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Economic Evaluation of Pomegranate Cultivation in Western Rajasthan

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Abstract Economic appraisal of pomegranate cultivation technology in arid Rajasthan revealed the annuity of Rs. 20, 193.0 ha^{-1} at 14 % discount rate. The BC ratio was 2.74 and the pay back period of investment was 4 years. The technology was found to be beneficial even at discount rate of over 40%. The pomegranate technology is viable even under a combination of natural, economic and market induced fluctuations. The adoption of the technology, however, hinges on the availability of irrigation.

Key words Costs, Returns, Economic viability, Sensitivity analysis, Pomegranate.

Pomegranate is one of the fruit crops suggested for arid zone in view of its tolerance to brackish water irrigation, and time of flowering and fruiting (Pareek 1977). The Jalore seedless variety of pomegranate grown at the Central Research Farm CAZRI, Jodhpur since 1986 has given encouraging results. Hence it is essential to study the financial and economic viability of the technology. The present study is an attempt in this direction.

Materials and Methods

The present study is based on experimental data collected by Horticulture section of CAZRI, Jodhpur. The study was initiated in July 1986 and data pertaining to costs and returns upto January 1991 were taken for economic evaluation. The cost and return flows were taken for various operations and materials (Table 1) at the prevailing market rates during the course of the study. The cost and returns of 5th year is assumed to hold true for the next five years. To account for fluctuations in costs and returns attributable to climatological disturbances and variations in market rates, sensitivity analysis was carried out. To judge the economic viability of pomegranate technology in arid region, five criteria viz., net present value (NPV), discounted benefit-cost ratio (DB-CR), annuity (A) internal rate of return (IRR) and pay back period (PBP) were employed (Gittinger 1972, Bhati *et al.* 1985).

Results and Discussion

Costs : The maximum cost flows (Table 1) were for labour (46.22%), followed by manuring and fertilization (13.9&12.8%), interest on working capital (12.28%), plant protection, tractor use and planting costs (3 to 5%) and the least was for irrigation (1.9%).

Returns : The picking of fruit starts from the third year onwards. Average production $plant^{-1}$ after accounting for damages worked out to be 5 kg in third year, 10 kg in 4th year and 20 kg in 5th year. The production of 6th to 10th years is taken to be that of 5th year. The production of fruit increases with the growth of plants (observed) but we have assumed it to remain constant after 5th year. The pomegranate produce is valued at Rs. 5.00 to 8.00 kg^{-1}, well below the prevailing market rates (Table 1).

Economic viability : The economic parameters (Table 2) indicated positive trend up to the discount rate of 100.7%,which is very high and proves the economic viability of the technology. The pay back period of the technology is 4th years, which is a short period, compared to other horticultural options, like Ber (7 years) and Date palm (11 years) (Kalla *et al.* 1986, Bhati *et al.* 1985). The irrigated pomegranate technology ensured an annuity of Rs 20, 193.0 ha^{-1} at 14% discount rate, with a BC ratio of 2.74. The NPV of the technology was Rs 1,05,331.20. The technology is therefore, highly vi-

Table 1 *Yearwise operational cost, input cost and returns for a pomegranate orchard in western Rajasthan*

Particulars of operation/input	Years					
	1st	2nd	3rd	4th	5th	6-10th
			Operational cost (Rs.)			
Cleaning of plot	220	–	–	–	–	–
Harrowing	120	360	360	450	540	2700
Digging of pits	330	–	–	–	–	–
Filling of pits	220	–	–	–	–	–
Application cost of fertilizer	110	112	136	220	357	1787
Planting	110	–	–	–	–	–
Weeding & hoeing	330	420	510	660	1072	5362
Spraying of fungicide	88	112	204	352	572	2860
Pruning/trimming	22	42	68	264	572	2860
Watering	528	672	816	1056	1716	8580
Plants	1655	–	–	–	–	–
Manure	400	600	1600	2000	2000	10000
Fertilizers	–	560	1368	1744	2400	12000
Plant Protection	114	339	385	814	971	4855
Irrigation charges	100	150	200	200	250	1250
Picking of fruits	–	–	1190	1540	2681	13406
Watch & Ward	–	–	1020	1320	2145	10725
Interest	609	471	1100	1487	2138	10693
Total	4956	3838	3958	12107	17416	87080
			Returns			
Fruit yield (Q)	–	–	20	40	80	400
Fruit value (Rs.)	–	–	10000	20000	64000	320000
			Input cost (Rs)			
Labour	2013	1358	3944	5412	9116	21843 (46.2%)*
Tractor	120	360	360	450	540	1830 (3.9%)
Manure	400	600	1600	2000	2000	6600 (13.9%)
Fertilizer	–	560	1368	1744	2400	6072 (18.8%)
Insecticides/pesticides	114	339	385	814	971	2623 (5.5%)
Irrigation	100	150	200	200	250	900 (1.9%)
Seedlings	1600	–	–	–	–	1600 (3.4%)
Interest	609	471	1100	1487	2138	5806 (12.3%)

