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The Economics Assessment of the Project for Mixing Wells with Canals to Supply Quality Water Suitable for Isfahan Saline Lands

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Abstract: The existence of saline water in some parts of Isfahan province is an issue which has endangered agricultural sustainability. There fore, if agricultural techniques and production efficiency of fields do not logically and appropriately improve, noncompliance between income and the costs of crops production agriculture on these lands. Based on this, in the present study conducted on the farms sampled from saline lands east of Isfahan city, the project of mixing wells water with canals water to supply suitable quality water and its application in sprinkler irrigation using the cost – benefit theory and the budgeting method and considering functional treatments and facilities interest rates were economically tested and assessed. Relevant results showed that in all functional treatments under study, the yield of the above mentioned project enjoys the required economic justification.

Key words: Economic assessment % Water mixing % Isfahan saline lands

INTRODUCTION

The existence of saline waters in some regions is an issue which has endangered agricultural sustainability. The lack of enough water with suitable quality and the existence of alkaline and saline waters annually cause us not to harvest anything in some parts of the lands we have cultivated and thus render our industrious efforts fruitless. The conservation and survival guarantee of agriculture in saline regions thus entail, on a long-term basis, basic investments in agriculture. Based on this, the project of mixing soft and saline waters, especially in saline regions which enjoy the favor of rivers soft water, such as Isfahan city, can support agricultural authorities as the most effective strategy. For this purpose, we must both consider the appropriate conveyance of canal water through gates to consumption sites and prevention of water spoilage and allocate ponds required for mixing canal water with wells saline water on every farm and determine the level of canal water volume with that of wells water volume and mixing ratio to supply enough and appropriate water for plants irrigation. In this connection, the high costs of preliminary investment are one of the problems in the increase of consumers' acceptance of pressurized irrigation and it should be said that failure in paying such costs by consumers has practically encountered the development of pressurized irrigation systems application with obstacles [1-8].

In this study which was conducted on a farm sampled from the saline regions east of Isfahan city, efforts have been made economically test and assess the project of mixing wells and canals waters to supply water with appropriate quality and relevant application in sprinkler irrigation. At present, though the existing cultivated area of this farm is 560 hectares. Harvest is always less than this, equaling 350 ha.

Table1, shows the information relevant to the cultivated area of different products grown on the total cultivated area existing per year is a bout 350 ha most of which relates to wheat and barley each with 100 ha. Sunflower with a cultivated area of 70 ha constitutes %20 of the cultivated combination. Corn with a cultivated area of 30 ha constitutes % 8.60 and sugar beet and hay, each with a cultivated area of 20 h, constitute % 5.70 of the cultivated combination. Colza with a cultivated area equaling 10 ha has % 2.80 of the cultivated combination on the projects of water mixing and sprinkler irrigation system on the farms, the cultivated and irrigated area will increase from the present 350 ha to 530 ha.

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Table 1: Comparison of cultivated area, yield and value of project crops at present and in future

	Cultivated			Yield (kg/ha)				Value (million Rials)	
Crop	Present	Future	Increase	Present	Future	Increase	Price(Rials)	Present	Future
Wheat	100	125	25	5000	6000	1000	1700	850	1275
Barley	100	120	20	5000	5000	-	1600	800	960
Colza	10	20	10	1000	2500	1500	3100	31	155
Corn	30	40	10	25000	55000	30000	250	188	550
Sugerbeet	20	40	20	22000	40000	18000	390	171	624
Hay	20	40	20	75000	12000	4500	1800	270	864
Clover	-	20	20	-	5000	5000	1800	-	180
sorghum	-	65	65	-	50000	50000	200	-	650
Safflower	-	20	20	-	2000	2000	2950	-	118
Sunflower	70	40	-30	1200	2700	1500	2900	243	314
Total	350	530	180	-	-	-	-	2553	5670
Mean income per ha								7294	10698

Source: [1]

On the other hand, upon performing these projects, relevant advantages and removal of limitations, both the cultivated area & production per unit area will increase. In Table1, the farms cultivated area and crops yield at present have been compared with the expectable situation after the yield of the projects (future). Based on this, the table information shows that due to crops yield, the average income from each ha of crops cultivated area will increase from 7294000 Rials to 10698000 Rials per year. This level of increase equals % 46.70. Upon the yield of this project, these crops annual production. Total value will increase from 2553000000 Rials on the 350 ha area to 5670000000 Rials on the 530 ha area.

