

ORIGINAL ARTICLE

Growth Trends, Impact of Agricultural Inputs on the Production and Constraints Associated with Production of Rapeseed-Mustard: A Case Study of Khoirabari Block of Udalguri District of Bodoland Territorial Region (BTR)

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ABSTRACT

The study has been carried out to examine the growth trends of area, production and productivity of rapeseed-mustard, to examine the impacts of agricultural inputs on the production of rapeseed-mustard and find out the constraints faced by the rapeseed-mustard growers of Khoirabari block. The result of using compound annual growth rate shows that there has been increasing nature of growth trends in area, production and productivity of rapeseed-mustard in study area. Finding reveals that the regression coefficient of irrigated area, fertilizer and labour were positive and significant at 1 per cent significant level. While non-irrigated area was found to be positive and significant impact on rapeseed-mustard production at 5 per cent significant level. The result also reveals that seed has positive but not significant impact on production. It is found from survey that selected respondents are not using HYV seed and hybrid seed for which it has positive but not significant impact on production. Pesticide has negative and not significant impact on the production of rapeseed-mustard production. The result of using Garrent's ranking technique for ranking the major constraints faced by the farmers by the farmers for the production of rapeseed-mustard was lack of availability of seed followed by high cost of fertilizer, inadequate irrigation facility, lack of pesticide and lack of labour. The government should take steps of developing HYV seeds of rapeseed-mustard to ensure quality seeds and availability of inputs at reasonable prices at the proper time.

Keywords: Rapeseed-mustard, Growth Trends, Multiple Regression Analysis, Constraints

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INTRODUCTION

India is the third-largest producer of rapeseed and mustard, following Canada and China, contributing to around 11 per cent of the world's total production. Rapeseed and mustard are important oilseed crops and rank as the second-largest oilseed crops in India. In India, rapeseed and mustard are grown during the rabi season, from September to October. Since these crops are grown during the dry season, pre-sowing irrigation is necessary before the seeds are sown. For optimal growth, the crops typically require three irrigation applications at three-week intervals after sowing. Rapeseed and mustard production in India has increased from approximately 8.6 million tons (MT) in 2020-21 to 11 MT in 2021-22, and further to 12 MT in 2023-24 [7]. The area under cultivation has expanded from 6.70 million hectares in 2020-21 to 8.8 million hectares in 2022-23 [7]. The economic contribution of rapeseed-mustard has risen significantly, from 223 billion INR in 2012 to 327 billion INR in 2021 [5]. The seeds and oil are used as condiments in the preparation of pickles, curries, vegetables, hair oils, medicines and for the manufacture of grease. The leaves of young plants are consumed as green vegetables, while the green stems and leaves serve as an excellent source of fodder for cattle. Additionally, rapeseed and mustard cultivation provides a significant income source for farmers. In the state, rapeseed-mustard is grown entirely as a rainfed crop, because of non-availability of irrigation facilities. Moreover, about 90 per cent of the crop is cultivated by

the farmers in marginal and sub-marginal land. Production of it is also limited owing to non-adoption of recommended agronomic practices like timely sowing, optimum fertilizer application, seed rate, etc. which also reduce the yield to a greater extent. There has been a significant increase in the area, production, and productivity from 2007-08 to 2021. The cultivated area expanded from 235,000 hectares in 2007-08 to 288,945 hectares in 2021. Similarly, production rose from 123,000 tons in 2007-08 to 186,129 tons in 2021. Productivity also saw an improvement, increasing from 523 kg per hectare in 2007-08 to 644 kg per hectare in 2021. [11]

LITERATURE REVIEW

Sarkar (2023) used correlation and regression analysis to find the impact of chemical fertiliser, organic fertiliser and pesticide on yield of mustard of Kaliyaganj CD block of Uttar Dinajpur District of West Bengal. The result reveals that all the three variables having significantly correlated with the mustard yield [9]. Yilmaz and Avkiran (2020) found from their study that the government supports of diesel oil, fertilizer, certified seed usage and premium support have important increasing effects on farmers income and decreasing the costs in canola (rapeseed) production in Trakya Region of Turkey. It means that used of irrigation, fertiliser, HYV seed and government subsidy have significant impact on the production of rapeseed-mustard [12]. Kumar et al. (2018) found that proper irrigation, insecticide spraying, appropriate sowing methods, thinning, use of basal doses of urea at sowing time and effective weed management significantly enhance the productivity of rapeseed and mustard in the Jammu Division of Jammu and Kashmir [6]. There has been a moderate to high significant growth rate in area, production and productivity of rapeseed-mustard in Nagaon compared to Assam. And there has been also wide fluctuation in the growth of area, production and productivity of rapeseed-mustard over the study period (Das and Sharma, 2012) [2]. Weedicide, high cost of insecticides and pesticides, malpractices of the merchants, high cost of fertilizers and high cost of HYVs seed are the major constraints faced by the cultivators (Asiwal, 2013) [1]. While high input costs, merchant malpractices, and costly HYV seeds continue to be major obstacles, rapeseed and mustard yields are increased by proper irrigation, pest control, timely sowing, urea application, and weed management.

