A STUDY ON KNOWLEDGE AND ADOPTION OF RECOMMENDED CULTIVATION PRACTICES OF BLACKGRAM GROWERS IN NORTH EASTERN REGION OF KARNATAKA

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A STUDY ON KNOWLEDGE AND ADOPTION OF RECOMMENDED CULTIVATION PRACTICES OF BLACKGRAM GROWERS IN NORTH EASTERN REGION OF KARNATAKA

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BY

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CERTIFICATE

This is to certify that the thesis entitled **"A STUDY ON KNOWLEDGE AND ADOPTION OF RECOMMENDED CULTIVATION PRACTICES OF BLACKGRAM GROWERS IN NORTH EASTERN REGION OF KARNATAKA"** submitted by **Mr. ASHOKKUMAR BANSILAL** for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRICULTURAL EXTENSION EDUCATION** *to the University of Agricultural Sciences, Raichur, is a record of research work carried out by him during the period of his study in this University, under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.*

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Affectionately Dedicated To

My parents,

Sri. Bansilal Rathod

Smt. Rukmini

Grand mother

My lovely Brothers and Sisters

And my beloved teachers and friends

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LIST OF ABBREVIATIONS

%	Percentage
@	At the rate
AA	Agricultural Assistant
AAO	Assistant Agricultural Officer
ADA	Assistant Director of Agriculture
DAS	Days after sowing
F	Frequency
KA	Full adoption
kg	Kilogram
FK	Full knowledge
Fig	Figure
g	Gram
ICMR	Indian Council of Medical Research
KVK	Krishi Vigyan Kendra
l	Litre
ml	Millilitre
NA	No adoption
NK	No knowledge
NPK	Nitrogen Phosphorus Potassium
PA	Partial adoption
PK	Partial knowledge
PSB	Phosphorous Solubilising Bacteria
q	Quintal
SD	Standard Deviation
t	Tonnes
T.V	Television
UAS	University of Agricultural Sciences

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I. INTRODUCTION

Pulse crops play an important role in Indian agriculture. Besides being rich in protein, pulses are the main sources of essential amino acids for predominantly vegetarian population of India. They contain 22-24 per cent of protein, which is almost twice the protein in wheat and thrice as that of rice. In India, owing to its diverse agro-climatic conditions, pulses are grown throughout the year and plays an important role in crop rotation, mixed and inter-cropping, maintaining soil fertility through nitrogen fixation, release of soil-bound phosphorus and thus contribute significantly to sustainability of the farming systems. In the production process, pulses require less water than cereals.

India is the leading country in pulse area and contributes 25 and 27 per cent of the world's pulse production and consumption, respectively. It is also the larg0est importer of pulses with a contribution of 34 per cent of the global food use. The per cent contribution of pulses to the total food grain production in India has declined during the last three decades. The area under pulse crops at present is 23.47 million ha with the production of 18.34 million tonnes and productivity being 781 kg/ ha.

Major pulses grown in India include chickpea, pigeonpea, lentil, blackgram, mungbean, lablabbean, mothbean, horsegram, pea, grasspea or khesari, cowpea, and broadbean or fababean. More popular among these are chickpea, pigeonpea, mungbean, urdbean and lentil. Among various pulse crops, chickpea dominates with over 40 per cent share of total pulse production followed by pigeonpea (18-20 %), mungbean (11 %), urdbean (10-12 %), lentil (8-9 %) and other legumes (20 %) (Anon., 2013).

Thus, India is the largest importer, producer and consumer of pulses. On the other hand, India is also the largest pulses processor, as pulses exporting countries like Myanmar, Canada and Australia do not have adequate pulses processing facilities. Large shares of pulses import, including chickpea, pigeonpea, mungbean, urdbean and kidney bean come from Myanmar. Importers favour Myanmar because it offers varied pulses with qualities similar to those produced in India, low freight rates and relatively fast delivery. Canada and Australia are major suppliers of dry peas and kabuli chickpea to the Indian market, each supplying about one-third of India's pulses imports. Most kabuli chickpeas come from Mexico, Australia, Canada, Turkey and Iran. Nepal and Syria account for the largest shares of Indian lentil imports.

It has been estimated that India's population would reach 1.68 billion by 2030 from the present level of 1.21 billion. Accordingly, the projected pulse requirement for the year 2030 is 32 million tons with an anticipated required growth rate of 4.2 per cent (Anon., 2011). India has to produce not only enough pulses but also remain competitive to protect the indigenous pulse production. In view of this, India has to develop and adopt more efficient crop production technologies along with favourable policies to encourage farmers to bring more area under pulses. Net daily pulses availability for Indians has increased slightly from 32 g per capita in 2000 to 41.9 g per capita in 2013 according to Indian Council of Medical Research (ICMR) recommendation.

India ranks first in the world in terms of pulse production. In India, Madhya Pradesh, Maharashtra, Uttar Pradesh, Andhra Pradesh, Karnataka and Rajasthan are the major states growing pulses in India. These six states contribute 80 per cent of total pulse production and area (Anon., 2013).

In Karnataka, blackgram occupies an area of 1.26 lakh ha with the production of 0.64 lakh tones and productivity of 507 kg/ ha. The major urdbean growing states of the country are Maharashtra, Andhra Pradesh, Uttar Pradesh, Madhya Pradesh, Tamilnadu and Karanataka. In Karanataka, major blackgram growing districts are Bidar, Kalaburgi, Raichur, Yadgir, Bijapur, Baglakot, Dharwad, Bellari, Koppal and Belgaum districts of Northern Karnataka (Anon., 2012).

Among the various pulses, blackgram or urdbean [*Vigna mungo* (L.) Hepper] belonging to the tribe phaseolea of family Leguminosae is of immense importance as, it is rich source of phosphoric acid. Blackgram is a rich source of protein. It gives 340 calories per 100 g dry weight. Blackgram contains 20-25 per cent *i.e* double the amount of proteins compared to cereals. It also contains albumin and globulin.

Blackgram is a rich source of methionine, tryptophan and lysine. Urd is said to have originated in India where it is most widely grown grain legume. It is known as "poor man's meat" and constitutes a major source of dietary protein of the large section of vegetarian population of the world. Blackgram seeds contain approximately 25-28 per cent protein, 1.0 -1.5 per cent oil, 3.5 – 4.5 per cent fiber, 4.5 – 5.5 per cent ash and 62 – 65 per cent carbohydrates on dry weight basis. Urdbean is used for different purposes in Indian culinary system. The major portion is being utilized in making *dal*, curries, soup, sweets and snacks. It is very special "Dal makhni" of Punjab or the

"Vada Sambhar" of South India, the taste rules the hearts of one and all alike. In South India, the most popular *idli,* dosa and *vada* are prepared by mixing rice and urdbean flour (Rajasekaran, *et al.* 2011).

The biological value improves greatly, when wheat or rice is combined with blackgram because of the complementary relationship of the essential amino acids such as lysine and sulphur containing amino acids methionine and cysteine. In addition, being an important source of human food, it is also used as nutritive fodder, especially for milch animals. Blackgram also has medicinal properties, like curing diabetes, sexual dysfunction, nervous disorder, hair disorders, digestive system disorders and rheumatic afflictions. It is valued for its high digestibility and freedom from flatulence effect. Blackgram is grown as sole crop, mixed crop, catch crop, or sequential crop under rainfed or semi irrigated condition in *kharif* and *spring/summer* season. It is a tropical crop and it requires hot and humid climate. It also able to tolerate high temperature. As such this is a short day plant, but in present days, neutral varieties are also available for cultivation in summer.

The yield and area expansion of blackgram and greengram are widely limited by inadequate availability of improved seed and knowledge of optimum cultivation practices, limited policy and marketing support and inadequate storage and processing facilities. The primary reason for the uncertainty of yield harvested at the end of the crop season is aberrant weather conditions, which cause extremes of soil water stress, ranging from drought to excessive soil moisture and high atmospheric humidity.

The adoption of improved varieties of pulses should be emphasised and transfer of technology in relation to blackgram and other pulses should be strengthened in farmer participatory mode with active involvement of multidisciplinary team of scientists in order to increase the productivity of pulses. Creation of informal seed village system is required, where farmer to farmer seed production and distribution chain will ensure easy availability of quality seed.

Improvement in agriculture is possible with the adoption of new and modern farming agro-techniques. New agriculture techniques are disseminating through extension methods. Extension methods like demonstration, training programmers, field days, extension group meeting, agricultural exhibition, krishimela, educational tour and field visit etc., are some of the major weapons for introducing the findings of modern research

in agricultural practices to increase agricultural production in particular on sustainable income of the rural masses in general.

Several studies have been conducted on pulse crops to know the knowledge and adoption of recommended cultivation practices but very few research studies have been conducted on blackgram crop. In this regard, the present study was undertaken with the following specific objectives.

1. To study the knowledge of blackgram growers about the recommended cultivation practices
2. To measure the extent of adoption of blackgram growers about the recommended cultivation practices
3. To know the extent of yield gap and reasons for the same
4. To study the socio- economic profile of blackgram growers
5. To elicit the constraints encountered by blackgram growers in adoption of recommended cultivation practices

Significance of the study

Present study tries to identify the prevailing gaps in farmer's practices and recommended cultivation practices. The analysis of personal, socio-economic factors may substantiate the presence of gaps to a considerable extent. The identified gaps may help to give directions to the field level workers to manipulate the appropriate factors so as to increase the adoption level. An attempt has also been made to study the constraints faced by the blackgram growers, thereby the efforts can be made to eliminate those constraints in order to increase their knowledge and adoption level of recommended cultivation practices. The results of the study are expected to be useful to the extension personnel and the administrators to know the extent of knowledge and adoption behaviour of blackgram growers. Further, the results could be used to bridge the gap through intensive training and by organizing other extension activities.

Limitation of the study

The study was confined to two major blackgram growing districts of Karnataka State due to limitations of time and other resources at the disposal of researcher.

However, considerable care and thought was exercised in making the study as scientific, systematic and objective as possible. It is a qualitative study based on personal bias and prejudice of the blackgram growers. Hence, the findings have to be viewed in the specific context of the conditions prevailing in the study area.

II. REVIEW OF LITERATURE

Review of literature was undertaken keeping in view the variables for the study. It was rather difficult to find adequate research studies exclusively relating to recommended practices of blackgram cultivation. Therefore, studies related to other crops were also reviewed and presented covering all aspects of the investigation comprehensively under the following headings;

2.1 Knowledge of blackgram growers about the recommended cultivation practices

2.2 Adoption of blackgram growers about recommended cultivation practices

2.3 Yield gap of crop and reasons for the same

2.4 Socio- economic profile of blackgram growers

2.5 Constraints encountered by blackgram growers in adoption of recommended cultivation practices

2.1 Knowledge of blackgram growers about the recommended cultivation practices

Kanavi (2000) carried out a study on knowledge and adoption behaviour of sugarcane growers in Belgaum district of Karnataka and reported that, 68.00 per cent of the respondents belonged to medium level of knowledge followed by 18.66 per cent and 13.33 per cent belonged to high and low level of knowledge, respectively.

Budihal (2001) in his study on utilization pattern of cotton production technology by farmers of northern Karnataka and reported that, large number (72.08 %) of the respondents had medium level of knowledge about the recommended practices of cotton cultivation, while 15.42 per cent of farmers had high knowledge followed by 12.50 per cent of them possessed low knowledge.

Nithyashree and Angadi (2001) in their study on knowledge and adoption of IPM practices among cotton growers of Raichur district and concluded that, 58 per cent of the respondents had low level of knowledge of IPM practices of cotton crop while 34 per cent of them had medium and only 8 per cent of them had high level of knowledge.

Sophiasatyavathy (2001) carried a study on knowledge and adoption of sustainable cultivation practices in sugarcane and cotton by farmers in Cuddlore district of Tamil Nadu and reported that, 66.25 per cent of the farmers had medium knowledge

level followed by 17.50 per cent with high knowledge level and 16.25 per cent with low knowledge level about sustainable cultivation practices in cotton. Whereas, 80.00, 12.50 and 7.50 per cent had medium, high and low knowledge levels regarding sustainable cultivation practices in sugarcane, respectively.

Arneja and Khangura (2003) conducted study on knowledge of pea growers and its association with their selected socio personal characteristics and concluded that, the pea growers were categorized in to three different categories according to their overall performance of knowledge score that 40.00 per cent of farmers had low while 32.00 of farmers had medium level of knowledge and only 28.00 per cent pea growers had high level of knowledge regarding varies pea cultivation practices.

Maraddi and Verma (2003) in their study on knowledge of farmers on cotton production technologies in Malaprabha command area revealed that, 69 per cent of the respondents had medium level of knowledge of cotton production technologies followed by 17 per cent of the respondents possessed high knowledge, where as 14 per cent of respondents had low level of knowledge.

Kadam, *et al.* (2005) investigated knowledge level of farmers about improved soybean production technology in Parbhani district of Maharashtra state and reported that, there is a scope for improving the knowledge level of the farmers about improved soyabean production technology.

Raghavendra (2005) conducted a study on knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district of Karnataka and found that, 61.66 per cent of the respondents possessed medium level of knowledge followed by 22.50 per cent and 15.84 per cent fell under low and high categories, respectively.

Raghavendra *et al.* (2006) conducted a study on knowledge level of farmers about cultivation practices and post harvest technology in redgram and revealed that, majority of the respondents (70.66 %) had medium knowledge level about cultivation practices, followed by low (18 %) and high (11.34 %) categories respectively.

Tripathi *et al.* (2006) carried out a study on knowledge extent of farmers about chickpea production technology and revealed that maximum percentages of the respondents were having medium level of knowledge, which the respondents were

distributed accordingly to the knowledge categories *viz*. low, medium and high. Out of 12 agricultural practices of chickpea production, knowledge about field preparation was ranked at first (92 %) followed by seed rate (90.00 %) and harvest and post harvest (83.71 %) ranked at second and third, respectively. The poor extent of knowledge was reported for the practices viz. insects and pests control (28.22 %), seed treatment (24.83 %) and disease control (12.88 %). The overall extent of knowledge was found to be 52.86 per cent.

Shakya *et al.* (2008) conducted a study on knowledge level of chickpea growers about chickpea production technology and revealed that, the chickpea growers had poor knowledge about soil treatment, high yielding varieties and bio-fertilizer, while majority of them had knowledge about critical stage of irrigation.

Sidram (2008) conducted a study on analysis of organic farming practices in pigeonpea in Gulbarga district of Karnataka state and found that, majority (63.33 %) of the respondents belonged to the medium knowledge level category, while 23.33 per cent and 13.33 per cent of the respondents belonged to high and low knowledge categories, respectively.

Sendilkumar (2010) in a study on knowledge and information sources utilisation pattern of soybean growers in Nagapattinam district at Tamil Nadu and revealed that, majority of growers possessed good how-to knowledge in the case of seed treatment with biofertilizer and 2 per cent DAP foliar spray and poor how-to knowledge in the case of herbicide application.