MATERIALS AND METHODS

Materials: This study was conducted in 2006 for the economic assessment of sprinkler irrigation system project using mixed waters of wells and water of canals branched from Isfahan Zayandeh roud River on saline lands southeast of Isfahan. Based on this, using documentary studies and the survey research method, required information including water resources, relevant level of salinity cultivation model, project yield predicted costs, costs relevant to water supply resources including fixed and current costs, cost of canals water application and income costs of diversified crops cultivation entered into the farms cultivation model was obtained.

METHODS

The method used in this project economic assessment is the cost-benefit theory in which the project costs are calculated and compared with the benefits obtained. Since the project costs and benefits relate to different years, they will thus initially be converted into present value and then compared [4].

In order to calculate gross margin, it is enough to deduct the production costs of the crops of cultivation model from the cultivation gross total income of these crops using the following (Eq.) [5]:

$$GM = \sum_{i=1}^{n}(Yieldi \times PYieldi) - \sum_{i=1}^{n} VCi - \sum_{i=1}^{n} Irrilbrwi - (Acperm3 \times totwat)$$

Where:

Yieldi = yield in unit area of crop i
PYieldi = unit price of crop i
VCi = variable costs including production inputs and
Irrilbrwi = wage of laborer irrigating crop i

For calculation costs of irrigating laborer in the sprinkler irrigation method, regarding times and hours of irrigation in each time & day-man work force wage, the level of irrigation work force cost was calculated for a farming period for 1 ha of different crops. Acperm3: cost of processing 1 m^3 of water and totwat is water total consumption for 1 ha of different crops of cultivation model using the sprinkler irrigation method the quantity of which is cultivated using the following equation:

Totwati= ((watneedi*100)/return)*10.

Where totwati is water consumed for 1 ha of crop I, waterneedi is plant water need in 1 farming year & return is irrigation efficiency which was considered to be %80 in the sprinkler irrigation method. For calculating the processing cost of 1 m^3 of water, it is enough to divide the total present value of all the costs including current and fixed costs of water supply resources and canal water purchase annual fee by total consumed water required for different crops of cultivation model (Eq.9).

Acper m^3= (atfc+tvc+twatpric)/totwat, where:

Atfc is annual uniform equivalent fixed costs of wells and mixing system equipment. Tvc is mixed water resources annual variable costs and twatpric is canal water annual purchase cost.

RESULTS AND DISCUSSION

Table 2, shows current costs relevant to farming operations, production inputs and gross income of 1 ha of different crops under sprinkler irrigation conditions using wells and canals mixed water on the farm. Based on this table information, total costs relevant to farming operations and production inputs supply of different crops producible on the farms and their gross income in each ha has been 39439070 and 101530000 Rials, respectively. The comparison of income-cost items in this project suggests the existence of a gross benefit of 62090930 Rials.

In surveying the research objective, the cost of processing each m^3 of consumed water from the existing water resources and relevant mixing in the predicted mixing system was calculated. For this calculation, it is enough to divide the total present value of all the costs including current and fixed costs of water supply resources and canal water purchase annual fee by total consumed water required for different crops of cultivation model. Based on this, the cost of processing each m^3 of mixed water was calculated to be 224.7 Rials (Table 3).

