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Economic evaluation of three patterns of cultivating rice, rice-rice, rice-Ratoon in Amol City

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Abstract

As one of the strategic plants, rice has an important role in providing food security of Asian communities such as Iran. The farmers plant rice in sedimentary plains, floodplains and in terraces mountainous lands. From these areas, many parts of Amol town can be mentioned. Statistics of largest area under cultivation in Mazandaran province is about 240 thousand hectares that Amol has allocated 39 thousands hectares of under cultivated lands to itself. Current study is planned aiming to investigate three types of cultivation of rice with categorizing first, second and Ratoon cultivation in Amol town. In addition to increase efficacy and optimum use of farming land for maintaining agriculture, mentioned cultivations causes increasing financial power of farmers, income and production promotion as well. Due to this the ideas of 60 farmers of mentioned area have been received through questionnaires and were analyzed using SPSS software and ANOVA test. The obtained results represented that first, second and Ratoon cultivation is respectively the most expensive and most profitable types of cultivations. In addition to increase efficacy and optimum use of farming land for maintaining agriculture , Mentioned cultivations causes increasing financial power of farmers, income and production promotion as well.

Key words: economic evaluation, rice, first cultivation, second cultivation, Ratoon, Amol province

Introduction

One of main problems in today world is providing food needs in a way that food security has been placed in government's agenda as one of the important goals and that would be provided when all people, any time have access to sufficient, nutritious food physically and economically. (FAO, 1996) Because of having vital role in providing needed food for community, agriculture is considered as one of the most important economic sections of the country (Mousavi et al, 2012; 2011)

The importance of agriculture sections in economic development of the country caused that increasing production and income for farmers in Iran always draw the attention of policy makers of agriculture so the necessity of supporting and providing economic security of active population in this section in order to increase their production power can be always felt. (Mehrabi Basharbadi, 2008, Kohansal & Akbari, 2013; Akbari & Zare, 2011). In Iran after wheat, rice is considered as the most important food and a main good which can be found in family portfolio and has important role in food pattern. Increasing population of the country increases the demand for rice significantly so that the per capita consumption of rice in Iran is approximately 38 kilograms. (Pirdashti et al, 2006) The experiences has shown that considering increasing population and the per capita consumption of rice, not only the first cultivation is insufficient for providing food but also its obtained products cannot compete with the products of developed countries. (Mehrabi Basharbadi, 2008) Increasing producing rice because of consumers' demands is very important. On the other hand rapid increasing of agriculture products for providing the community's needs isn't the thing that can be done through traditional agriculture methods (first rice cultivation) because by these methods and traditional operations only a finite amount of products can be produced. Therefore in order to achieve increasing production capacity, one of recommended solutions is re-cultivation and Ratoon to be able to provide a wide part of our country's needs and food security as well as increasing farmers' income. (Hashemnia, 2012; Kohansal et al, 2015) According to the definition Ratoon means re-germination of harvested claws in the main product which is a way of increasing performance without increasing areas under rice cultivation. (Bond et al, 2005)

The main reasons of proposed solution are maintaining sustainable agriculture, promoting production, creating job opportunity, increasing financial power of farmers, increasing national income, reducing the outflow of currency from the country, meeting frequency problems and as result maintaining environment (Amirnejad et al, 2007). Generally a special attitude toward increasing production, earning more income, creating job opportunity and self-sufficiency through multiple cultivation system in the form of specified goals and policies in accurate perspective joining with production facilities and accessible resources at the macro level can be the key to issues and constraints that has surrounded rural community these days. (Hashemnia, 2012) Since there are finite sources in the field of rice cultivation, using these resources economically and proposing solutions for improving current situation seem to be necessary. Considering the importance of agriculture part in the country economy generally and in Amol specifically, studying about economic evaluation of three cultivation pattern in this area is very important and necessary. The current study was formed based on this. Due to this done librarian studies showed that this subject has not been investigated directly but due to economic evaluation of cultivating some of products globally, nationally and regional, there have been some works such as Amirnejad (2008) who has used financial-economic estimation and linear planning in order to determined economic cultivation pattern for about one third of paddy fields of the province that are prone for second cultivation. The required data which was sectional has been collected out of published statistics by Ministry of Agriculture and Agricultural Organization of Mazandaran province. Financial-economic estimation showed that cultivating Ratoon rice compared to appropriate activities of second cultivation of province including Colza and wheat with the value of gross profit, has been more profitable for cultivation. The results of linear planning also showed that considering the restrictions and curved coefficients of activities related to limiting factors, cultivating Ratoon rice was again better as the only product under the cultivation in optimum pattern of cultivating in paddy fields of the province that are prone for second cultivation.

