

A Study of Growth Performance and Economics of Rapeseed and Mustard Cultivation in Rajasthan, India

Dinesh Kumar, Madhu Sharma, Rajesh Sharma, and Mohamad Awais^{1*}

Department of Agricultural Economics, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner, Rajasthan (India)-334 006

¹ICAR-National Institute of Agricultural Economics and Policy Research, Pusa, New Delhi-110012

*Corresponding Author E-mail: syedawais2007@gmail.com

Received: 5.11.2018 | Revised: 16.12.2018 | Accepted: 24.12.2018

ABSTRACT

The present study has examined the growth performance and economics of rapeseed and mustard (R&M) cultivation in Rajasthan using both secondary and primary data. R&M is one of the important oilseed crops of rabi season and accounts for about 25 percent of total oilseed production in India during 2016-17. Descriptive statistics like mean and coefficient of variation; and compound growth rate have been used to analyse the data. Rajasthan state alone share between 46-50 per cent of total R&M production of the country. Findings have revealed that output growth of both total oilseeds and R&M declined in period II (2006-07 to 2016-17) as compared to period I (1996-97 to 2006-07) and overall period (1996-97 to 2016-17), while variability in area, production and yield has come down in period II over the period I and overall period. Cultivation of R&M provides net return of about Rs 40,000/- per hectare and operational expenses to cultivation was found to be Rs 37,254/-. The operational activities like irrigation charges (16.8%), harvesting (12%), field preparation (11.2%), chemical fertilizers (6.5%) and threshing (5%) were the main items of cost and these five operations together accounted for about 52 percent of total cost of cultivation.

Key words: Cost and returns, Growth performance, Rapeseed-mustard

INTRODUCTION

India is a leading player in edible oils, being the world's largest importer of edible oils (ahead of the EU and China) and the world's third largest consumer (after China and the EU). Country meets more than half of its domestic demand through imports due to lower production as compared to its domestic demand. In 2016-17, India imported about

1.40 crore tonnes of vegetable oils costing of Rs. 730.39 billion. Despite rising prices of edible oils, its consumption is growing rapidly. The per capita consumption of edible oils in the country is around 14.3 kg/ year⁴.

The huge demand-supply gap of edible oils in India poses serious threat and provides opportunities to do better.

Cite this article: Kumar, D., Sharma, M., Sharma, R. and Awais, M., A Study of Growth Performance and Economics of Rapeseed and Mustard Cultivation in Rajasthan, India, *Int. J. Pure App. Biosci.* 6(6): 804-809 (2018). doi: <http://dx.doi.org/10.18782/2320-7051.7197>

In order to bridge the demand-supply gap, achieve self-sufficiency, and reduce the high import bills; the Technology Mission on Oilseeds (TMO) was launched by the Government of India to increase the production of oilseeds in 1986³. Though the mission was successful in increasing production of oilseeds, achieving self-sufficiency has remained a dream and the country is still dependent on huge imports to meet domestic demand. India meets about 60 percent of edible oil demand through import. To give further boost to oilseeds production, the Government of India implemented a scheme of oilseeds, pulses, oil palm and maize from 2004-05 to 2013-14. This helped in achieving record oilseeds production of 32.75 million tonnes (Mt) in 2014-15, which in later years has declined and reached to 25.25 Mt in 2016-17. Moreover, increasing production of edible oilseeds continues to be the top priority of the country.

Rapeseed and mustard (R&M) is one of the important *rabi* oilseeds in India. It accounts for about one-fourth (24.6%) of total (nine) oilseeds production during triennium ending (TE) 2016-17. The production of R&M in the country was 7.9 million tonnes (Mt) with an area of 6.1 million hectare and productivity of 1303 kg/ha in 2016-17. The production of R&M is concentrated in five major states of Rajasthan, Madhya Pradesh, Haryana, Uttar Pradesh, and West Bengal accounting to about more than 85 percent of total production in India. There is a wide variability in mustard yield across major states. Oilseeds are usually grown in non-irrigated conditions and in few states critical irrigation is provided. This is clear from the fact that irrigated area under oilseeds has not increased as compared to cereals and horticultural crops². About consumers preference, people in northern and eastern regions consume mustard oil, while in western region consume groundnut oil and in southern region both groundnut and coconut oils. The present paper attempts to examine growth performance and cost and returns from R&M cultivation in Rajasthan.

MATERIAL AND METHODS

The latest knowledge of growth performance and cost involved in cultivation of a particular crop helps in to development departments, policy makers and researchers to know the changes taking place in production of crop. To identify the sources of growth in R&M in India and in Rajasthan, time-series data on area, production and yield were collated from the Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Government of India for the year 1996-97 to 2016-17.

