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Cost-Economic Analysis of Carrot Production in Hisar District of Haryana

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Abstract **– The present study was conducted to examine carrot production farming as well as to analyze the economic involvement and benefit received by the farmers. The research was undertaken in Behbalpur village of the Hisar district of Haryana, which was selected purposively on basis of high producers of carrot in Hisar district from which 30 carrot growers were randomly selected from the village. The study found that total expenditure in carrot production was Rs. 58,472 (tractor) and Rs 63,222 (labour) in one acre of agricultural land. Maximum expenditure was noticed in collecting carrot, separating green activities (Rs. 12,000), which were done after harvesting followed by harvesting (Rs. 9,500) and irrigation (Rs. 5,072). The total production of carrot in one-acre land was 11,250kg which was equal to 112.5 quintals. Gross return in one-acre carrot production was Rs. 1,35,000 with a net return of Rs. 76,528 (if harvesting was done by tractor) and 71,778 (if harvesting was done by labour). So based on this economic analysis, the benefit-cost ratio was 1.76 (by tractor) and 1.88 (by labour), respectively. The major production problems faced by the farmers in carrot farming were high fuel costs ($\bar{x}$ = 4.3), breakdown of irrigation systems ($\bar{x}$ = 3.9) and pests and diseases ($\bar{x}$ = 3.4). Regarding marketing problems of carrot, farmers were found to be facing problems related to poor communication with traders ($\bar{x}$ = 4.2), and poor understanding among farmers ($\bar{x}$ = 4.1) and high competition with importers ($\bar{x}$ = 3.9).**

Keywords **– Cost-Economy, Benefit, Carrot Growers, Harvesting.**

I. INTRODUCTION

Carrot is an important vegetable because of its large yield per unit area and its increasing importance as human food. It is orange-yellow, which adds attractiveness to foods on a plate, and makes them rich in carotene; a precursor of vitamin A. It contains abundant amounts of nutrients such as protein, carbohydrate, fibre, vitamin A, potassium, and sodium (*Ahmad et al.,* 2005). Carrot, like other vegetables, is a short duration crop and the farming community earns enormous profits through its cultivation. The farmers had a small chunk of land holdings and surplus family labour to earn a huge amount of profit by growing this vegetable because the carrot crop requires less amount of inputs and plant protection measures. The duration of the carrot crop is 90 to 100 days or 3 months which may vary according to the seed selected for sowing. The required seed rate for carrot farming is 2 kg carrot seed per acre. The farmer can expect a yield of 7 to 8 tons or 7000 to 8000 kg from 1-acre carrot farming. The carrot grower can immediately send to the nearest vegetable market for selling within 3 to 4 days after harvesting. However, if the carrots are stored post-harvest, they can remain fresh for up to 3 to 4 months or 100 days if stored at 0 to 4.4 degree Celsius, (*Reddy,* 2019). As carrots are grown both in rural and urban areas, their potential for generating employment is an added advantage to improve the economic conditions of the weaker segment of the society. The leaves of this crop are also used as fodder for farm animals. This is an additional advantage, as at times the supply of fodder is scarce in the region. Thus it is multi-dimensional activity and can serve the economy in various ways due to its higher yield potential, higher return, high nutritional value and highly labour-intensive attributes (*Tahir and Altaf,* 2013). So, the present study was planned to assess the present status of the carrot cultivation in the Hisar district of Haryana, identify the

problems of the farmers, production, and yield of carrots, and study the socio-economic conditions as well as production and marketing problems of the carrot farming community.

II. METHODOLOGY

For this study, *Behbalpur* village of Hisar district was purposively selected with the consultation of the Directorate of Research, CCSHAU, Hisar. A total of 30 farmers (male and female), were taken by using a random sampling technique. A well-structured and field pre-tested comprehensive interviewing schedule was used for the collection of detailed information on various aspects of carrot crop production. Survey data contained information on the socio-economic characteristics of the farmers, activities involved in carrot production and input-output quantities. For economic analysis, the *Benefit-cost ratio* was used to determine the profitability of carrot growing. A simple budgeting technique has been employed to estimate the cost and returns of carrot production. Carrot cost of production was estimated by incorporating all costs such as Field preparation cost (*FPCc*), Sowing cost (*Sc*), Fertilization cost (*Fc*), line making cost (*LMc*), Bed making cost (*BMc*), Irrigation cost (*Ic*), Pesticides cost (*PCc*), Harvesting cost (*HRVc*) Collecting carrot, (*Cc*) separating green (*CcSGc*), Transportation cost (*TPc*) and Washing cost (*Wc*)

