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## **Opium Supply Control Policies in Afghanistan: A Case Study OF Daykundi Province, Kiti District**

*Mohammad Tavakoli, Mansour Zibaei, Fatemeh Fathi*

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### **Introduction**

The opium poppy cultivation is one of the many problems that Afghanistan is facing nowadays. To address this problem, many strategies such as eradication, interdiction and alternative livelihood opportunities have been adopted. But, it is a well-established fact that these efforts have not been successfully proved as they were envisaged when started. It is believed that cultivation of opium poppy will automatically contract by enhancing licit livelihood opportunities. But, alternative livelihood development has failed to recognize the different motivations and factors that influence household's decision to cultivate illicit drug crops and ignored the fact that these motivation and factor differ across households from different socio-economic group in different areas of Afghanistan. The goal of this study was to examine opium cultivation alternative policies.

### **Materials and Methods**

In this study to examine opium cultivation alternative policies positive mathematical programming (PMP) model at representative farm (RF) levels used. PMP has been improved to overcome normative character of optimization models. The main aim of PMP is to give as true a picture as possible of the situation and then simulate the behavior of farmers as parameters in which the object of agricultural policy intervention is shifted. Therefore, PMP is highly practical for analyzing the consequences of agricultural policies as long as enough empirical data are available for calibration of the model. A linear programming model was used for the RF of homogenous groups when no empirical data was available. Farm level data were obtained from a sample of poppy farmers in the Kiti district of Daykundi province. A two stage cluster sampling was used to select the sample farmers. At the first stage, a cluster of

seven villages (Hoshai, Royan, Kissev, Malmunjac, Sartighan, Hazarderakht and Tajrib) was selected. In the second stage, by a simple random sampling method, 132 poppy producers were chosen for interview and collection of necessary farm level data in 2010. Because construction of a model for each farm is time consuming, costly and inefficient, cluster analysis was applied to the farm data such as land in crops, land to labor, land to water, land to capital ratios and net income per Jerib to find homogenous groups in the sample farms. The cluster analysis divided the sample farms into three groups. The median farms of each group were chosen as being representative farm.

### **Results and discussion**

The results showed that opium is the only cash crop in contrast with other crops which are cultivated primarily to meet subsistence requirements. The exclusion of opium had significant effects on farmers' income and decreased their gross margins by 34.7 to 68 percent. Results also indicated that saffron is a serious alternative for opium poppy particularly at the representative farm of group 2 under current conditions. But, the retail margin for the poppy is very high and if a part of this margin assign to poppy farmers, none of the crop can compete against opium poppy. In other words, saffron cannot be an alternative crop if the farm gate price of poppy becomes eighty thousand Afghanis per Man (approximately 1Man=5 kilos). Finally, it was found that price and non-price policies of wheat and corn can alleviate economic effects of poppy interdiction.

The results show that pricing and non-price policies is needed to limit opium poppy cultivation. By applying such policies, it is possible to create the attractiveness of alternative products such as saffron, hybrid corn to replace opium poppy cultivation. But it should not be forgotten that in the current situation, only a small part of the margin of opium market is allocated to farmers. Therefore, it is always possible that the current structure will be transformed by increasing the share of farmers from the margin of this product, and as a result, the effectiveness of price and non-price policies will be greatly reduced. Therefore, using the legal constraints, can removed it from the crop pattern.

### **Suggestion**

According to the result, the most effective policy to reduce the real supply of any opium material, is the decline in opium demand, that causes its price will be reduced and gradually eliminated from the pattern of farmers. Moreover, the results of this study well illustrate the effect of the elimination of opium on income, the crop pattern of cultivation and consumption of inputs by farmers, which can be used to compensate, reduce income.

***JEL Classification:*** C02,C61,O21

***Keywords:*** Opium, Cultivation Alternative Policies, Positive Mathematical Programming Afghanistan,

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## **Effect of Macroeconomic Variables (Domestic production, Relative prices and Exchange rate) on Export of Saffron**

*Arezoobahador Bahador, Seyyed Habibollah Mousavi and Sadegh Khalilian 1*

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### **Introduction**

Saffron is on the export products and Iran is one the main and the largest producer and exporter of the saffron with 88% of the world production. A survey of the approach of global export shows that the increase or decrease in the amount of Iran export directly and obviously influences the global export of saffron and it is affected by the increase or decrease of Islamic republic of Iran export. Thus, in this study, the effects of the changes in products amount on the saffron export have been studied as a result of changes in cultivated area, relative prices and the currency fluctuations. Previous studies have shown that variability in macroeconomic variables influences the export of agricultural products. In this study, we seek to answer the question of how the variability in domestic production, the real exchange rate and export prices affect the supply of Iranian saffron exports.

