Economic Analysis and Growth Pattern of Ajwain in Chittorgarh District of Rajasthan

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ABSTRACT

The research problem *"Economic Analysis and growth pattern of ajwain (Trachyspermum ammi) in Chittorgarh District of Rajasthan"* is an exercise to determine the growth rates of area, production and productivity along with cost of cultivation and returns of ajwain in Chitttorgarh district of Rajasthan. Chittorgarh district of Rajasthan was selected on the basis of highest area under ajwain in Rajasthan. The data collected from the growers for the crop year 2018-19 were analyzed using tabular and functional analysis. The results obtained showed that the compound growth rates of area, production and productivity of ajwain in Chittorgarh district were, -2.92, -4.81 and -1.94 per cent per annum, respectively during the year 2007-08 to 2016-17. The overall cost of cultivation of ajwain crop was estimated as ₹ 21736.05 per hectare. The break - up of the overall cost showed that about 32.30 per cent of the total cost was in the form of Machine labor whereas rental value of owned land (17.75%) stood at the second highest place. Remaining 49.95 per cent cost was shared by other items. Overall gross income from ajwain during 2018-19 was estimated as ₹ 52763.25 per hectare whereas average net income over cost C_2 and average family labor income was ₹ 31027.20 and ₹ 34935.93 per hectare, respectively. The average return per rupee was worked out to ₹ 2.42 and the average cost of production was ₹ 3980.49 per quintal.

HIGHLIGHTS

◉ Compound growth rate of area, production and productivity of ajwain were -2.92, -4.81 and -1.94 per cent per annum and the cost of cultivation was ₹ 21736.05 per hectare of ajwain in Chittorgarh district of Rajasthan.

India enjoys a prominent position in spices production in the world and is thus called a country of spices. The Indian spices have been known for their flavor all over the world. About 10.7 million tonnes spices are produced annually from 4.51 million hectares of land in India during 2020-21 (Report of Horticulture Statistics Division, 2021). Seed spices are extensively grown in arid and semi-arid tracts of Rajasthan and Gujarat where climatic condition is very harsh and these crops provide livelihood to a large section of the population in these dry areas. Rajasthan was the leading state in area and production of spices with 1.08 thousand hectare of area (23.94%) and 1.24 million tonnes

(11.58%) of production during 2020-21 (Report of Horticulture Statistics Division, 2021). Rajasthan was the leading state in area and production of ajwain with 10875 hectare area (65%) and 6137 tonnes of production (75%). While, Chittorgarh was leading district for ajwain with 8806 hectare area (71.63%) and 4852 tonnes of production (62.07%) share in area and production (Government of Rajasthan, Department of Agriculture Report, 2019-20).

MATERIALS AND METHODS

The compound growth rate of area, production and productivity of ajwain in Chittorgarh district of Rajasthan were workout in order to know the pattern of growth in these variables. These were computed by fitting exponential function to the figures of area, production and productivity for the period of 2008-09 to 2016-17. The ordinary least square method was used. The following form of exponential function was used to know the compound growth **(**Acharya *et al.* (2012**)**.

$$Y = ab^t u_t$$

Where, Y = area/production/productivity

t = time in years

u_t = error term

a = constant

b = growth rate over a time period and

$$b = (r + 1)$$

Where,

r = compound growth rate

Log transformation of this equation;

$$Log\ Y = Log\ a + t\ Log\ b + log\ u_t$$

Compound growth rate "r" = (Antilog of b − 1)100

The significance of compound growth rate (CGR) was tested by using t-test (Arti and Rai 2017).

Cost of Cultivation

Cost structure in cultivation of ajwain on different size holdings and pattern of resource use was studied. The cost of cultivation of ajwain was worked out by using various cost concepts as defined below (Agarwal *et al.* 2018):

Cost A$_1$: It includes

1. Value of hired human labour (₹)
2. Value of owed and hired animal labour (₹)
3. Value of owed and hired machine labour (₹)
4. Value of seeds (both farm produced and purchased) (₹)

5. Value of manures, fertilizers, insecticides and pesticides (₹)
6. Irrigation charges (₹)
7. Depreciation (₹)
8. Land revenue (₹)
9. Interest on working capital (₹)
10. Miscellaneous expenses (₹)

Cost A$_2$: Cost A$_1$ + rent paid for leased- inland

Cost B$_1$: Cost A$_1$ + interest on fixed capital assets (excluding land)

Cost B$_2$: Cost B$_1$ + rental value of owed land + rent paid for leased-in land

Cost C$_1$: Cost B$_1$ + imputed value of family labour

Cost C$_2$: Cost B$_2$ + imputed value of family labour

Cost C$_3$: Cost C$_2$ + 10 per cent of cost C$_2$ as management cost (Kumari *et al.* 2021).

