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RESEARCH PAPER

Constraints faced by farmers in energy consumption in crop production in Belagavi and Gadag districts of north Karnataka

S. N.VARSHITHA [1], S. S. GULEDAGUDDA[1], G. N. KULKARNI[1] AND N. M. KERUR[2]

[1]Department of Agricultural Economics, [2]Department of Agri business Management
College of Agriculture, University of Agricultural Sciences, Dharwad - 580 005, India
E-mail: varshithasn7@gmail.com

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Abstract: Energy is a critical input in all forms of economic activity on adaptability basis and plays a significant role in daily living from cooking to production activities. A farm is both consumer of energy and also producer. Farming through production process converts input energy into output energy on various forms of outputs produced in agriculture. The pattern in which energy inputs are used in crop production is closely related to the nature of cropping pattern and crop intensities. Therefore, there is a need to understand the constraints faced by farmers in energy consumption during crop production. In this context, the present study was conducted in Belagavi and Gadag districts of North Karnataka. The primary data pertaining to the crop year 2021-22 were collected from 72 farmers from irrigated condition and equal number of farmers from rainfed condition from two districts, comprising 144 farmers. The collected data on constraints were analysed using Garrett ranking technique. The major findings of the study revealed that non-availability of labour during peak operations in crop production observed in both Belagavi and Gadag districts (with Garrett score of 76.55 and 67.69 respectively). The second major constraint in Belagavi district was non-availability of draft animals (65.44) while, in Gadag district it was lack of accessibility of inputs like seeds, fertilizers and FYM (62.90), respectively. The third constraint in Belagavi district was non-availability of required machines at custom hiring centers (Garrett score 61.25) while, in Gadag district it was high cost of using mechanical power during farm operations (Garrett score 59.63) and the last constraint in both districts was given to Govt. support through subsidy to purchase of machinery (with score of 18.55 and 15.28).

Key words: Agriculture, Constraints, Energy, Garrett rank

Introduction

Agriculture in India occupies a significant position in the country's economy and provides livelihood and employment to over 42 per cent of the population (Anon., 2021) and contributes around 18.80 per cent to the GDP (2021-22). The agriculture sector has major implications for the overall demand and supply of energy in India.

Energy has been a key input for agriculture since the age of subsistent farming. It is established worldwide that agricultural production is positively correlated with energy input while; agriculture is both a producer and consumer of energy. It uses large quantities of locally available non-commercial energy input, such as seed, manure and animate power, as well as commercial energies, directly and indirectly in the form of diesel, electricity, fertilizer, plant protection chemicals, irrigation water, machineries *etc*.

India has made a considerable progress in enhancing agricultural production and productivity due to the introduction of high yielding varieties, intensive cropping system and increased usage of chemicals, fertilizers and high level of mechanization. On the contrary, the agriculture production too has become quite energy intensive (Sidhu *et al.,* 2004).

The use of energy in crop production depends on the availability of energy sources and the capacity of the farmers. Agricultural productivity is directly proportional to energy input usage in the form of improved inputs such as seeds, fertilizers, chemicals, irrigation water and mechanization including management practices (Kalbande and More, 2008).

Material and methods

Study area and sampling procedure

The main objective of the present research was to analyse the constraints on energy use faced by farmers in Belagavi and Gadag districts of North Karnataka. Belagavi district was chosen purposively based on highest area (80% of the gross cropped area) under irrigated farming while, Gadag district was selected based on maximum area under rainfed farming (75% of the gross cropped area) within the UAS, Dharwad jurisdiction. The purpose of selecting a two production regime mainly to analyse diversity in terms of energy use pattern among farmers.

Multistage purposive cum random sampling technique was employed for the selection of districts, taluks and villages. In the first stage, Belagavi and Gadag districts were chosen purposively based on highest area under irrigated and rainfed farming, respectively. In the second stage, two taluks are selected based on similar criteria adopted for each district. In third stage, three villages are choosen based on irrigation and rainfed criteria adopted for each taluk. In the fourth stage, 12 farmers are selected randomly in each regime. Thus, comprised a total sample size of 144 farmers.

Sources of data

For achieving the objective of the study, primary data were used. The primary data pertaining to the cropping year 2021-22 were collected from 144 farmers from both districts who cultivated sugarcane and cotton crops based on area under irrigation in Belagavi and area under rainfed production in Gadag

district.The data on different inputs energy used for field operations (land preparation, cultural practices, management, chemical fertilizers, pesticides and harvesting *etc*.) were collected by interviewing 72 farmers each from selected sample districts using a specially designed pre-tested schedule adopting field survey method. The primary data were completely memory based as none of the farmers maintained farm records.

Analytical tools and techniques employed

Garrett's ranking technique

To identify constraints faced by sample respondents in energy consumption under irrigated and rainfed conditions of North Karnataka, Garrett's ranking technique was used. Basically, it gives the change of orders of constraints and advantages into numerical scores. Initially a pilot survey and also literature review was taken up to list the various constraints in energy consumption in crop production. Various constraints were listed down for energy consumption in both irrigated and rainfed conditions including the additional constraint given by the respondent other than the listed constraints during the survey. The prime advantage of this technique over simple frequency distribution is that the constraints are arranged based on their severity from the point of view of respondents.