Table 2: Cultivation income and costs in the sprinkler irrigation method in mixing project (Rials)

Crop	Total of production inputs and operations costs	Gross income
Wheat	2915700	10200000
Barley	2628200	8000000
Colza	2232150	7830000
Corn	6117150	13750000
Sugerbeet	6765080	21600000
Hay	2325850	7750000
Clover	6187150	15600000
sorghum	2501830	10000000
Safflower	2256750	5900000
Sunflower	5509210	9000000
Total	39439070	101530000

Source: research findings

Table 4 shows coats relevant to water and watering each ha different crop in connection with water processing coats of required irrigating laborer. Based on the table information 98375 m^3 of water are totally required for each ha of these crops in which the highest consumption relates to hay (17500 m^3) and the lowest consumption relates to barley (6500 m^3). Regarding the processing (supply) coast calculated for each m^3 of water mentioned in Table 2, 22104861 Rials are totally paid annually to supply the water request for each ha of the crops. Regarding irrigation work force annual wage (Rails 1099750), total coast of water and watering has been calculated to equal Rial 33103611.

Table 5 shows sprinkler irrigation project economic assessment result with mixed waters for 10 crops of cultivation model using the criterion of the benefit- cost ratio. Based on this table information, in all the yield of the above mentioned project enjoys the required economic justification. Even if the yield of the crops decreases by 20% from its reported level. Yield of the project at most with a return rate equaling 70% still enjoys economic justification. Regarding reported yield, this investment return rate is %180. If we reckon the crops yield decrease limit 10% and 15%, this level will be 120% and 100%, respectively, of- course it is evident that the

Table 3: Processing cost of each m3 of mixed water applicable in sprinkler irrigation system (Rials)

Annual uniform fixed cost of wells	Present value of wells current costs in 2005	Annual uniform fixed cost of mixing system	Present value of mixing system current cost in 2005	Pumping stations annual uniform fixed cost	Present value of pumping stations current cost in 2005	Water purchase cost	Total water consumed for different crops	Processing cost of 1 m3 of water
121883450	69558050	542682350	7190212	176187770	72688000	64157180	4691250	224.7

Source: research findings

Table 4: Irrigation cost of each ha of different produces in the sprinkler irrigation method (Rials)

Crop	Consumed water(m3)	Water processing cost	Irrigation labors cost	Irrigation total cost
Wheat	7250	1629075	700000	2329075
Barley	6500	1460550	875000	2335550
Colza	9250	2078475	980000	3058475
Corn	8125	1825687	1251250	3076937
Sugerbeet	17500	3932250	1925000	5857250
Hay	7250	1629075	787500	2416575
Clover	13875	3117712	1120000	4237712
sorghum	7500	1685250	1120000	2805250
Safflower	8750	1966125	1120000	3086125
Sunflower	12375	2780662	1120000	3900662
Total	98375	22104861	10998750	33103611

Source: research findings

Table 5: Benefit-cost ratio of sprinkler irrigation and water mixing project of the treatments studied in different interest rates yield treatment