To identify the changes in cost and return from cultivation of R&M, a field survey of growers was conducted in Alwar district of Rajasthan and data related to agricultural year (July-June) 2016-17. A multi-stage sampling was employed to select state, district, block development, village and farmers. For this study, state of Rajasthan was selected purposively, as this state alone accounts for about 47 per cent of total R&M production in the country in 2016-17. At second stage, Alwar district was again chosen purposively, as Alwar is the highest producer of R&M, while at third stage, Ramgarh block was once more was chosen purposively due to highest R&M producing block of Alwar. At fourth stage of sampling, two villages Navgaon and Lakshmansar were selected randomly and at finally 15 randomly selected farmers from each village, making a total of 30 farmers, were interviewed for collecting cost and returns involved in cultivation of R&M. To analyze the data utilized in paper descriptive statistical techniques like mean, coefficient of variation and compound growth rate have been used.

Compound growth rate analysis

Growth rate in area, production and yield of total oilseeds and R&M were computed for a period of 21 years from 1996-97 to 20216-17. In the present study, compound growth rates in area, production and productivity of total oilseeds and R&M at all India level and in Rajasthan were estimated by using the exponential growth function¹ of the form,

$$Y_t = a b^t U_t \quad \text{.....(1)}$$

where,

Y_t = area/production/ yield, of total oilseeds and R&M in year 't'.

a = Intercept

b = Regression coefficient

t = Year which takes values 1, 2, ... n.

U_t = Disturbance term in year 't'.

The equation (1) was transformed into log-linear and written as

$$\log Y_t = \log a + t \log b + \log U_t \quad \text{.....(2)}$$

Equation (2) was estimated by using Ordinary Least Square (OLS) technique.

The compound growth rate (g) was then estimated by the identity given in equation (3)

$$\hat{g} = (\hat{b} - 1) \times 100 \quad \text{.....(3)}$$

where,

\hat{g} = Estimated compound growth rate per annum in percentage

\hat{b} = Antilog of log b

Variability analysis

The extent of variability in area, production and productivity of total pulses were analysed through coefficient of variation.

$$C.V. = \frac{\text{Standard deviation}}{\text{Mean}} \times 100$$

RESULTS AND DISCUSSION

Production Outreach of Total Oilseeds and R&M in India and Rajasthan

Rapeseed-mustard is the major source of income especially for the marginal-and small-farmers in rainfed areas which are about 25 percent of the total cultivated area. Due to low water requirement and feasibility of rapeseed-

mustard, it suits and adapts well in different cropping systems⁶. A total nine oilseeds namely groundnut, rapeseed & mustard, soybean, sunflower, safflower, linseed, castor seed, sesamum, and niger seed are produced in India. India holds a significant share in world's oilseeds production. It is second largest producer of groundnut after China and third largest producer of rapeseed after China and Canada. Presently India produces about 27.5 Mt total oilseeds covering area of 26.1 Mha and average yield of 1055 kg/ha. Among Indian states, Gujarat is the leading producer of total oilseeds in the country in 2015-16. Rajasthan is the second most important state accounting for about 18 percent of total area and 21 percent of total oilseeds production of the country.

Mustard is the important *rabi* oilseed in India. It accounts for about 24% of total (nine) oilseeds production. The production of mustard at national level was 7.9 Mt with an area of 6.1 million hectare and productivity of 1303 kg/ha during 2016-17. Regionally, this crop is concentrated in five major states covering of Rajasthan (36.16%), Madhya Pradesh (9.7%), Haryana (7.2%), Uttar Pradesh (9.1%), and West Bengal (6.5%). These together contributed to 69 percent of total area and 86 percent of total R&M production in the country in 2016-17 (Table 1). There is wide variability in R&M yield ranging from 1064 kg/ha in Uttar Pradesh to 1626 kg in Haryana. Moreover, above 85% area under mustard cultivation is irrigated, except Madhya Pradesh, where area under irrigation is 51 percent.

Table 1: State-wise area, production and yield of rapeseed/ mustard in India, TE 2016-17 (Total area in Mha, total production in million tonnes)

States/ features	RJ	MP	HR	UP	WB	India (Total)
Area (%)	36.1	9.7	7.2	9.1	6.5	5.9
Production (%)	46.7	11.0	11.7	9.7	7.0	7.0
Yield (kg/ha)	1293	1128	1626	1064	1079	1190

Growth performance of total oilseeds and R&M in India and Rajasthan

The annual compound growth rate of total oilseeds and R&M at both all-India and in Rajasthan during the period 1996-97 to 2016-17 is presented in Table 2. The study period of growth performance is divided into period I (1996-97 to 2006-07), period II (2006-07 to 2016-17), and overall period (1996-97 to 2016-17). Analysis shows that output growth of total oilseeds increased more than 2 per cent

during overall period. The growth in output was mainly contributed by growth in yield (1.63%) and rest was through area expansion (0.47%). Data shows that growth of total oilseeds declined in period II (0.64%) over period I (1.3%), and this was mainly due to negative growth in area (-0.24%). In comparison to India, total oilseeds output growth in Rajasthan was double (4.3%) during the overall period and this was contributed to both yield and area growth.