The variable cost (*VCc*) for carrot production was calculated by the following expression; $VCc = FPc + Sc + Fc + LMc + BMc + Ic + PCc + Wc + HRVc + CcSGc + Pc + TPc + Wc$

Further, the total cost was calculated by incorporating land rent (LRc) in variable cost. Miscellaneous cost includes farmyard manure cost, weeding cost and pesticide cost. The estimated expression is given below: $TPc = VCc + LRc$

In the next step, the gross revenue (*GRc*) of carrot production was calculated by multiplying gross yield/acre (*GYa*) with price/kg (*PpK*) received by carrot growers. $GRc = GYa \times PpK$

Furthermore, net returns to carrot growers were estimated by the following expression. $NRc = GRc - TCc$

Furthermore, the benefit-cost ratio was calculated to estimate the return on per rupee investment through the division of revenues to the total cost. $BCR = GR/NR$

Table 1. Benefit-cost ratio of carrot production (one acre).

Variable	Particular
Total production *(TPc)*	variable cost *(VCc)*+ land rent cost *(LRc)*
Gross return *(GR)*	gross yield/acre *(GYa)* × price/kg *(PpK)*
Net Return *(NR)*	Gross return *(GR)*- Total cost *(Tc)*
Benefit cost ratio (*BCR)*	Gross return *(GR)* / Net Return *NR*

All the analyses were done based on per acre because of the ease of computation and availability and nature of data. For statistical analysis frequency, percentage and weighted means were used for giving data a significant shape.

III. RESULTS AND DISCUSSION

The present study was conducted to find out the existing condition of carrot farming in Haryana. The present study was conducted on 30 farmers (43.3 % male and 56.7 % female) who were found to be engaged in the

carrot production system. Similar results were obtained by *Joshi and Kalauni* (2018) that greater numbers of females i.e. 58.75% were involved in agriculture than compared to men (32.5%) in vegetable farming. The data in Fig.1 show that 60.0 per cent of respondents belonged to the age group of 32-42 years; followed by 23.3 per cent having age between 42.1- 53 years and 16.7 per cent were between the ages of 53.1-63 years. Data regarding the education of the respondents' shows that one-third of the respondents (33.3%) were having education up to high school, followed by matric (26.7 per cent) and bachelor degree (16.7 %). A few per cent of the respondents were having the education of middle (13.3 %) and master (10.0 %). Maximum respondents (93.3 %) were having farming as their main occupation. Only 6.7 per cent of respondents were found to be involved in a government job with farming. The majority of the respondents (86.7 per cent) were having a land area of 2.5-10.0 acres followed by 10.0 per cent and 3.3 per cent were having an agricultural land area of 10.1-18.5 acres and 18.6-25.0 acres, respectively. Findings in the table further reflect that more than fifty per cent respondents (60.0%) were having carrot production on 1.6acres to 2.5 acres of land followed by 26.7 per cent farmers were having 0.5-1.5 acres of land under carrot production and 13.3 per cent farmers were found to be producing carrot on 2.5-4.0 acres of agricultural land.