The cost of production was work out by using following formula:

Cost of production per quintal =

$$\frac{\text{Cost of cultivation per hectare}}{\text{Yield/hectare}}$$

RESULTS AND DISCUSSION

Growth Rate of Area, Production and Productivity of Ajwain

The CGR under area, production and productivity of ajwain in Chittorgarh district were found to be -2.92, -4.81 and -1.94 per cent per annum, respectively during the study period as shown in table 1. Thus, the compound growth rates of area, production and productivity were found to be negative in Chittorgarh district but all of these were non-significant in Table 1 it is shown level of significance at 5 percent level. This decrease in area of ajwain may be due to area diverted to the comparable *kharif* crops like sorghum and Aswaganda. Technological support was not met in ajwain as there was a not new variety in ajwain that's why yield of ajwain decreased.

Table 1: Compound growth rates of area, production and productivity of ajwain

Year	Area (ha)	Production (mt)	Yield (kg/ha)
2007-08	12145	7187	592
2008-09	12278	11050	900
2009-10	11393	2922	256
2010-11	12795	8981	702
2011-12	14910	11929	800
2012-13	11002	6384	580
2013-14	9811	6879	701
2014-15	9558	5737	600
2015-16	9138	2954	323
2016-17	11052	6543	529
CGR	-2.92*	-4.81*	-1.94*
Sd. Error	1.34	5.03	4.42
'b' value	-0.0128	-0.021	-0.008

Significant at 5 % L.O.S.

Source: *Government of Rajasthan Department of Agriculture Report, 2016-17, Pant Krishi Bhawan, Jaipur, Rajasthan.*

Cost of Cultivation

The cost of cultivation per hectare of ajwain in Chittorgarh district, for three size groups of farms in the year 2018-19, is worked out and presented in Table 2. An over view of results revealed that cost of cultivation of ajwain crop varied between ₹ 21515.77 to ₹ 22059.10 per hectare presented in Table 2 (Bala *et al.* 2011). The overall cost of cultivation of ajwain crop was estimated to be ₹ 21736.05 per hectare. The break - up of the overall cost showed that about 32.30 per cent of the total cost was in the form machine labour. Rental value of owned land (17.75%) stood the second highest.

Remaining 49.95 per cent cost was shared by other items. Among other items the most important one was charges towards manures followed by family labour, interest on working capital, plant protection charges, hired human labour, depreciation, seed, interest on fixed capital and fertilizer which accounted for 11.84, 11.31, 6.94, 4.52, 4.28, 3.71, 3.46, 2.14 and 1.75 per cent of the total cost presented in Table 2, respectively. The overall total labour cost for all operation was ₹ 10527 per hectare. It was lowest (₹ 10192.56/ha.) in the case of small size group and highest in case of large size group of farms (₹ 11024.27) (Jagtap *et al.* 2012). The total variable cost of cultivation ranged from ₹ 16430.18

to ₹ 16916.16 per hectare. The important items of the cost were machine labour, family labour and manures which contributed about 70.13 per cent of the total variable cost.

Table 2: Cost of cultivation per hectare of ajwain (₹/ha)

Cost items	Small	Medium	Large	Overall
Family Labour	2664.27	2592.64	2465.20	2574.03
	(12.43)	(11.98)	(11.17)	(11.84)
Hired Human Labour	752.69	927.84	1114.38	931.63
	(3.54)	(4.28)	(5.08)	(4.28)
Machine Labour	6775.60	6845.20	7444.69	7021.83
	(31.54)	(31.64)	(33.74)	(32.30)
Seed	720.24	725.69	810.57	752.16
	(3.39)	(3.35)	(3.67)	(3.46)
Manure	2992.14	2427.88	1956.22	2458.74
	(13.95)	(11.22)	(8.86)	(11.31)
Fertilizer	320.67	357.22	467.27	381.72
	(1.54)	(1.65)	(2.11)	(1.75)
Plant protection charges	710.92	1120	1120	983.64
	(3.35)	(5.17)	(5.07)	(4.52)
Interest on working capital @10%	1493.65	1499.64	1537.83	1510.37
	(6.49)	(6.93)	(6.97)	(6.94)
Total variable cost	16430.18	16496.11	16916.16	16614.15
	(76.23)	(76.22)	(76.67)	(76.40)
Rental Value of owned land	3765.67	3880.58	3897.11	3847.85
	(17.60)	(17.93)	(17.66)	(17.75)
Depreciation on Farm implements	857.60	789.60	778.30	808.50
	(3.98)	(3.14)	(3.52)	(3.71)
Interest on fixed capital @10%	462.32	467.01	467.54	465.63
	(2.19)	(2.71)	(2.15)	(2.14)
Total fixed cost	5085.59	5137..22	5142.94	5121.91
	(23.77)	(23.78)	(23.33)	(23.60)
Total cost	21515.77	21633.33	22059.10	21736.06
	(100)	(100)	(100)	(100)

Figure in parenthesis are per centages of column totals.