	Yield treatment											
	Crop reported performance			Report yield with %10 decrease			Report yield with %15 decrease			Report yield with %20 decrease		
	Loin interest rate (%)			Loin interest rate (%)			Loin interest rate (%)			Loin interest rate (%)		
Interest rate (%)	8	12	16	8	12	16	8	12	16	8	12	16
5	12.89	11.80	10.87	9.09	8.32	7.67	7.19	6.58	6.06	5.29	4.84	4.46
12	9.37	8.65	8.04	6.60	6.10	5.67	5.22	4.82	4.48	3.84	3.55	3.30
18	7.45	6.94	6.50	5.25	4.89	4.58	4.15	3.87	3.62	3.05	2.85	2.67
20	6.96	6.5	6.11	4.90	4.58	4.30	3.88	3.63	3.40	2.85	2.67	2.5
25	5.96	5.61	5.30	4.20	3.96	3.74	3.32	3.13	2.95	2.45	2.30	2.17
30	5.21	4.93	4.68	3.67	3.48	3.30	2.91	2.75	2.61	2.14	2.02	1.92
35	4.63	4.40	4.20	3.26	3.10	2.96	2.58	2.46	2.34	1.90	1.81	1.72
40	4.16	3.97	3.80	2.93	2.80	2.68	2.32	2.22	2.12	1.71	1.63	1.56
45	3.78	3.62	3.48	2.67	2.56	2.46	2.11	2.02	1.94	1.55	1.49	1.43
50	3.46	3.33	3.21	2.44	2.35	2.26	1.93	1.86	1.79	1.42	1.37	1.32
60	2.97	2.87	2.78	2.09	2.03	1.96	1.66	1.60	1.55	1.22	1.18	1.14
70	2.61	2.54	2.47	1.84	1.79	1.74	1.46	1.42	1.38	1.08	1.05	1.02
80	2.32	2.26	2.20	1.64	1.60	1.56	1.30	1.26	1.23	0.96	0.93	0.91
90	2.08	2.04	1.99	1.47	1.44	1.41	1.17	1.14	1.11	0.86	0.84	0.82
100	1.89	1.85	1.82	1.34	1.31	1.28	1.06	1.04	1.02	0.78	0.77	0.75
110	1.74	1.70	1.67	1.23	1.20	1.18	0.97	0.96	0.94	0.72	0.71	0.69
120	1.60	1.57	1.55	1.13	1.11	1.09	0.90	0.88	0.87	0.67	0.65	0.64
140	1.39	1.37	1.35	0.98	0.97	0.95	0.78	0.77	0.76	0.58	0.57	0.56
160	1.25	1.23	1.21	0.87	0.86	0.85	0.71	0.70	0.69	0.53	0.52	0.51
180	1.10	1.09	1.07	0.78	0.77	0.76	0.62	0.61	0.61	0.46	0.45	0.45
200	1	0.99	0.98	0.71	0.70	0.69	0.56	0.56	0.55	0.42	0.41	0.41
220	0.91	0.90	0.89	0.65	0.64	0.63	0.51	0.51	0.50	0.38	0.38	0.37

Source: research findings

benefit-project coast ratio will be higher with a lower-interest- rate loan. It is note worthy in this regard that having bank facilities with an 8% interest rate will also Justify investment return up to the level of 200% Results obtained from calculating the above mentioned project benefits present value index.

CONCLUSION

Though sprinkler irrigation project economic assessment results using mixed waters for the 10 crops of cultivation model using the studied economic criteria suggest the existence of a high economic justification

in the above mentioned project yield, yet, it is very important to note (this point) that the results of this research can be the basis of the project yield only if we are able to practically provide the qualifications to access the quantity of canal water stipulated in the research text which hare been considered within the farming year and for the assessment period. Other wise the lack of canal water within the farming year and for the project perspective, despite the project profitability will practically encounter farmers with limitations in any decision making to receive. Loans and put the project into operation.

REFERENCES

1. Anonymou, 2004. Studies on Methods suitable for irrigation Design of sprinkler irrigation systems and pumping stations on foka Cultivation & Animal Husbandry Land. 5th Volumes of saman faryab Consulting Engineers Company Reports.
2. Karbasi, A., S. khalilian and M. Danashvar, 2000. Economic survey of pressurized irrigation system, collection of paper of the 3rd conference of Iran 3rd conference of Iran's Agricultural economic, Mashhad, pp: 53-77.
3. Sanrai, M.L., 1995. Economics of Drip Irrigation in India, Micro Irrigation for a Changing World, Producing of the Fifth International Micro Irrigation Congress, Florida.
4. Soltani, G.H., 1990. Engineering Economics, Shiraz university press, Shiraz, pp: 293.
5. Torkamani, J. and A.M. Jafari, 1998. Factors Effective on the Development of pressurized Irrigation systems in Iran. Periodical of Agricultural Economics and Development, 22: 7-19.
6. Wichelns, D., L. Houston and D. Cone, 1997. The Economic Analysis of Sprinkler and siphon Tube Irrigation Systems with Implication for Public Policies. Agricultural Water Management, 32(3): 259-273.
7. Tongongar, B., C. Kan and H. Chen, 2008. Can efficiency offset reliability in irrigation systems? American-Eurasian J. Agril. Environ. Sci., 3(2): 269-278.
8. Edet, J.U. and S.B. Akpan, 2007. Measuring Technical Efficiency of Water Leaf (Talinum triangulare) Production in Akwa Ibom State, Nigeria. American-Eurasian J. Agril. Environ. Sci., 2(5): 518-522.