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Resource-use-efficiency and Constraints Faced by the King Chilli Growers in Peren District of Nagaland

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ABSTRACT

Background: The cultivating of King chilli has been practicing since long in Peren district of Nagaland; and registered under Geographical Indication Tag in the year 2006. So, the present study aimed to access the inputs used with maximum level of resource-use-efficiency tocontributethe output and highlight the major constraints faced by the King chilli growers.

Methods: The present research investigation were carried out during the agricultural year 2020-21 with a total of 120 King chili growers; selected by following a multi-stage simple random quota sampling technique to access the impact.

Result: The King chilli growers of marginal and small both farm size groups were found to be highly statistically significant at 1 per cent level; by ceteris paribus, the selected inputs were categorized *viz;* underutilized and over utilized with the available resources and further main constraints faced by the respondents were highlighted.

Key words: Constraints, Efficiency, King chilli, Peren, Resource.

INTRODUCTION

Chilli (*Capsicum annum* L.) is valued for its diverse commercial uses. It has been used since ancient time traditionally in the form of spices (Jagtab *et al*., 2012). It is used as a natural flavour and colorants. Besides using chilli in culinary dishes, they are also possessing medicinal properties which are used in the treatment of various diseases (Anonymous, 2019). Chilli is widely used in the north eastern Indian states as traditional medicine for treatments of various ailments as well as to increase the taste and flavour of food (Anonymous, 2018a).

Chilli is mostly grown for its pungency and antioxidants which play a vital role in preventing and reducing many diseases. Chilli consists of five domesticated species: *Capsicum annum, Capsicum baccatum, Capsicum chinense, Capsicum frutescence* and *Capsicum pubescences*. Out of this *Capsicum annum* is grown worldwide (Anonymous, 2018b).

The world area and production of chilli is around 1.50 million ha and 7.00 million tonnes, respectively. The major chilli producing countries are Pakistan, Indonesia and Sri Lanka in Asia, Nigeria, Ghana and Egypt in Africa, Mexico, USA in North and Central America. India is the world leader in production of chilli followed by China and Pakistan. The bulk share of chilli production is held by the Asian country (Ravichandran and Banamurthy, 2011).

Chilli which is popularly known as 'Wonder spice' is a major spice as well as vegetable crop in many countries. It gains its popularity through more than 400 varieties available all over the world with different pungency, size, shape and colours and its usage (Babu *et al.* 2003). Chilli is an indispensable condiment and used in the diet of every Naga household in one or the other form. For a decade Naga people have been eating chilli. It fruits forms an essential ingredient of the Naga kitchen cuisine (Kedrishi, 2021). King chilli is used in bulk quantities both in fresh as well as dried forms. Chilli in Nagaland is grown commercially for its fruits and constitutes the principal source of dry chillies for marketing.

King chilli which is popularly known as 'Wonder spice' is a major spice as well as vegetables crop in many countries.

- Even for the King chilli Geographical Indication (GI) has been registered by the Nagaland State Government to be a hottest chilli in the world in 2006 with 1,001,304 Scoville heat unit (SHU) (Anonymous, 2019). The King chilli cultivation is very popular in the Nagaland state with different varieties, pungency, size, shape and colours and its usage.
- King chilli is also used for a medicinal purpose, fresh and dried chillies are used for ingredients and pickle; it is also used for extraction of oleoresin and capsaicin.
- King chilli is extensively consumed in the state, therefore it is foremost need to evaluate the resource-use-efficiency to gain more benefit against input.

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Objective

For the present study two specific objectives were fame to conduct the research study:
i). To evaluate the resource-use-efficiency in the production of King chilli and ii). To study the constraints faced by the respondents during the cultivation of King chilli.

MATERIALS AND METHODS

The present research study was conducted in Peren district of Nagaland during the agricultural year of 2020-21. Table 1 reveals that a sample of 120 King chilli growers were selected following a multistage sampling technique. In the first stage two blocks of Peren district *viz*; Peren Block 'B' and 'C' and four villages were selected randomly, then a list of farmers of the village were prepared separately and on the basis of land holdings (ha), then 30 farmers from each village were selected by purposive stratified simple random method and distributed into two groups, based on the area of land holding of the respondent for the assessment of resource-use efficiency of king chilli cultivation *viz*; respondents were classified into two groups Group-I: marginal (<1.00 ha), Group-II: small (1.01 to 2.00 ha) based on the area under land holding (opted from Kedrishi, 2018).

