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Economics of mentha oil production in Ambedkar Nagar district of Uttar Pradesh

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Abstract

The study based on 100 farms (Marginal 56, Small 29 and Medium 15) were interviewed from five villages of Ambedkar Nagar district of Uttar Pradesh. The study revealed that average holding size was 1.30 hectare and cropping intensity was 273.64 percent, menthe occupied 22.37 percent of gross cropped area. It offers net income Rs. 102908.27 with an expenditure of Rs. 78594.50 as total cost per hectare. Cost of production per Kg. menthe oil was found to be Rs. 444.18. Input-output ratio was found to be 1:2.15 on overall farm. Mentha cultivation in the study was characterized in decreasing return to scale.

Keywords: Resource use efficiency, Cost, return, Analytical tools, Respondents

Introduction

Japanese mint (*Mentha arvensis*) is being commercially grown as source of a natural mentha and dementholised oil which have massive use in flavoring industries. In India mentha is also used in tobacco and chocolate medicine industries. It plays an important role in Indian economy and shaping agriculture and medicinal policy. India is first largest producer of mentha oil following China in the world with around 14000 million tonnes produced during 2003. At present the mint crop is being grown on an area of about 125000 hectare and produced 42000 tonnes of essential oil in the country (Among 2012-13). Ninety percent crop of India, grown in Uttar Pradesh, rest 10% in Punjab, Haryana, Rajasthan and other part of country. Mentha cultivation in India appears quit remunerative to the grown and fit well in existing cropping system in mint growing areas in the country. Mint growers consider mentha as a bonus cash crop as it does not disturb or replace the cultivation of any major winter and rainy season crop. Being a labour intensive crop, cultivation, distribution, processing and marketing of mint provide ample employment opportunity in rural area.

Tarai area of Uttar Pradesh to be a suitable place for the cultivation of *Mentha arvensis*. The area of mentha crop substantially increased in central regions of U.P. mainly in Ambedkar Nagar, Barabanki, Lucknow and Sitapur districts. In Ambedkar Nagar district of Eastern Uttar Pradesh, mentha occupies an area of 73850 hectares and production 810140 lakh litres oil (Uddyan Vibhag, Ambedkar Nagar 2010-11). The present study aims at fulfilling some of these information needed with respect to the mentha industry. Therefore the present study entitled economics of mentha oil production in Ambedkar Nagar district of Eastern U.P. with following objectives;

1. To work out costs and returns of mentha oil production, and
2. To examine resource use efficiency in menthe oil production.

Material and Methods

(i). Selection of sample farmers

Farms were selected on the basis of stratified random design for the present investigation. The mentha growers were selected from five (5) villages of Tanda block of Ambedkar Nagar district. In each villages mentha growers categorized as per their land holding capacity, viz., marginal (below 1 ha.), small (1-2 ha.) and medium (2- 4 ha.) farmers. Thus 100 farmers (56 marginal, 29 small and 15 medium) were selected for the study.

(ii). Method of enquiry

Primary data were collected by survey methods through personal interview on well structured and pre tested schedule, while secondary data were collected from the records of districts offices. The data were related to the Agricultural year 2013-14.

(iii). Analytical tools

Both tabular and functional analysis were used, weighted average, regression analysis, MVP and test of significance were work out with following formula;

$$\text{Weighted Average (W. A.)} = \frac{\sum W_i X_i}{\sum W_i}$$

Where-

W. A. = Weighted average

X_i = Variables

W_i = Weights of X

Regression Analysis: Cobb. Douglas production function was applied to study the resource use efficiency in mentha production. The mathematical form of Cobb. Douglas function is,

$$y = aX_1^{b_1} \cdot X_2^{b_2} \cdot X_3^{b_3} \cdot X_4^{b_4} \cdot X_5^{b_5} \cdot e_u$$

Where,

Y = per hectare output (Rs.)

A = constant

X_1 = Cost of seed material (Rs./ha.)

X_2 = Total human labour (Rs./ha.)

X_3 = Manure & fertilizer (Rs./ha.)

X_4 = Irrigation charges (Rs./ha.)

X_5 = Distillation charges (Rs./ha.)

e_u = Error term

b_1, b_2, b_3, b_4 and b_5 are production elasticity of the respective input variables.

