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Cropping Pattern and Comparative Advantage of Agricultural Products in Ilam Province

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Abstract

In this study, the comparative advantage of main agricultural products and its relation to cropping pattern was studied in Ilam Province. For data analyzing the comparative advantage and government policies effects indices, Policy Analysis Matrix (PAM) were used. The obtained results for the comparative advantage indices of Domestic Resource Cost (DRC), Social Cost Benefit (SCB) and Net Social Profitability (NSP) show that production of irrigated wheat, dry-farming wheat and dry-farming barely has not comparative advantage in Ilam Province but the production of irrigated barely, corn, dry-farming pea, dry-farming lentil, watermelon, cucumber and tomato have comparative advantage in Ilam Province. In addition, the obtained results for NPIC index show the Nominal Government Protection of inputs in all products. Also, Nominal Protection Coefficient index indicated that nominal market protection of products like wheat (irrigated and dry-farming) and barely (irrigated and dry-farming) was positive and those of other products were negative and the Effective Protection Coefficient for wheat and barley had the highest values. The results showed that the existing cropping pattern was not allotted with comparative advantage but is related to the effective protection coefficient.

Keywords:
Comparative Advantage, Cropping Pattern, Policy Analysis Matrix, Ilam Province

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INTRODUCTION

Using comparative advantage principle can determine a region pattern of crop and distribute resources optimally among different activities in order to optimizing use of resources, the production and exporting capabilities might be recognized and conditions for the effective investments might be provided as well. This applies to commercial integration process especially in joining the World Trade Organization is very useful and beneficial. Most of the researchers, on the growth and development of the agricultural sector and its role on the development of the national economy of the excess supply of surplus capital, supply food and industrial raw material, provision of foreign currencies; also on changes of agricultural structure in fundamental and comprehensive study of existing forces, participation, optimum utilization of existing facilities and resources, organization and conduction of planned and measured to the scientific lifestyle emphasis. Since the present world is a world of economic competition and every country has to plan economic designs with precision in order to maintain its political and economic supremacy and autonomy and due to the fact that the principle of comparative advantage is one of the most useful economic policing tools. Discovering and utilizing comparative advantages of production in different economic sectors not only improve the policies of country's allocation of resources and production pattern but also could determine export types and their combinations (Karbasi *et al.,* 2009).

The comparative advantage is the central point of trade and profit obtained through trade and its path. The growth and development of global trading in recent years, national, international organizations and institutions established for this sake, have made governments to contemplate seriously about competition and especially comparative advantage; since real and trouble-free competition is founded on the base of comparative advantage. The competition states that within a country or among several countries which production units (or generation of which products) could have a better activity in global markets on determined assumptions. So, paying attention to comparative advantage in production activities is one of the most important aspects of economic planning which is of considerable stability (Noori, 2003).

Salvatore (1998) describes free trade as the best policy for the world's countries believes that generating to the degree of complete independence of all products is to disadvantage of those countries. Smith argues that via free trade, each country could specialize in producing those products which have absolute advantage in their production. This method of trade causes the optimized allocation of production factors in countries and also increased production; consequently all countries will be at the same time benefited from trade. Since the absolute advantage theory operates weakly especially when a country has absolute advantage in generating all products, it has not been applied very often and limitations of this theory allowed for comparative advantage theory coming to stage. According to this theory, even if a country has not absolute advantage in producing of any product compared to another country, it still could be present in global market and be benefitted. This country should produce and export those goods which has comparative advantage in their production and import those goods which has not comparative advantage in their production. The theory of comparative advantage evolved so that since 1970 decade, it was identified as the basis for taking investment decisions and economic policies and eventually it was used as a tool for determining the pattern of the optimized production and trade in a country.

Fong and Fang (1999) studied the comparative advantage of main agricultural products of China for 1992 to 1998 using policy analysis matrix. Results of this study indicated that China had comparative advantage in labor-wanting agricultural products and lacked this advantage in land-wanting products. Yazdani and Eshraghi (2006) investigated the comparative advantage of almond production in Iran (Cheharmehal-o-Bakhtiari Province). According to the obtained results, almond production in the region of study had comparative advantage. Reig-Martínez *et al*. (2008) combined policy analysis matrix and data envelopment analysis techniques to model the analysis of profitability from farming. The main conclusion was that the usefulness of the policy analy-