Production function analysis (PFA)

To measure the efficiency of input variable, production function analysis was carried out. The Cobb-Douglas production function is a follow:

$$Y = a\, x_1^{b1}, x_2^{b2}, x_3^{b3}, x_4^{b4}, x_5^{b5}, x_6^{b6}, x_7^{b7}, x_8^{b8} \ldots\ldots X_n^{bn}$$

Whereas:
Y = Total yield of King chilli (kg/ha).
x_1 = Land rental value (Rs/ha).
x_2 = Own family labour (Rs/ha).
x_3 = Hired family labour (Rs/ha).
x_4 = Seed value cost (Rs/ha).
x_5 = FYM expenditure cost (Rs/ha).
x_6 = Irrigation water charges (Rs/ha).
x_7 = Transportation cost (Rs/ha).
x_8 = Miscellaneous cost (Rs/ha).
a = Constant.
b_1, b_2, b_3, b_4, b_5, b_6, b_7 and b_8 = Regression coefficients of respective independent variable over dependent variable.

In the present study Cobb-Douglas type of production function was used to examine the resource use efficiency in King chilli cultivation. Per farm gross yield was regressed with per unit of input used *viz*; expenditure on land hiring charges, own family labour, hired human labour, seed cost, FYM cost, Irrigation water cost incurred, transportation cost and miscellaneous expenses (included interest on working capital, packing materials, depreciation and interest on fixed capital assets). The regression coefficients thus obtained were found to be either positive or negative without statistical significance. The zero-order correlation matrix did not show any degree of multicollinearity among some of the independent variables.

The final regression analysis included land hiring charges (x_1), own family labour (x_2), hired human labour (x_3), seed cost (x_4), farmyard manure cost (x_5), Irrigation water cost (x_6), transportation cost (x_7) and miscellaneous expenses (included interest on working capital, packing materials, depreciation and interest on fixed capital assets) (x_8). The results of the analysis have been presented in the following section.

Constraints in production and marketing

The response of the farmer to various problems faced in production and marketing of king chilli was estimated through frequency, simple percentages are estimated to examine the problems.

RESULTS AND DISCUSSION

Table 1 reveals the total 120 farmers were selected for the King chilli cultivation; out of total 31.67 per cent was marginal farmers (up to 1 ha land) and 68.33 per cent was small farmers (1.01 to 2.00 ha land), respectively.

Table 2 reveals the ordinary least square (OLS) estimates of parameters of the Cobb-Douglas production function with respect to different size groups and all farm samples. The regression coefficient of land hiring charges was found to be positive and statistically significant at 1 per cent level on Group I (marginal), II (small) and Group III (overall) farm size groups, which was indicating the significant contribution towards the gross yield of the King chilli cultivation in all the selected farm size groups.Similar results are in the line with Sharma and Kalita (2008) and Sharma *et al.* (2018).The regression coefficient of seed cost was found to be positive and statistically significant at 5 per cent level in group I and II, indicating the significant contribution to the gross yield of the King chilli cultivation on both (marginal and small) farm size groups, respectively. Similar results were in the line with Sharma (2012) and Chishi and Sharma (2019).

Table 2, reveals that the regression coefficient of seed cost was found to be positive and statistically significant at 10 per cent in group III, indicating significant contribution to the gross yield of the King chilli cultivation in this group.The regression coefficient of transportation and Miscellaneous cost expenses and other expenses were found to be positive but non-significant in overall farm size groups.It was observed from the data that some regression coefficients were negative and non-significant indicating that although these inputs were important but played reverse role in the present level of production of King chilli cultivation, so it has negative contribution of these inputs to gross yield.

Table 1: Sample respondents on different farm size groups.

Group	Category (ha)	No. of selected samples farmers
Marginal	<1.00 ha	38 (31.67)
Small	1.01 to 2.00 ha	82 (68.33)
Total		120 (100.00)

(Parentheses indicate percentage to the total).

Similar results were in the line with Sharma (2006) and Sharma (2012).

Table 2 reveals that the value of co-efficient of multiple determinations (R^2) ranged from 0.99.39 in group I to 0.9528 in group III, which explained variation in the dependent variable by the independent variables chosen in the function. The remaining variation of dependent variable might be due to those variables, which have not been captured in the function such as rainfall, temperature, humidity. The value of (R^2) in all farm samples was found to be 0.9939 indicating that 99.39 per cent of variation in the dependent variable was explained by the independent variables chosen in the function. The remaining 0.61 per cent of variation might be due to some other factor; which have not been captured in the function. Similar results were in the line with Sharma (2013a) and Yadav and Sharma (2019).

Table 3 reveals the return to scale was estimated and found to be greater than unity in group I, group II and group III, which was further indicating increasing return to scale, whereas it was less than unity means less than 1 on group III, indicating decreasing return to scale. The elasticities of production of each input revealed the estimated percentage change in gross return associated with one per cent change in the input, while other resources inputs are held constant. The estimated elasticity of production of each input, it was found to be less than unity in different size groups except for transportation in group III, indicating that use of one more unit of will keeping other inputs constant in group III would

Table 2: Elasticity Co-efficient of Strategic inputs of king chilli on farm size groups.