OBJECTIVE

The study is based on following objectives:

1. To examine the growth trends of area, production and productivity of Rapeseed-Mustard of Udalguri.
2. To examine the impacts of agricultural inputs on the production of rapeseed-mustard in Khoirabari block.
3. To find out the constraints faced the rapeseed-mustard growers of Khoirabari block.

MATERIAL AND METHODS

Study Area

Udalguri district is a district of BTR of the state of Assam. According to the 2011 census, total area of district is 1,852.16 sq. km. Udalguri district is bounded by Bhutan and West Khamen district of Arunachal Pradesh in the north, Sonitpur district in the east, Darrang district in the south and Baksa district in the west. Udalguri district is located between 26.7452° N latitude and 92.0962° E longitude. The economy of Udalguri district is predominantly agrarian, with nearly 95% of the total population depending on agriculture and allied activities for their livelihood. According to the 2011 census, more than 95 per cent of the total population of Udalguri district lives in rural areas. Agriculture is the primary occupation of the inhabitants of Udalguri district and contributes significantly to the district's economy. After rice they cultivate green gram, mustard, blackgram, potato and vegetables. In the district there are 11 blocks, out of the 11 blocks Khoirabari block has been selected purposively because most of the farmers are cultivate it.

Data Collection and Study Techniques

The study was based on both primary and secondary data. Secondary data have been collected from District Statistical Handbook of Udalguri, books, journals and websites.

To collect primary data study was conducted in three villages of Khoirabari block of Udalguri district. The purposively sampling method was used to determine the village and the number of samples for each village based on rapeseed-mustard growing activities. Data were collected mainly from primary sources by a questionnaire administered to 54 rapeseed-mustard growers selected by simple random sampling method. The questionnaire was implemented in 2023-24 in 3 (three) villages were selected to represent the rapeseed-mustard growing area.

Method to Analyze Data

1. To analyse the growth of area, production and productivity of rapeseed-mustard in the district, the Compound Annual Growth Rate (CAGR) has been used. The following is the formula of CAGR –

$$\text{CAGR } (t_0, t_n) = \left(\frac{V(t_n)}{V(t_0)} \right)^{\frac{1}{t_n - t_0}} - 1 \times 100$$

Where, $V(t_0)$ = Beginning value of area, production and productivity of rapeseed-mustard (i.e 2008-09).

$V(t_n)$ = Final value of area, production and productivity of rapeseed-mustard (i.e 2017-18).

$t_n - t_0$ = Number of years.

2. To examine the impact of agricultural inputs on rapeseed-mustard production, irrigation, high-yielding variety (HYV) seeds, fertilizers, pesticides and labour were randomly selected as independent variables and multiple regression analysis was used. The literature review indicates that all the selected independent variables significantly influence rapeseed-mustard production. However, the survey revealed that only a small number of respondents use irrigation for rapeseed-mustard cultivation. Therefore, non-irrigated areas, where the selected respondents did not use irrigation, were also included in the study as an independent variable to assess their impact on rapeseed-mustard production.

Formula of Multiple regression analysis –

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + e$$

Where, y = Dependent variable (production rapeseed-mustard).

b_0 = Intercept, b_1 = Slope of Coefficient for irrigation used area, b_2 = Slope of Coefficient for fertilizer, b_3 = Slope of Coefficient for seed, b_4 = Slope of Coefficient for pesticide, b_5 = Slope of Coefficient for labour, b_6 = Slope of and Coefficient for non-irrigated area.

X_1, X_2, X_3, X_4, X_5 and X_6 = Independent variables (irrigated area, fertiliser, seed, pesticide, labour and non-irrigated area) and e = error term.

Garrent's Ranking Technique

Technique has been used to ranking the constraints faced by the by selected respondents in the cultivation of rapeseed-mustard. Formula of Garrent's Ranking Technique:

$$\text{Percent position} = \frac{100(R_{ij} - 0.5)}{N_j}$$

Where,

R_{ij} = Rank given for the i^{th} variable by j^{th} respondents.

N_j = Number of variable ranked by j^{th} respondents.

RESULT AND DISCUSSION

1 Growth in Area, Production and Productivity of Rapeseed-Mustard of Udalguri from 2008-09 to 2017-18.

The study was conducted over a period of 10-years, from 2008–09 to 2017–18, as this represents the span for which reliable and consistent data were available. While a longer timeframe might have offered deeper insights into long-term trends, but due to data limitations the analysis is confined to these years. By focusing on this period, the study ensures the use of accurate and verifiable information, effectively capturing key patterns and trends.