### **materials and methods**

at the first, information and data required for research were mustered from the Jihad of Agriculture Organization, the Islamic Republic of Iran, the Iranian Statistics Center and the Saffron National Council for the period 1965-1393. variables used in this study including: domestic production, relative prices, export supply, real exchange rate and variables affecting production. In the following, a mathematical programming model including production, export prices, and export supply of this product were developed for performing the simulations. In the next step, the method and the fan of simultaneous equations and the 3sls method were used to estimate the expanded model parameters. The corresponding functions were estimated using the simulator system and mathematical programming model. In purpose to estimate the system of simultaneous equations before the beginning of the estimation, the staticity of the variables in question, and also cointegration

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<sup>1</sup> Respectively: M.Sc. graduate student, assistant and associate professor of Agricultural Economics, Tarbiat Modares University,  
Email: shamosavi@modares.ac.ir

tests, concurrency, diagonal, and diagnostic problems were examined. In purpose to simulate used from linear programming model and the parameters and coefficients of the variables of required in the model were used by estimating production functions, export prices and export supply, which was estimated using the econometric model.

### **Results and discussion**

The results of this estimation showed that the variability in domestic production as a result of increasing the area under cultivation by changing the pattern of crop to low water on saffron has a significant and positive effect on the supply of this product. And also results showed that the export of saffron has taken a positive effect from the changes in the real exchange rate, In other words by increasing the real exchange rate or the devaluation of the national currency, that's mean the dollar appreciation rate relative to the rial, with other conditions remaining constant, would reduce export commodity prices For foreigners, the demand for export goods will increase, and the export receivables will increase, and the incentive for exports will be strengthened. And as a result, exports of saffron will also increase. According to the results, the increase in the price of saffron has a negative and negative effect on the price and export supply of saffron. And the increase in domestic production by increasing the crop area will increase export prices as well as export supply. The real exchange rate fluctuations also have a positive effect on the export and export prices, so that the increase in the real exchange rate will increase the price and export supply of saffron.

### **Suggestion**

According to the importance and positive effect of the real exchange rate and its fluctuations on export prices of saffron, therefore the application of management and oversight policies and the establishment of a real exchange rate has a significant role in increasing the export of saffron. On the other hand, transparent information about of future trend of fluctuations in the real exchange rate will have an important role in increasing the export of saffron and maintaining Iran's position on global markets.

**JEL Classification:**Q17 ,F18 ,F14

**Keywords:** Model of Math Planning, Simultaneous equations, Price and Export Supply, Iran Saffron

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# Water Security in Kowsar Dam Basin under Climate Variability: Application of System Dynamics Approach

*Ghasem Layani, Mohammad Bakhshoodeh<sup>1</sup>*

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## Introduction:

Generally, due to the complexity of the water system, one of the best tools for understanding the relationship between all components within a complex system is the system dynamic (SD) (Stermann, 2000). Given the growing population and demand for food, as well as the reduction of water supply by precipitation, this paper presents an integrated SD simulation model for exploring the water resource security index in the *Kowsar* dam basin in southwestern Iran. *Kowsar* dam, located in *Zohre* river basin is in the west of *Gachsaran* County in *Kogiluyeh and Boyerahmad* province, southwestern Iran. The water stored in *Kowsar* dam has declined in recent years. Because one of the most important goals of the *Kowsar* dam construction is the supply of drinking water in the southern provinces of Iran and agricultural development in these areas, meeting the growing water demand in this basin is becoming a concern among policymakers. Therefore, there is a crucial need to make an accurate simulation about the water availability to help policymakers adopting appropriate policies as well as achieving sustainable water management.

