ASSESSMENT OF AONLA (*EMBLICA OFFICINALIS*) CULTIVATION IN PRATAP GARH DISTRICT, UTTAR PRADESH
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ABSTRACT: The financial appraisal of aonlacultivation in Pratap Garh has been studiedthrough a sample of 150 aonla growers from 12 selected villages i.e. Bhoj Pur, Hital Mau, Ajgara, Deva Pur, AshpurDevsra, Sangipur and Khajuri and Dandi were selected for the study. It was found from the study after third year of plantation although initial establishment of aonla orchard involves high outlay yet the annual net incomeis moderatelyhigh. The values of economic parameters, viz. NPV, BCR, IRR and PBP have been found to be Rs 652652, 5.25, 65.03 per cent and 55 months, respectively at 10 per cent discount rate. Under varying cost and returnsituations, values of all these feasibility parameters have satisfied theacceptance rules for the investment proposition. It has confirmed theeconomic viability, stability and certainty of investment on aonla orchard.The study has suggested that financial institutions should give credit toaonla producers in the area.

Aonla or Indian gooseberry (*Emblica officinalis*) is an indigenous fruit to the Indian subcontinent. Owing to hardy nature, suitability to various waste lands, high productivity/unit area (15-20tons/ha), nutritive and therapeutic value, anola is becoming more and more commercially important with every passing year. Anola fruits are a very rich source of vitamin C having an ascorbic acid content varying from 0.9 to 1.3 per cent. This is the second highest among all the cultivated fruits. This fruit is highly valued among indigenous medicines. It is a multi-purpose fruit, extremely rich in vitamin C, helps cure gastro-intestinal disorders, is said to encourage youth and liveliness.It is acrid, cooling, refrigerant, diuretic and laxative. Dried fruits have been reported to be useful in haemorrhages, diarrhea, dysentery, anaemia, jaundice, dyspepsia and cough. Trifala and chyavanprash are well known indigenous medicines in Ayurvedic system using anola fruits. Its cultivation is common in Uttar Pradesh, particularly in Pratap Garh, Raebareilly, Varanasi, Jaunpur, Sultanpur, Kanpur, Agra and Mathura districts of Uttar Pradesh. Its intensive plantation is being done in the salt affected areas of the state of Uttar Pradesh, including ravenous areas in Agra, Mathura, Etawah, Fatehpur and semiarid tract of Bundelkhand. Anola cultivation is also spreading rapidly in the semiarid regions of Maharashtra, Gujarat, Rajasthan, Andhra Pradesh, Karnataka, Tamil Nadu, Aravali ranges in Haryana and Kandi area in Punjab and Himachal Pradesh.

The Pratap Garh district is one of the district of Uttar Pradesh states of India, and Pratap Garh town is the district headquarters. The Pratap Garh district is a part of Allahabad division and lies between 25° 34' and 26° 11' latitudes while between 81° 19' and 82° 27' longitudes.Primarily, an agrarian district, for a while now, Pratap Garh has risen in ranks as the top producer of aonladue to marginal soils –slightly acidic to saline/sodic soils in the area. It grows well on soil pH range from 6.5-9.5.It is exported all over India and possibly over world in form of sweets and medicines.Its hardy nature, suitability to various wastelands, high productivity, and nutritive and therapeutic value has made aonla an important fruit. It can be judged from the fact that areaunder aonla has expanded rapidly in the past couple of decades in India aswell as in the Pratap Garh. It was being cultivated mainly in the Kala Kankar, Kunda Lal Ganj and Magraurain district of central Pratap Garh, but during the past decade, its cultivationhas spread over the entire district. A study on the economic status of its production may help theextension workers and policymakers to devise appropriate policy for theproduction of the anola. It may also be useful to the financial institutions forfixing scale of loan and subsidies, which will ultimately benefit the aonlagrowers. Considering these facts, the study was undertaken.

METHODOLOGY

The present study was conducted in PratapGarh district, Uttar Pradesh for cultivation of aonlain four Blocks namely Kala Kankar, Kunda Lal Ganj and Magraurawerepurposively selected.Under these blocks two village from each block vizBhoj Pur, Hital Mau,

Ajgara, Deva Pur, AshpurDevsra, Sangipur and Khajuri, Dandi were purposively selected respectively. Total one hundred fifty farmers were selected; the selected farmers were divided into four groups viz: marginal, small, medium and large size groups.