Sharanappa (2011) conducted a study on knowledge and adoption of recommended production practices of paddy by the farmers of Tungabhadra project area, Karanataka and revealed that, majority of the farmers (78.33 %) had knowledge and their control measures about the brown plant hoppers and stem borer (74.17 %) respectively. Among diseases majority of the farmers (84.17 %) did know about the blast diseases and their control measures.

Umale *et al*. (2011) conducted a study on correlation of knowledge of soybean cultivation practices and reported that, majority of the respondents had a high level of knowledge of cultivation practices recommended for soybean. Recommended practices like preparatory tillage, method of sowing, sowing time, proper hoeing time, soil type,

high yielding varieties, sowing depth and recommended intercropping requirement for soybean were known to most of the farmers.

Biradar (2012) conducted a study on technological gap in adoption of improved chilli cultivation practices in Yadgir and Raichur districts of Karnataka revealed that, over one third (35.00 %) of the chilli growers had high knowledge level about recommended practices of chilli cultivation with a mean score of 15.88 whereas, 33.33 per cent and 31.67 per cent of respondents had medium and low knowledge levels with mean knowledge scores of 14.38 and 12.95, respectively.

Choudhary and Yadav (2012) in a study on knowledge level of beneficiary and non-beneficiary farmers about improved mungbean production technology and found that, FLD beneficiary farmers (mungbean) were having good knowledge about high yielding varieties (83.44 %), plant protection measures (76.22 %), organic manure and fertilizers management (70.30 %), sowing of seed and spacing (67.33 %), soil and field preparation (64.12 %), seed treatment (60.89 %), harvesting (55.93 %), weed management (40.66 %) and storage (35.11 %) practices where as non-beneficiary farmers were reported less knowledge *i.e*. 67.00, 58.66, 51.27, 49.16, 44.26, 39.75, 39.46, 28.85 and 25.18 per cent with regard to high yielding varieties, plant protection measures, organic manure and fertilizers management, sowing of seed and spacing, harvesting, soil and field preparation, seed treatment, weed management and storage practices.

Ramakrishna (2012) conducted a study on impact analysis of demonstration on transplanting method of redgram cultivation in Bidar district of Karnataka state and revealed that, fifty per cent of demonstration farmers and thirty per cent of non-demonstration farmers were belonged to medium knowledge category, while, 31.67 per cent of demonstration and 21.67 per cent of non-demonstration farmers were belonged to high knowledge category. Whereas 18.33 per cent of demonstration and 48.33 per cent of non-demonstration farmers were belonged to low knowledge category.

Singh *et al.* (2012) conducted study on knowledge and adoption of mothbean production technology in western zone of Rajasthan and revealed that, the majority of farmers had medium level of knowledge regarding mothbean cultivation.

Singh *et al.* (2012) conducted a study on constraints in adoption of mothbean production technology in arid zone of Rajasthan and highlights that, the composite

knowledge about recommended cultivation practices of mothbean was observed to the extent of medium level in case (69.30 %) of mothbean growers. Quite a few (14.24 %) of them were found to possess enough knowledge about recommended production technology of mothbean.

Tidke *et al*. (2012) conducted study on knowledge and adoption of farmers about the management of pod borer complex in pigeonpea and revealed that, knowledge of respondent about the package of practices of pod borer management in pigeonpea was medium (47. 67 %) to high (43.33 %) and 10.00 per cent of respondents having low level knowledge.

Avinash Khare *et al.* (2013) conducted study on correlates of adoption and constraints faced by the gram farmers in adoption of improved cultivation practices and revealed that, majority (81.66 %) of the respondents very less knowledge about scientific plant protection measures. While 74.16 per cent of respondents reported that they have less unavailability of chemical fertilizers in season followed by 71.66 and 70.83 per cent of respondents had lack of knowledge about seed treatments and High cost of pesticides and insecticides.

Khare *et al.* (2013) conducted study on farmers knowledge in improved cultivation practices of gram and revealed that, majority (59.16 %) of the respondents had medium level of knowledge about improved cultivation practices of gram, whereas 21.67 per cent and 19.17 per cent of the respondent farmers were having high and low level of knowledge of improved cultivation practices of gram.

Patodiya *et al.* (2013) conducted study on knowledge of improved production technologies of pulses by the farmers in Rajsamand district and revealed that, majority of the farmers have substantial amount of knowledge about the harvesting and storage, irrigation management and application of rhizobium culture. While farmers had poor knowledge about plant protection measures, seed treatment and soil treatment in all selected pulse crops. It was further concluded that farmers had also good knowledge about high yielding varieties with regard to all selected crops except gram cultivation. Farmers had average knowledge about fertilizer application in all crops.

Chandawat *et al.* (2014) conducted study on knowledge of improved cultivation practices of gram among the farmers of Kheda district of Gujarat and revealed that, most

of the gram growers had medium level of knowledge (72 %) about the improved cultivation practices of gram crop whereas equal number of respondents (14 %) had high and low level of knowledge.

Jhakar *et al.* (2014) conducted study on knowledge level of farmers about recommended cultivation practices of mungbean in Nagaur district of Rajasthan and reveal that, the marginal farmers 66.67 per cent having medium knowledge, whereas, 18.33 per cent having low knowledge and remaining 15.00 per cent possessed high knowledge and the small farmers 78.33 per cent having medium knowledge, whereas, 10.00 per cent having low knowledge and remaining 11.67 per cent possessed high knowledge about recommended cultivation practices of mungbean.

The studies on knowledge of farmers on field crops highlighted that, majority of the farmers had medium level of knowledge.

2.2 Adoption of blackgram growers about recommended cultivation practices

Muhammad (2000) studied on adoption of recommended practices of soybean cultivation by farmers and showed that, majority of the farmers were aware of the recommended practices of land preparation, seed rates, method of sowing, dose of N and P, hoeing and chemical control measures. Regarding recommended irrigation practices, majority of farmers were unaware. Majority of farmers adopted the recommended practices of land preparation, variety of soybean, seed rate and method of sowing. Majority of farmers did not adopt recommended practices of inoculation, nitrogen and phosphorus doses and first and second hoeing. It was observed that output of this oilseed crop in comparison with its cost of production is not satisfactory due to financial constraints.

Budihal (2001) conducted a study on utilization pattern of cotton production technology by farmers of northern Karnataka and reported that, 65.83 per cent of the respondents were in the medium adoption category followed by 16.67 per cent and 17.50 per cent were in high and low adoption categories, respectively.

Nagaraj (2002) conducted a study on knowledge of improved cultivation practices of sugarcane and their extent of adoption by farmers in Bhadra command area in Davanagere district and revealed that, large majority (61.26 %) of the respondents

belonged to medium level of adoption category, while 25.83 per cent and 12.91 per cent of the respondents belonged to low and high adoption categories, respectively.

Maraddi and Verma (2003) in their study on adoption of cotton production technologies by the farmers of Malaprabha command area of Karnataka state and found that, great majority (95%) of the farmers had medium to low adoption level, whereas only 5 per cent of the farmers had high level of adoption.

Sunil Kumar (2004) from his study on farmer's knowledge and adoption of production and post-harvest technology in tomato crops of Belgaum of Karnataka state and indicated that, majority of the tomato growers (53.30 %) belonged to medium knowledge level category.

Raghavendra (2005) in his study on knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district and revealed that, 53.30 per cent of the respondents belonged to medium adoption category, while 31.50 per cent and 15 per cent of respondents belonged to low and high adoption categories, respectively.

Reddy (2006) in his study on knowledge and adoption of integrated pest management practices among vegetable growers of Gadag district in northern Karnataka and indicated that, 59.17 per cent of the farmers were noticed in medium adoption group of IPM practices of cabbage crop followed by 25.83 per cent in low adoption group, whereas 15.00 per cent in high adoption category.

Tripathi *et al.* (2006) in his study an adoption of chickpea production technology and observed that, majority of the respondents (67 %) were found medium level of adoption followed by 19 per cent and 14 per cent respondents who had low and high levels of adoption respectively. The mean of scores was found to be 52.86 with a range of minimum 35.64 and maximum 77.54.

Manjunath (2007) conducted a study in rehabilitant farmers in upper Krishna project area of Bagalkot district of Karnataka to assess the overall adoption level of bengalgram cultivation practices and revealed that, 45.63 per cent of the respondents belonged to medium level of adoption category followed by 30.62 per cent and 23.75 per cent of the respondents belonged to low and high level of adoption category, respectively. With respect to adoption level of individual practice wise are, it could be

observed that, the adoption of detailed recommended cultivation practices in order of priority were, pests and their control (77.50 %), diseases and their control (76.25 %), varieties recommended (66.68 %), seed treatment (61.88 %), seed rate per acre (55.00 %), correct time of sowing (54.38 %), recommended spacing (36.25 %) and fertilizer dose (27.50 %). Further, the table also reveals that, the respondents not adopted the recommended cultivation practices in order of priority were: fertilizer dose (72.50 %), spacing between two rows (63.75 %), correct time of sowing (45.62 %), seed rate per acre (45.00 %), seed treatment (38.12 %), varieties recommended (33.12 %), diseases and their control (23.75 %) and pests and their control (22.50 %).

Sidram (2008) conducted a study on analysis of organic farming practices in pigeonpea in Gulbarga district of Karnataka state and found that, majority of the respondents (63.33 %) belonged to the medium knowledge level category, while 23.33 per cent and 13.33 per cent of the respondents belonged to high and low knowledge categories, respectively.

Bhagwan Singh and Chauhan (2010) studied on adoption of mungbean production technology in arid zone of Rajashtan and concluded that, majority of the marginal, small and large farmers belonged to low adoption category for the mungbean production technologies such as high yielding varieties, seed treatment, application of organic manure, application of nitrogenous fertilizers, application of phosphatic fertilizers and plant protection measures. Medium level of adoption is found for the practices such as time of sowing and interculture and weeding while high adoption is noticed for the practices such as seed rate, method of sowing and spacing.

Upma *et al.* (2010) conducted study on livelihood security of farmers through adoption of pigeonpea cultivation technology in Udaipur district of Rajasthan and indicated that, 56.25 per cent of the total respondents adopted the pigeonpea production technology to medium level whereas, 26.88 and 16.87 per cent of total respondents adopted pigeonpea production technology to low and high level respectively.

Dwivedi *et al.* (2011) conducted study in Ghazipur district of U.P. to find out the adoption level of improved production technology of pigeonpea and revealed that, overall 52 per cent of the total respondents were found to be in the medium adoption group, whereas 33 per cent respondent were reported from the low adoption group and only 15 per cent respondents could be placed in the high adoption group.

Nanchhu *et al.* (2011) conducted study on adoption of improved cluster bean cultivation practices by the farmers and revealed that, 51.67 per cent of the total respondents adopted the cluster bean production technology to a medium level whereas, 31.67 and 16.66 per cent of total respondents adopted cluster production technology to low and high level respectively.

Vashishtha *et al.* (2011) conducted study in Udaipur district of Rajasthan, to review the adoption level of pigeonpea production technology and found that, 56.25 per cent of the respondents adopted pigeonpea production technology to medium level whereas, 26.88 and 16.87 per cent of total respondents adopted the technology to low and high level respectively. It was also observed that extent of adoption in tribal farmers was 30.83 to 90.4 per cent while in case of non-tribal farmers the extent was observed to be 32.50 to 92.50 per cent.

Ashish Kumar *et al*. (2012) studied on behaviour of farmers in adoption of recommended technology of soybean and reported that, majority of soybean growers were having partial knowledge and partial adoption of recommended soybean practices. Extent of knowledge, attitude and adoption of recommended practices were found to be medium.

Lokesh *et al.* (2012) the study was carried out in Sihora block of Jabalpur district of Madya Pradesh to identify the impact of trainings on adoption of chickpea production technology and revealed that, out of 60 participating farmers 44.45 per cent indicates a high level of adoption followed by 31.11 per cent medium and 24.44 per cent low adoption of improved chickpea production technology. Further, it is noticed that, comparatively higher per cent of non participating farmers where observed in medium and low adoption, but their representation in high level of adoption was very low *i.e,* only 17.79 per cent as against 44.45 per cent of participating farmers.

Ramakrishna (2012) conducted a study on impact analysis of demonstration on transplanting method of redgram cultivation in Bidar district of Karnataka state and revealed that, 48.33 per cent of demonstration and 28.33 per cent of non-demonstration farmers were belonged to medium adopter category. While, thirty per cent of demonstration and twenty per cent of non-demonstration farmers had noticed in high adopter category. Whereas, 21.67 per cent of demonstration and 51.67 per cent of non-demonstration farmers were in lower adopter category.

Singh *et al.* (2012) conducted study on knowledge and adoption of mothbean production technology in western zone of Rajasthan and revealed that, more than half of the mothbean growers had medium extent of adoption, followed by high and low level. The maximum gap was observed in irrigation management technology followed by plant protection measures, sowing time and seed rate, very little gap was observed in weed management practices. The overall adoption indicated that, 67.02 per cent of mothbean growers followed recommended cultivation practices.

Tidke *et al.* (2012) conducted study on knowledge and adoption of farmers about the management of pod borer complex in pigeonpea and revealed that, more than half of the respondents (58.33 %) had low level of adoption followed by 25.00 and 16.17 per cent of respondent in medium and high level of adoption of recommended practices of pod borer management in pigeonpea.

Khare *et al*. (2013) carried out study in Akola district of Maharashtra state to focus the adoption level of improved cultivation practices of gram by the farmers and revealed that, more than half of the gram growers (59.16 %) observed in medium level of adoption of improved cultivation practices of gram. As regards practice wise adoption level all of gram growers had adopted about land preparation (100 %) while sowing time (77.50 %), type of soil requirement (76.66 %), recommended variety (73.33 %) and yield of gram (60.83 %), recommended seed rate (60.00 %), sowing method (50.00 %) and recommended spacing (45.83 %) had adoption about cultivation practices of gram.

Srivsatava *et al*. (2013) carried out investigation in Karchhana Block of Allahabad District, to determine the level of adoption of improved practices of pigeonpea production technology and inferred that, half of the respondents (50.40 %) had medium adoption level, while 25 per cent of the respondents possessed high level of adoption followed by 24 per cent respondents in low level of adoption of improved recommended practices.

Jadhav and Aski (2014) conducted a study on extent of adoption of redgram production technologies by the trained and untrained farmers and revealed that, 41.43 per cent of trained and 37.14 per cent untrained respondents were belonged to medium adoption level category. Cent per cent of trained and untrained respondents had adopted practices like, sowing time and method of sowing. The other practices like summer ploughing (97.01 % and 94.29 %), spacing (88.57 % and 85.71 %) and seed rate (74.29 % and 68.57 %), respectively. Majority of trained and untrained farmers did not

adopted the practices like seed treatment (90.00 % and 100 %), dosage of chemical for seed treatment (90.00 % and 100 %), nipping (72.86 % and 95.71 %), micronutrient application (55.71 % and 88.57 %), application of potash (50.00 % and 74.29 %) and disease control measures (more than70 % in both categories), respectively.

Singh *et al.* (2014) conducted study on extent of adoption of recommended practices of pulses through FLD and revealed that, 50.00 per cent of respondent had medium level of adoption category about improved production technology practices on pulses crops followed by high (43.33 %) and low (6.67 %) low level categories.