## System Dynamics Methodology:

System dynamics modeling involves the following steps: (1) articulating the problem and defining system boundary; (2) developing a conceptual model or casual loop diagram (CLD) and a stock and flow diagram of system; (3) Testing model; and (4) analyzing policy options (Stermann, 2000). The first step in SD modeling is to be specific about the dynamic problem and problem articulation (Ford, 1999). Model formulation is representing the structure of the problem and formulating a SD simulation model of the causal theory (Stermann, 2000; Zhuang, 2014). There are several diagram tools to capture the structure of the system, including causal loop diagram (CLD) and stock and flow diagram. Model testing begins as the first equation is written and it is a critical step in SD modeling (Stermann, 2000). Tests to rely on SD model can be divided into two groups,

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<sup>1</sup>Respectively. Ph.D. Student and Professor of Agricultural Economics at Shiraz University (Corresponding: Bakhshoodeh@gmail.com)

structure tests and behavior tests (Forrester, 1997). Structure tests compare the structure of the SD model with the available knowledge about the real system presented in historical data. Behavior test is to run the model and compare the results to the reference mode (Historical or observed data). When the simulation results match the reference mode, you have reached a major milestone in the modeling process (Ford, 1999).

**Result and Discussion:**

The performance of the model is discussed by comparing model outputs for the selected variables to the corresponding historical data. The simulated results follow the same trend as the observed data, indicating that the model is well calibrated. After testing the reliability of the model, the SD model is implemented under different scenarios. The behavior of the system is then simulated over time to assess the availability of water resources and sustainability index. The results showed that during the simulation period, the water availability would be declining. While water demand, which is directly impacted by population growth, is rising. Under optimistic weather conditions (first scenario), the surface water inflow is improving, yet increasing evaporation and outflow of water causes the water supply system to be vulnerable. As the water security index is in a better situation in the early years, it is expected to reach even lower than one at the end of simulation period. The results also indicated that the lowest water security index is related to pessimistic climatic conditions (second scenario). Therefore, demand management policies can play a significant role in the sustainable management of water resources by reducing water use per capita or increasing irrigation efficiency and reducing water consumption per hectare of agricultural production.

**JEL Classification:** Q01, Q50, Q21

**Keyword:** System Thinking, Water Management, Supply and Demand of Water, Iran.

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## **Analysis of Factor Productivity in Iranian Agricultural Sector in an Input – Output Framework**

*Vahideh Ansari, Akram Tahmasbinezhad, Habibollah Salami<sup>1</sup>*

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### **Introduction**

Due to the scarcity of production resources in agricultural sector, it is essential to enhance factor productivity to achieve growth objective in this sector. This requires knowledge of total factor productivity (TFP) as well as specific factor productivity (SFP) growth potentials in this economic sector. In addition, knowledge of productivity potentials and its change over time provides valuable information to policy makers and planners to specify effective economic policies to accelerate economic growth and achieve sectoral development goals. The main purpose of this study is to analyze TFP in the Iranian agricultural sector and its four subsectors over the period 1986-2001 in an input-output framework.

### **Materials and Methods**

TFP and SFP in Iranian agricultural sector were calculated using Tornqvist-Theil index approach and data from input-output tables for the years 1986, 1991, and 2001. In addition, annual growth rate of these productivity measures were computed over the periods of 1986-1991, 1991-2001 and 1986-2001. Finally, growth of TFP was decomposed into the productivity growth of contributing inputs namely; labor, capital, land, and intermediate inputs. Since data on outputs and inputs appear in nominal terms in all Iranian input-output tables, the data were transformed to real terms with 1997 prices as the base prices. In addition, all activities in input-output tables were aggregated into 20 sectors including, 4 subsectors of agriculture, 3 subsectors of mining, 10 subsectors of industry and 4 subsectors of services. The main focus of this study is on measuring overall productivity of agriculture sector and the productivities of the four subsectors namely; crops and horticulture, livestock and poultry, Fish and other aquatics, and Forest and pasture.

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<sup>1</sup> Respectively: Assistant Professor, Graduate (M.Sc) student and Professor of agricultural economics, Faculty of Economics and Agricultural Development, University of Tehran.  
Email: vansari@ut.ac.ir

## **Results**

The results of this study indicate that, although productivity of some inputs has increased during the study period, however, TFP has declined in all agricultural subsectors, except in the livestock and poultry subsector. In the livestock and poultry subsector, increase in productivity of intermediate inputs and capital, and the decrease in labour productivity, has led to the growth of total factor productivity in this subsector. This is reversed for the crop and horticultural subsector, in which a substitution of labour for capital resulted in a negative growth of total factor productivity. In the fish and other aquatics subsector, productivity of intermediate inputs has increased and productivity of primary inputs has decreased. The reverse is revealed by the forest and pasture subsector. The livestock and poultry subsector has experienced the highest annual growth of TFP while, the forestry subsector indicated the lowest annual growth of this index.