Sampling Design and Database:

DistrictPratap Garh have 50 per cent aonla orchard of the total area. Main reason for the aonla cultivation the soil is alkaline which is most suitable for aonla plantation. The selection of famers was made using two-stage stratified random sampling technique. Four blocks of the districts, viz Kalakankar, KundaLalganj and Magraura were purposively selected, as they have the highest area under aonla about 80 per cent. Two villages from each block having maximum area under aonla were selected purposively. The number of villages from each selected village was decided on the basis of relative area of aonla orchard in the villages. In all, 8 villages were chosen at random, 2villages from each blockwas purposively selected for the study. Twelveaonla growers were selected from each of these villages at random in proportion to number of growers in the size group of different holdings. Thus, in all, 150 growers comprising 42marginal (<2 ha), 39 small (2 ha to < 3 ha), 37 medium (3 ha to < 4 ha) and 32 large (above4 ha) size of farms were selected for the study. The data were collected during the agricultural year 2013-14.

Tool of Analysis: Simple and weighted average and percentage methods were used for tabular analysis. Analysis for specified objectives was carried out using various standard statistical tools. Amortization of Fixed Cost:The annual amortization of cost was computed from the investment made on aonla up to the first flowering (i.e. for the first 3 years of aonla plantation) stage, assuming that the rate of interest to be 12 per cent and the expected economic life of aonla orchard to be 30 years. Thus, annual payback cost was worked out using the compounding cost formula. The annual costof cultivation of aonla orchard was worked out by adding it to maintenance cost of respective farm groups.

$$A = P \frac{I(1+I)^n}{I(1+I)^n - 1} \qquad (1)$$

Where,

A = Annual sum (in Rs),

P = Present sum (in Rs),

I = Interest rate (12 % per annum), and

n = Economic life of the orchard (in years).

Benefit Cost Ratio (BCR): It was worked out by discounting the future gross returns and cost during the life period of orchard at the rate of 10 per cent. The data was analyzed with simple tabular method. An Economic Evaluation of Investment on Aonlawas estimated (V.K. Gondalia and G.N. Patel 2007). The level of input utilization and cost of cultivation of aonla plantation was worked out by using different cost concept. Cost 'A'- this cost includes (1) hired human labour (casual / permanent; (2) bullock / tractor labour(owned /hired); (3)value of the manures (farm produced / purchased); (4) value of fertilizers; (5) value of Aonla seedling; (6) plant protection; (7) irrigation charges; (8) land revenue; (9) depreciation; (10) interest on working capital; (11) miscellaneous expenses.

COST 'B'-it was worked out by adding the interest on fixed capital and imputed rental value of owned land to cost 'A'.

COST 'C'- it was calculated by adding the cost of family labour to the cost 'B'.

a) Pay-Back Period.

The Pay-Back Period is the number of years an investment project takes to return its cost from its returns. Symbolically, the Pay-Back Period equals t*, where t* is the lowest of t for which the following inequality holds.

b.) Net Present Value (NPV)

The Net Present Value of an investment is the discounted value of all cash inflow net of all cash out flows of the project during its lifetime. It was computed under the following formula:

$$NPV = \sum_{t=1}^{T} \frac{\left(Benefit_t - Cost_t\right)}{(1+r)^t}$$

Where, the new notations have the following meanings:

i = Discount rate   t = Project life

c) Benefit-Cost Ratio (BCR)

The Benefit-Cost Ratio (BCR) of an investment is the ratio of the discounted value of all cash inflows to the discounted value of all cash outflows during the life of the project. It can be computed as

$$BCR = \frac{\sum_{t=1}^{r} \frac{B_t}{(1+r)^t}}{\sum_{t=1}^{r} \frac{C_t}{(1+r)^t}}$$

Where, B_t is the benefit in time t and C_t is the cost in time t. If the BCR exceeds one, Ct = Cost in period t.i = Discount rate

Since the cash flow was not constant from year to year, the PBP wasdetermined by calculating the cumulative proceeds in successive years untilthe total was equal to the original outlay.Sensitivity Analysis: Sensitivity

analysis for the above four parameter was made with the following assumptions/situations:

(a) 15 per cent increase in costs,

(b) 15 per cent decrease in returns,

(c) 15 per cent increase in costs and ten per cent decrease in returns, and

(d) 15 per cent increase in returns.