The generalization that can be drawn from the above studies is that there exists a gap in adoption of recommended package of practices. These studies have given a base to study the adoption gap of farmers with respect to recommended blackgram cultivation practices.

2.3 Yield gap of crops

Basavaraj (2000) in his study on crop yield potentials and constraints in production of major crops in northern dry zone of Karnataka and revealed that, the magnitude of yield gap-I ranged from 24.00 per cent in sunflower to 33.00 per cent in groundnut and yield gap II was highest for groundnut *i.e.*, 41.00 per cent.

Verma *et al.* (2002) in their study on groundnut productivity and yield gap analysis of groundnut production opined that, an average of 36.22 per cent yield gap was observed between frontline demonstration yields and yields obtained by farmers.

Rajaratnam and Reddy (2003) studied impact of sunflower on-farm extension demonstrations (OFEDs) and observed that, 61.84 per cent of beneficiaries had medium increase in yield, 21.05 percent had high increase and 17.11 per cent of respondents had low increase in yield after the implementation of on-farm extension demonstrations.

Sharma *et al.* (2005) in their study on adoption pattern and constraints of soybean production technology in Malwa plateau of Andhra Pradesh and revealed that, there was a considerable yield gap of 60.03 per cent between potential yield and actual yield.

Bhatia *et al.* (2006) carried out study on yield gap analysis of soybean, groundnut, pigeonpea and chickpea in India using simulation modelling and reported that, the farmers average yield of crops is 1040 kg/ha for soybean, 1150 kg/ ha for groundnut,

690 kg/ ha for pigeonpea and 800 kg/ ha for chickpea in India. The total yield gap of the four legumes, indicating the need to scale-up the improved crop production technologies from on-farm demonstration sites to farmers in the production zones. To abridge the yield gaps of legumes, integrated watershed management approach comprising of *in-situ* soil and water conservation, water harvesting and groundwater recharging for supplemental irrigation and improved crop management technologies is needed.

Singh *et al.* (2007) conducted study on yield gap and level of demonstrated crop production technology in Sagar district and concluded that, higher yields under demonstration over farmers practices was found in case of management of insect pest, organic farming, improve variety JA-4, use of zinc sulphate, followed by other demonstration.

Das *et al.* (2008) in their study on diffusion and adoption of mustard production technology and found that, the yield performance of mustard was 431 kg/ ha at the farmers field and 937 kg/ ha at the demonstration plots in the year 1998-99.

Raj *et al.* (2013) carried out a study on impact of front line demonstration (FLD) on the yield of pulses and revealed that, FLD recorded higher yield as compared to farmer's local practice. The improved technology recorded higher yield of 1880 kg/ ha, 1480 kg/ ha, 880 kg/ ha and 927 kg/ ha in pigeonpea, chickpea, blackgram and greengram, respectively than 1450, 1130, 680 and 711 kg/ ha. In spite of increase in yield of pulses, technological gap, extension gap and technology index existed. The improved technology gave higher gross returns, net returns with higher benefit cost ratio as farmer's practices.

Kumbhare *et al.* (2014) carried out study on micro analysis of yield gap and profitability in pulses and cereals and revealed that, the average yield gap-I (technology gap) for pigeonpea was 1167 kg/ ha in Uttar Pradesh and 1250 kg/ ha in Haryana. While, the average yield gap-II (extension gap) for pigeonpea was relatively lower i.e. 183 kg/ha in Uttar Pradesh and 125 kg/ ha in Haryana. The average yield gap-I for chickpea was observed as 1641 kg/ha in Uttar Pradesh and 877 kg/ ha in Haryana. Whereas, the average yield gap-II for chickpea was relatively lower i.e. 614 kg/ ha in Uttar Pradesh and 622 kg/ ha in Haryana.

Sanjay Kumar *et al.* (2014) conducted a study on assessment of gaps in pulse production in Hamirpur district of Himachal Pradesh and revealed that, there was a wide yield gap between the potential and demonstration yields in chickpea and blackgram pulse crops mainly due to technology and extension gaps. The frontline demonstrations on black gram crop indicated that, per cent increase in yield over farmers practice ranged from 31.1 to 76.6 per cent whereas in case of chickpea the range was 39.4 to 63.6 per cent over five years. It was further observed that in terms of economics, both blackgram and chickpea crops recorded higher net returns per hectare compared to farmer's practice during all the years.

2.4 Socio- economic profile of blackgram growing farmers

2.4.1 Age

Karpagam (2000) conducted a study at Erode district of Tamil Nadu state and indicated that, majority (70.83 %) of the turmeric growing farmers belonged to middle aged group.

Babanna (2001) conducted a study on arecanut growers in Shimoga district and stated that, 38.40 per cent of growers belonged to old age, 35 per cent of them are middle aged and 26.66 per cent of the growers were young.

Vedamurthy (2002) in his study on arecanut growers in Shimoga district and focused that, 25.33 per cent of the growers were old aged, 40 per cent of middle aged and 34.66 per cent were young aged group.

Sunil Kumar (2004) conducted a study in Belgaum district and indicated that, majority (53.30 %) of the tomato growers belonged to middle age group.

Shashidhar (2004) reported that majority of the respondents fell under middle age (48.33 %) category followed by young age (31.66 %) and old age (20.00 %) groups.

Amol (2006) conducted a study on indigenous technical knowledge about rice cultivation and bovine health management practices in Konkan region of Maharashtra reported that, majority of the respondents belonged to middle age group.

Chandrashekhar (2007) investigated an analysis of onion production and marketing behaviour of farmers in Gadag district of Karnataka and revealed that, majority

of the respondents (63.34 %) belonged to middle age group followed by equal per cent in both young age and old age group (18.33 %).

Mande and Thombre (2009) observed that 53.33 per cent of the dairy cattle owners were between 36 and 50 years followed by 35 years of age (15.00 %) and above 50 years of age (31.67 %).

2.4.2 Education

Shakuntala and Chaman (2000) in their study on socio-economic characteristics of rural families in Bangalore rural district of Karnataka state and revealed that, 33.33 per cent of the family heads had education up to high school followed by middle school (22.17 %) and illiterates (18.67 %).

Dhamodaran and Vasanthkumar (2001) found that, majority of the respondents (35.83 %) had high school education followed by middle school (25.00 %), primary (16.67 %) and collegiate level (15.00 %).

Palaniswamy and Sriram (2001) conducted a study on scale to measure extension participation of tamarind farmers and revealed that, majority of the farmers belonged to medium education level (53.06 %) while 21.77 and 25.17 per cent belonged to low and high education levels respectively.

Vedamurthy (2002) in his study on arecanut growers of Shimoga district in Karnataka and noticed that, 38.66 per cent of the farmers were studied upto high school. Almost equal percentage of farmers educated upto primary school (13.33 %) and college (14.66 %) whereas only 8 per cent of the respondents were illiterate and 6.66 of the farmers were graduates.

Shashidhara (2003) in his study on drip irrigation in Shimoga and Davanagere district and noticed that, 31.11 per cent were studied upto high school, 30.00 per cent had the graduation and 24.44 per cent educated upto pre-university, whereas middle and primary school education was possessed by 8.89 and 5.56 per cent.

Venkataramalu (2003) in his study in chilli growers in Gutur district of Andhra Pradesh and revealed that, majority of them studied up to primary school (25.83 %) followed by illiterate (22.50 %) and high school.

Amol (2006) conducted a study on indigenous technical knowledge about rice cultivation and bovine health management practices in Konkan region of Maharashtra and reported that, majority (66.20 %) of the farmers were educated upto or below middle school. Whereas, 21.13 per cent of the respondents were illiterate followed by primary (40.85 %), middle school (23.35 %) and only (2.82 and 8.45 %) of the respondents had studied high school and pre-university level education, respectively.

Chandrashekhar (2007) from his analysis of onion production and marketing behaviour of farmers in Gadag district of Karnataka and revealed that, 43.33 per cent of the respondents had high school level of education followed by 26.67 per cent upto middle school, 13.33 per cent upto primary, 7.50 per cent illiterate, 1.67 per cent of the respondents can read and write category and 0.83 per cent fall in post graduate category.

Mande and Thombre (2009) reported that, 13.33 per cent of dairy cattle owners had illiterate followed by 36.67 per cent had primary school education, 21.67 per cent had secondary school, 16.67 per cent had high school and 11.66 per cent had collegiate.

Raghavendra (2010) in his study stated that, 41.67 per cent of demonstration farmers and 63.33 per cent of other farmers were illiterates, whereas, 25.00 and 21.67 per cent of demonstration farmers and 13.33 and 10.00 per cent of other farmers had education up to primary school and high school, respectively. Very negligible number of demonstration and other farmers (1.67 %) had education up to college level.

2.4.3 Size of land holding

Kanavi (2000) a study on the knowledge and adoption behaviour of sugarcane growers in Belgaum district of Karnataka categorized sugarcane growers in to large farmers (61.33 %), medium farmers (30.66 %), semi-medium farmers (6.55 %) and small farmers (1.33 %). None of the farmers belonged to the category of marginal farmers.

Karpagam (2000) conducted a study on turmeric growers in Erode districts of Tamil Nadu and observed that, majority of the respondents (40.83 per cent) had medium land holding and 31.66 per cent of the respondents had semi medium land holding.

Shakuntala and Chaman (2000) conducted a study on rural families in Bangalore rural district of Karnataka and reported that majority (87.00 %) of the farmers belonged to small farmers category and 61 per cent of farmers belonged to medium farmers.

Natikar (2001) in his study reported that, majority of the subscriber (63.00 %) farmers belonged to big farmers category with land holding of more than 25 acres, whereas 21, 11 and 4.4 per cent belong to medium, semi-medium and small farmers category, in respect of their land holding.

Nagaraj (2002) conducted study on knowledge of improved cultivation practices of sugarcane and their extent of adoption by farmers in Bhadra command area in Davangere district of Karnataka and found that, majority the respondents belonged to medium land holding (48.75 %) followed by semi medium land holding category(30.00 %) .

Shashidhara (2003) in his study on socio-economic profile of drip irrigation farmers in Shimoga and Davanagere district of Karnataka state and revealed that, comparatively more number of farmers (46.67 per cent) belonged to semi medium category followed by medium (32.22 %) and small land holding categories (18.89 %).

Raghavendra (2004) in his study on knowledge and adoption level of post harvest technologies by redgram cultivators in Gulbarga district of Karnataka revealed that, majority of the respondents belonged to medium land holding (48.75 %) followed by semi-medium land holding Category (30 %).

Reddy (2005) in the study on knowledge, extent of participation and benefits derived by participant farmers of the watershed development programme and reported that, 64 per cent of farmers belonged to semi-medium land holding category followed by 22 per cent in medium category, whereas 10.67 per cent of them had small land holding and a meager 3.33 per cent of them belonged to big land holding category.

Sidram (2008) conducted a study on analysis of organic farming practices in pigeonpea in Gulbarga district of Karnataka state and revealed that, big land holders category occupied the highest percentage (60.83 %), while 23.33 and 15.83 per cent of the respondents were in medium and small land holders category.

Mande and Thombre (2009) studied that 8.33 per cent of the dairy cattle owners were marginal farmers followed by small farmers (18.33 %), semi-medium farmers (28.33 %), medium farmers (25.00 %) and big farmers (20.00 %).

Sureshkumar (2009) in a study on technological gap in recommended soybean cultivation practices and reported that, 45.33 per cent of farmers belonged to medium

land holding category (10.01-25.00 ac) followed by 22.67 per cent of them belonged to semi-medium land holding category (5.01-10.00 ac), 16.67 per cent of them were small farmers (2.51-5.00 ac) and 4.66 per cent were big land holding farmers.

Satyanarayan and Jagadeeswary (2010) studied that, 6.00 per cent of the livestock farmers were small land holding followed by 2.00 per cent of the livestock farmers were having medium land holding and 87.00 per cent of the livestock farmers were having large land holding.

2.4.4 Farming experience

Natikar (2001) in their study found that, majority of the respondents belonged to medium farming experience (48.00 %) followed by high (45.00 %) and low (7.00 %) farming experience respectively.

Thiranjanagowda (2005) carried out a study on cultivation and marketing pattern of selected cut flowers in Belgaum district of Karnataka and noticed that, 40.62 per cent of the respondents belonged to high experience category. While, 35.93 and 23.45 per cent of the respondents belonged to medium and low farming experience category, respectively.

Vinay Kumar (2005) from his study on knowledge and adoption of rose growing farmers in Karnataka and reported that, 53.33 per cent of the respondents belonged to low experience category followed by medium (45.00 %) and high (1.67 %) farming experience.

Amol (2006) conducted a study on indigenous technical knowledge about rice cultivation and bovine health management practices in Konkan region of Maharashtra and reported that, majority (90.19 %) of the respondents had high farming experience (>20 years) While, not a single respondents had low farming experience (upto 10 years) and 9.86 per cent of the respondents had medium farming experience.

Sidram (2008) carried out a study on analysis of organic farming practices in pigeonpea in Gulbarga district of Karnataka state and replaced that, nearly one third farmers (30.83%) had high experience in farming whereas majority (69.17 %) had low experience.

Madhushekhar (2009) reported that, 41.25 per cent of the chilli growers had medium experience followed by low experience (37.50 %) and high experience (21.25 %) in chilli.

2.4.5 Annual income

Vedamurthy (2002) in his study on arecanut growers of Shimoga district in Karnataka and noticed that 48.66 per cent of the respondents belonged to high income category, while 34.00 per cent and 17.34 per cent were noticed in medium and low income category, respectively.

Shashidhara (2003) in his study revealed that, 42.44 per cent of the respondents belonged to medium level of income (Rs. 1-2 lakh) and in low income category 30.00 per cent of respondents were noticed, whereas 27.70 per cent of the farmers belonged to high income group.

Sunil Kumar (2004) conducted a study tomato growers in Belgaum district of Karnataka and found that, majority of the respondents belonged to medium income category (48.33 per cent).

Shashidhara (2004) conducted a study on drip irrigation farmers in Bijapur district of Karnataka and reported that, 49.17 per cent of the farmers belonged to medium income category.

Raghavendra (2005) conducted a study on knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district of Karnataka and reported that, majority of the respondents (15.00 %) had annual income between Rs. 75,000 to Rs. 1,00,000, whereas, 31.60 per cent of respondents had an annual income above Rs. 1,00,000. Rest of them 23.30 per cent had an income between Rs. 20,000 to Rs. 75,000 per annum, whereas, only 10.00 per cent of them had income below Rs. 20,000 per annum.

Amol (2006) carried out a study on indigenous technical knowledge about rice cultivation and bovine health management practices in Konkan region of Maharashtra and reported that, majority of the farmers (85.92 %) were in medium income category (Rs. 12,680,00 to Rs. 71,320,000) followed by (4.23 %) had low annual income

(upto Rs. 12,567.44). While, 9.86 per cent of the respondents had high annual income (Rs. 71,321.00 and above).