## **Discussion**

According to the results, all agricultural subsectors, except in the livestock and poultry subsector, have experienced negative growth rate of TFP over the study periods. This implies that, there has been a lack of proper planning in Iran to enhance productivity in most of the agricultural subsectors. In addition, results indicated that agricultural mechanization and substitution of capital for labor did not lead to an increase in overall productivity in the related subsector. This suggest that more appropriate machineries and equipment are needed to reinforce TFP in agricultural sector. Finally, given that increase in productivity is essential for any growth in output and to offset increase in the cost of production, a special focus on the increase in productivity of less productive inputs, specified in this study, is recommended.

**JEL Classification:** D24, D57, Q10.

**Keywords:** Total factor productivity, specific factor productivity, input-output tables, Tornqvist- Theil index, agricultural sector, Iran.

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## **Environmental Efficiency Analysis of Cage Culture Fish Farming System; the Case of Mazandaran Province**

*Saeed Yazdani ,Mohammadreza Ramezani ,Hamed Rafiee<sup>1</sup>*

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**Introduction:** Cage farming industry has been a rapidly growing industry in many parts of the world in a way that it is practiced in numerous countries nowadays. However, there is a growing concern about the side effects of this industry on the environment. Unlike land-based aquaculture systems, marine cage systems discharge their wastes directly into the environment. Therefore, the expansion of cage aquaculture has led to an increased awareness that fish farming may have considerable impacts on the aquatic ecosystem. Nevertheless, measurement of environmental impacts of fish cage culture, along with providing solutions for the optimal use of fish food, can be used as an effective tool to reduce the side effects of this system. So the purpose of this study is to quantify nutrient loadings in rainbow trout (*Oncorhynchus mykiss*) marine cage farms and assess the environmental efficiency of cage farming system in Mazandaran province.

**Materials and Methods:** In the production cycle of 2017-18, there were 9 active rainbow trout cage farms in the study area which the pollutants loadings from each farm were calculated based on an indirect method proposed by Hall et al. (1992). Subsequently, we used Slack-Based Measure Data Envelopment Analysis (SMB-DEA) for constant return to scale, with input orientation to assess the environmental efficiency with regard to the emission of pollutants. SBM-DEA is a nonparametric method of efficiency measurement which deals directly with the input excesses of decision making unit (DMU) and seems to be more accurate than conventional DEA models known as Charnes-Cooper-Rhodes (CCR) and Banker-Charnes-Cooper (BCC) models. CCR and BCC models deal

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<sup>1</sup> Respectively: Professor, M.Sc. student & Assistant professor of agricultural economics, University of Tehran  
Email: Syazdani@ut.ac.ir

with proportional changes of inputs and neglect slacks, while the SBM model does not assume proportional changes of inputs and handles input slacks directly. Because some inputs are substantial and do not change proportionally, the SBM model is more appropriate than the CCR and BCC models in reflecting the real-world behavior of decision making units.

**Results and Discussion:** According to the results, per ton of produced fish, an average of 73.979 kg of nitrogen, 13.893 kg of phosphorus and 488.353 kg of carbon were released into the environment. Almost all of the carbon (85 to 94%), phosphorus (86 to 94%) and nitrogen (86 to 94%) input to the farm was supplied with fish food. The rest was supplied with juvenile fish. Furthermore, feed conversion ratio ( $FCR = \text{feed supplied} / \text{body weight gained}$ ) varied between 0.897-4 with an average of 1.249 which indicates severe inefficiencies of feeding. Regarding to environmental efficiency, the average efficiency was about 59.9% representing that rainbow trout farmers could reduce the emission of pollutants about 40% at the current output level and technology.

