taxes in purchasing the inputs. The amount of profit, based on the shadow values, is bigger than the profit based on the market values. In the situation that government intervenes in the production of corn grain through its policies, the producer of corn grain in Shaft city earns lower profit rather than the free-trade condition and the government’s policies are necessary.

According to the tables of calculated policy analysis matrixes at the exchange rates of 30000, 35000, 40000, 45000 IR Rials, the values for DRC, SCB, NSP, and supportive indices of NIPC, NPCO, EPC, and the indices of the ability of competition such as PCR, PC, UCd, and UCx are illustrated in the below table (Table 6).

<table>
<thead>
<tr>
<th>Comparative Advantage Indices</th>
<th>Exchange Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30000</td>
</tr>
<tr>
<td>DRC</td>
<td>0.05</td>
</tr>
<tr>
<td>SCB</td>
<td>0.22</td>
</tr>
<tr>
<td>NPCO</td>
<td>0.85</td>
</tr>
<tr>
<td>NPC</td>
<td>0.27</td>
</tr>
<tr>
<td>EPC</td>
<td>0.98</td>
</tr>
<tr>
<td>NSP (Million IR Rials)</td>
<td>68</td>
</tr>
<tr>
<td>PCR</td>
<td>0.03</td>
</tr>
<tr>
<td>PC</td>
<td>0.99</td>
</tr>
<tr>
<td>UCx</td>
<td>0.09</td>
</tr>
<tr>
<td>UCx</td>
<td>0.08</td>
</tr>
</tbody>
</table>

As you can see in table 6, as the exchange rate increases, the index of domestic resource cost decreases. And because DRC < 1 is lower than one, then production of corn grain possesses advantage meaning than the domestic price is cheaper and the government demands taxes. By the increase exchange rate, the nominal input protection coefficient decreases. The index of NIPC < 1 is lower than one which means that the cost of exchangeable inputs at the market price is lower than its cost at the shadow price. Thus, the producer pays taxes for using these inputs. Also by increasing the exchange rate, the nominal protection coefficient of product (NPCO) decreases and because NPCO <1, therefore, the market price of the product is lower than its shadow price, so the government demands taxes. Also as the exchange rate increases, the index of efficient protection coefficient decreases and EPC <1. It means that the government policies did not support the product’s manufacturing process and demands taxes and the producer incur a loss. By the increase of the exchange rate, the index of social cost benefit (SCB) decreases and because its values are less than one it indicates advantage and profitability of production and export of the corn grain. By the increase of the exchange rate, the index of net social profit increases and because NSP > 0 is bigger than zero, it means that there is comparative advantage in the production of corn...
grain and we gain profit. Otherwise, the production activity lacks social profitability and comparative advantage.

Considering that the product cost (PC) at the exchange rates of 30000, 35000, 40000, and 45000 IR Rials were constant and the value is lower than one, it shows the higher ability of competing for corn product. Also, the profit coefficient decreases as the exchange rate increases and because its value is less than one, it indicates that the transitional effect of policies led to the decrease of the market profit. The index of ability of domestic competition ($\mu_{dc}$) remained constant as the exchange rate increased and its value became less than one, meaning that the producer possesses the ability of domestic cost competition. The ability of export competition ($\mu_{ec}$) decreases as the exchange rate increases and its value became less than one, meaning that the producer has the ability of export cost competition in producing its product. In an article titled examine comparative advantage in the production and export of Iranian saffron results show that the exchange rate index decreased (NIPC) the shadow price has increased. The NPC under market exchange rates is less expensive and the price of the imported product in the domestic market remains steady, so the market would be to the detriment of domestic production. And the difference between the price of the product to the market price of more than shadow price. The exchange rate index decreased (EPC), which represents the support of the product of the most important parameters involved in product price index of comparative advantage.

**CONCLUSION**

The results suggest that, based on the measures of economic analysis, cultivation of corn grain in Guilan Province is economical. The results obtained from calculating policy analysis matrix (PAM) reveals that cultivation of corn brings social profit, meaning that beside national dimension, it embraces production comparative advantage, occupation, and value added. Cultivation of corn grain can be economical in terms of social dimensions. Also regarding that cultivation of corn grain in Guilan Province have had the proper comparative advantage and efficiency and is capable of competing in global markets too, the development of fields under cultivation of corn grain in the regions which have the appropriate condition, seems rational. If, in long-term period and using a strategic plan, we could take effective measures in order to develop and manage cultivation of corn grain, undoubtedly, it can lead to provide development basis in the region and improving comparative advantage in production. Due to the economic development of control methods for crops as an alternative to chemical control, promote, monitor and guide the use of technology must be carried out continuously by the authorities in order to reduce production costs and improve and maintain comparative advantages indices of this crop.

**REFERENCES**