Chandrashekhar (2007) investigated on analysis of onion production and marketing behaviour of farmers in Gadag district of Karnataka and revealed that, half of the respondents (50.00 %) had annual income ranging from Rs. 25,000 to Rs. 50,000 followed by 24.17 per cent of them had upto Rs. 25,000, 16.67 per cent had in between Rs. 50,000 to Rs. 75,000, 5.83 per cent had Rs. 75,000 to 1,00,000 and 3.33 per cent of the respondents had income above Rs. 1,00,000 per annum from all the sources.

Nayak (2007) conducted a study on management practices of pineapple growers in Karnataka and reported that, 46.24 per cent of the respondents belonged to high annual income followed by medium (25.63 %), semi medium (17.50 %) and (10.63 %) low annual income categories.

Madhushekar (2009) observed that, 40.62 per cent of chilli growers had medium economic status followed by low (33.75 %) and high economic status (25.63 %) groups.

Mande and Thombre (2009) studied that 25.00 per cent of the respondents were having low income, 45.00 per cent of the respondents were medium income and 30.00 per cent of the respondents were having high income.

Satyanarayan and Jagadeeswary (2010) studied that, 79.00 per cent of the live stock farmers were having low income *i,e.*, less than 68000, 14.00 per cent were having medium income *i,e.*, 68,000 to 136000 and 7.00 per cent were having high income i,e., 136000 to 206000.cultivations.

2.4.6 Cropping intensity

Kokate *et al.* (1996) found that, majority of the farmers (51.98 %) belonged to low category of cropping intensity.

Kanavi (2000) inferred that, 58.00 per cent of sugarcane growers were under low category of cropping intensity and 42.00 per cent of farmers under high category.

Nagaraj (2002) carried out a study on knowledge of improved cultivation practices of sugarcane and their extent of adoption by farmers in Bhadra command area in

Davanagere district and reported that, 90.00 per cent of sugarcane growers fell under low category of cropping intensity and 10.0 per cent were found in high category.

Maraddi (2006) in his study on analysis of sustainable cultivation practices followed by sugarcane growers in Karnataka and reported that, incidence of medium level of cropping intensity was seen with 47.22 per cent of farmers followed by low cropping intensity with 27.22 per cent of farmers and only 25.56 per cent of famers had high cropping intensity

2.4.7 Extension contact

Ramanna *et al*. (2000) revealed that, 70 per cent of the respondents had medium level extension agency contact and 30 per cent of the respondents had high level extension agency contact.

Dhamodaran and Vasanthakumar (2001) in their study on adoption of improved sugarcane cultivation practices revealed that, majority of the respondents (52.50 %) had low level of extension agency contact followed by 47.50 per cent of the respondents had medium level of extension agency contact.

Palaniswamy and Sriram (2001) in their study found that, majority of the respondents (84.35 %) had medium level of extension agency contact followed by 5.45 per cent and 10.20 per cent of the respondents who had low and high level of extension agency contact, respectively.

Sunilkumar (2004) revealed that, 40.83 per cent of the respondents belonged to medium extension contact category followed by 30.00 per cent and 29.16 per cent belonging to high and low categories of extension contact in Belgaum district of Karnataka state, respectively.

Thiranjangowda (2005) revealed that, the contact of cut flower growers regarding contact with assistant horticultural officer 64.06 per cent followed by 46.87 per cent of the respondents contacted Assistant Director of Horticulture.

Santosh (2006) in his study on technological gap and constraints of bidi tobacco cultivation in Belgaum district of Karnataka and revealed that, 30.67 per cent of respondents contacted Agricultural Assistants regularly while Assistant Agricultural

Officer (50.00 %) and Private Company Staff (40.67 %) were occasionally contacted by the farmers.

Aghazia (2008) found that 61.48 per cent of onion farmers had low extension contact followed by medium (29.64 %) and high level of extension contact (8.68 %).

Madhushekhar (2009) inferred that, 45.63 per cent had low extension contact followed by medium extension contact (42.50 %) and high extension contact (11.87 %).

The above studies revealed that, the majority of the farmers belonged to medium extension contact category.

2.4.8 Extension participation

Kanavi (2000) conducted a study on the knowledge and adoption behaviour of sugarcane growers in Belgaum district of Karnataka and reported that, none of the respondents participated regularly in training and demonstrations. Nearly one third (31.33 %) of respondents participated in Krishimela. Whereas, very less number of respondents participated in extension activities like farm visits (1.33 %), group discussion (2.66 %) and study tour (4.00 %), whereas, 20 per cent participated occasionally in Krishimela followed by training (4.66%), group discussion (4.00 %), demonstration and farm visits (2.00 %) each and study tour (0. 66 %).

Mamatha and Hiremath (2000) reported that, small, medium and Artisan category of farm women participated in trainings, demonstrations and other extension activities in varied levels ranging from 4.5 to 17.5 per cent.

Venkataramalu (2003) indicated that, majority of the farmers participated in discussion with village extension workers (70.00%), Krishimela (62.50 %) and some exhibitions on agriculture (61.67 %).

Raghavendra (2004) conducted study on knowledge and adoption level of post harvest technology by redgram cultivators in Gulbarga districts and found that, 24.66 per cent of the respondents were participated regularly in agricultural exhibitions, demonstrations (22.67 %) conducted in their villages.

Shashidhara (2004) conducted a study on drip irrigation farmers of Bijapur district and revealed that, 45.83 per cent of the respondents participated in group meetings

followed by exhibition (41.66 %) and 18.33 per cent of the respondents participated in Krishimela.

Sunilkumar (2004) from his study on farmers knowledge and adoption of production and post-harvest technology in tomato crop of Belgaum district in of Karnataka and revealed that, nearly 23.00 per cent of respondents participated regularly in agricultural exhibition followed by 20.83 per cent in demonstrations. Majority of them never attended in activities like trainings (66.67 %), educational tours (94.17 %) and field visits (92.05 %).

Thiranjanagowda (2005) in his study on a cultivation and marketing pattern of selected cut flowers in Belgaum district of Karnataka and observed that, 73.43 per cent of the cut flower growers had extension participation regarding demonstration occasionally while 26.43 per cent participated regularly.

Jayaprada (2007) conducted a study on impact of Karnataka Vikas Grameen bank on Agriculture Development of Beneficiaries in Dharwad district of Karnataka and reported that, majority of the respondents (46.50 %) had high extension participation followed by 32.70 per cent had medium participation in extension activities whereas 20.80 per cent had low extension participation.

Atul (2008) in his study on constraints analysis of grape exporting farmers of Maharashtra state and reported that, majority (70 %) of the respondents were from medium extension participation category, followed by low (19 %) and high extension categories (11 %), categories.

2.4.9 Achievement motivation

Palaniswamy and Sriram (2001) observed in their study on modernization characteristics of sugarcane growers that, 72.11 per cent of respondents belonged to medium level of achievement motivation category, while 14.28 and 13.61 per cent of respondents belonged to high and low level of achievement motivation category, respectively.

Chatterjee (2000) study on the impact of National watershed development project forvrainfed areas (NWDPRA) in Burdwan district of west Bengal and inferred that majority (68.33 %) of the beneficiaries fall under medium level of achievement

motivation followed by high (20.00 %) and low (11.67 %) levels of achievement motivation.

Budihal (2001) carried out a study on utilization pattern of cotton production technology by farmers of northern Karnataka and revealed that, 72.5 per cent of the respondents were in the medium category while 17.08 per cent and 10.42 per cent of the respondents were in the high and low categories of achievement motivation, respectively.

Sophiasatyavathy (2001) revealed that, all the sugarcane farmers were aware of the cane officers, among them 97.5 per cent contacted them regularly, 73.75 per cent of cotton farmers are aware of Agriculture Development Officer.

Ravichandra Prasad (2002) study on the impact of on farm extension demonstration (OFEPs) in Rice in Nellore district of Andhra Pradesh and revealed that 62.50 per cent of the beneficiaries had medium achievement motivation followed by high (25.00 %) and low 12.50 %) levels of achievement motivation.

Suresh (2004) indicated that, around sixty per cent of the respondents (61.25 %) had medium achievement motivation followed by 20.42 per cent low level and 18.33 per cent high level.

Nagesh (2005) revealed that, 71.66 per cent of vegetable seed production farmers had medium achievement motivation followed by more or less equal percentage of respondents in low (15.00 %) and high (13.33 %) achievement motivation, respectively.

Maraddi (2006) in his study on analysis of sustainable cultivation practices followed by sugarcane growers in Karnataka and reported that, incidence of medium level of achievement motivation was seen with 59.45 per cent of farmers followed by low achievement motivation with 27.22 per cent of farmers and only 13.33 per cent of famers had high achievement motivation.

From the above reviews it can be inferred that majority of the respondents had medium level of achievement motivation.

2.4.10 Innovativeness

Babanna (2001) conducted a study on arecanut growers in Shimoga district in Karnataka and focused that 34.10 per cent farmers were of medium innovativeness

category followed by 33.33 per cent of them having high and 32.66 per cent of them possessed low innovativeness.

Natikar (2001) conducted a study on attitude and use of farm journal by the subscriber farmers and their profile North Karnataka and revealed that, 73.75 per cent of the subscriber farmers belonged to medium innovativeness category followed by low (15.63 %) and high (10.62 %) innovativeness categories.

Shashidhara (2003) in his study on socio-economic profile of drip irrigation farmers in Shimoga and Davanagere district of Karnataka and found that, majority of the farmers belonged to medium innovativeness category (47.50 per cent) followed by low (31.66 per cent) and high (20.83 per cent) innovativeness category, respectively.

Shashidhara (2004) reported that higher percentage (47.50 %) of the respondents was in medium innovativeness category followed by low (31.66 %) and high (20.83 %) innovativeness category.

Suresh (2004) indicated that the milk producers in Chittor district in Andhra Pradesh had medium, high and low innovativeness in the order of 55.00, 24.58 and 20.42 per cent, respectively.

Nagesh (2005) from his study on entrepreneurial behaviour of vegetable seed producing farmers in Haveri district of Karnataka and reported that, majority of the respondents (63.33 %) had medium innovativeness followed by 18.33 per cent of them with high and low innovativeness in vegetable seed production.

Raghavendra (2005) conducted a study on knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district of Karnataka and reported that, majority of the respondents (45.00 %) belonging to medium level of innovativeness category. While 29.16 and 25.83 per cent of respondents belonging to low and high level of innovativeness category, respectively.

Reddy (2006) conducted a study on knowledge and adoption of integrated pest management practices among vegetable growers of Gadag district in northern Karnataka and reported that, majority (72.50 %) of the respondents had medium innovativeness. But a less percentage of respondents were noticed in high innovativeness (15.00 %) and low innovativeness (12.50 %) categories.

Venkatashivareddy (2006) conducted a study on knowledge level, adoption and marketing behaviour of chilli growers in Guntur district of Andhra Pradesh and reported that, majority (72.50%) of the respondents had medium innovativeness. But less percentage of the respondents were noticed in high innovativeness of the respondents were noticed in high innovativeness (15.60 %) and low innovativeness (12.50 %) categories.

Manjunath (2007) carried out a study on rehabitant farmers in Upper Krishna Project area of Bagalkot district and observed that, majority of the respondents (56.25 %) were found in medium innovativeness category, while 27.25 per cent and 16.25 per cent of the respondents belonged to low and high innovativeness category, respectively.

Sidram (2008) conducted a study on analysis of organic farming practices in pigeonpea in Gulbarga district of Karnataka state and found that, majority of the respondents (45.00 %) belonged to medium innovativeness category. While, 32.50 per cent and 22.50 per cent of the respondents belonged to low and high innovativeness category, respectively.

2.4.11 Information seeking behavior

Sontakki (1995) found that nearly half of the respondents (48.75 %) possessed radio and majority of them (61.54 %) listened to it regularly, while the remaining 38.46 per cent listened to it occasionally. Similarly, TV was possessed by 47.50 per cent of the respondents and a large chunk (94.74 %) of them viewed the programmes regularly, while only 5.26 per cent viewed it occasionally. Nearly 65 per cent of respondents were subscribers of one or the other newspapers and almost all of them (98.08 %) read the newspapers regularly.

Purushothama (1997) in his study on job perception, job performance and job satisfaction of range forest officers and found that, 72.72 per cent of respondents had medium mass medium exposure and 27.28 per cent of them had high mass media exposure.

Bosco (2000) found that, 73.17 per cent of the Assistant Agricultural Officers had a medium level of information seeking behaviour, while 13.41 per cent of them had low and high information seeking behaviour respectively.

Jyothi (2000) reported that, input dealers were the most frequently consulted information sources followed by progressive farmer, TV, Extension personnel of private organization, friends, radio and Assistant Agriculture Officers.

Kumar (2001) observed that, 41.66 per cent of floriculture cultivators had low information seeking followed by medium (32.50 %) and high (25.90 %) information seeking categories, respectively.

Vijay Kumar (2001) reported that, 41.66 per cent of floriculture farmers fell under low information seeking category followed by 33.34 and 25.00 per cent of respondents fell under medium and high information seeking categories, respectively.

Tripathi (2001) conducted a study on information receiving behaviour of rural women influencing productivity of milch animals and found out that, high percentage of respondents (78.12 %) utilized the non-institutional interpersonal information sources such as friends, relatives, neighbours, own family members *etc.* at high level. About 11 per cent of them were medium level utilizers and institutional sources such as veterinary doctors, cooperative personnels, scientists, extension agency, block personnel *etc.* were utilized at medium level by majority (58.12 %) of the respondents. About 13.55 per cent and 31.77 per cent of them were high and low level utilizers of the institutional information sources, respectively.

Sonawane *et al*. (2001) conducted a study on utilization of communication sources by the farmers for seeking farm information and revealed that, among the personal localite sources friends (90.62 %) were the major source of information for the farmers followed by neighbourers (76.56 %), relatives (60.15 %) and progressive farmers (60.15 %), whereas, among the personal cosmopolite sources, agricultural assistant (96.87 %) was the main source of information followed by university scientists (53.90 %), agricultural officer (25.78 %) and subject matter specialists (21.87 %).

Jayalatha (2003) conducted a study on impact of commercial bank schemes on the growth of entrepreneurs and revealed that, majority of (65.22 %) of the respondents used advertisement by banks as main source of information at middle level. Nearly 21.14 per cent and 35.71 per cent of them used the same source at high and low levels respectively.

Suresh (2004) carried out an experiment on entrepreneurial behaviour of milk producers in Chittoor district of Andhra Pradesh and reported that, majority of the

respondents (68.75 %) had medium level of information seeking behaviour followed by high (17.08 %) and low (14.17 %) information seeking behaviour categories, respectively.

Chandramouli (2005) indicated that 35.84 per cent of rice growing farmers had medium information seeking behaviour followed by low (34.16 %) and high (30.00 %) information seeking categories, respectively.

Nagananda (2005) found that, cent per cent of officers subscribed the newspapers and possessed television. Viewing of TV programme and newspaper reading was observed in a higher per cent of both respondents (ADAs 91.7 % and 95.0 % and AO 93.3 % and 96.7 %), respectively.

2.4.12 Management orientation

Hanchinal (1999) observed that, the respondents found grouped into low (34.58 %), medium (32.92%) and high (32.50 %) management orientation categories

Vasanthkumar (2000) revealed that, a majority of big farmers had high management orientation (57 %) whereas a considerable percentage of small growers (44 %) were under medium management orientation.