Note : Labour @ Rs. 11.0, 14.0, 17.0, 22.0 and 35.75 day^{-1}
Tractor use @ Rs. 40.0, 50.0 and 60.0 $hour^{-1}$
Cost of plants @ Rs. 4.0 $plant^{-1}$
Electricity cost Rs. 1.0 $unit^{-1}$ for irrigation
Manure @ Rs. 2.0 to 4.0 cft^{-1}
Fruit value Rs. 5 kg^{-1} in 3 and 4th year and Rs. 8.0 in 5th year onward.
*Total input cost during five years and data in parenthesis are % of total cost..

able at the prevailing bank rate for long term advances.

Sensitivity analysis : Fluctuations in climate, market and prices are common. In order to account for these factors, sensitivity analysis was carried out, results of which are set out in Table 2. The costs and return flow in all the situations were discounted at 10,14,25,40 and 105% per annum.

Table 2 *Sensitivity analysis of parameters and economic attributes related to economic viability of pomegranate cultivation*

Economic parameters	Discount rates (%)				
	10	14	25	40	105
			Economic attributes		
NPV	13707	105331	53660	23225	−284
BC	2.84	2.74	2.44	2.17	0.95
NPV	147648	113628	58195	25474	0.16
BC	2.98	2.87	2.57	2.17	1.00
A	24029	21784	16298	10554	0.17
PBP	–	–	4th year	–	–
IRR	–	–	100.7	–	–
			Sensitivity analysis		
			(a) No increase in cost with 5 % increase in returns		
NPV	147648	113628	58195	25474	0.16
BC	2.98	2.87	2.57	2.17	1.00
A	24029	21784	16298	10554	0.17
PBP	–	–	4th year	–	–
IRR	–	105	–	–	–
			(b) 5 % increase in cost and no increase in return		
NPV	143923	110598	56344	24387	−298.9
BC	2.84	2.74	2.44	2.06	0.95
A	23423	21203	15780	10104	−314.16
PBP	–	–	5th year	–	–
IRR	–	100.7	–	–	–
			(c) 10% increase in cost and 5% increase in return		
NPV	147209	112945	57217	24464	−277.8
BC	2.71	2.61	2.33	1.97	0.95
A	23958	21653	16025	10136	−278.1
PBP	–	–	5th year	–	–
IRR	–	96.66	–	–	–
			(d) 5% increase in cost and 10% increase in return		
NPV	187371	144190	73830	32302	−17.07
BC	2.97	2.86	2.56	2.16	0.99
A	30494	27643	20677	13383	−17.94
PBP	–	–	4th year	–	–
IRR	–	104.8	–	–	–

The sensitivity analysis revealed that all the economic parameters in the four situations displayed highly positive trends even at 40 % and above, discount rates. The pay back period did not change considerably, confirming the economic viability of the pomegranate technology even under adverse conditions.

Policy implications : The arid districts of Rajasthan are known to contain exploitable ground water, which can be beneficially utilised for pomegranate cultivation. The canal irrigation in Ganganagar and Bikaner districts have been reported to have increased the recharge of ground water through seepages. The intensity of tubewell-irrigation is also increasing in arid regions. If the farmers are encouraged to devote a portion of their tubewell command area for pomegranate cultivation, the incomes of the farmers could be increased and maintained even under adverse conditions.

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