sis matrix might be substantially enhanced by simulating profitability after efficiency-improving managerial decisions have been adopted. Karbasi *et al*. (2009) in a study investigated the comparative advantage of the major agricultural products of Kerman using the indices of domestic resource cost, pure social profitability, economic advantage and advantage scale. According to the obtained results, irrigated wheat had comparative advantage in this province; in other words, generating this product was more economic than importing it. Pakravan *et al*. (2012) performed a computation of comparative advantage indices of agricultural products of the city of Sari. Results of this study showed that among the products under study, barely had not advantage; however, it had third rank in terms of acreage among the studied products. Also, wheat product had DRC index equal to 1 in the lowest value of exchange currency rate in IRR and this suggested that high social profitability of this product encouraged farmers even with the lowest social income to generate this product which also has the second rank of acreage in the present conditions. Rozane and Philippe (2013) evaluate the profitability and the effects of direct and indirect taxes on rice production in Brazil compared to other member countries of Mercosur, use the Policy Analysis Matrix. The results have shown that in 2010, rice production in Argentina and Uruguay had positive social and private profitability, while in Brazil and Uruguay there were negative private results. Secondly, a simulation of an alternative scenario for Brazil was performed, considering a reduction in the direct and indirect tax burden to a similar percentage between the countries compared. Kanaka and Chinnadurai (2013) used PAM to model the analysis of profitability from farming. The main conclusion is that the usefulness of the policy analysis matrix might be substantially enhanced by simulating profitability after efficiency-improving managerial decisions have been adopted.

Hasanpour *et al*. (2013) studied the comparative advantages of rainbow trout production through PAM. The results based on the DRC approved the comparative advantage of fish production. NPCO indicated that there is a direct subsidy on the producer; the amount of NPCI represented the indirect taxes on tradable inputs of fish, EPC showed that the government's policies support production process.

The agricultural sector of Ilam Province is considered an important and effective sector in the economy of this neglected province. Through proper planned investments in this sector, steps might be taken on economic growth of the province by increased production and offering products to inside and outside markets. Borderland geographical status of this province is a significant advantage in the development of exporting products. Because neighborhood with a country like Iraq and having more than 420 kilometers of international border with this country has provided a close potential market for internal surplus products of the province. Making use of this relatively appropriate market situation and the degree of success in important issue of economic boom of the province through the productive activities of the agricultural sector depends on productive potential and competitive ability of agricultural products generated in the province in global markets including the market of the stated foreign country. Due to restrictions of many production inputs and factors in agricultural sector and also different climatic and geographical characteristics of different regions, taking steps based on the principle of comparative advantage in each region is of high importance. Using comparative advantage principle, it is possible to determine regionalizing pattern of cropping and distribute the resources optimally among the different activities in order that in addition to optimized use of resources, producing and exporting capabilities might be recognized and context for effective investments might be prepared. Paying attention to this issue is very helpful in trade integration processes especially in joining to the world trade organization. Taking into account the comparative advantage of agricultural products in agricultural plans of this province could be viewed as an important step in generating the profitable products and providing the appropriate context for informed presence in the global markets which requires the recognition of capabilities and potentialities of each region. Since through using comparative advantage principle, it would

be possible to determine the regionalizing pattern of cropping and also distribute resources in an optimized way between different activities so that beside optimal use of resources, production and exporting capabilities could be recognized and the necessary context for effective investing could be provided, the analysis of comparative advantage of the major agricultural products of Ilam Province and its relationship with the current cropping pattern seems necessary. Regarding the significance of the subject of this study, the comparative advantage of main products of the province was measured using domestic resource index and then cropping pattern based on comparative advantage was determined and the quality of government intervention was also determined via computing the effective protection coefficient. At last, the cropping pattern based on comparative advantage was compared against the current cropping pattern of major agricultural products of the province and their respective relationships with the protection coefficient were studied. The focus of this research was to investigate the comparative advantage of main agricultural products in Ilam Province and its relation to cropping pattern.

MATERIALS AND METHODES

Identifying the comparative advantage of generated products especially agricultural products is indeed moving toward the optimized allocation of potential resources and facilities of each specific region in order to develop producing and exporting these products. Since in many countries, government for protecting agriculture and increasing production amount carries out various supports in forms of inputs provision and distribution, guaranteed purchase, market adjusting, offering facilities, paying subsidies and so on, a reasonable growth has appeared in products of this sector in light of these protections. Since government intervention has brought about inevitable effects on total price and real cost of a product, those who determine the economic policies, are puzzled over real prices and costs of generating a product. On the other hand, unreal prices and costs governing on the product and input market deviates the economic evaluation of generating these products. In order to identify the amount of deviations and evaluating economically the generation of different products, a method called policy analysis matrix is usually used.