Sahana (2002) with regard to management orientation (46.67 %) of the farmers had medium level of management orientation, merely one third of the farmers (32.50 %) had high level of management orientation and remaining (20.83 %) of the farmers had low level management orientation

Chauhan and Patel (2003) in their study on entrepreneurial characteristics of poultry entrepreneurs and reported that, majority (71.25 %) of the poultry entrepreneurs had medium to high level of management orientation.

Nagesh (2005) in his study revealed that, majority (66.7 %) of the respondents belonged to medium category of management orientation, followed by (19.2 %) of the respondents having low management orientation and (14.2 %) of the respondents having high level management orientation.

2.5 Constraints encountered by blackgram growers in adoption of recommended cultivation practices

Thyagarajan and Vasanthakumar (2000) conducted a study on constraints in getting high yield in rice in south Arcot district of Tamil Nadu and revealed that, lack of reasonable support price was found to be the first important constraint by 36.33 per cent followed by high cost of inputs expressed by 34.00 per cent of respondents.

Mutkule *et al.* (2001) conducted a study on constraints in adoption of chilli technology in Nanded district of Maharashtra and observed that, majority of the respondents (93.33 %) experienced the constraints like insecticides and pesticides were costly followed by fluctuation of prices of chilli (86.00 %).

Nithyashree and Angadi (2001) in their study on the knowledge and adoption of IPM practices among cotton growers of Raichur district and revealed that, major constraints in adoption of IPM practices among the cotton growers was the lack of knowledge (75 %). This was followed by lack of proper guidance (70 %), non availability of the required material (62 %), lack of training (60 %) and requires a lot of skill (40 %).

Nagaraj (2002) conducted a study on knowledge of improved cultivation practices of sugarcane and their extent of adoption by farmers in Bhadra command area of Davanagere district and reported that, majority of the respondents faced the problem of high cost of fertilizer (92.48 %) followed by delay in release of loan by the banks (81.65 %), high rate of interest (80.82 %), delay in transport of harvested cane from field by the factory (76.23 %), delay in issuing permit by the factory (76.23 %), improper guidance from the extension workers (72.90 %), delay in payment by factory (69.57 %) and shortage of labour (49.57 %).

Maraddi *et al.* (2004) conducted a study on constraints in adoption of cotton production technologies in Malaprabha Command area of Karnataka and reported that, many of constraints were related to economic (75.00 %) and technical guidance (71.66 %) as compared to other categories of constraints related to inputs (67.58 %), production (60.00 %) and marketing (57.77 %).

Sunilkumar (2004) carried out a study on farmers knowledge and adoption of post harvest technology in tomato crop of Belgaum district in Karnataka and reported that, majority of the farmers (75.83 %) faced the problem of lack of technical knowledge and

guidance about improved cultivation practices as well as post-harvest technology. Whereas, 65.00 per cent of the respondents faced the problem of high fluctuation in market price followed by high transportation cost (62.53 %), labour shortage and high wages (55.83 %) and lack of irrigation facilities and power shortage (46.66 %).

Khan and Chauhan (2005) conducted a study on adoption of farmers towards new farm technology and concluded that, high cost of improved seed, unavailability of seeds in time and lack of knowledge about improved seed, recommended seed rate, long dry spell, high cost of chemicals for plant protection measures etc, were main constraints expressed by the majority of respondents in adoption of new farm practices of ground nut and gram cultivation.

Raghavendra (2005) conducted a study on knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district of Karnataka and reported that, high cost of fertilizer was a problem faced by 85.00 per cent of respondents followed by problem of pest (80.00 %), problem of disease (78.30 %), limited and irregular power supply (38.30 %) and high cost of plant protection chemicals (38.33%). While fluctuation in prices (81.60 %), exploitation by middle men (71.66 %) and poor transportation facilities (35.60 %) were the major marketing problem.

Thiranjangowda (2005) conducted a study on cultivation and marketing pattern of selected cut flowers in Belgaum district and revealed that, high investment in poly house (75.00 %), problems of pests and diseases (65.00 %), high cost of fertilizers (45.00 %) and high cost of plant protection chemicals (17.50 %) are the main constraints regarding gerbera flower cultivation.

Nayak (2007) carried out a study on management practices of pineapple growers in Karnataka and revealed that, cent per cent of respondents were facing the problem of lack of regulated markets, where as almost all the farmers faced the problem of low market price for the produce (97.50 %). Micronutrient deficiency in soil (92.50 %), lack of storage facility (88.12 %), lack of technical guidance (85.63 %), lack of processing units (80.00 %), non availability and high labour charges (70.63 %) were the other reported problems. Further, less than sixty per cent of respondents expressed problems of exploitation from pre-harvest contractors and middle men (57.50 %) and non availability of required quantity of fertilizers in time (33.12 %).

Singh *et al.* (2007) studied on adoption constraints of pigeonpea cultivation in Lucknow district of Central Uttar Pradesh and reported that, the production constraints which are being faced by farmers in the area have been analyzed through personal survey. The major constraints taken into account were technological, socioeconomic and agro-ecological which limit the adoption of modern package of practices for its cultivation and ultimately the yield. The incidence of pests and diseases on plants (97.52 %) respondents, non-availability of quality seed material (96.23 %) and non-availability of sulphur based phosphatic fertilizer for balanced nutrition (94.35 %) respondents were identified as major constraints which cause setback in the expected production.

Suresh Kumar (2009) carried out investigation to know the constraints faced by farmers in adoption of recommended cultivation practices of soyabean and reported that, in order of priority were, majority of the farmers (88.00 %) indicated high cost of inputs, shortage of labours (85.33 %), and lack of knowledge of disease control (77.33 %).Whereas, 74.67 per cent of the farmers expressed non-availability of ‘rhizobium, thiram and zinc sulphate. 70.67 per cent of the farmers expressed fluctuation in the market price. More than 50.00 per cent of the farmers expressed financial constraints.

Parveen Kumar *et al. (*2010) conducted a study on constraints in pulses cultivation as perceived by the farmers and revealed that, the main constraints faced by pulse grower were non availability of improved variety seeds, manure and fertilizers in time, lack of knowledge regarding weed control and lack of regulated market for sale.

Dwivedi (2011) conducted study to elicit the perceived constraints in adoption of the recommended technology of pigeonpea, on the basis of the analyzed data, lack of information about improved variety ranked 1st, followed by the use of inappropriate methods of sowing and lack of technical skill about proper weed management.

Jat *et al.* (2011) conducted study on constraints in adoption of moth bean production technology in arid zone of Rajasthan and revealed that, most important were weed control through 'herbicides is technically complex phenomenon', 'lack of knowledge about improved technologies of seed, weedicides and plant protection measures', 'absence of assured marketing at remunerative price and insurance policy facility', 'lack of operational skill in the plant protection equipments' and 'sandy storm, high wind velocity

and high temperature affect the growth of crop and productivity', 'unavailability of inputs at the time of peak season' and 'lack of water policy decided by the government'.

Kumbhare and Singh (2011) carried study on adoption behaviour and constraints in wheat and paddy production technologies and revealed that, the major technical, resource and market related constraints perceived by farmers in wheat and paddy were perceived by farmers were non-availability of quality seeds of wheat, non-availability of rubber milling facility in their locality for rice processing, breakage of grain during milling/ processing, lack of transportation facilities, and lack of market facility.

Sharanappa (2011) conducted a study on knowledge and adoption of recommended production practices of paddy by the farmers of Tungabhadra project area, Karanataka and revealed that, majority of the respondents (94.17 %) faced the problem of low price to product in case of marketing constraints, followed by non-availability of the labour in time (74.17 %), high cost & non availability of chemical fertilizers (72.50 %) and high wages of labour (66.67 %) in case of management constraints.

Shashikant *et al.* (2011) conducted study in Gulbarga district of Karnataka state to find out the constraints in production and marketing of redgram by the farmers and indicated that, high incidence of pest and diseases (rank I), followed by inadequate availability of labour (rank II) in redgram cultivation were the major challenges faced by farmers in raising redgram productivity. The other important challenges were high cost of pesticide, inadequate availability of fertilizer and quality seeds, low output price during post harvest period, High output price fluctuation, damage due to natural calamities, lack of support to redgram cultivation, availability of quality pesticides were the other common constraints faced by farmers.

Ashish Kumar *et al*. (2012) studied on behaviour of farmers in adoption of recommended technology of soybean and reported that, non availability and cost effective labour at proper time was expressed by the majority of farmers (76.66%) followed by non availability of money at proper time (64.67%), non availability of quality seed (60.00 %), lack of protective irrigation (58.00 %) and lack of knowledge about weedicides and its proper use (56.66 %).

Singh *et al.* (2012) study on constraints in adoption of mothbean production technology in arid zone of Rajasthan and highlights that, there are various constraints

which affect the process of adoption, however, few of them are most important one which affect the extent of adoption of recommended production technology of mothbean. The most important were weed control through herbicides is technically complex phenomenon, lack of knowledge about improved technologies of seed, weedicides and plant protection measure, absence of assured marketing at remunerative price and insurance policy facility, lack of operational skill in the plant protection equipments and sandy storm, high wind velocity and high temperature affect the growth of crop and productivity, unavailability of inputs at the time of peak season and lack of water policy decided by government.

Meti (2013) conducted a study on sunflower production Technologies - constraints analysis in Raichur district of Karnataka and revealed that, the constraints faced by respondents in adoption of recommended cultivation practices. As high as 95.83 percent of farmers expressed lack of irrigation facility as a major constraint followed by non availability and high labour charges (93.33 %), erratic price fluctuation (86.66 %), non availability of quality seeds (76.67 %), high disease and pest problems (74.17 %), lack of technical and advisory services (65.00 %) and non-availability quantity fertilizers when needed (65.00 %).

It could be witnessed from the above reviews that the farmers have expressed several problems in adoption of recommended cultivation practices of crops.

III. METHODOLOGY

A study on knowledge and adoption of recommended cultivation practices of blackgram growers in north eastern region of Karnataka was conducted during 2014-2015 in Bidar and Kalaburgi districts of Karnataka. The research methodology followed in the study is given under the following sub heads.

3.1 Research design

3.2 Locale of study

3.3 Description of study area

3.4 Selection of districts

3.5 Selection of talukas

3.6 Selection of villages

3.7 Selection of respondents

3.8 Selection of variables for the study

3.9 Operationalization and measurement of variables

3.10 Constraints faced by blackgram growers in adoption of recommended cultivation practices

3.11 Procedure employed in data collection

3.12 Statistical methods used to analyse the data

3.1 Research design

In the present study "Ex-post facto design" was used for the study. This design was considered appropriate because, the phenomena had already occurred.

3.2 Locale of study

The study was conducted in Bidar and Kalaburgi districts of Karnataka state, which is shown in fig. 1, as these stood first and second in area and production of blackgram in North Eastern Karnataka. Among five talukas of Bidar district, Bhalki taluka had the maximum area under blackgram. Similarly, among seven talukas of Kalaburgi district Chincholi taluka had maximum area. Hence, Bhalki taluka from Bidar district and Chincholi taluka from Kalaburgi district were purposively selected for the study area.

3.3 Brief description of study area

The Bidar district is situated between 17°35’ and 18°25’ North latitudes and 74°42” and 73°39’ east longitudes and lies in the extreme north of the state. Its maximum length from east to west is 93.4 km and from north east to south west 11.52 km. The district has geographical area of 5,451 sq.km. With 4, 74,224 ha of agricultural land of which 1,71,807 ha is the cultivable land. The district receives an average rainfall of 890.60 mm per year. It is situated at a height of 618.7 mt above the mean sea level. It is surrounded by Andhra Pradesh and Maharashtra states at north – east and west directions, respectively and Gulbarga district at south direction.

The soil type is red laterite and medium to deep black soil. Bidar district lies under agricultural zone-1 (Northern transiation zone), consisting 5 talukas *viz.,* Aurad, Basavakalyan, Bhaliki, Bidar and Humnabad. The district has got the advantage of three sugar factories. The district receives *kharif* rains from July to September and *Rabi* rains in the month of October to December. The major crops in the *kharif* season among cereals, paddy, jowar *etc*., among pulses; redgram, greengram, blackgram, horsegram *etc*., and among oil seeds; groundnut, sunflower, safflower and with respect to commercial crop; sugarcane and cotton are grown. In *rabi* season, *rabi* jowar and wheat among cereals grams in pulses, safflower and sunflower in oil seeds are cultivated. Groundnut and sunflower among oilseeds and sugarcane as commercial crop are being cultivated extensively in the district.

Kalaburgi district is located in the northern part of the Karnataka state at an altitude of 443.88 meters, a latitude of 16°2’ and 7°46’ longitude 76°42’ east. This district has two agro-climatic zones namely North eastern transition zone comprising of Aland and Chincholi taluka and North eastern dry zone consisting of remaining 5 talukas *viz.,* Afzalpur, Chittapur, Jewargi, Kalaburgi and Sedam.

The total geographical area of the district is 10954.97sq.kms. The soils of the district are deep to very deep black, medium black, sandy loam and are light textured soils. The average annual rainfall ranges from 575.2 to 642.0 mm. The total population is 21,74,742 with literacy percentages of 51. The total cultivable area in the 10,61,757 hectares. The major crops grown in the district are redgram, greengram, blackgram, groundnut, sunflower, jowar and bajra during *kharif, while rabi* jowar, bengalgram, safflower, cotton, wheat, paddy are grown during *rabi.*

3.4 Selection of districts

The study was conducted in Bidar and Kalaburgi districts of North Eastern Karnataka during the year 2014-15. The districts are purposively selected based on maximum area under blackgram cultivation in North Eastern Karnataka.

Sl. No.	Disrticts	Area (ha)
1	Bidar	32929
2	Kalaburgi	18553
3	Yadgir	11
4	Raichur	48
5	Koppal	251
6	Ballari	67

3.5 Selection of talukas

The study was conducted in Bidar and Kalaburgi districts of North Eastern Karnataka. Bidar district comprises of five talukas namely Aurad, Basavakalyan, Bhalki, Bidar and Humnabad. Kalaburgi districts comprises of seven talukas namely Afzalpur, Aland, Chincholi, Chittapur, Jevargi, Kalaburgi and Sedam. Bhalki taluka from Bidar district and Chincholi taluka from Kalaburgi district were purposively selected based on highest area under blackgram cultivation (Anon., 2014a and Anon., 2014b).