Jaber Ansari et al (2015) did a research in Sari city in order to evaluate economically the production of native varieties and high yielding rice in traditional and mechanized methods. The results showed that the most performance in mechanized cultivation of high yielding varieties was produced with 4417 kilograms of white rice in hectare. Fewer yields and more cost in traditional cultivation of local yielding have caused that production cost is in the highest range for each kilograms of white rice.

Manouchehr Pajouhandeh (2013) did a research named economic evaluation of rice cultivation method in Gialn province. The results of variance analysis showed that the difference among different cultivation methods of rice in terms of harvest cost, food and service cost, the length of cultivation in day and hour is significant in one percent level. The mechanized cultivation method compared to manual cultivation 49 percent, rather semi-mechanized method 31 percent is less expensive.

Dilip et al (2002) economically analyzed tomato contract cultivation in the state of Haryana, India using cost-benefit analysis. The samples were categorized into three groups of small (less than 2.5 hectare), avearge (2.5 to 7 hectare) and large (more than 7 hectare) based on the cumulative frequency method. The results of this investigation showed that the ratio of cost-benefit, product yields in hectare and net return were more in large exploiters than avearge and small ones.

Brosh and Barmen (2000) economically analyzed producing and marketing tomato in states of Assam, India. In order to this, they used analyzing cost, benefit and the criteria of marketing. The results of this research showed a direct relationship between net return and the size of the field.

Agha alikhani (2013) in an investigation of rice production energy in Mazandaran province, reported the rate of consuming human resources in each hectare for traditional cultivation operation of local, high and hybrid yields respectively 120.78, 145.35 and 151.19 hours. Consuming human resources in one hectare for mechanized cultivation operation of local, high and hybrid yields was announced as respectively 10.50, 12.36 and 13.93 hours. But nothing was reported about the costs of traditional and mechanized methods of rice.

Generally a special attitude toward increasing production, earning more income, creating job opportunity and self-sufficiency through multiple cultivation system in the form of specified goals and policies in accurate perspective joining with production facilities and accessible resources at the macro level can be the key to issues and constraints that has surrounded rural community these days. (Hashemnia, 2012) Since there are finite sources in the field of rice cultivation, using these resources economically and proposing solutions for improving current situation seem to be necessary. Considering the importance of agriculture part in the country economy generally and in Amol specifically, studying about economic evaluation of three cultivation pattern in this area is very important and necessary. The current study was formed based on this.

Methodology

In terms of methodology this research is descriptive and in terms of goal is functional and collecting data is field survey one. Statistical population of this investigation is all producers of Amol that in addition to first cultivation in crop year of 2013-2014 have done re-cultivation and Ratoon cultivation as well. These farmers are 27 thousands people; 24000 people did Ratoon cultivation and 3000 did re-cultivation. Required data and information for achieving the goals of research were collected through questionnaires. Considering the equation of Cochran sample volume determination, the number of required sample for doing this research has been determined as 160 cases. Because of low educated farmers in Amol and lack of cooperation with questioner, only 60 samples were analyzed. For calculating the number of required sample in simple random sampling, Cochran formula was used as equation 1.

$$n = \frac{\frac{z^2 pq}{d^2}}{1 + \frac{1}{N}\left(\frac{z^2 pq}{d^2} - 1\right)} = \frac{10953/1699}{67/953173} = 161/30$$

Some of main effective variables have been evaluated through investigating the previous researches in this field on rice cultivation method such as rice cultivation income, rice production cost and net profit. After collecting initial information from questionnaires, each one of mentioned variables was evaluated and monitored. Two categories of statistical method; descriptive and inferential were used in this research. In descriptive statistics for all individual indicators of research such as gender, age, academic degree and work experience in agriculture profession, distribution tables were organized that included frequency, frequency percentage and cumulative frequency. Then descriptive characteristics of all research variables are pictured for different cultivations in the form of a table that include mean, mean error standard. In this step when data distribution is normal and when the researcher wants to compare more than two means with difference among the means of two samples, variance analysis (ANOVA test) is used. (Delavar, 2007) In output table of this test, if significance level is less than error value of 0.05 it is inferred that at least one pair of population are different (Seyedi, 2006). In this case for calculating the difference inside groups, post hoc tests are used. If significance level is more than 5 percent, Post hoc tests cannot be used at all (Houman, 2008).