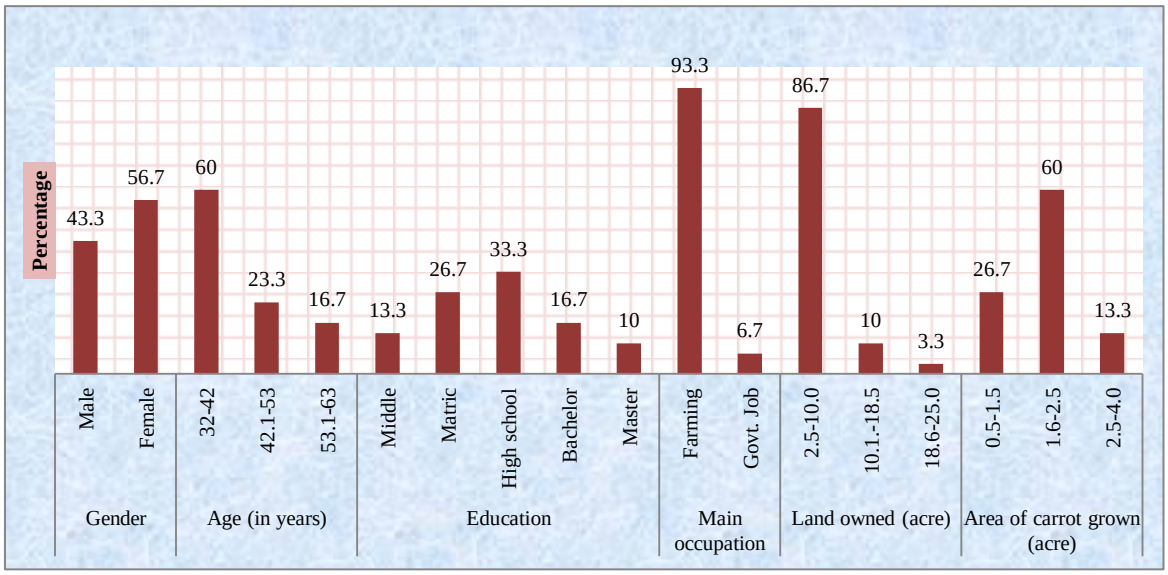

Fig. 1. Personal profile of respondents.

As Fig. 2 shows in carrot production 14 activities were included as; *field preparation, sowing, line making, bed making, irrigation, fertilizing, weeding, pesticides spray, harvesting, collection of carrot, separating green, packing, transportation and washing*. Time requirement and labour involvement in each activity were different. Many of the activities were labour intensive like; weeding, harvesting, collection of carrot, separating the green from carrot, loading and irrigation.

Table 2 shows the time required for each activity. Findings show that field preparation, sowing, line making, bed making and fertilizing were done in the first three days. Result depict that irrigation was done throughout the cropping season of carrot by an interval of 7-10 days. Total 7-8 times irrigation was required by the crop for proper growth. The weeding process (up to 10 days) was done after 22 days of sowing and which found to be continuing up to 30 days of the cropping season. Pesticide spray was done just after the weeding activity to control the weeds. The last six tasks including; harvesting, collection of carrot, separating green, packing, transportation and washing required 8-10 days depended on the method of harvesting was used. As per findings,

carrot farming was found to be an 85-90 days crop. According to the project report of *Reddy*, 2019 the duration of carrot crop was 90-100 days or 3 months which may vary according to seed selected for sowing.

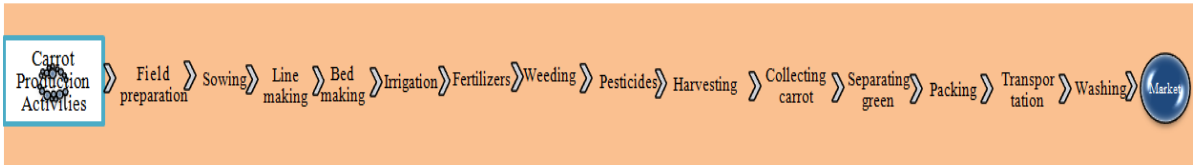

Fig. 2. Activities involved in carrot production.

Table 2. Time involvement in each activity.

	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27	28-30	31-33	34-36	37-39	40-42	43-45	46-48	49-51	52-54	55-57	58-60	61-63	64-66	67-69	70-72	73-75	76-78	79-81	82-84	85-87	88-90
Field preparation																														
Sowing																														
Line making																														
Bed making																														
Irrigation																														
Fertilizers																														
Weeding																														
Pesticides																														
Harvesting																														
Collecting carrot																														
Separating green																														
Packing																														
Transportati--on																														
Washing																														

Data in Fig. 3 revealed that carrot farming activities were mostly done by male respondents but two activities (weeding and separating) were only performed by female respondents. Besides this majority of females, farmers were found to be involved in weeding (57.7%), collecting carrot (57.7%), separating green (57.7%), packing/loading (57.7%) and harvesting (26.7%). As per findings, labour-intensive activities were mainly done by female farmers/ respondents. Females were found to involve more in transplanting (83.8%) and cleaning and harvesting (83.8%) activities, which are considered to be less skilled (*Joshi and Kalauni* 2018). Activities that required outdoor communication, decision making and marketing were found to be done by male respondents. Similarly, *Zewdu et al.* (2016) revealed that in most cases, men are the heads of households and are therefore the principal decision-makers in the household however some consultation with women may take place. *Mrunaliniand and Snehalatha, (2010)* found that the role of women in crop production was more active by their

total share in activities. This is because 37 per cent of activities are performed by women either exclusively or by their domination of number. Whereas the men exclusive or domination by number was seen in only 26 per cent of crop activities. *UN* (2015) found that though most of the men are performing the job they are informally involved in agricultural activities. And they become the principal decision-makers of the overall activities including agriculture.