Districts	Talukas	Area (ha)
Bidar	Aurad	6785
	Basavakalyan	7187
	Bhalki	10216
	Bidar	4401
	Humnabad	4040
Kalaburgi	Afzalpur	260
	Aland	4216
	Chincholi	6119
	Chittapur	1700
	Jevargi	-
	Kalaburgi	2220
	Sedam	4038

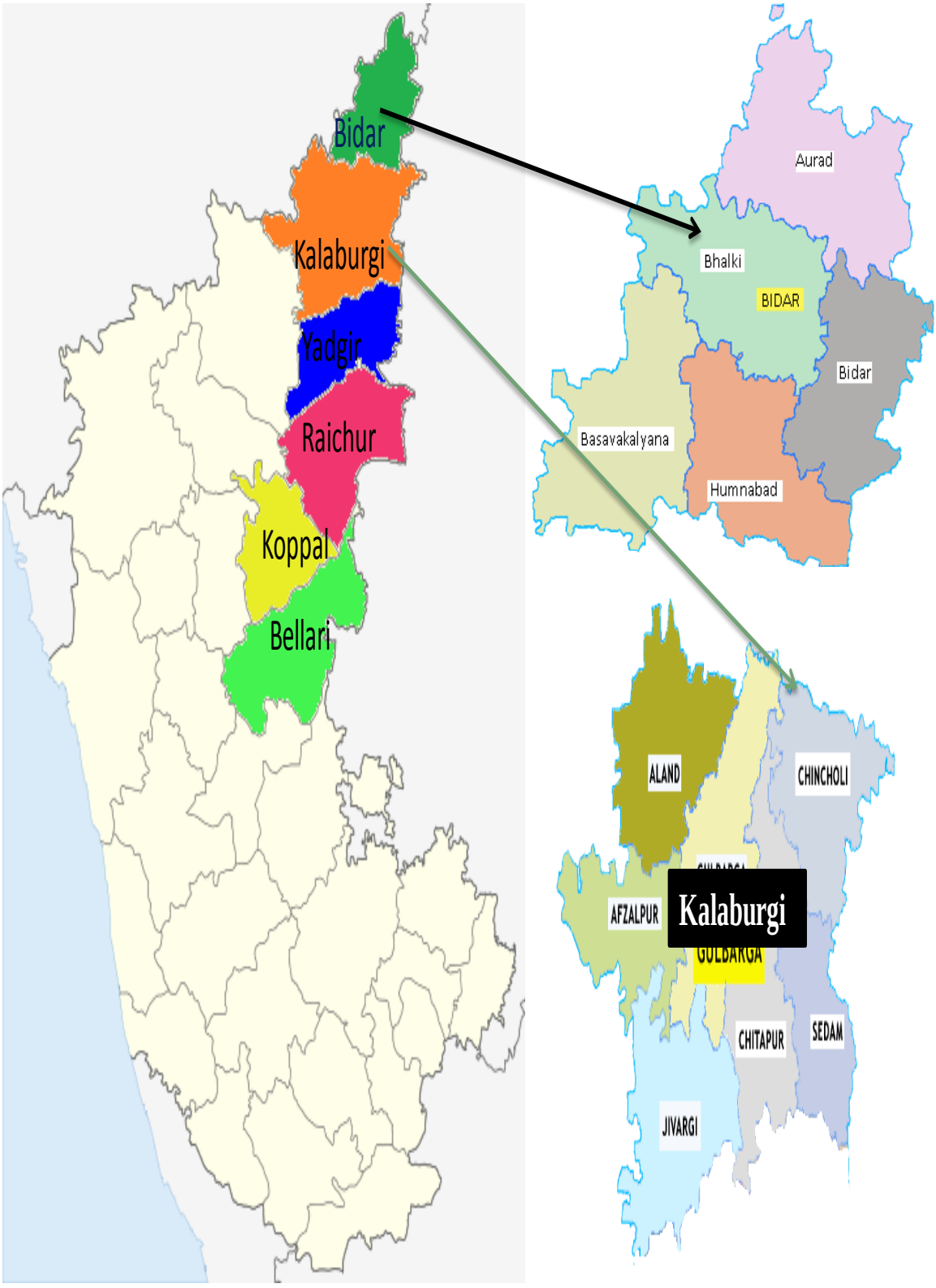

Fig.1. Map showing study area

3.6 Selection of villages

The list of villages having highest area under blackgram in Bhalki and Chincholi talukas were obtained from Department of Agriculture. Considering the highest area under blackgram cultivation, the list of villages was prepared. From this, three villages from each taluka were selected based on maximum area under blackgram crop. The list of villages selected from each taluka for the study. Thus Nittur (B), Saigaon and Chalkapur villages from Bhalki taluka of Bidar district and Salebinalli, Nidagunda and Chincholi villages from Chincholi taluka of Kalaburgi district were selected purposively.

3.7 Selection of respondents

From each selected village a list of farmers cultivating blackgram was prepared with the help of Agricultural Assistant of Karnataka State Agriculture Department. Then 20 blackgram growers from each village were randomly selected to constitute the total sample size of 120 respondents.

Districts	Talukas	Villages	No. of respondents
Bidar	Bhalki	Nittur (B)	20
		Saigaon	20
		Chalkapur	20
		Sub total	60
Kalaburgi	Chincholi	Salebirnalli	20
		Nidagunda	20
		Chincholi	20
		Sub total	60
		Total	**120**

3.8 Selection of variables for the study

3.8.1 Dependent Variables

1. Knowledge
2. Adoption

3.8.2 Independent Variables

1. Age
2. Education

3. Size of land holding
4. Farming experience
5. Annual income
6. Cropping intensity
7. Extension contact
8. Extension participation
9. Achievement motivation
10. Innovativeness
11. Information seeking behavior
12. Management orientation

3.9 Operationalization and measurement of variables

3.9.1 Yield gap: The difference between package of practice yield and actual farm yield or realistic yield is referred as yield gap.

Package of practice yield: The university recommendation yield in package of practice. Package of practice of blackgram yield 10 quintal/ ha.

Realistic yield: It is the yield per hectare realized by the farmers on their own farm and with their own resources and management practices.

The yield of the Blackgram in *kharif* on the grower's field in the year 2014-15 was taken as the actual farm yield

$$\textbf{Yield gap} = \frac{\text{Yield mentioned in package of practice–realistic yield of respondents}}{\text{Yield mentioned in package of practice}} \times 100$$

3.9.2 Cost and returns

Total operational cost was worked out. The gross returns, net returns and Benefit: cost ratio was calculated by using the formula given below

$$\text{BCR} = \frac{\text{Gross returns (Rs/ acre)}}{\text{Total operational cost (Rs/ acre)}}$$

Gross returns (Rs) = Actual per acre yield of blackgram x market price (Rs./ t)

Net returns (Rs) = Gross returns (Rs/ acre)-total operational (Rs./ acre)

Benefit: cost ratio (operational cost) (BCR)

3.9.3 Variables and their empirical measurement

3.9.3.1 Dependent variables

Knowledge and adoption were considered as the dependent variables for the study.

3.9.3.1.1 Knowledge

It refers to the factual information possessed by a farmer regarding recommended cultivation practices of blackgram.

The "Teacher made test" suggested by Anastasi (1961) was employed to measure the knowledge level of respondents with slight modification. All the recommended operations of blackgram cultivation were listed separately in consultation with the experts. The questions and answers were carefully framed by referring to the package of practices of the University of Agricultural Sciences, Raichur. The answers elicited from the farmers were quantified by giving two score to correct, one score for deviation answer and zero to wrong answer.

Based on the total scores, the respondents were grouped into three categories as low, medium and high using mean and standard deviation as measures of check.

Sl. No.	Categories	Score
1	Low	Less than (mean – 0.425*SD)
2	Medium	Between (mean ± 0.425*SD)
3	High	More than (mean + 0.425*SD)

The above procedure was followed by Raghavendra (2005) and Angadi (1999).

3.9.3.1.2 Adoption

It refers to the adoption of recommended cultivation practices of blackgram by the farmers as recommended by the Agriculture University, Raichur. All the recommended operations in blackgram cultivation were listed. A total number of 17 common recommended practices were selected based on the judgment of the specialists. The proper answers for these items were obtained with the help of package of practices and blackgram specialists of the University of Agricultural Sciences, Raichur. The answers

elicited from the farmers were compared and quantified by giving two score for adoption, one for any deviation in adoption or partially adoption and zero for non adoption.

Based on the total scores, the respondents were grouped into three categories as low, medium and high by using mean and standard deviation as a measure of check.

Sl. No.	Categories	Score
1	Low	Less than (mean – 0.425*SD)
2	Medium	Between (mean ± 0.425*SD)
3	High	More than (mean + 0.425*SD)

Also to get a practice wise adoption figure, against each practice frequency and percentages were calculated and presented in tabular form. The procedure followed by Reddy (2006) and Gandhi (2002) were considered study.

3.9.3.2 Independent Variables

3.9.3.2.1 Age

It refers to the chronological age of the respondent at the time of investigation. The age of the respondents was recorded as mentioned by them in completed years. The respondents were categorized in to three age groups based on the procedure followed by Binkadkatti (2008).

Sl. No.	Categories	Age (years)
1	Young	Less than 30
2	Middle	Between 31 to 49
3	Old	Above 50 years

3.9.3.2.2 Education

Education is operationalized as the number of years of formal education the person has undergone. For each year of schooling, a score of one was given. The respondents were grouped into different categories based on the procedure followed by Shashidhara (2003) as follows

Sl. No.	Categories	Education	Scores
1	Illiterate	Cannot read and write	0
2	Primary school	1 to 4th standard	1
3	Middle school	5 to 7th standard	2
4	High school	8 to 10th standard	3
5	Pre-university	11 to 12th standard	4
6	Graduate	Above 12th standard	5

3.9.3.2.3 Size of Land holding

It refers to the number of acres of land possessed by the farmer. The criterion prescribed by the Karnataka land Reforms Act 38 of 1966 (part –B) 99, 195-96 under section 2(a) 32 as one acre of irrigated or garden land was equated to 3 acres of dry land. The criterion prescribed by Ministry of Rural Development, Government of India vide circular No. 280-12/16/19 RD-III (Vol. II) dated 15th November 1991 and as followed by Shashidhara (2003) was used and the respondents were grouped into different categories, as follows

Sl. No.	Category	Land holding (in acres)
1	Marginal farmers	Up to 2.50
2	Small farmers	2.51 to 5.00
3	Semi-medium farmers	5.01 to 10.00
4	Medium farmers	10.01 to 25.00
5	Big farmers	Above 25.00

3.9.3.2.4 Farming experience

It refers to total number of years of farming experience of the farmers. The experience of the farmer in completed years at the time of investigation was considered. They were categorized into low, medium and high by considering mean and standard deviation as a measure of check. Procedure followed by Binkadkatti (2008) was used for categorization.

Sl. No.	Categories	Farming experience (years)
1	Low	Less than (mean – 0.425*SD)
2	Medium	Between (mean ± 0.425*SD)
3	High	More than (mean + 0.425*SD)

3.9.3.2.5 Annual income

It was operationalized as the total income earned by the respondents from agriculture and allied enterprises and expressed in rupees. Based on this, the respondents were grouped into four categories as per the norms suggested by ministry of rural development, Government of India, 1992 and as followed by Deepak (2003).

Sl. No.	Categories	Income (Rs/annum)
1	Low income group	Upto Rs 17,000
2	Semi-medium income group	Rs 17,000 – 34,000
3	Medium income group	Rs 34,000 – 51,000
4	High income group	Above Rs 51,000

3.9.3.2.6 Cropping intensity

It is an index of agricultural development which is defined as the ratio of gross cropped area to the net cultivated area.

It refers to the degree to which an individual puts land into use by cultivating number of crops during the year. This variable was empirically measured by computing cropping intensity index based on the formula suggested by Sinha and Kolte (1974).

$$\textbf{Cropping intensity} = \frac{\text{Gross cropped area (in acres)}}{\text{Net cultivated area (in acres)}} \times 100$$

Sl. No.	Categories	Score
1	Low	Less than (mean – 0.425*SD)
2	Medium	Between (mean ± 0.425*SD)
3	High	More than (mean + 0.425*SD)

3.9.3.2.7 Extension contact

Extension contact has been operationally defined as the frequency of contact of respondents with extension personnel and extension agencies for seeking information about cultivation practices. The procedure followed by Gandhi (2002) was used.

Sl. No.	Frequency of contact	Score
1	Contacted once in a week	3
2	Contacted once in a fortnight	2
3	Contacted when problem arose	1
4	Never contacted	0

3.9.3.2.8 Extension participation

Extension participation refers to the extent of participation of farmers in different extension activities conducted during the last one year prior to the time of interview. The following activities were included to determine the extent of participation of respondents and the scoring pattern was followed as used by Raghavendra (2004).

Sl. No.	Extension activities	Score		
		Regular	Occasional	Never
1	Training	2	1	0
2	Demonstration			
3	Field days			
4	Field visit			
5	Extension Group meeting			
6	Agricultural exhibition			
7	Krishimela			
8	Educational tours			
9	Others			

The responses obtained were expressed in frequency and percentage.

3.9.3.2.9 Achievement motivation

In the present study, the achievement motivation is defined as the value associated with an individual that drives him to excel in farming and related field and thereby attain a sense of personal accomplishment.

The achievement motivation scale developed by Singh (1978) and followed by Binkadakatti (2008) was used in the present study. The scale has six statements in the form of questions. The questions 1, 4 and 6 were grouped under positive statements with scores of 2, 1 and 0 for three alternative answers *viz*., agree, undecided and disagree. The

negative questions were 2, 3 and 5 and reverse scoring of 0, 1 and 2 was followed for alternate answers. The total scores of the respondent indicate the level of achievement motivation he had. The total score ranged from 0 to 12.

To assess the level of achievement, the respondents were categorized as low, medium and high based on mean and standard deviation as measures of check.

Sl. No.	Categories	Score
1	Low	Less than (mean – 0.425*SD)
2	Medium	Between (mean ± 0.425*SD)
3	High	More than (mean + 0.425*SD)

3.9.3.2.10 Innovativeness

Innovativeness is the degree to which an individual is relatively early in adopting the new ideas/practices when compared to other member in the social system. This variable was quantified by using the scale developed by Moulik and Rao (1973) and as followed by Patil (2005) with suitable modification. The scale consists of 5 statements. Among them 1, 2 and 4 were grouped under positive statements and 3 and 5 under negative statements. Maximum and minimum score one can get was 15 and 0, respectively. The scoring pattern is given below.

Sl. No.	Category	Agree	Undecided	Disagree
1	Score for positive statements	3	2	1
2	Score for negative statements	1	2	3

Sl. No.	Categories	Score
1	Low	Less than (mean – 0.425*SD)
2	Medium	Between (mean ± 0.425*SD)
3	High	More than (mean + 0.425*SD)

3.9.3.2.11 Information seeking behaviour

Information seeking behaviour was operationally defined as the frequency of contact or exposure of a farmer to different sources for obtaining farm information.

The information seeking behaviour of a farmer was measured with rating scale, the procedure followed by Chandramouli (2005) with slight modification. The scale

contains 16 items and was categorized under three sub-heads namely informal sources, formal sources and mass media. For determining the degree of information seeking by the respondents through these sources, four response categories namely frequently, occasionally, rarely and never were provided with weightages 3, 2, 1 and 0, respectively.

3.9.3.2.12 Management orientation

In order to know the respondents management orientation the scale developed by Samanta (1977) with slight modifications made and used by Biradar (2012) was used. The scale consists of 18 statements each for planning, production and marketing aspects. In each group, positive and negative statements were mixed retaining more or less a psychological order of statements.