In this study, for investigating the comparative advantage of generating main agricultural products in Ilam Province, Policy Analysis Matrix is used. This method is considered one of the most comprehensive and applied methods of policy analysis and computing comparative advantage.

The Policy Analysis Matrix (PAM) is developed by Monke and Pearson (1989) and augmented by Masters and Winter-Nelson (1995), for measuring input use efficiency in production, comparative advantage among commodities, and the degree of government interventions. PAM is a product of two accounting identities, one defining profitability as the difference between revenues and costs and the other measuring the effects of divergences (distorting policies and market failures) as the difference between observed parameters and parameters that would exist if the divergences were removed. By filling in the elements of the PAM for an agricultural system, an analyst can measure both the extent of transfers occasioned by the set of policies acting on the system and the inherent economic ef-

Table 1: Policy Analysis Matrix.

	Revenues	Tradable Inputs	Domestic Factors	Profit
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergences	I	J	K	L

Table Notes:
Private profits, D= A- (B + C) Input transfers, J= B- F
Social profits, H= E - (F + G) Factor transfers, K= C-G
Output transfers, I= A-E Net policy transfers, L= D-H
Source: Based on Monke and Pearson (1998)

Table 2: Indicators of comparative advantage and protection co-efficient for main crop in Ilam.

Indicator	tomato	cucumber	water-melon	dry-farm-ing lentil	dry-farm-ing pea	corn	dry-farm-ing barely	irrigated barely	dry-farm-ing wheat	irrigated wheat
DRC	0.52	0.21	0.19	0.39	0.75	0.29	1.46	0.93	1.76	1.12
SCB	0.58	0.24	0.25	0.56	0.80	0.46	1.29	0.97	1.37	1.08
NSP	97763	3823159	300709	181178	113460	886406	-76524	13786	-67333	-54719
NPCI	0.64	0.77	0.72	0.74	0.83	0.37	0.65	0.51	0.69	0.65
NPC	0.75	0.69	0.85	0.94	0.72	0.95	1.12	1.18	1.28	1.15
EPC	1.16	0.68	1.08	1.30	0.79	1.23	1.35	1.42	1.68	1.41
NPIR	36%	23%	28%	26%	17%	63%	35%	49%	31%	35%
NPR	25%	31%	15%	6%	28%	5%	12%	18%	28%	5%
EPR	16%	32%	8%	30%	21%	23%	35%	42%	68%	41%

ficiency of the system (Table1).

The data in the first row provide a measure of private profitability (N), defined as the difference between observed revenue (A) and costs (B+C). Private profitability demonstrates the competitiveness of the agricultural system, given current technologies, prices for inputs and outputs, and policy. The second row of the matrix calculates the social profit that reflects social opportunity costs. Social profits measure efficiency and provide a measure of comparative advantage. In addition, comparison of private and social profits provides a measure of efficiency.

A positive social profit indicates that the country uses scarce resources efficiently and has a static comparative advantage in the production of that commodity at the margin. Similarly, negative social profits suggest that the sector is wasting resources that could have been utilized more efficiently in some other sector. In other words, the cost of domestic production exceeds the cost of imports, which indicates the sector cannot survive without government support at the margin. The third row of the matrix estimates the difference between the first and second rows. The difference between private and social values of revenues, costs, and profits can be explained by policy interventions.

The PAM framework can also be used to calculate important indicators for policy analysis. The Nominal Protection Coefficient (NPC), a simple indicator of the incentives or disincentives in place, is defined as the ratio of domestic price to a comparable world (social) price. NPC can be calculated NPCI. The domestic price used in this computation could be either the procurement price or the farm gate price, while the world reference price is the international price adjusted for transportation, marketing and processing costs. The other two indicators that can be calculated from the PAM include the Effective Protection Coefficient (EPC) and Domestic Resource Cost (DRC). EPC is the ratio of value added in private prices (A-B) to value added in social prices (D-E). An EPC value of greater than one indicates that government policies provide positive incentives to producers, while values less than one indicate that producers are not protected through policy interventions. Domestic resource cost, the most useful indicator of the three, is used to compare the relative efficiency or comparative advantage between agricultural commodities, and is defined as the shadow value of no tradable factor inputs used in an activity per unit of tradable value added (F/(D-E)). The DRC indicates whether the use of domestic factors is socially profitable (DRC<1) or not (DRC >1). A region will have a comparative advantage in a given crop if the value of the DRC for that crop is lower than the DRC for other crops grown in that state. A good alternative to the DRC is the Social Cost/Benefit (SCB), which accounts for all costs (Fang and Beghin, 1999). The SCB is calculated as the ratio (E+F)/D. can compute the rates of protection by use below equation:

$$NPR= (NPC-1)*100 \quad (1)$$

$$NPIR= (1-NPI)*100 \quad (2)$$

$$EPR= (EPC-1)*100 \quad (3)$$

The shadow price

The shadow price is the real value of a product or an input in conditions of free competition and without interference of any factor outside the market resources. Providing these conditions inside a country is not a simple task especially in case of agricultural products. Because due to

taking protection and taxing policies inside countries, the price of agricultural products has undergone deviation and in such conditions, domestic shadow prices could not reflect well the real values of products. Therefore, for computing shadow prices of products and inputs generated for export or replacement of imports inside country, the Fob border price of the product is multiplied by the shadow exchange rate to get its border shadow value in IRR. Then transfer cost of the product from the region of study to export borders subtracted from it. For obtaining shadow price of imported products or inputs, their CIF cost is multiplied by shadow exchange rate and the cost of transferring from the border to farm is added to it.

The tradable inputs include chemical fertilizers, toxins (herbicides, insecticides and fungicides) and a part of machinery cost. The shadow price of machinery, the use cost of agricultural products are mainly due to using sorts of tractors, sprayers, water engine, vehicles and thrasher. Among the machineries, operations of tractor are more frequent than others. Plowing, disk, troweling, seeding, spraying and other operations could be carried out by tractor. So, in this research, determination of the shadow price of tractor is dealt with as the shadow price of machinery. Machineries have ambivalent characters; some of their parts are considered among tradable inputs and some among non-tradable inputs. In this study, based on previous studies, 66% of this cost is considered as non-tradable cost and 34% belonging to tradable costs.

The shadow price of chemical fertilizer: chemical fertilizer (phosphate, urea, ammonium nitrate, ammonium sulfate, potassium sulfate, nitrogen and other fertilizers) is a fully-exchangeable product. The consumptive chemical fertilizer is provided partly from domestic production and partly through imports.

In which xi is the amount of type i fertilizer and Pi is the price for type i fertilizer and the shadow price of consumptive fertilizers is FOB price of imported fertilizers.

The shadow price of toxin: The most important consumptive toxins for agricultural products are herbicides, fungicides and insecticides.

In which xi is the amount of type i toxin and Pi is the price of type i toxin and the shadow price of consumptive toxins is FOB price of the imported toxin.

Non-tradable inputs include seed, human resource, land, water, organic fertilizer and internal transportation.

The shadow price of seed: Since seed is among the inputs usually produced and exchanged by farmers themselves and there is not usually any special dysfunction in its market, its market price is assumed its very shadow price.

The shadow price of human resource: In the present study, the cost of lost opportunity of the employed labor is considered as shadow price. For the computation of the cost of lost opportunity, the highest wage paid for different activities in generating the product of study is considered.

The shadow price of land: For measuring the shadow price of land, according to previous studies, there are different methods. In the studies of Gonzales *et al*. (1993) the mean rate of land's rent was used as the shadow price by applying the 85% coefficient. the applied coefficient is because the subsidies given to tradable inputs cause the land's renting price to be more than its real value; therefore, the land's renting rate mean was assumed as the shadow price of land by applying 85% coefficient in the major regions of cropping the selected products. In this study, for computing the shadow price of land, 85% of the highest price of land renting has been considered as the base price of land in regional tradition.

The shadow price of organic fertilizer: it's selling and buy price (market price) has been considered as the shadow price.

The shadow price of water: In this study, the shadow price of water has been computed on the basis of highest total cost of water harvesting. The cost of internal transportation is considered the mean transportation cost of every ton of products to external gates and vice versa. This has been computed based on inquiring the consented rate of transportation of products in the syndicate of garage-owners and drivers, truck-owners Corporation and also the transportation terminals organization.

The shadow exchange rate

Another variable needed for analyzing the comparative advantage is the shadow exchange rate.