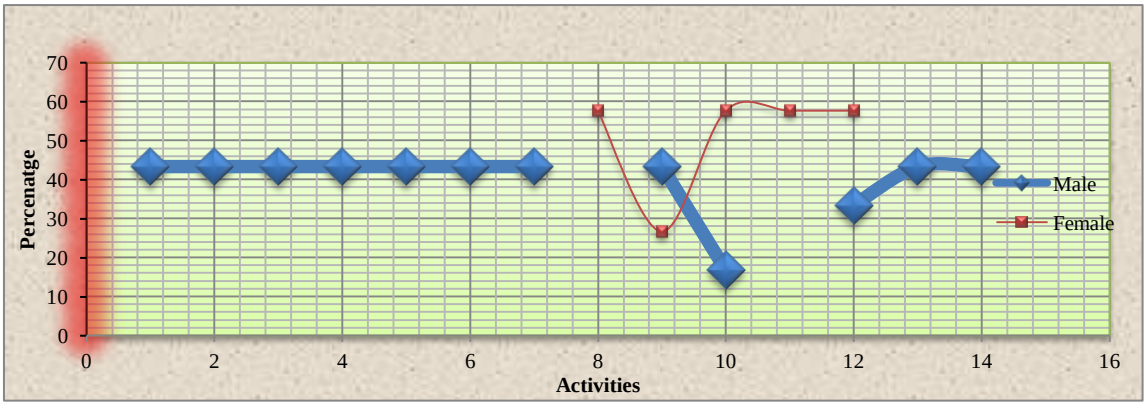

Fig. 3. Involvement pattern of respondents in carrot production.

The input used and cost of carrot production in a one-acre land,

1. *Field Preparation (Fc):*

For carrot production, agricultural land was prepared accordingly. Two ploughings were given and ridges and furrows were formed at 30 cm spacing. The cost for the field includes tractor cost and labour cost was Rs. 2500/-.

2. *Sowing (Sc):*

Sowing was done manually (by hand) by farmers. For a one-acre land total of 8 kg carrot seeds were required. The rate of seeds was Rs. 250/kg, and total Rs. 2000/- were spend on seeds. August-September is the best time for sowing carrots (Anonymous, 2018).

3. *Fertilizers (Fc)*:

One packet of each; DAP, Zinc and Sulphur were used in a one-acre area of carrot production. The first application of fertilizer (DAP-45 kg) was found to be done at the time of sowing. Then carrot farming required the application of Zinc and Sulphur fertilizers when the top head of the crop reached 3 inches tall. Total expenditure on fertilizers was Rs. 2700 per acre.

4. *Line making (Lc):*

After sowing seed and fertilizing the land, lines were made by tractor in carrot production field; a total of 96 lines were made in one acre of land which cost was Rs. 500.

5. *Bed Making (BMc):*

A raised bed provides carrot with perfect soil condition to reach their full potential. This activity was done by labour. It requires two workers for two days with the cost of Rs. 250/- per worker per day. So the total cost of bed making was Rs. 1000/-.

6. *Irrigation (Ic):*

About a week after plantation/sowing the seeds, the first irrigation was done. After then irrigation was required at an interval of every 10-12 days throughout the carrot production system. Total eight times irrigation was done in carrot crop. Carrot farming required about an inch of water per week to reach its full production. Water at least one inch per week to start, then two inches as roots mature (*Stillman et al., 2018*). The total cost (Rs. 5072) included diesel charge and labour wages for irrigating.

7. *Weeding (Wc):*

The unwanted plants that grow in-between crops were called weeds. The process of removal of such unwanted plants is called weeding. After cultivation, weeding is to be done in 15 days. Thinning and earthing up should be given on the 30th day, (*Reddy, 2015*) Weeding in carrot farming was mainly done by female labour usually after 20 days of sowing. For one acre 4 labours were required for 3 days. The total cost was Rs. 2000.