**Conclusion:** Based on study findings, weak technical knowledge of farmers, especially in choosing the right time for start and the end of production cycles and feeding mismanagement will lead to an increase in the amount of pollutants released into the marine and near-shore ecosystem. Rainbow trout is a cold-water species that has a high sensitivity to heat in such a way that 20 Celsius is considered as the threshold temperature and higher temperatures could result in severe increase in fish mortality. In this regard, we highly recommend that in addition to advising the farm managers on choosing the best time for start and end of production cycles, restrictive rules should be laid down in which fishkeeping in cages after the onset of intense heat is prohibited because the environmental hazards of this system are very serious. Furthermore, it is suggested that successful farms be encouraged by incentive policies to transfer their experiences to other farms in order to improve the environmental efficiency of cage culture system. This can be done through training courses using well trained instructors and successful farmers.

**JEL Classification:** Q10, Q12, C14

**Keywords:** Fish Cage Culture, North of Iran, Pollution, Environmental Efficiency, SBM-DEA

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## **Investigating the Status of Exporting Medicinal Plants with Relative Advantage, Global Market Structure and Commercial Planning in Iran**

*Mohammadreza Kohansal, Maryam Dehghani Dashtabi, Fahime Rashidi Ranjbar, Sasan Esfandyari<sup>1</sup>*

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The strong fluctuations resulting from crude oil exports, the increase in population and the end of oil resources have led policy makers to develop exports and get rid of the single-product economy. In this regard, paying attention to forest products, rangelands, medicinal plants, which are among the most valuable resources in natural resources, is very important. This research was conducted with the aim of determining the relative advantage of medicinal plants and the structure of the global market for medicinal plants and planning their exportation, during the period of 2017-2005. To determine the relative advantage, RCA and RSCA indices were applied, in addition to determine the structure of the market, the concentration ratio and HHI were applied and for the commercial mapping of medicinal plants TM index were used. The results showed that Sri Lanka, Vietnam, India and Indonesia possessed the most relative advantage in exporting medicinal plants, and Iran possessed relative advantage during the course of the study except the year 2015. According to the results of Iran, the export of medicinal plants has a comparative advantage, But it has not been able to play a suitable role in the global market, this suggests that there is no proper marketing system for Iran's medicinal plants. Therefore, planning to help identify new target markets, end-use markets, and global advertising can help increase exports. Adopting appropriate policies to promote the export of such products, including the formation and coherence of exporters cooperatives, will strengthen their bargaining power in determining their price and their legal capacity to regulate commercial contracts and market development. The results showed that the

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<sup>1</sup> Respectively: Professor of agricultural Economics, Ferdowsi University of Mashhad, M.Sc. students of agricultural economics, University of Tehran & Phd student Dept. of Agric. Economics, Univ. of Mashhad Ferdowsi  
Email: m.deghani@ut.ac.ir

global market structure of medicinal plants is of two types of multilateral monopolies and is open and closed between multilateral monopolies. Also, India, Syria, Bulgaria, Iran, China, the Netherlands, Indonesia, Nepal, Thailand and the United Arab Emirates have the largest share of the market for exporting medicinal plants. Investigating the export prices of medicinal plants exporting countries showed that despite the fact that the medicinal herb has a significant potential for export, it has lower export prices due to the weakness in the global marketing process of medicinal plants. Therefore, preventing the supply of raw and bulky medicinal plants, improving the process of packaging and processing of medicinal plants in line with world-wide standards, with the aim of increasing export and export prices, preventing smuggling of goods and creating a suitable brand name for medicinal plants of the country, creating a plant exhibition Medication in foreign consumer countries, export tariff modification to increase exports and influence on the target markets of competing countries can be effective. It is also necessary to initially provide the medicinal plants listed in accordance with the standards of foreign consumers. And then there will be necessary and acceptable business relations to reach the ultimate target markets that are not saturated and do not intend to export again. In the discussion of the business map, the results showed that in the years 2013-2002, when the global market is declining, Iran has emerged as a winner in some years, and in the 2016-2014 period, when the global market has grown, Iran is often as a winner. And also the calculation of the TM index with regard to agricultural products shows that in many years the market has been declining and Iran has often emerged as a loser in a declining market. In order to face the decline in exports of Iranian herbs, Iran is recommended to seek solutions to identify the import markets of its medicinal plants. To import them only by a certain number of countries because the continuation of export of a product to a particular market causes the saturation of the opposite market and the importing country seeks to supply the imported product from another country.

***JEL Classification:*** Q13, P15, C22

***Key words:*** Medicinal Plants, Relative Export Advantage, Market Structure, Commercial Planning,