Table No. 1 Growth in Area, Production and Productivity of Rapeseed-Mustard of Udalguri from 2008-09 to 2017-18

Year	Rapeseed & Mustard		
	Area	Production	Productivity
2008-09	5529	1839	333
2009-10	5144	1608	313
2010-11	3860	1596	413
2011-12	4370	1659	380
2012-13	4763	1328	279
2013-14	6831	2452	359
2014-15	7036	5852	832
2015-16	5815	2452	359
2016-17	6050	4734	782
2017-18	6045	4443	735
CAGR	0.9	10.2	9.1

Area= Hectare; Production= Metric Tons; Productivity= Kg/hectare

Source: Statistical Handbook of Udalguri.

Calculated by Author.

It is also clear from Table No. 1 that growth trends of area, production and productivity of rapeseed & mustard exhibit fluctuation and increasing nature. The area, production and productivity of rapeseed & mustard increased by 0.99 per cent, 10.2 per cent and 9.1 per cent respectively. It is observed from the finding that production and productivity have increased due to increased in area of cultivation.

ii. Impact of Agricultural Inputs on the Production of Rapeseed-Mustard

From the literature review, it has been found the agricultural inputs such as irrigation, fertilizer, labour, seed and pesticide played a significant role in enhancing the production of rapeseed-mustard.

Table No. 2 Impact of Agricultural Inputs on the Production of Rapeseed-Mustard

Particular	Coefficients				Sig.
	Unstandardized Coefficients		Standardized Coefficients	T	
	B	Std. Error	Beta		
(Constant)	1.194	.349		3.419	.001*
Irrigated Area	.148	.032	.475	4.652	.001*
Fertiliser	.042	.006	.556	6.757	.001*
Labour	.124	.038	.300	3.255	.002*
Seed	.032	.022	.178	1.442	.156
Pesticide	-.031	.019	-.144	-1.601	.116
Non- Irrigated Area	.057	.026	.283	2.198	.033**

R Square=.796, * Significant at 1% Significant and ** Significant at 5% significant

Source: Field Survey

Calculated by Author.

Table No.2 highlights the impact of irrigated area, fertilizer, labour, seed, pesticide and non-irrigated area on rapeseed-mustard of study region. The R square value 0.796 of using multiple regression analysis shows that 79.6 per cent variation in rapeseed-mustard production is due to above mentioned variables. Finding reveals that the regression coefficient of irrigated area, fertilizer and labour were positive and significant at 1 per cent significant level. One per cent increase in quantity of irrigated area, fertilizer and labour were led to an increase in the production by .148 per cent, .042 per cent and .124 per cent, respectively. While Non-irrigated area was found to be positive and significant impact on rapeseed-mustard production at 5 per cent significant level and one per cent increase in quantity of non- irrigated area led to an increase in the production by .057 per cent. The error term accounts for the 20.4 per cent variation in rapeseed-mustard production that is not explained by the above taken independent variables. [1, 2,9,12 and 6] found from their study that used of irrigation, fertiliser, HYV seed, insecticide spraying and government subsidy have significant impact on the production of rapeseed-mustard. But the study found that seed has positive but not significant impact on production. And also Pesticide has negative and not significant impact on the production of rapeseed-mustard production. It is found from survey that selected respondents are not using HYV seed and optimal quantity of pesticide for which they have not significant impact on production.

Ranking Constraints faced the Rapeseed-Mustard Growers of Khoirabari block

The major constraints faced by farmers in production are presented in Table No. 3. It can be seen from Table No.3 that lack of availability of seed was considered most important constraint related to rapeseed-mustard production with Garret's score of 58.7 followed by high cost of fertiliser 57.9, inadequate irrigation facility by 53.6, lack of pesticide 52.8 and lack of availability of labour by 50.3. Finding of the study is similar to the findings of [8] and [10].

Table No. 3 Ranking Constraints faced the Rapeseed-Mustard Growers of Khoirabari block.

Sl. No.	Particulars	Total Number of respondents	Total Score	Total Mean	Rank
1.	Inadequate Irrigation Facility	54	2904	53.6	III
2.	High cost of Fertiliser	54	3130	57.9	II
3.	Lack of Availability of Labour	54	2720	50.3	V
4.	Lack of Availability of Seed	54	3175	58.7	I
5.	Lack of Pesticide	54	2855	52.8	IV

Source: Field Survey

Calculate by Author

CONCLUSION

From the study it has been found that there has been positive growth trend of area, production and productivity of rapeseed & mustard exhibit fluctuation and increasing nature. It is observed from the finding that production and productivity have increased due to increase in area of cultivation. Finding reveals that the regression coefficient of irrigated area, fertilizer, labour and non-irrigated area were positive and significant impact on the production. The result also reveals that seed has positive but not significant impact on production. It is found from survey that selected respondents are not using HYV seed and hybrid seed for which it has positive but not significant impact on production. Pesticide has negative and not significant impact on the production of rapeseed-mustard production. The result of the study also reveals that major constraint faced by the farmers in the study area was lack of availability of seed. The government should take steps of developing HYV seeds of rapeseed-mustard to ensure quality seeds and availability of inputs at reasonable prices at the proper time.

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