Cobb-Douglas Production Function in Log Forms:

$$\text{Log } Y = \log a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + u \text{ Log } e$$

$$\text{MVP}_{(x_j)} = \frac{b_j \bar{Y}}{\bar{X}_j}$$

Where,

MVP_j = marginal value product of j^{th} input

b_j = Production elasticity with respect to X_j

\bar{Y} = Geometric mean of dependent variable Y

\bar{X}_j = Geometric mean of independent variable X_j

$$'t' \text{ calculated} = \frac{b_j}{\text{S. E. of } b_j}$$

Result and Discussion

Cost and Returns

Per hectare costs and income from the cultivation of mentha crop on different categories of farms were worked out and presented in Table-1. This table indicates that on an average per hectare cost of cultivation of mentha was Rs. 78384.05, cost of cultivation was observed higher on medium farm (Rs. 79167.74) followed by small farm (Rs. 79002.80) and marginal farm (Rs. 77853.72), respectively. The total cost on medium farms was maximum due to heavy expenditure on use of human labour and rental value of owned land as compared to other size group of farms. The further distribution of costs on overall farms shows the maximum expenditure on total human labour i.e. (15.86) per cent followed by rental value of owned land (15.30), irrigation charges (13.63), tractor charges (11.30), manure & fertilizer, distillation charges, seed/suckers, fixed capital and land rent interest corresponding to 9.49, 8.23, 5.21, 1.29 and 0.66 per cent respectively.

Table 1: Per hectare cost of different inputs used in mentha crop on different size group of sample farms

S. No.	Particulars	Size group of sample farms			
		Marginal	Small	Medium	Overall
1.	Family Labour	9251.38 (11.88)	6065.65 (7.67)	4986.17 (6.29)	7687.73 (8.90)
2.	Hired Labour	4174.10 (5.36)	4837.07 (6.12)	6723.71 (8.49)	4748.80 (5.05)
3.	Total human labour	13425.48 (17.24)	10902.72 (13.80)	11718.88 (14.80)	12437.88 (15.86)
4.	Tractor charges	9058.68 (11.63)	10807.95 (13.80)	9933.64 (12.54)	9697.21 (11.30)
5.	Seed/Suckers costs	5948.01 (7.63)	5820.97 (7.36)	4528.81 (5.72)	5698.28 (5.21)
6.	Manure & fertilizer	7552.65 (9.70)	8038.40 (10.17)	5892.56 (7.44)	7444.45 (9.49)
7.	Irrigation	9156.43 (11.76)	12036.20 (15.23)	13783.41 (10.00)	10685.60 (13.63)
8.	Distillation charges	5889.00 (7.55)	6784.00 (8.58)	14500.00 (10.02)	6452.09 (8.23)
9.	Interest on working capital	493.24 (0.63)	567.64 (0.71)	529.71 (0.66)	520.28 (0.66)
10.	Rental value of owned land	12000 (15.41)	12000 (15.18)	12000 (15.15)	12000 (15.30)
11.	Interest on fixed capital	910.75 (1.06)	1142.20 (1.44)	1135.85 (1.43)	1011.63 (1.29)
	Grand total	77853.72 (100)	79002.80 (100)	79167.74 (100)	78384.05 (100)

The various income measures per hectare are presented in Table-2. It is depicted from the table that, on an average the total cost of cultivation (C_3) was found Rs. 78594.50. The maximum per hectare cost was found on marginal farms (Rs. 79986.40) followed by small, medium farms corresponding to Rs. 77262.65 and 75973.02, respectively. It was also observed

from the table that cost of cultivation has the negative relationship with the farm size, as it decreases with the increase in the size of farm.

As for the income measures are concerned. It is observed from the table that per hectare gross income was maximum to Rs. 189220.28 on medium farms followed by marginal and

small farms corresponding to Rs. 179041.75 and Rs. 141576.30, respectively. Whereas the average gross income on overall farms came to Rs. 169703.54.