Table 2. Annual compound growth rate of total Oilseeds and R&M in India and Rajasthan, 1996-97 to 2016-17

Particulars	Period I	Period II	Overall period
<i>Total Oilseeds (India)</i>			
Area	0.31 (8.6)	- 0.24 (2.8)	0.47 (7.0)
Production	1.29 (16.3)	0.64 (10.3)	2.11 (18.2)
Yield	0.98 (11.3)	0.88 (10.1)	1.63 (14.4)
<i>Total Oilseeds (Rajasthan)</i>			
Area	1.51 (24.5)	1.02 (9.4)	1.91 (20.0)
Production	5.19 (35.3)	2.61 (14.0)	4.28 (30.7)
Yield	3.62 (18.3)	1.57 (7.8)	2.32 (16.9)
<i>R & M (India)</i>			
Area	0.43 (17.3)	- 0.54 (7.4)	0.17 (13.1)
Production	3.44 (23.8)	0.77 (11.0)	2.09 (19.9)
Yield	3.00 (14.4)	1.32 (7.2)	1.92 (14.1)
<i>R & M (Rajasthan)</i>			
Area	1.51 (30.8)	- 1.05 (14.7)	0.71 (23.8)
Production	5.82 (38.5)	0.79 (16.8)	3.12 (30.0)
Yield	4.25 (18.0)	1.87 (9.8)	2.39 (17.3)

Note: Figures in parentheses denote coefficient of variation; **Period I** (1996-97 to 2006-07); **Period II** (2006-07 to 2016-17); and **Overall Period** (1996-97 to 2016-17).

Growth performance in R&M behaved like total oilseeds at both all-India and in Rajasthan during various periods. The output growth of R&M grew at about 2 percent annually during overall period and was mainly due to growth in yield (1.9%). Data further shows that R&M output growth in period I was higher than that of growth in period II. However, in both the periods, increase in output growth was mainly driven by increase in yield which could be attributed to improved technology, adoption of good agronomic practices and input use.

Rajasthan is the leading state in cultivation of R&M in India. The output of R&M increased

more than 3 percent annually during the overall period and was mainly driven by increase in yield followed by area expansion (0.7%). Data reveals that output growth of R&M in period II declined as compared to period I and overall period. In period I, output increased at the rate of 6 percent, while yield growth was 4.25 percent. In nutshell, the growth in output of both total oilseeds and R&M was driven mainly by growth in yield. This implies that research contribution to technological achievement and its adoption on farmer fields and benefiting to them. Estimation of coefficient of variation gives

idea of reduction in risk. The estimates of coefficient of variation have come down in period II over the period I and overall period for both total oilseeds and for R&M. The reduction in coefficient of variation indicate that the development of new technology over years and favorable policy environment have played major role in stabilizing area, production and yield of both oilseeds and R&M at all-India level and in Rajasthan state. The growth performance of R&M crops in the state had been prone to various kinds of risk over time. Several biotic, abiotic, technological, institutional, and socio-economic constraints inhibit exploitation of the yield potential of oilseeds and need to be addressed⁷.

Economics of R&M

With the adoption of new technology in mid-1960s, use of purchased inputs has increased substantially which made farmers more conscious for input and output prices used in growing of crops on their farms. Along with

farmers, other stakeholders in agriculture like researchers, policy makers and extension workers are also concerned with cost-price behaviour of different agricultural commodities. The estimation of economics of different crops at farmers' field at prevailing prices of input and output help in taking rational decision for allocation of resources. This helps farmers' to know suitability of crop in terms of profit. Since the cultivation of R&M is mainly undertaken in high risk regions with rainfed conditions and poor investment in technology, the returns to the R&M cultivators are often uncertain⁵. This section describes economics of R&M based on farm survey in Alwar district of Rajasthan and the results obtained are presented in Table 3. Results show that per hectare average cost of cultivation of R&M was Rs. 50,124/-, while gross return was Rs. 90,000/-. The cultivation of mustard provided net return of Rs. 39,876/- per hectare.