RESULTS AND DISCUSSION

A close perusal of results presented in Table 1 reveals that, on anaverage, the total investment per hectare was Rs 117465.71. It was highest in medium farms (Rs.123086), followed by small (Rs 122113), marginal (Rs119927) and large (Rs 107085) farm groups. It was due to moreInvestment on machinery and irrigation infrastructure by medium, small and marginalfarms than large farms. The per hectare total investment,land accounted for the highest share, varying from about 65.92 per cent onmedium farms to about 75.36 per cent on marginal farms. The preliminary investmenton aonla orchards, land, tractor, tractor-drawnimplements, and farm-house irrigation system planting material together accounted for about 98.58 per cent as thesimilar results were reported by Khunt et al. (2003) for pomegranate in theSaurashtra region.

The establishment cost of aonla orchard included cost ontractor/bullock labour and tractor drawn implements charges, planting material cost, value of land, interest onfixed capital, interest on working capital, and depreciation charges incurredup to the first bearing stage of orchard (for the period 1 - 3 years). Theresults (Table 2) showed that on an average, the total establishment cost per hectare amounted to Rs 36649 per year. The highest cost of cultivation was Rs. 40249 on marginalfarms, followed by small (Rs 38453), medium (Rs. 34579) andlarge (Rs 34059) farms. On an average, of the total establishment cost, rental value land accounted for the highest share (31.13 per cent), followed by materialcost (24.52 per cent), irrigation charges (13.41 per cent), human labour cost (11.31 per cent), interest on fixed capital (8.38 per cent), tractor/bullock labour and tractor drawn implements charges (6.45 per cent) and family labour cost was lowest (1.43 per cent).

Table-1: Farm /orchard Non –Recurring cost of Anola in different size groups (Rs/ha)

S.No	Particulars	Size of groups				Over all
		Marginal	Small	Medium	Large	
1	Value of land	90370 (75.35)	89591 (73.37)	87863 (71.38)	70589 (65.92)	84182 .34 (71.67)
2	Bullock /Tractor	5136 (4.28)	6010 (4.92)	6970 (5.66)	7251 (6.77)	6310.09 (5.37)
3	Sprayers /Dusters	2250 (1.88)	3266 (2.67)	3842 (3.12)	4518 (4.22)	3451.74 (2.94)
4	Irrigation System	8103 (6.77)	10101 (8.27)	11761 (9.56)	12613 (11.79)	10591.54 (9.01)
5	Planting Materials	12240 (6.75)	11424 (9.36)	11016 (8.95)	10608 (9.90)	11265.67 (9.59)
6	Bio-Fencing	1828 (1.52)	1721 (1.41)	1634 (1.33)	1506 (1.40)	1663.93 (1.42)
	Total	119927 (100)	122113 (100)	123086 (100)	107085 (100)	117465.71 (100)

Note: Figure in parenthesis represents percentage total

Table - 2: Cost cultivation of Anola orchard different size groups (Rs/ha)

S. No.	Particulars	Size of Groups				Over all
		Marginal	Small	Medium	Large	
1	Human Labour	4033 (10.02)	3939 (10.24)	3839 (11.29)	4798 (14.09)	4146 (11.13)
2	Tractor /Bullock	2405 (5.98)	2400 (6.25)	2371 (6.85)	2290 (6.72)	2354 (6.42)
3	Family Labour	941 (2.34)	895 (2.33)	275 (0.79)	00 (00)	526 (1.43)
4	Material Cost	10660 (26.48)	9992 (25.98)	8017 (23.18)	7452 (21.88)	8985 (24.52)
5	Rental Value of Land	12375 (30.74)	11642 (30.27)	11014 (31.86)	10831 (31.80)	11408 (31.13)
6	Interest on working capital	3375 (8.39)	3225 (8.39)	2892 (8.36)	2855 (8.38)	3071 (8.38)
7	Interest on Fixed capital	985 (2,45)	971 (2.53)	943 (2.73)	856 (2.52)	934 2.55)
8	Deprecation	355 (0.88)	309 (0.80)	298 (0.86)	286 (0.84)	310 (0.85)
9	Land Revenue	00	00	00	00	00
10.	Irrigation cost	5120 (12.73)	5080 (13.21)	4870 (14.08)	4691 (13.78)	4915 (13.41)
Total		40249 (100)	38453 (100)	34579 (100)	34059 (100)	36649 (100)

Note: Figures in parenthesis represents percentage of the total.