Variables		Coefficients	Standard error	t-statistics	
Marginal farm size group (n=38)					
Inputs	R^2	0.9939768	-		***
	F-value	206.280977			***
	a	-2.7918644	4.22516128	-0.66077	NS
Land	x_1 Variable	109.757131	3.7006165	29.65915	***
Own Family labour	x_2 Variable	-0.001683	0.0006712	-2.50741	NS
Hired human lab	x_3 Variable	-0.0022812	0.00179629	-1.26994	NS
Seed cost	x_4 Variable	0.02231481	0.0092419	2.414526	**
FYM cost	x_5 Variable	-0.0557088	0.18813129	-0.29612	NS
Irrigation water cost	x_6 Variable	-2.161E-05	0.00120142	-0.01799	NS
Transportation	x_7 Variable	-0.0017105	0.00074318	-2.30155	NS
Miscellaneous cost	x_8 Variable	-0.0010678	0.00137009	-0.77935	NS
Small farm size group (n=82)					
Inputs	R^2	0.99403521	-		***
	F-value	208.313059			***
	a	-271.5439	410.600588	-0.66133	NS
Land	x_1 Variable	10983.2613	368.758077	29.78446	***
Own Family labour	x_2 Variable	-0.1677821	0.06660285	-2.51914	NS
Hired human labour	x_3 Variable	-0.2306354	0.17875463	-1.29023	NS
Seed cost	x_4 Variable	2.26057763	0.92136781	2.453502	**
FUM cost	x_5 Variable	-0.0828214	0.19180013	-0.43181	NS
Irrigation water cost	x_6 Variable	-0.0050238	0.11419378	-0.04399	NS
Transportation	x_7 Variable	-0.170825	0.07309648	-2.33698	NS
Miscellaneous cost	x_8 Variable	-0.1065297	0.13521377	-0.78786	NS
Overall farm size group (120)					
Inputs	R^2	0.95278305	-		***
	F-value	128.640064			***
	a	1230.569	789.577819	1.558515	*
Land	x_1 Variable	9705.20527	328.674641	29.52831	***
Own Family labour	x_2 Variable	-0.0210214	0.1504593	-0.13972	NS
Hired human labour	x_3 Variable	-0.1234738	0.1946989	-0.63418	NS
Seed cost	x_4 Variable	0.51790499	0.91486143	0.566102	*
FYM cost	x_5 Variable	-0.9286774	0.43525158	-2.13366	NS
Irrigation water cost	x_6 Variable	-0.0001529	0.20573607	-0.00074	NS
Transportation	x_7 Variable	0.02530609	0.14156633	0.178758	NS
Miscellaneous cost	x_8 Variable	0.06461886	0.14884987	0.434121	NS

(***,**,*Significant at 1 per cent; 5 per cent and 10 per cent; NS: Non-significant).

increase the gross yield by unit per cent, showing overall increasing return with respect to these particular variable, while negative and less than unity on the different farm size groups, indicating to reduce the investment immediately. Similar results were in the linewith Sharma (2013b) and Sachin *et al.* (2015).

To evaluate how efficiently the farmers of the study area were using their resources, the marginal value of product (MVP) of an input was compared with its respective costs in Table 3. The overall MVP of land hiring cost was worked out, which indicated that addition of one unit of unit would have increased the gross yield by the unit itself. Amongst the different size groups of growers has potential to all farm size groups. The overall MVP of inputs selected was worked out with negative signed, indicating that addition of one unit, would have decreased gross yield, amongst the different size groups of growers. Similar results were in the line with Sharma (2013c); Sharma (2015a).

While the MVP with positive signed was worked out at different level of test of significance, indicating that addition of one unit of would have increased gross yield by the unit selected and also having the future scope of investment to the input on group I, II and III. Finally, the overall situation, the ratio of MVP to its factor cost was found to be positive but less than unity for land hired cost and seed cost, transportation cost and miscellaneous expenses indicating a increasing as well as decreasing return of these inputs to the gross yield. Thus, there is no scope for increasing the expenditure of those inputs, while it was found to be negative but less than unity; indicating excess use of these inputs, which should be minimised to ensure significant contribution to the gross yield. So reshuffling of the resources from least potential to the fusible invest it required immediately to make the existing farming business more profitable towards the increase in the use of those inputs in order to secure higher returns within the available resources. Similar results were in the line with Sharma *et al.* (2007) and Sharma (2015b); Yani and Sharma (2022).