Cost of production per Kg. on the basis of C₃ was highest to Rs. 497.46 on small farms followed by marginal and medium farms corresponding to Rs. 436.21 and 370.93, respectively, whereas it was Rs. 444.18 per quintal on overall farms. The

input-output analysis was also done on the basis of cost A₁ to cost C₃. It varies from 1:4.36 to 1:2.23 in case of marginal farms size group, 1:3.14 to 1:1.86 on small farms and 1:4.11 to 1:2.49 on medium farms size groups. The overall average of input-output ratio on the basis of various costs varies from 1:3.95 to 1:2.15.

Table 2: Cost and income measures of Mentha on different size of farms (Rs.)

S. No.	Particulars	Marginal	Small	Medium	Overall Average
1.	Cost A1/A2	41031.40	44965.28	45958.20	42911.33
2.	Cost B1	41942.15	46107.48	47094.05	43922.88
3.	Cost B2	53942.15	58107.48	59094.05	55922.88
4.	Cost C1	63193.53	64173.13	64080.22	63610.61
5.	Cost C2	72714.91	70238.78	69066.39	71449.55
6.	Cost C3	79986.40	77262.65	75973.02	78594.50
7.	Gross income	179041.75	141576.30	189220.28	169703.54
8.	Net income	99055.35	64313.65	113247.24	102908.27
9.	Family labour income	125099.60	83468.82	130126.23	113780.66
10.	Farm business income	111966.10	77455.85	143262.08	126792.30
11.	Cost of production (Rs./Kg)	436.21	497.46	370.93	444.18
12.	Yield (Kg/ha.)	158.92	160.60	178.72	166.08
13.	Input-output relationship				
a.	On cost A1/A2 basis	1:4.36	1:3.14	1:4.11	1:3.95
b.	On cost B1 basis	1:4.26	1:3.07	1:4.01	1:3.86
c.	On cost B2 basis	1:3.31	1:2.43	1:3.20	1:3.03
d.	On cost C1 basis	1:2.83	1:2.20	1:2.95	1:2.66
e.	On cost C2 basis	1:2.46	1:2.01	1:2.73	1:2.37
f.	On cost C3 basis	1:2.23	1:1.83	1:2.49	1:2.15

Resource use efficiency

The Cobb-Douglas production function was applied to find out the efficiency of various resources used in the production of mentha. Table-3, indicated that five variables viz. seed, manure & fertilizer, irrigation, human labour and distillation

charges jointly explained 85.34, 83.80 and 87.79 per cent variation of the dependent variables on marginal, small and medium farms, respectively. It is also revealed from the table that, statistically significant at 1 per cent level of probability in all size group of farms.

Table 3: Efficiency of Resource used on different size group of sample farms

Size group of farms	Production elasticity					Sum of elasticity	R ²
	X ₁	X ₂	X ₃	X ₄	X ₅		
Marginal	0.133505** (0.046727)	0.042166 (0.044989)	0.210923** (0.058268)	0.311290** (0.032217)	0.201498** (0.061337)	0.899384	0.8534479
Small	0.135214* (0.058970)	0.048396 (0.140220)	0.179000 (0.106284)	0.297811** (0.043156)	0.173309 (0.103516)	0.833732	0.838061
Medium	0.094263 (0.183984)	0.344877 (0.179030)	0.030973 (0.256552)	0.333714* (0.152667)	0.008640 (0.243451)	0.812478	0.879733

(*Significant at 5% probability level, **Significant at 1% probability level) X₁, X₂, X₃, X₄ and X₅ stands for Seed, Manure & fertilizer, Irrigation, Human labour and Distillation charges)

Return to scale on marginal, small and medium farms were found 0.899384, 0.833732 and 0.812468 respectively. It is therefore concluded that cultivation of mentha is characterized by decreasing return to scale on each farm situation.

Table 4: Marginal Value Productivity (MVP) of included factors in production process

Marginal Value Productivity					
Size group of sample farms	X ₁	X ₂	X ₃	X ₄	X ₅
Marginal	3.3138	0.8186	3.3875	0.3412	2.1892
Small	3.6260	0.8278	2.4651	4.5711	0.1503
Medium	0.3369	11.5720	0.4560	6.1427	0.1156

X₁, X₂, X₃, X₄ and X₅ stands for Seed, Manure & fertilizer, Irrigation, Human labour and Distillation charges.

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