Results and discussion

For analyzing descriptive statistics, the table of respondents' individual characteristics was investigated. Based on the results of current study, in age distribution part it was identified that 6% of respondents are in 20-30 years old, 17 percent of respondents in 31-40 years old, 32% of respondents in 41-50 years old and 45% of respondents were more than 50 years old.

In the section of distributing gender it was analyzed in this way that 100% of respondents were men. The table of respondents' education distribution showed that 45% of respondents were in education level below Diploma, 32% Diploma, 11% bachelor and 11% had master or higher degree. Work experience distribution table represented that 3% of respondents had been working for 1-5 years, 17% 6-10 years, 5% 11-15 years, 12% 16-20 years and 63% of them had been working for more than 20 years in agriculture profession. Investigating descriptive characteristics related to each one of effective variables' effect on three models of cultivations showed that respectively first cultivation, second and Ratoon are most lucrative, most expensive and most profitable types of cultivations.

Table 1- descriptive characteristics related to income for different cultivations

	Standard error of the mean	Mean	Count	Type of cultivation
	27701.30	5000.39	60	Ratoon
	66908.10	6167.10	60	Second cultivation
	59311.15	8833.10	60	First cultivation

ANAVA test for income variable

H0: least income mean is equal in all three types of cultivation.

H1: least income mean isn't equal in one types of cultivation with the other methods.

Table 2- ANOVA test for comparing the income of all three cultivations

Changes source	Degrees of freedom	Sum of squares	Mean of squares	F	Significance level of test
Type of cultivation	2	292273753361	146136876681	652.47	<0.0001

Experimental error	177	39643469083	223974401.6
Total	179	331917222444	

Considering the significance level of test which is less than 0.05 so zero hypothesis is rejected. As result least income mean is different in one of cultivation methods from other ones.

Table 3- the results of mean comparison among three types of cultivation in terms of income considering Duncan test

Type of cultivation	Count	Mean	Statistical Category
First cultivation	60	154918	A
Second cultivation	60	104808	B
Ratoon	60	56218	C

Considering the results of test of Duncan for mean comparisons, first cultivation of rice has the most mean of income and second and Ratoon are in next ranks in terms of income mean.

Table 4- descriptive characteristics related to cost for different cultivations

Standard error of the mean	Mean	Count	Type of cultivation
14843.30	1967.22	60	Ratoon
32598.12	8851.00	60	Second cultivation
34175.88	9833.64	60	First cultivation

ANAVA test for cost variable

H0: least cost mean is equal in all three types of cultivation.

H1: least cost mean isn't equal in one types of cultivation with the other methods.

Table 5- ANOVA test for comparing the cost of all three cultivations

Changes source	Df	Sum of squares	Mean of squares	F	Significance level of test
Type of cultivation	2	69403325742	34701662871	242.49	<0.0001
Experimental error	177	25329929778	143106948		
Total	179	94733255521			

Considering the significance level of test which is less than 0.05 so zero hypothesis is rejected. As result least cost mean is different in one of cultivation methods from other ones.

Table 6- the results of mean comparison among three types of cultivation in terms of cost considering Duncan test

Type of cultivation	Count	Mean	Statistical Category
First cultivation	60	70103	A
Second cultivation	60	46812	B
Ratoon	60	22013	C

Considering the results of test of Duncan for mean comparisons, first cultivation of rice has the most mean of cost and second and Ratoon are in next ranks in terms of income mean.

Table 7- descriptive characteristics related to net profit for different cultivations

	Standard error of the mean	Mean	Count	Type of cultivation
	726650	1374.73	60	Ratoon
	7791.33	5449.71	60	Second cultivation
	14135.39	9587.90	60	First cultivation

ANAVA test for cost variable

H0: least net profit mean is equal in all three types of cultivation.