8. *Pesticides (Pc):*

There were many pests attack and diseases were found in carrot crop like carrot rust, damping off, black root, bacterial leaf blight, white mould, beetle etc. For controlling these pests and diseases pesticides spray was done in carrot crop just after the weeding process. The farmers were found to be applying pesticide once in a crop, which charged Rs. 550 (including labour).

9. *Harvesting (HRVc):*

Harvesting was found to be done after 81 days of sowing. Harvesting was done in two ways; machine (tractor) or manually (labour). The cost for both was different. The cost of harvesting through tractor was Rs. 4750 and manually was Rs. 9500.

Table 3. The input used and cost of carrot production in one-acre land.

Sr. No	Particular	Unit	Quantity	Rate (Rs.)	Cost (Rs.)
1	Field preparation (FPc)	Total Hours	-	-	2,500
2	Sowing (Sc)	Kg	8 kg	250	2,000
3	Fertilizers (Fc)	Labour	3	250	
	DAP	Kg	45	1250	750
	Zink	Kg	5	350	1,950
	Sulphur	Kg	5	350	
4	Line making (Lc)	Tractor	-	-	500
5	Bed making (BMc)	Total Hours	4	250	1,000
		Labour	4		
6	Irrigation (Ic)	Diesel	48	64	3,072
		Labor	8	250	2,000
7	Pesticides (PCc)	Cost		300	550
		Labor	1	250	

Sr. No	Particular	Unit	Quantity	Rate (Rs.)	Cost (Rs.)
8	Weeding (Wc)	Days	3		3,000
		Labor	4	250	
9	Harvesting (HRVc)	Tractor*	95	50	4,750
		Labor**	95	100	9,500
10	Collecting carrot,	Labor	5	300	6,000
		Day	2		
11	Separating green (CcSGc)	Labor	5	300	6,000
		Day	2		
12	Packing (Pc) and loading	Packet *(bori)*	300	16	4,800
13	Transportation (TPc)	Tractor	4	500	2,000
14	Washing (Wc)	Machine	300	22	6,600
15	land rent (LRc)	1 acre	6 months		11,000
15	Total Production cost (TPc)	Tractor*			58,472
		Labor**			63,222

*Tractor was used for harvesting the carrot **labour was used to harvest the carrot from the field.

1. *Collecting Carrot, Separating Green and Packing (CcSGc)*:

For doing after harvesting carrot activities (Collecting carrot, separating green and packing) on one acre of land 10 labours were required for 10 days. The total cost for these three activities was Rs. 16,800, which included labour charge for 4 days and the cost of packing material (*Bori*). A total of 250 bags were made and each was having 45 kg of carrot. So the total production of carrot was 11,250 kg (112.5 Quintal) in one care of farming.

2. *Transportation (Tc):*

Total cost of transportation was Rs. 2000, which was the tractor charge for 4 trips.

3. *Washing (Wc):*

Done by machine with charges of Rs. 22 per package. So the total cost was Rs. 6600 for cleaning the carrot.

4. *Total Production Cost (TPc):*

Total production of carrot in one-acre land was Rs. 47,472 (by using the tractor for harvesting) and 52,222 (harvesting done by labour).

As per a study done by *Naik and Kannan, 2018*, the cost of carrot cultivation on an acre was estimated as Rs. 38,871 which included total fixed cost and variable cost. The average yield per acre was found to be 150q/ha which was sold out at the rate of Rs 10 per kg. For this total income in an acre, carrot production was 1,50,000. The benefit-cost ratio was estimated to be 2.85:1.

Table 4 gives a clear picture of the benefit-cost ratio of the carrot production system. As per findings, it was f-

-ound that the total production of carrot on one acre was 11,250 kg (112.5 Quintal) which was Rs. 1,35,000 as a gross return. Because the harvesting was done by two methods; tractor and manually, so the calculation of the benefit-cost ratio was also done according to both way. Net return in term of rupees was Rs. 76,528 (by tractor) and Rs. 71,778 (manually). As per the calculation of the benefit-cost ratio, the BC ratio was 1.76 and 1.88 by tractor and manually, respectively. Inline, similar results were obtained by *Mahmood et al. (2017)* in his research on '*Profitability Analysis of Carrot Production in Selected Districts of Punjab*' that overall yield production was 10780.0kg/acre with price/kg of Rs. 11.81. Overall average gross revenue attained by carrot growers in carrot farming was Rs. 158235.58/acre with net revenue of Rs. 66436.17/acre and benefit-cost ratio of Rs. 1.64/rupee investment. The study postulated that the gross return of carrot production is significantly affected by human labour, tillage operation, seeds, fertilizers, irrigation, insecticide and manure.