Table-3: Cost- Benefit of Anola orchard in different size groups (Rs. /ha/year)

S.No	Particulars	Size of Groups				Overall
		Marginal	Small	Medium	Large	
1	Amortized cost	31770	32783	34518	35144	33386
2	Maintenance Cost	10633	11021	12836	13112	11841
3	Total Cost	40249	38453	34579	34059	36649
4	Production(Kg)	8502	8415	8288	8426	8365
5	Gross Income	93522	92565	91168	92686	92025
6	Net Income	53273	54112	56589	58627	55376
7	C:B ratio	1:1.23	1:1.24	1:1.26	1:1.27	1:1.25

Table-4: Cost of production of Anola at different stage of orchard

S.No.	Particulars	Stage of Orchard		Mature Stage Bearing
		Pre-stage Bearing	Post-stage Bearing	
1	Human Lab our	3629	3999	4318
2	Tractor /Bullock	2284	2421	2614
3	Total Material	10873	11193	11299
4	exp.	13878	14602	15801
5	Rental Value	2913	3060	3233
6	Interest on	1526	1418	1390
7	Interest on	348	452	508
8	Deprecation	213	340	361
9	Revenue	35664	37485	39524
10	Total cost	00	8007	8188
11		25101	88077	90068
12	Gross Income	(-)10563	50592	50544
	Net Income			

Table- 5: Year production Cost-Benefit and net return from Anola orchard.

S.No.	Total Cost	Production	Gross Income	Net Income
1	25080	0	0	(-)25080
2	10162	0	0	(-)10162
3	12415	0	0	(-)12415
4	13210	2806	30873	17663
5	13018	5082	55907	42889
6	15611	6487	71359	55748
7	17931	7336	80705	62774
8	17999	8274	91024	73025
9	18660	9717	106889	88229
10	20212	9907	108979	88767
11-15	19633	11051	121561	103021
16-20	18540	13124	144364	125824
20-25	18200	15410	169510	151310
25-30	16533	12005	132055	115522
30&above-	16050	8970	98670	82620

Table-6: Economic feasibility analysis of anola cultivation of over all groups.

S. No.	Particulars	NPV(Rs.)	BCR	IRR	PBP
1.	Cost of cultivation	626429	5.35	63.07	56
2.	Cost Increase (10%)	637283	4.67	60.32	58
3.	Return decrease (10%)	531873	4.27	59.98	58
4.	Increased and decreased of cost and returns (10%)	549978	4.15	58.06	60
5.	Increase in returns (10%)	689069	5.58	65.35	52

Thus, on an average, expenditure on rental value of land, planting material, irrigation charges andhuman labour accounted for a major share of about 75 per cent in the total costof establishment of aonla orchard.

Cost of Production and Returns from Aonla Orchard

The annual cost involving of amortized and looking after costs andreturns from aonla orchard are depicted in Table 3. The data reveal thaton an average, the total annual cost incurred per hectare was Rs 36649. Itshowed decreasing trend with increase in size of farm, being highest (Rs40249) in marginal farms, followed by small (Rs 38453), medium (Rs 34579)and large (Rs 34059) farm groups. The overall amortized cost was Rs10,633 per hectare per annum, which was 33.35 per cent of the total annualcost, while the annual maintenance cost was Rs 333386 (67.65 per cent) to totalannual cost (Khunt et el 2003).