H1: least net profit mean isn't equal in one types of cultivation with the other methods.

Table 8- ANOVA test for comparing the net profit of all three cultivations

Changes source	Df	Sum of squares	Mean of squares	F	Significance level of test
Type of cultivation	2	68661104000	34330552000	172/18	<0.0001
Experimental error	177	35290972097	199384023.15		
Total	179	103952076096			

Considering the significance level of test which is less than 0.05 so zero hypothesis is rejected. As result least net profit mean is different in one of cultivation methods from other ones. In another word these three types of cultivation have significant difference in terms of net profit.

Table 9- the results of mean comparison among three types of cultivation in terms of net profit considering Duncan test

Type of cultivation	Count	Mean	Statistical Category
First cultivation	60	81614	A
Second cultivation	60	63617	B
Ratoon	60	34228	C

Considering the results above, rice product compared to other cultivations has the most net profit and second and Ratoon cultivations are ranked in next positions. In another word three types of cultivating rice are placed in different statistical levels in terms of net profit.

Conclusion and recommendations

The results show that harvesting Ratoon after harvesting rice helps net income of farmers. Considering table 7, it can be said that the mean of net profit of Ratoon cultivation is almost one seventh of profit related to first cultivation. Moreover it can be proved that two cultivations of rice cause increasing farmers' income. Based on the obtained results from table 1, it can be said that income mean for both Ratoon and second cultivation are respectively one seventh and one second of income mean in first cultivation so the profitability of these two types of cultivation has been proved. The results of mean comparisons in table 3 also represent second and Ratoon cultivations causes increasing farmers' income and in terms of income are in next ranks after first cultivation. It can be also said that rice second cultivation causes increasing more income and net profit of farmers than second and Ratoon cultivation. This finding get realized in findings of table 1 and 7. Considering the proposed results, income and net profit mean for second cultivation is almost three times of Ratoon cultivation so second cultivation has been more profitable than Ratoon. Generally it can be said that the obtained results in this research show that second and Ratoon cultivation beside first cultivation have been important in terms of increasing income and net profit for farmers and by eliminating the problems and existing barriers in agriculture section and cultivating this strategic product in Mazandaran Province, we can step toward developing sustainable agriculture and increasing income. There were some restrictions and barriers during the interviews with farmers that are necessary to be mentioned here. The conditions of studies and researches of university centers and the centers related to agriculture jihad about rice have not been sufficient and functional in Mazandaran Province in a way despite double profit than before which was for farmers, because of harmful fertilizers and pesticides used in the second cultivation, mentioned cultivations weren't permitted to be used. It seems by more studies, more resistant items and less harmful fertilizers and pesticides can be proposed to market. on the other hand lack of appropriate mechanisms in the field of purchasing products and insurance of agriculture products have made farmers less motivated for doing such these cultivations. Lack of transferring scientific findings of university researchers to farm and not using them were the other barriers which were more tangible whatever we approached to deprived areas and traditional farms. Based on obtained results, there are some recommendations. Since supplementary cultivations such as second and Ratoon cultivation cause more profitability for farmers so in addition to suggesting second cultivation to farmers, the authorities in this field are recommended to persuade farmers for second cultivation by marketing and guaranteeing their extra production sale. The authorities can provide some necessities for farmers due to financially providing them in order to enable them for using second cultivation by consultations with financial and credit institutions. Making encouraging policies due to persuade the farmers such as financial and instrumental support, giving required fertilizers and other supporting decisions cause acculturalization for agriculture community toward second cultivation, this important issue is also recommended to the authorities of agriculture in Provinces and towns. Producing resistant and less expensive items with sooner and more return and coordinated with climate conditions of different areas in order to expand and promote second cultivation are the other things which are recommended to the farmers. Since Ratoon cultivation is the least expensive type of cultivation, farmers are recommended not to ignore the profits of Ratoon cultivation in case low financial power for second cultivation. In the end, accurate marketing of rice and in time proposing of imported items which are done due to control the prices, in addition to stabilizing in agricultural arena and farmers' profit guarantee, they are very effective on motivating them for second cultivations.

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