The identified problems of respondents in the energy consumption in crop production are ranked by making use of Garrett's Ranking Technique. The technique was used to rank the preference mentioned by the respondents on constraints or problems on energy consumption in crop production across irrigated and rainfed regimes in North Karnataka. The technique was used to find out the most significant constraints which influenced the respondents during production. The study had the respondents' ranks on different problems and outcomes based on their impact and converted them into score value and were ranked with the help of the following formula:

$$\textbf{Per cent position} = 100 * (R_{ij} - 0.5) / N_j$$

Where,

R_{ij} = Rank given for i^{th} factor by j^{th} individual

N_j = Number of factors ranked by j^{th} individual

The per cent position of each rank is then converted into scores referring to the table given by Garrett and Woodswordh (1969). For each factor, the scores of individual respondents were added together and divided by the total number of the respondents for whom scores were added. These mean scores for all the factors were arranged in descending order, ranks were given, and the most important constraints were identified.

Results and discussion

Constraints of farmers in energy consumption in crop production in Belagavi district

The specific constraints faced by farmers in consumption of energy input in sugarcane and cotton cultivation under irrigated condition in the Belagavi district of North Karnataka are shown in Table 1. The ranks were assigned according to farmers' response and average score was calculated by using Garrett's ranking technique. It can be inferred from the results that non-availability of labour energy during peak crop production season was the major problem in Belagavi district with mean Garrett scores of 76.55 in the cultivation of sugarcane and cotton crops. The second constraint faced by farmers in the district was non- availability of draft animals (Garrett score 65.44). The third constraint faced by them was on non-availability of required machines at custom hiring centers (Garrett score 61.25). The other constraints in the district were lack of accessibility of inputs like seeds, fertilizers and FYM (Garrett score of 58.55), high cost of using mechanical power (Garrett score of 49.25), timeliness of operations is not possible by using mechanical power (Garrett score of 39.85), difficulties in repair and replacement of spare parts of farm machinery (Garrett score of 22.56). The last constraint faced by sample farmers was given to Govt. support through subsidy to purchase of machinery with a Garrett score of 18.55. These results are in line with the study conducted by Singh *et al.* (2021), who reported that majority (93.33%) of respondents faced problems in high cost of insecticides/fungicides/herbicides followed by high cost of farm machinery (91.67%), high cost of agricultural labour (87.50%), high cost of fertilizers (85.00%), high cost of sugarcane seed setts (81.67%) under economic constraints.

Constraints of farmers in energy consumption in crop production in Gadag district

The specific constraints faced by sample farmers in consumption of energy inputs on sugarcane and cotton cultivation under rainfed condition in the Gadag district are shown in Table 2. It can be inferred from the results that non-availability of labour during peak crop production season was the major problem with mean Garrett scores of 67.69 in the district in the cultivation of sugarcane and cotton crops. The second constraint faced by farmers was on lack of accessibility of key inputs like seeds, fertilizers, FYM (Garrett score 62.90). The third constraints faced by farmers in the district was high cost

Table 1. Constraints faced by farmers in energy consumption in Belagavi district for sugarcane and cotton cultivation

Factors	Belagavi district(n=72)	
	Mean score	Rank
Non-availability of labour during peak period	76.55	I
Non- availability of draft animals on time	65.44	II
Non- availability of required machines at custom hiring centers	61.25	III
Lack of accessibility of inputs (seeds, fertilizers, FYM) during sowing season	58.55	IV
High cost of using mechanical power during farm operations	49.25	V
Timeliness of operations is not possible by using mechanical power	39.85	VI
Difficulties in repair and replacement of spare parts of farm machinery on timely	22.56	VII
Govt. support through subsidy is not available on time to purchase of farm machinery	18.55	VIII

Table 2. Constraints faced by farmers in energy consumption in Gadag district for sugarcane and cotton cultivation

Factors	Gadag district(n=72)	
	Mean score	Rank
Non-availability of labour during peak period	67.69	I
Lack of accessibility of inputs (seeds, fertilizers, FYM) during sowing season	62.90	II
High cost of using mechanical power during farm operations	59.63	III
Timeliness of operations is not possible by using mechanical power	52.38	IV
Non- availability of required machines at custom hiring centers	42.21	V
Difficulties in repair and replacement of spare parts of farm machinery on timely	34.33	VI
Non- availability of draft animals on time	25.27	VII
Govt. support through subsidy is not available on time to purchase of farm machinery	15.28	VIII

of using mechanical power during farm operations (Garrett score 59.63). the other constraints faced by farmers were timeliness of operations is not possible by using mechanical power as fourth constraint (Garrett score of 52.38), non –availability of required machines at custom hiring centers (Garrett score of 42.21), difficulties in repair and replacement of spare parts of farm machinery (Garrett score of 34.33), non-availability of draft animals (Garrett score of 25.27) and the last constraint faced by sample farmers in the district was given to lack of Govt. support through subsidy to purchase of machinery (Garrett score of 15.28). These results are in line with the study conducted by (Patel and Vyas, 2017, Shashikant *et al*. 2011) who reported that shortage of labours (86%), unavailability of plant protection appliances (76%). More than half of the respondents faced constraints like lack of knowledge about disease control (68%), unavailability of inputs in time (54%) and inadequate availability of labour was the second major problem in red gram as cultivators required more labour for harvesting of red gram.

Conclusion

The study identified several critical problems faced by farmers of Belagavi and Gadag districts. On the basis of the findings, therefore, it may be concluded that the most serious and primary constraint perceived by the farmers was non-availability of labour during the peak crop production in both Belagavi (GS: 76.55) and Gadag (GS: 67.69) districts as sugarcane and cotton crops are labour intensive crops. The second major constraint faced in Belagavi district was the non-availability of draft animals, while in Gadag district; it was lack of accessibility of essential inputs like seeds, fertilizers, and FYM this problem. While the last constraint was on lack of government's subsidy support for the purchase of machinery.

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