The average annual production was 8007 kg/ha and showed an increasingtrend with increase in size of farm. Annual gross return varied from Rs92025/ha on marginal farms to Rs 93522/ha on large farms, with anaverage of Rs 92686/ha. The overall annual net return amounted to Rs 55376/ha, which was the highest (Rs 58627/ha) in large farms, followed by medium (Rs56589/ha), small (Rs 54112/ha) and marginal (Rs 53273/ha) farm groups. Thus, farmers

Economic Feasibility of Aonla production

Since the production of anola is high in the Pratap Garh area due to saline and sodic soil which is not fit for the agriculture point of view so that the economic feasibility of aonla production, data about productionand income per hectare per annum, cash outflow and inflow and economicevaluation under varying situations were collected and are discussed accordingly. The year-wise production, cost – benefit and net return per hectare aregiven in Table 5.It is found from the study that aonla-bearing started at after age of above 4 years andthe yield increased continuously from 3210kg/ha in the fourth year to 20987kg/ha in the after eighth year which.The anola start full bearing after eighth year and continuous up to twenty year of its age after that state decreasing at increasing rate. Thereafter, it decreased marginally and againincreased to a highest plateau of 24349 kg/ha in the eighteenth year. It starteddecreasing in the later age of orchard. The same tend was noticed in the case of income (V.K. Gondalia and G.N. Patel 2007). The maximum net income was Rs 115542/ha in the twentieth year of orchard. The production was zero from first to fourth year of plantation therefore net returns were in negative during the first three years. The income turned positive from fourth year.

of large-size farm group were found more efficient in utilizing their resources in aonla production compared to otherfarm-size groups.

Stage-wise Cost of Production

The cultivation of aonla demanded large investments from establishmentto maturity. The requirement of investment was not uniform over the periodand varied according to different stages of orchard. Therefore, analysis ofcost on orchard management at different stages was carried out. The costof cultivation of aonla comprised various cash and non-cash costs. Detailsof cost components involved at different stages of orchard are given inTable 4.The study represent that human labour play vital role for the increase and decrease the production cost.It is stated in this study that rental value of land as the major cost incurred atdifferent stages of orchard accounting for about 48 per cent to 52 per cent,followed by material cost (21-28%),total labour cost (15-18%) and intereston fixed capital (6-7%). Thus, rent on land, material cost and labour costtogether accounted for a lion's share of about 89 per cent in total cost ofcultivation at different stages of orchard.The annual production of aonla in early-bearing and mature-bearingstages was 8181 kg/ha and 11202 kg/ha, respectively. The net returns perhectare were Rs 55,965 and Rs 86,567 at early-bearing and mature-bearingstages of orchard, respectively (Ramchandra et el 2006).

The production of anola remained positive till thirty years that is economic life of the orchard.

Economic Assessment of Investment on Aonla

It is stated from the study that the estimated values of various parameters used to test the economicviability of investment on aonla orchard along with the sensitivity analysis ofinvestment under variable situations are presented in Table 6.It is depicted from the results that under normal cost and returns situation,the net present value (NPV) was positive (Rs 626429) at 10 per centdiscount rate, which indicates the financial reliability of the investment onaonla orchard(Ramchandra et el 2007). The benefit cost ratio (BCR) was found much higher thanunity (5.35), indicating the worthiness of the investment. The internal rateof return (IRR) was found higher than the normal bank interest rate andpayback period (PBP) was found to be 54 months.The feasibility on changing the cost and returns for 10 per cent rate ofdiscount revealed that under all the four varying situations of costs andreturns, values of NPV, BCR, IRR and PBP satisfied the acceptance rulesof investments. These indicated the level of stability and certainty of economicviability of investment on the aonla orchard (Ramchandra and Vinod Kumar 2013).

Conclusions and Policy Implications

It has been found that establishment of aonla orchard involves highinvestment, but the annual net realization has been found quite high Rs40269/ha at early-bearing stage and Rs 90432/ha at mature-bearing stageof orchard. With normal cost and returns as well as in varying situations ofcost and returns, values of all the feasibility parameters have satisfied theacceptance rules for the investment proposition. These have confirmed theeconomic feasibility, stability and certainty of investment on aonla orchard.As the aonla cultivation is highly profitable, there is a potential ingenerating more returns per unit area through expansion of area under thiscrop for the farmers of Pratap Garh in general. However, the crop requires huge initial investment, and therefore, financialinstitutions should provide adequate credit to the aonla growers in the area.

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