Cost items were grouped under cost A_1 to cost C_3, operational and overhead costs which are given in Table 3. The operational cost exceeds overhead cost in all farm size groups (small, medium and large). The average proportion of operational and overhead cost, in the total cost was 76.43 and 23.57 per cent, respectively. The overall cost A_1 and cost A_2 accounted 68.31 per cent of total cost as there was no leased in leased out tendency. The B_1 and

B_2 costs were 70.45 and 88.15 per cent of total cost, respectively. The cost C_1 accounted 82.29 per cent of total cost. On the overall basis to grow one hectare of ajwain a farmer required about ₹ 14848.62. It was ₹ 14623.51 per hectare in case of small size and ₹ 14693.07 per hectare for medium and about 15229.26 per hectare for large size group of farms (Srikala *et al.* 2016).

Table 3 Size group wise different costs of ajwain cultivation (₹/ha)

Size group	Small	Medium	Large	Overall
O.C.	16430.18 (76.37)	16496.11 (76.26)	16916.16 (76.69)	16614.50 (76.44)
O.H.C.	5085.59 (23.63)	5137.22 (23.74)	5142.94 (23.31)	5121.91 (23.56)
Cost A_1	14623.51 (67.96)	14693.07 (67.91)	15229.26 (69.03)	14848.62 (68.31)
Cost A_2	14623.51 (67.96)	14693.07 (67.91)	15229.26 (69.03)	14848.62 (68.31)
Cost B_1	15085.83 (70.11)	15160.08 (70.07)	15696.80 (71.15)	15314.23 (70.45)
Cost B_2	18851.50 (87.61)	19040.66 (88.01)	15593.91 (88.82)	19162.02 (88.15)
Cost C_1	17750.10 (82.49)	17752.72 (82.06)	18162.00 (82.33)	17888.27 (82.29)
Cost C_2	21515.77 (100)	21633.30 (100)	22059.11 (100)	21736.06 (100)
Cost C_3	23667.34 (110)	23796.63 (110)	24265.02 (110)	23909.66 (110)

Figure in parenthesis are the per cent ages of column totals.

Comparison of cost, income and returns per rupee of ajwain in Chittorgarh district are shown in Table 4.

Table 4: Size group wise income measures on sample farms (2018-19)

Particular	Size group			Overall
	Small	Medium	Large	
Yield in quintal (per ha)	5.19	5.50	5.69	5.46
Price (per qtl)	9654.80	9665.15	9670.85	9663.60
Gross income (per ha)	50108.41	53158.32	55027.13	52763.25
Cost of cultivation (per ha)	21515.77	21633.30	22059.10	21736.05
Net income	28592.64	31525.02	32968.03	31027.20
Family labour income	31256.91	34117.66	39433.22	34935.93
Farm business income	35484.90	38465.25	39797.87	37916.00
Cost of production (per qtl)	4137.72	3933.32	3870.43	3980.49
Return per rupee	**2.32**	**2.45**	**2.49**	**2.42**

Overall gross income from ajwain during 2018-19 was estimated as ₹ 52763.25 per hectare. Average net income over cost C_2 and average family labour income was ₹ 31027.20 and ₹ 34935.93 per hectare, respectively (Meena *et al.* 2016). The average return per rupee was worked out to ₹ 2.42. The average cost of production was ₹ 3980.49 per quintal (Choudhri *et al.* 2018).

CONCLUSION

The compound growth rates of area, production and productivity of ajwain in Chittorgarh district were -2.92, -4.81 and -1.94 per cent per annum, respectively during the year 2007-08 to 2016-17. Thus, the compound growth rates of area, production and productivity were found to be negative and non-significant in Chittorgarh district (Sunitha *et al.* 2018). An over view of results revealed that cost of cultivation of ajwain crop varied between ₹ 21515.77 to ₹ 22059.10 per hectare (Sarfraz *et al.* 2014). The overall cost of Cultivation of ajwain crop was estimated to be ₹ 21736.05 per hectare. The break - up of the overall cost showed that about 32.30 per cent of the total cost was in the form machine labour. Rental value of owned land (17.75%) stood the second highest. The overall gross income was estimated at ₹ 52763.25 per hectare. Average net income and family labour income were ₹ 31027.20 and ₹ 33601.23 per hectare. The gross income over variable cost of cultivation ranged from ₹ 50108.41 to ₹ 55027.13 per hectare (Sonwani *at el.* 2018). The net return over variable cost was highest in case of large size group and lowest in the small size group i.e. ₹ 38110.97 and ₹ 33678.23 per hectare, respectively. The average cost of production was ₹ 3980.49 per quintal and return per rupee was Rs. ₹ 2.42.

Implications

Efforts should be made to educate farmers about the use of improved seeds through extension experts for agencies so that productivity as well as profitable of ajwain can be increased. The farmers of this region generally used local seed of ajwain which resulted

in poor yield of this crop. The Government should ensure the supply of improved quality of ajwain seed in the region through the KVK's and seed cooperative agencies. So that farmers can accelerate the production of ajwain.

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