Table 3. Cost and returns from Rapeseed & Mustard cultivation in Alwar district, Rajasthan

S. No.	Items	No./Quantity	Rate	Value	Per cent of total cost
1	Field preparation	4	1400	5600.0	11.17
2	Pre-sowing irrigation	1	2800	2800.0	5.59
3	Sowing	1	1600	1600.0	3.19
4	Ridging	1	400	400.0	0.80
5	Seed (kg)	6	70	420.0	0.84
6	Seed treatment	1	300	300.0	0.60
7	Farm yard manure (FYM) in quintal	50	80	4000.0	7.98
8	Chemical fertilizers (kg)				
8.1	Urea	60	6	360.0	0.72
8.2	Di-ammonium phosphate	60	25	1500.0	2.99
8.3	Single super phosphate	-	-	-	-
8.4	Zinc sulphate	20	70	1400.0	2.79
9	Irrigation	2	2800	5600.0	11.17
10	Weeding/ Hoeing				
10.1	Chemical	-	-	-	-
10.2	Manual	1	1600	1600.0	3.19
11	Plant protection	1	600	600.0	1.20
12	Harvesting	1	6000	6000.0	11.97
13	Threshing	1	2500	2500.0	4.99
14	Miscellaneous	1	800	800.0	1.60
15	Interest on working capital		@10%	1774.0	3.54
	Variable cost			37254.0	74.32
16	Transport charges			1350.0	2.69
17	Management charges			530.0	1.06
18	Risk factor			390.0	0.78
19	Rental value of land			10000.0	19.95
20	Rent on fixed capital		@12%	600.0	1.20
	Fixed cost			10990.0	21.93
	Total cost			50124.0	100.0
21	Production (quintal)				
21.1	Main product	20	4200	84000.0	
21.2	By-product	30	200	6000.0	
22	Gross return			90000.0	
23	Return over variable cost			52746.0	
24	Net return			40476.0	

The main items of operational cost were irrigation (16.8%), followed by harvesting (12%), field preparation (11.2%), chemical fertilizer (6.5%), and threshing (5.0%). The other items of cost were sowing and weeding (3.2%, each) and plant protection (1.2%). These eight items of variable cost shared for about 59 per cent of the total cost of cultivation. The rental value of land (i.e. opportunity cost of land) was estimated to be 20% of the total cost incurred in cultivation of mustard. The production cost per quintal of main product was Rs. 2463/-.

CONCLUSION

Rajasthan is one of the major oilseeds producing states in India and accounts for about one-fourth of total oilseeds production in India. In production of R&M, Rajasthan enjoys priority and shares between 45-50 percent of total production in the country. Analysis of growth performance of oilseeds and R&M has shown that their output growth have increased moderately and was mainly contributed by growth in yield. However, the growth in recent period has declined over period I and overall period. The estimates of coefficient have revealed that risk in oilseeds production have reduced and could be attributed to development of new technology and favorable policy environment which have helped in stabilizing area, production and yield of both oilseeds and R&M at all-India level and in Rajasthan state. The recent estimates of cost of cultivation will provide information to stakeholders in deciding the prices of outputs.

REFERENCES

1. Angles, A., Production and export of turmeric in South India: An economic

analysis. M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad, Karnataka, unpublished (2001).

2. Kumar, Sant, Pal, S., Kumar, P., Awais, M., and Tanwar A., Micro irrigation in Indian agriculture- progress, impact and estimation of indicative cost. *ICAR-National Institute of Agricultural Economics and Policy Research, New Delhi*, Research Paper, Mimeo (2018).
3. Nethrayini, K.R. and Mundinamani, S.M., Impact of technology mission on oilseeds and pulses on pulse production in Karnataka. *International Research Journal of Agricultural Economics and Statistics* **4(2)**: 148-153(2013).
4. Sahu, P. K., Kant, K., Choudhri, H. P. S. and Singh, G.P., Cost of cultivation of mustard crop in Fatehpur district of Uttar Pradesh. *Int. J. Curr. Microbiol. App. Sci* **7(8)**: 3356-3361(2018).
5. Sharma, A.K., and Thomas, L., Technology inputs and its impact on farm profits: A case study of rapeseed-mustard. *Indian Res. J. Ext. Edu.* **13(3)**: 9-14(2013).
6. Sharma, P., Sharma, H. O. and Rai, P. K., Strategies and technologies for enhancing rapeseed- mustard production and farmer income. *Indian Farming* **68(1)**: 44-48 (2018).
7. Swain, M., Problems and prospects of oilseeds production in Rajasthan: Special reference to rapeseed & mustard, *AERC Report* submitted to Ministry of Agriculture, Government of India, New Delhi (2013).