The positive statements were given scores of 2, 1 and 0 for agree, undecided, disagree, respectively. The scoring was reversed in case of negative statements.

The mean scores of the management orientation of the respondents were used for all purpose of grouping the respondents into low, medium and high management orientation.

Sl. No.	Categories	Score
1	Low	Less than (mean – 0.425*SD)
2	Medium	Between (mean ± 0.425*SD)
3	High	More than (mean + 0.425*SD)

3.10 Constraints faced by blackgram growers in adoption of recommended cultivation practices

To know the problems faced by the respondents in adoption of recommended cultivation practices, the respondents were asked to indicate the problems under the detailed items and thus, responses were recorded. Later, the obtained responses were enlisted and expressed in terms of frequency and percentage.

3.11 Procedure employed in data collection

A draft interview schedule against set objectives for measuring the variables of the study was first prepared and pre-tested with farmers in the non-sample area. In the light of pre-testing, necessary changes were incorporated in the interview schedule and were

standardized. The standardized structured schedule was used to collect the data through personal interview technique.

3.12 Statistical methods used to analyse the data

The statistical tools such as mean, standard deviation, frequency and percentage were employed wherever found appropriate and the data were analyzed to draw valid inferences.

Mean: The arithmetic mean is the sum of the scores divided by their number. This measure was used to categorize the dependent and independent variables into low, medium and high categories.

$$\text{Mean} = \frac{\text{Sum of observed values}}{\text{Number of observations}}$$

Frequency: This measure was used to know the distribution pattern of respondents variable wise and to categorize the problems perceived by blackgram growers in order of importance.

Percentage: This measure was used for simple comparisons.

Standard deviation: This measure was used to categorize the dependent and independent variables into low, medium and high categories.

The positive square root of the variance is called standard deviation. It explains the average amount of variation on either side of the mean.

$$SD = \sqrt{\frac{\sum (X - \overline{X})^2}{n}}$$

Where,

SD = Standard deviation

X = Value in the data set

$\overline{X}$ = Mean of all values in the data set

n = Number of values in the data set

IV. RESULTS

The findings of the present study in line with the objectives set forth are presented under the following headings.

4.1 Knowledge of blackgram growers about the recommended cultivation practices

4.2 Adoption of blackgram growers about recommended cultivation practices

4.3 Yield gap of crop and reasons for the same

4.4 Socio- economic profile of blackgram growers

4.5 Constraints encountered by blackgram growers in adoption of recommended cultivation practices

4.1 Knowledge of blackgram growers about the recommended cultivation practices

4.1.1 Overall knowledge of blackgram growers about recommended cultivation practices

A perusal of the data in Table 1 and Fig. 2 indicated that, half (50.83 %) of the respondents belonged to medium level of knowledge category about recommended cultivation practices of blackgram followed by high (27.50 %) and low (21.67 %) knowledge level categories.

4.1.2 Practice-wise knowledge of blackgram growers about recommended cultivation practices

The knowledge of the respondents with regard to practice wise cultivation of blackgram was studied and the data is presented in Table 2 and Fig. 3. It is interesting to note that cent per cent of the respondents possessed full knowledge with regard to sowing time of blackgram *i.e,* May to June. Further, 97.50 per cent of respondents had full knowledge on the varieties (DU-1 and TAU-1) and intercropping pattern followed by seed rate (75.83 %) and spacing (71.67 %). However, the practices like seed treatment of blackgram with *Rhizobium* with proper dosage (200g/ acre) was not known by 40.00 per cent of respondents.

With regard to farm yard manure and fertilizer application practices, majority (76.67 %) of respondents had possessed partial knowledge on the quantity of FYM application, whereas 92.50 per cent had full knowledge on time of application of FYM.

Table 1: Overall knowledge of blackgram growers about recommended cultivation practices

n=120

Sl. No.	Categories	Frequency	Percentage
1	Less than (mean – 0.425*SD)	26	21.67
2	Between (mean ± 0.425*SD)	61	50.83
3	More than (mean + 0.425*SD)	33	27.50
		Mean=33.27	SD=3.32

Table 2: Practice-wise knowledge level of blackgram growers about recommended cultivation practices

n=120

Sl. No.	Components	Knowledge level					
		Full knowledge		Partial knowledge		No knowledge	
		F	%	F	%	F	%
I	**Cultivation practices**						
1	Varieties (DU-1 and TAU-1)	117	97.50	0	0.00	3	2.50
2	Sowing time (May to June)	120	100.00	0	0.00	0	0.00
3	Seed rate (6-6.4 kg/acre)	91	75.83	29	24.17	0	0.00
4	Seed treatment (Rhizobium)	73	60.83	0	0.00	47	39.17
5	Seed treatment dosage (200g/acre)	59	49.17	13	10.83	48	40.00
6	Spacing (30 x 10 cm)	86	71.67	34	28.33	0	0.00
7	Intercropping (Blackgram + redgram, Blackgram + bajra, Blackgram + jawar)	117	97.50	0	0.00	3	2.50
II	**Fertilizers**						
1	FYM (2 tonnes/acre)	28	23.33	92	76.67	0	0.00
2	Time of application of FYM (2-3 Week before sowing)	111	92.50	9	7.50	0	0.00
3	Chemical fertilizer (NPK 10:20:0 kg/acre)	58	48.33	62	51.67	0	0.00
4	Time of application of chemical fertilizers (Basal dose)	120	100.00	0	0.00	0	0.00

III	**Weed management and intercultural operation**						
1	Intercultivation (2 times - Within 40 DAS)	93	77.50	27	22.50	0	0.00
2	Hand weeding (2 times)	120	100	0	0.00	0	0.00
3	Herbicide application (Pre emergence- Pendamithelin, Fluchoralin, and Allachlore)	23	19.17	0	0.00	97	80.83
4	Time of application of herbicide (before and after sowing)	23	19.17	0	0.00	97	80.83
IV	**Plant protection measures**						
1	Insect pest management						
a	Agromicide fly (Dimethoate @ 1.7 ml/l, Imidachloprid @ 0.3 ml/l)	39	32.50	72	60.00	9	7.50
b	Aphids (Dimethoate @ 1.7 ml/l)	41	34.17	71	59.17	8	6.67
c	Thrips (Monocrotophos @ 1 ml/l or Dimethoate @1.7ml/l)	37	30.83	67	55.83	16	13.33
d	Pod borer (Methyl parathion @ 1 ml/l)	19	15.83	96	80.00	5	4.17
2	Disease management						
a	Leaf spot (Mancozeb @ 2g/l or COC @ 3 g/l)	26	21.67	73	60.83	21	17.50
b	Powdery mildew (Sulphur (WP) @ 3g/l or Carbondenzim @ 1g/l)	38	31.67	77	64.17	5	4.17
c	Mosaic (Dimethoate @ 1.7ml/l or Phosphomidan @ 0.5ml/l)	15	12.50	83	69.17	22	18.33
V	**Yield (3.5- 4 quintals/acre)**	89	74.17	31	25.83	0	0.00

***F= Frequency, % = Per cent**

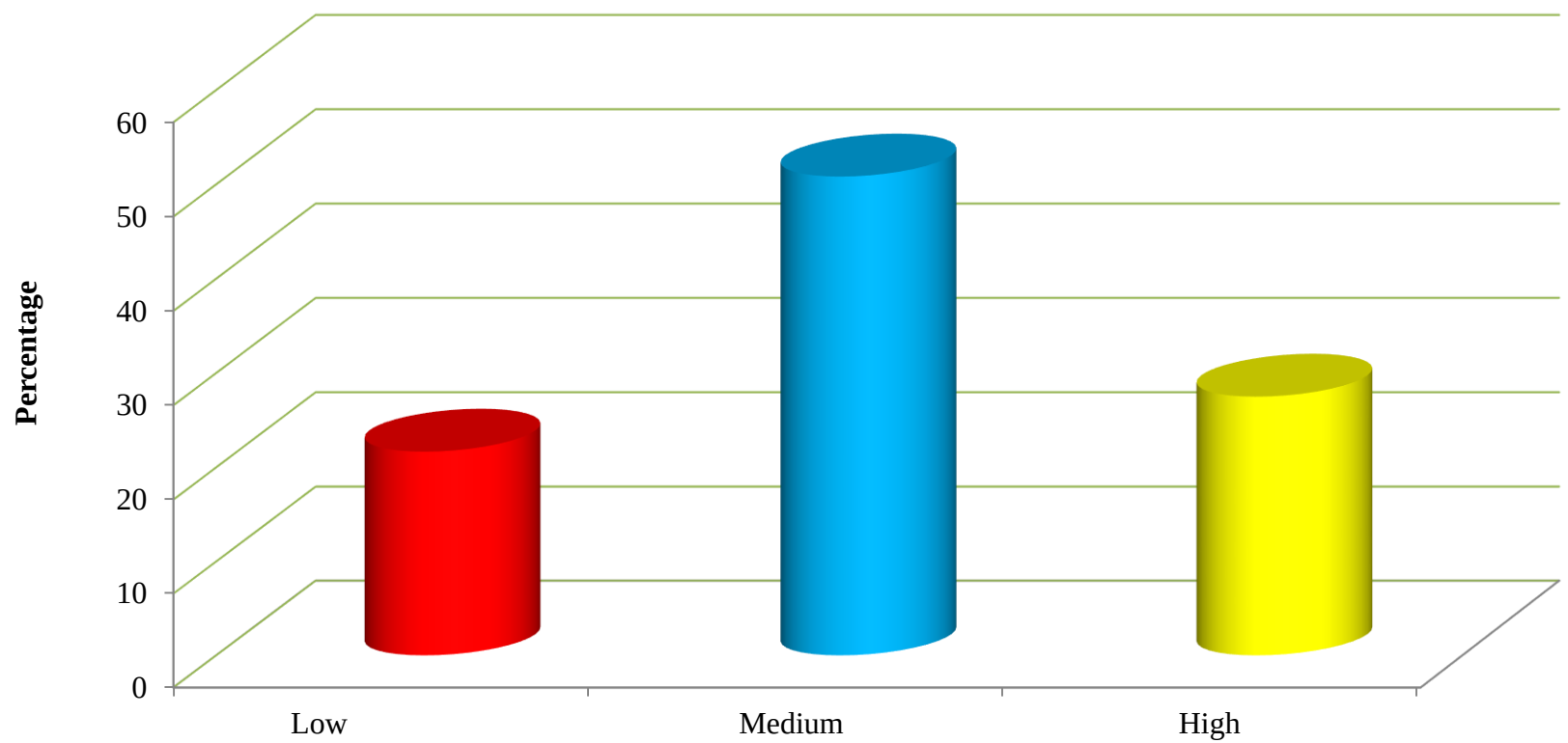

Fig. 2: Overall knowledge of blckgram growes about recommended cultivation practices

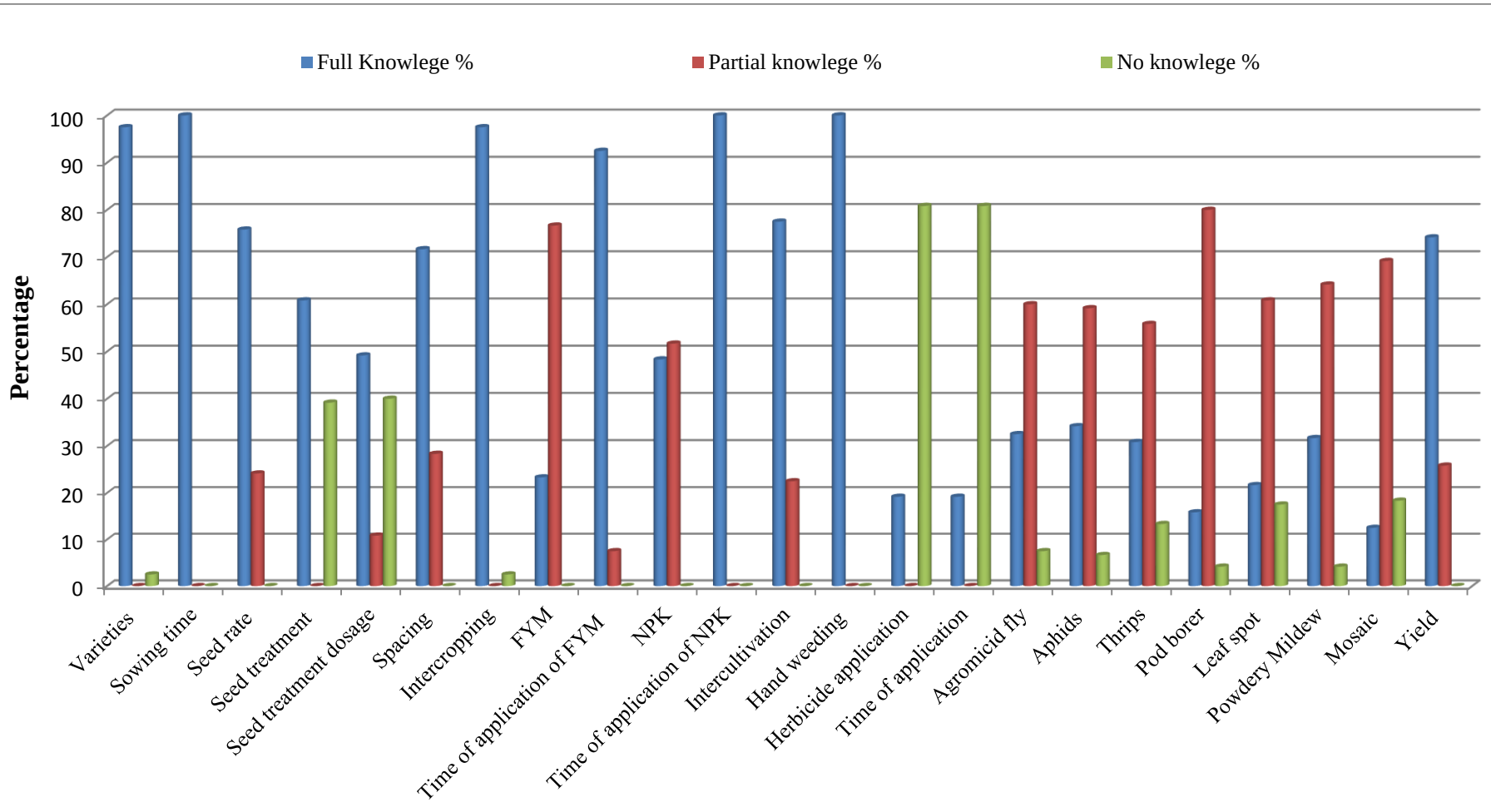

Fig. 3: Pracise-wise knowledge of blackgram growers about recommended cultivation prcactices

With respect to chemical fertilizer application, 48.33 per cent of the respondents had full knowledge on NPK fertilizer application in blackgram. Further, cent per cent of the respondents know the time of application of fertilizer as a basal dose.

With regard to weed management and intercultural operations, majority (77.50 %) of the respondents had full knowledge about intercultivation and were taking this operation two times within 40 DAS. Further, cent per cent of them had full knowledge on hand weeding. However, majority (80.83 %) of the respondents were not known the application of herbicides and also the time of application of herbicides.