An attempt was made to study the constraints faced by the king chilli growers in the study area. The results gathered

Table 3: Result of marginal value of product analysis of king chilli.

Particulars	MVP	Efficiency	Status
		Group I (Marginal farm)	
Land charges (x_1)	-7993.792	-0.989943	Over utilized
Family labour (x_2)	36463.2193	112.1945	Under utilized
Hired human (x_3)	-42.451855	-2.02151	Over utilized
Seed cost (x_4)	-0.7208319	-0.01029	Over utilized
Manures cost (x_5)	25.6416197	3.20520	Over utilized
Irrigation water (x_6)	-142.30602	-5.69224	Over utilized
Transport cost (x_7)	-0.0231907	-0.00165	Over utilized
Miscellaneous cost (x_8)	-2.0782106	-0.00218	Over utilized
Yield (Y)	-0.0912241	-0.00121	Over utilized
		Group II (Small farm)	
Land charges (x_1)	-1936126.6	-473.9599	Over utilized
Family labour (x_2)	3968503.13	13011.485	Under utilized
Hired human (x_3)	-9262.535	-441.0730	Over utilized
Seed cost (x_4)	-116.55421	-1.665060	Over utilized
Manures cost (x_5)	2203.81917	244.8687	Under utilized
Irrigation water (x_6)	-509.39953	-20.3759	Over utilized
Transport cost (x_7)	-12.533505	-0.895250	Over utilized
Miscellaneous cost (x_8)	-514.65006	-0.4972464	Over utilized
Yield (Y)	-16.037266	-0.2138302	Over utilized
		Group III (Overall farm)	
Land charges (x_1)	10401063.1	2543.047	Under utilized
Family labour (x_2)	3542157.21	11575.677	Under utilized
Hired human (x_3)	-1348.0596	-61.27543	Over utilized
Seed cost (x_4)	-65.658026	-0.92476	Over utilized
Manures cost (x_5)	474.833625	39.569468	Under utilized
Irrigation water (x_6)	-6498.884	-270.78683	Over utilized
Transport cost (x_7)	-0.4417991	-0.0276124	Over utilized
Miscellaneous cost (x_8)	108.028995	0.4321159	Over utilized
Yield (Y)	11.7133934	0.1464174	Over utilized

Table 4: Constraints faced by the king chilli growers.

Constraints	Frequency	Per cent	Rank
Problems due to pests and diseases	49	81.66	I
Lack of knowledge	48	80.00	II
Lack of extension service	46	76.66	III
Lack of marketing agency	44	73.33	IV
Lack of credit facility	43	71.66	V
Unavailability of market	42	70.00	VI
Lack of capital	36	60.00	VII
Unavailability of labour	30	50.00	VIII
Lack of transport facility	27	45.00	IX
Lack of storage facilities	20	33.33	X

from the research are expressed in descending order of their relative significant with the help of frequency, simple percentage and ranking. The ranking of constraints was found to be similar across various size groups of farmers. Therefore, problems faced by the king chilli growers are not according to different size groups. The above table represents the problems of sample farmers (Borah and Sharma, 2021).

Table 4 revels the production problems of King chilli faced by the growers in the study area. Pest and diseases and lack of knowledge was most felt recorded as ranks I and II in the production problem. Lack of extension service, lack of marketing agency and lack of credit facility comes to III, IV and V, respectively isalso ranking for production problems. Therefore, proper training and demonstration to the farmers need to be imparted for improved package of practices for efficient resource use, unavailability of market, lack of capital and unavailability of labour is also a major problem faced by the king chilli growers which comes to rank VI, VII and VIII in ranking, so the farmers generally sell their produce directly to the consumer or to the retailer, it was also found that the Lack of transport facility and lack of storage facility act as one of major problem which rank to IX and X. Similar results were in the finding with Sharma (2011); Sharma (2014) and Sharma (2016); Yadav *et al.* (2021).

CONCLUSION

The following conclusion may be drawn from the present study, since the farmers are not aware of technical knowledge and scientific technology. Training and demonstration on improved packaged of practices to the area should be given properly to enhance their knowledge and production. Further cultivation of improved varieties of king chilli with profitable economic return should be encouraged, to train the farmers for effective control of insects, pest and diseases, the agriculture extension workers need to gear up their activities. Also marketing system should be improved through market intelligence, market research and marketing extension in the area and to improve the marketing system as well as to avoid price fluctuation government and district municipal board should establish a regular market. Even it was also found that the Pest and diseases and lack of knowledge was most felt by the growers of king chilli. Lack of extension service, lack of marketing agency and lack of credit, unavailability of market, lack of capital and unavailability of labour is also a major problem faced by the king chilli growers, it was also found that the Lack of transport facility and lack of storage facility act as one of major problem.

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