The official exchange rate is in fact the domestic price of exchange currency. Influenced by different policies of government, this price also similar to the domestic prices of products deviates from its real value. The shadow rate of exchange currency has special importance in computation of the comparative advantage and determination of government protection rates. In fact, this rate is the base for an acceptable shadow price for tradable products and inputs (Karbasi *et al.*, 2009). There are various methods for computing the shadow rate of exchange currency; different assumptions have been considered in each method which results in different numeral quantities for the mentioned indices. In the present study, official exchange (dollar) rate is assumed as the shadow rate. The mean rate of dollar in the year 2010, according to the central bank of Islamic Republic of Iran report, is 10335 IRR.

RESULTS AND DISCUSSION

The results obtained through computing the indices of policy analysis matrix of 10 main agricultural products of Ilam province are reported in Table 2.

The obtained results from the computation of the comparative advantage indices of DRC, SCB and NSP show that Ilam Province has not comparative advantage in producing irrigated and dry-farming wheat and dry-farming barely but in producing corn, pea, lentil, cucumber, watermelon and tomato has comparative advantage and in other words social profitability. This is the case while the majority of the cultivated lands of Ilam Province are devoted to wheat and barley cropping.

Also, the results of computing NPIC index indicate the nominal protection by government of inputs in all products. The generators of this product have been given input subsidy; in other words, government intervention in inputs market has been to the advantage of generators of these products. The value of NPC index or nominal protection coefficient suggests that the nominal protection of the market of wheat (irrigated and dry) and barely (irrigated and dry) products has been positive and this index has been negative regarding other products of study. In other words, government policies has been beneficiary only to producers of wheat (irrigated and dry) and barely (irrigated and dry) and has had disadvantages for other products under study and toward not protecting internal generating of other products. It could be said that government has forced indirect taxes on generating other products. Effective protection coefficient EPC, which analyzes the effects of government intervention in inputs and product market at the same time, has highest values for wheat and barley.

The intervention of governments influences the cropping patterns and causes change in domestic superiorities (production in domestic prices). The protection amount of governments, short-term and long-term investments influence the private sector as well which may result in growth and blooming of these sectors. Since one aim of this study is the investigation of relationship between acreage and the comparative advantage of products in Ilam Province and the way government protection influences the cropping pattern in Ilam Province, the rank of acreage of each product is compared with the rank of effective protection rate and rank of comparative advantage of these products in the

Table 3: DRC, EPC and cultivated land.

Product	DRC	%EPC	Rank of EPC	Cultivated land(ha)	Rank of Cultivated land
Watermelon	0.19	8	10	4737	7
Cucumber	0.21	32	5	5936	5
Corn	0.29	23	7	10360	4
Dry-farming lentil	0.39	30	6	2109	8
Tomato	0.52	16	9	406	10
Dry-farming pea	0.75	21	8	5012	6
Irrigated barely	0.93	42	2	998	9
Irrigated wheat	1.12	41	3	49394	2
Dry-farming barely	1.46	35	4	47992	3
Dry-farming wheat	1.76	68	1	76952	1

region of study in Table 3.

According to the information of table 3, the cropping pattern for the province is not determined on the basis of comparative advantage index and those products with high acreage have not high comparative advantage. For instance, dry-farming wheat which lacks comparative advantage has the highest acreage and on the contrary products such as cucumber and watermelon that have the highest advantage, have not the highest acreage. Among reasons for the present situation, we may refer to: guaranteed purchase of products such as wheat and barley and also imbalance in the market of such products as cucumber and tomato and inconsistency in their price. As it can be seen in the table, it seems that acreage of agricultural products is ordered almost based on the government effective protection of the product ions.

CONCLUSION

Regarding the computed indices, Ilam Province has good comparative advantage in producing watermelon, cucumber and tomato; however, due to these products being high corruptible, it is necessary -beside programming for development of cropping these products- to pay attention to the peripheral issues such as processing industries, improvement in transportation, storage, packaging and marketing systems. Since the cropping pattern of agricultural products in Ilam Province is designed mainly on the basis of the effective protection of products, it is recommended that government protection be increased purposefully for those products which have higher comparative advantage in order that in addition to the development of cropping these products and consequently optimized use of production resources and factors, conditions might be provided in which producers have high competitive potential when faced with the trade integration process they could benefit mfro the trade integration process. Since the obtained values for protection indices indicate direct and indirect protections the agriculture's inputs and outputs market, attempts should be made to increase the range of these activities with the aim of developing agricultural exports of these products.