Table 5. The benefit-cost ratio of carrot production (one acre).

Variable	Particular	Output
Total production	Total production of carrot per acre	11,250 kg (112.5 Quintal)
Gross return (GR)	Gross yield/acre (GYa) ×price/kg (PpKc)	11.250X12=Rs. 1,35,000
Net Return (NR)	Gross return (GR)- Total cost (TCc)	1,35,000-58,472=76,528 (by tractor) 1,35,000-63,222=71,778 (labour)
Benefit cost ratio (BCR)	Gross return (GR) / Net Return NR	1.76 (by tractor) 1.88 (by labour)

Eight problems in horticultural production were identified and were ranked according to their seriousness. As per findings high fuel costs ($\bar{x}$ = 4.3), breakdown of irrigation systems ($\bar{x}$ = 3.9) and pests and diseases ($\bar{x}$ = 3.4) were the major production problems in the carrot production system with a rank of I, II and III, respectively. Data further revealed that insufficient infrastructure, lack of finance, high input costs, poor access to inputs and poor soil fertility were also the problems faced by farmers during the production system of carrot.

Table 6. Problems faced by farmers in carrot production.

	Variable	Weighted Mean	Rank		Variable	Weighted Mean	Rank
Production Problem	High fuel costs	4.3	I	Marketing problem	Poor communication with traders	4.2	I
	Breakdown of irrigation system	3.9	II		Poor understanding among farmers	4.1	II
	Pest and disease	3.4	III		High competition with imports	3.9	III
	Insufficient production	3.2	IV		Poor marketing infrastructure	3.8	IV
	Lack of finance	3.1	V		Lack of marketing skill	3.1	V
	High input cost	2.9	VI		Lack of knowledge	2.8	VI
	Poor access to input	2.5	VII		High transportation cost	2.2	VII
	Poor soil fertility	1.7	VIII		Inadequate demand produce	1.9	VIII

Problems about the marketing system represent that major problems faced by farmers were poor communication with traders, poor understanding among farmers and high competition with imports with weighted mean scores of $\bar{x}$ = 4.2, $\bar{x}$ = 4.1 and $\bar{x}$ = 3.9 respectively. Findings show that Poor marketing

infrastructure ($\bar{x}$ = 3.8), Lack of marketing skill ($\bar{x}$ = 3.1), Lack of knowledge ($\bar{x}$ = 2.8), High transportation cost ($\bar{x}$ = 2.2) and Inadequate demand for produce ($\bar{x}$ = 1.9). The major problems faced by growers in the production of carrot were reported as quality seed, insect pest and disease, lack of institutional credit, shortage of irrigation, scarcity of labour, lack of remunerative price, price fluctuation and pricing not according to quality, (*Singh*, 2006).

IV. Summary and Conclusion

As per the present study, carrot farming was the major crop of Behbalpur village, in which maximum farmer was found to be involved. Carrot farming was found to be a 90 days crop by involving a series of activities including; *field preparation, sowing, line making, bed making, irrigation, fertilizing, weeding, pesticides spray, harvesting, collection of carrot, separating green, packing, transportation and washing.* Most carrot production activities were labour intensive and required high attention starting from sowing till harvesting. As per the study the maximum cost of found to be involved in harvesting (Rs. 9,500/-), washing (Rs. 6,600/-) collecting and separating green (Rs. 6,000 in each) and packing and loading (Rs. 4,800/-). By including land rent and cost of all activities, the total production cost of carrot production in one-acre land was Rs. 63,222/-. The economic analysis however indicates that carrot farming is a profitable business and promises the farmers a return of Rs. 1.88 per rupee investment. Major problems faced by farmers in carrot farming were poor communication with traders, poor understanding among farmers and high competition with imports (*Lisenda*, 2007).

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Author's Profile

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