Despite the fact that Ilam Province has not comparative advantage in producing irrigated and dry-farming wheat and also dry-farming barely and that cropping these products has not social benefit, the majority of cultivated lands in Ilam are devoted to these products; easiness, fashion, low risk and old cropping methods have made farmers of this region not to be ready to crop any product other than wheat. So, it is not easy to remove the cropping of this product from the agricultural program. Increasing studies concerning the desired cropping pattern suited to the climatic and economic conditions of the region, increasing deep-seated studies about cropping new products and economic analysis of those products, educating farmers and comprehensive attempt to present practical solutions to improve yield and decrease costs for purchasing necessary inputs for farmers in order to arrive at a better state of comparative advantage are solutions for enhancing the profitability of wheat in the region.

The comparative advantage is a dynamic index and its value changes over time by changing factors. Therefore, aimed at permanent development of comparative advantage, the necessary investments must be carried out; structural and fundamental investing including permanent investment in researches, education and promotion is recommended.

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REFERENCES

1- Fong, C. B. J., & Fang, C. (1999). *Measuring Small Holder Comparative Advantage and Agricultural Trade* (CARD – Working Paper. No: 99 19). Gardner, B. & G.

2- Fang. C., &, Beghin, J. (1999). *Food self-sufficiency, comparative advantage, and agricultural trade: a policy analysis matrix for Chinese agriculture* (Working Paper 99-WP 223). Center for Agricultural and Rural Development, Iowa State University, Ames, IA.

3- Gonzales, L. A., Kasrino, F., & Rsegrant, M. W. (1993). *Economic Incentive and Comparative Advantage in Indonesian Food Crop Production* (Report NO 93). International Food Policy Research Institute, Washington D. C.

4- Hassanpour, B., Asadi, E., & Biniaz, A. (2013).

Investigation of Policies Effects and Comparative Advantage of Rainbow Trout Farming in KB Province, Iran. *International Journal of Agriculture and Crop Sciences*, 6(1), 31-34.
5- Huang, J. J., song, Qiao, F., & Fuglio, O. (2003). *Sweet Potato in China: Economic Accept and Utilization in Fig Production. International potato Center* (IPC), Pogor, Bogor, Indonesia.
6- Kanaka, S., & Chinnadurai, M. (2013).The policy analysis matrix of rice cultivation in INDIA. *European Journal of Physical and Agricultural Sciences*, - 1 (1), 8-17.
7- Karbasi, A. R., Shamsodini, S., & Rastgaripour, F. (2009). Determining comparative advantage of main cultivated production in Kerman. *Agricultural Economic and Development*. 65, 1-15.
8- Master, W. A., & Winter– Nelson, A. (1995). Measuring the comparative advantage of agricultural activities: Domestic resource cost and the social cost-benefit Ratio. *American Journal of Agricultural Economics*, 77,243-250.
9- Noori, K. (2003). Defining the production comparative advantage in major rice groups in Guilan and Mazandaran Province. *Journal of Agricultural Economics and Development*, 10(4), 25- 46.
10- Monke, E., & Pearson, S. (1989). *The policy analysis matrix for agricultural development,* Ithaca. NY: Cornell University Press.
11- Pakravan, M. R., ZareMehrjerdi, M. R., & Kazemnejad, M. (2012). Comparative advantage investigation of cultivated production in Sari. *Agricultural Economic and Development,* 77, 1-28.
12- Reig-Martínez, E., Picazo-Tadeo, A. J., & Estruch, V. (2008).The Policy Analysis Matrix with profit-efficient data: evaluating profitability in Rice cultivation. *Spanish Journal of Agricultural Research,* 6(3), 309-319.
13- Rozane, Â.L.S., & Philippe, P.R.J. (2013). Rice production in Mercosur seen through. *Ravista de Politica Agricola*, 22(1), 55-71.
14- Salvatore, D. (1998). *Theory and Problem of International Economics*. Schaum' Outline Series, McGraw-Hill Book Company. Printed in Ney Publications, Tehran, Iran.
15- Yazdani. S., & R. EshraghiSamani (2006). Economic analysis of Almond production in Chahar Mahal and Bakhtiariprovince. *Iranian Journal of Agricultural Sciences,* 36(3), 537-545.