With regard to insect pest management practices, it is clear from the Table 2 that, majority (80.00 %) of respondents had partial knowledge about pod borer management followed by agromicide fly (60.00 %), aphids (59.17 %) and thrips (55.83 %) management measures. Regarding disease management, majority (69.17 %) of respondents had partial knowledge about mosaic followed by powdery mildew (64.17 %) and leaf spot (60.83 %) and its management measures.

With regard to the knowledge on yield, 74.17 per cent of the respondents of blackgram had full knowledge on yield of blackgram.

4.2 Adoption of blackgram growers about recommended cultivation practices

One of the objectives of the study was to know the adoption of the recommended cultivation practices by the blackgram growers. The results in this regard are presented in Table 3 and 4.

4.2.1 Overall adoption of blackgram growers about recommended cultivation practices

Overall adoption of recommended cultivation practices of blackgram by the selected respondents is presented in Table 3 and Fig. 4. The results revealed that, majority (45.00 %) of respondents had medium level adoption category followed by 29.17 per cent and 25.83 per cent of the respondents had low and high level adoption categories, respectively.

4.2.2 Practise-wise adoption of blackgram growers about recommended practices

The adoption of recommended cultivation practices of blackgram by the respondents is given in Table 4 and Fig. 5. The data revealed that, cent per cent of the respondents adopted sowing time *i.e,* they have sown blackgram during the month of May

Table 3: Overall adoption of blackgram growers about recommended cultivation practices

n=120

Sl. No.	Category	Frequency	Percentage
1	Less than (mean – 0.425*SD)	34	29.17
2	Between (mean ± 0.425*SD)	54	45.00
3	More than (mean + 0.425*SD)	31	25.83
		Mean=23.54	SD=3.53

Table 4: Practise-wise adoption of blackgram growers about recommended cultivation practices

(n=120)

Sl. No.	Components	Adoption level					
		Full adoption		Partial adoption		No adoption	
		F	%	F	%	F	%
I	**Cultivation practices**						
1	Varieties (DU-1 and TAU-1)	115	95.83	0	0.00	5	4.17
2	Sowing time (May to June)	120	100.00	0	0.00	0	0.00
3	Seed rate (6-6.4 kg/acre)	83	69.17	37	30.83	0	0.00
4	Seed treatment (Rhizobium)	32	26.67	0	0.00	88	73.33
5	Seed treatment dosage (200g/acre)	21	17.50	11	9.17	88	73.33
6	Spacing (30 x 10 cm)	73	60.83	47	39.17	0	0.00
7	Intercropping (Blackgram + redgram, blackgram + bajra, blackgram + jawar)	82	68.33	0	0.00	38	31.67
II	**Fertilizers**						
1	FYM (2 tonnes/acre)	8	6.67	24	20.00	88	73.33
2	Time of application of FYM (2-3 Week before sowing)	25	20.83	7	5.83	88	73.33
3	Chemical fertilizer (NPK 10:20:0 kg/acre)	53	44.17	63	52.50	4	3.33
4	Time of application of chemical fertilizers (Basal dose)	116	96.67	0	0.00	4	3.33
III	**Weed management and intercultural operation**						
1	Intercultivation (2 times - Within 40 DAS)	69	57.50	51	42.50	0	0.00

2	Hand weeding (2 times)	113	94.17	0	0.00	7	5.83
3	Herbicide application (Pre emergence- Pendamithelin, Fluchoralin and Allachlore)	7	5.83	0	0.00	113	94.17
4	Time of application of herbicide (before and after sowing)	7	5.83	0	0.00	113	94.17
IV	**Plant protection measures**						
1	Insect pest management						
a	Agromicide fly (Dimethoate @ 1.7 ml/l, Phosphomidan @0.5ml/l, Imidachloprid @ 0.3 ml/l)	16	13.33	76	63.33	28	23.33
b	Aphids (Dimethoate @ 1.7 ml/l)	21	17.50	76	63.33	23	19.17
c	Thrips (Monocrotophos @ 1 ml/l or Dimethoate @1.7ml/l)	34	28.33	61	50.83	25	20.83
d	Pod borer (Methyl parathion @ 1 ml/l)	13	10.83	88	73.33	19	15.33
2	Disease management						
a	Leaf spot (Mancozeb @ 2g/l or COC @ 3 g/l)	8	6.67	17	14.17	95	79.17
b	Powdery mildew (Sulphur (WP) @ 3g/l or Carbondenzim @ 1g/l)	19	15.83	59	49.17	42	35.00
c	Mosaic (Dimethoate @ 1.7ml/l or Phosphomidan @ 0.5ml/l)	8	6.67	19	15.83	93	77.50

***F= Frequency, % = Per cent**

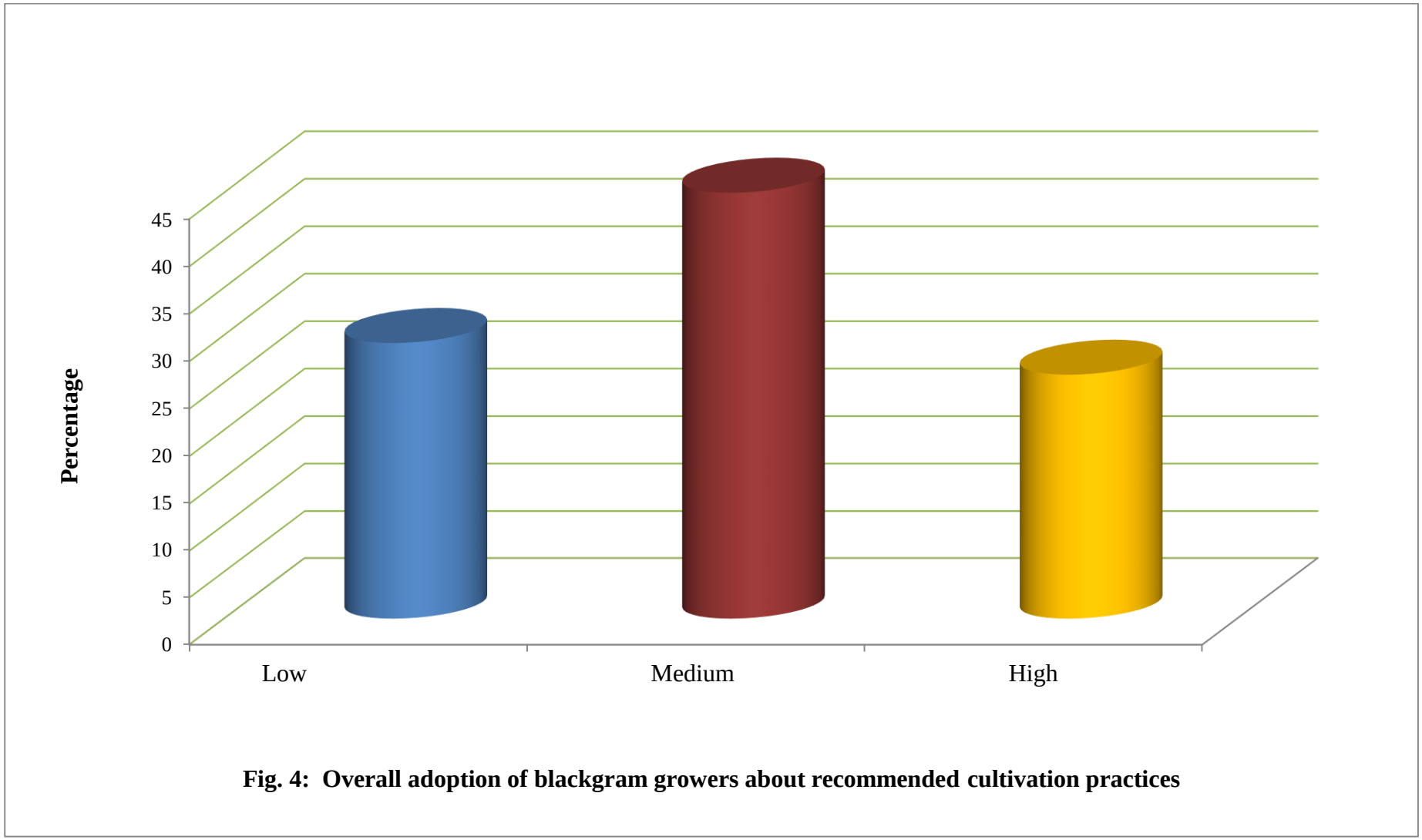

Fig. 4: Overall adoption of blackgram growers about recommended cultivation practices

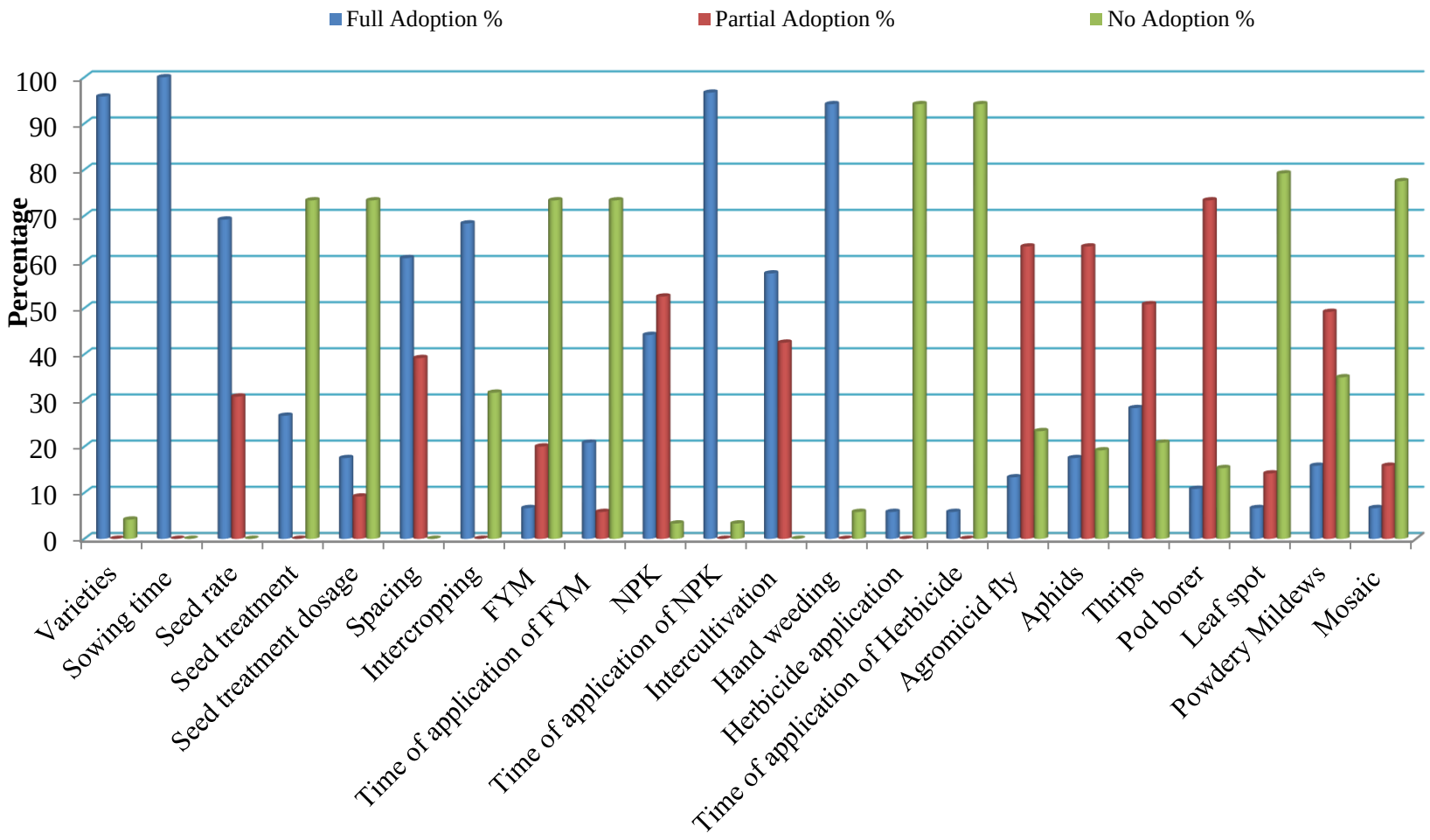

Fig. 5: Practise-wise adoption of blackgram growers about recommended practices

to June. With regard to adoption of recent varieties *viz,* DU-1 and TAU-1, 95.83 per cent fully adopted. The practices like recommended seed rate had fully adopted by majority (69.17 %) of respondents followed by intercropping (68.33 %) and spacing (60.83 %). However, seed treatment with *Rhizobium* and also the use of correct dosage for seed treatment was not adopted by 73.33 per cent of respondents.

With regard to fertilizer management, majority (73.33 %) of the respondents have not adopted recommended quantity of FYM. However, 20.00 per cent of them have partially applied FYM. The similar trend followed in case of time of application of FYM. With regard to application of NPK fertilizer, 52.50 per cent of the respondents partially adopted and remaining 44.17 per cent fully adopted recommended quantity of NPK fertilizer and 96.67 per cent of respondents fully adopted time of application of NPK fertilizer as a basal dose.

With regard to weed management and intercultural operations, 57.50 per cent of respondents had adopted intercultivation *i.e,* two times within 40 days. With regard to hand weeding, 94.17 per cent of respondents carried weeding during crop period. However, 94.17 per cent of respondents not adopted herbicides.

With respect to insect pest management, majority (73.33 %) of respondents partially adopted the chemical measures for pod borer followed by an equal per cent (63.33 %) of respondents followed it partially for the pests like agromicide fly and aphid and 50.83 per cent of respondents partially adopted management measures for thrips.

With respect to disease management, majority (79.17 %) of the respondents not adopted the recommended management measures for leaf spot followed by mosaic (77.50 %) and powdery mildew (35.00 %). However, 49.17 per cent of respondents partially adopted management measures for powdery mildew.

4.2.3 Cost and returns of blackgram cultivation

The Table 5 revealed that, total cost of cultivation accounts to be Rs. 8610.49/acre. Out of total cost of cultivation, the total variable cost accounts chunk share of Rs. 6781.3/acre. The total variable cost includes both labour as well as material cost. The labour cost incurred for land preparation was found to be more (Rs. 1400/acre) followed by operations like weeding and harvesting (Rs. 600/acre), intercultivation (Rs. 500/acre), sowing (Rs. 450/acre) and spraying (Rs. 300/acre). Among material cost,

Table 5: Cost and returns of blackgram cultivation for one acre

n=120

Sl. No	Particulars	Units	Quantity	Rate (Rs.)	Total (Rs)
I	**Variable cost**				
A	**Labour Cost**				
1	Land preparation	Rs.	-	-	1400
2	Sowing	Man day	1 man	300	450
			1 woman	150	
3	weeding	Man day	4 women	150	600
4	Spraying	Man day	1 man	300	300
5	Intercultivation	Rs.	2	500	500
6	Harvesting	Rs.	1 men	300	600
			2 women	150	
	Total cost				3850
B	**Material cost**				
1	FYM/Compost	tonnes	0.4	1300	520
2	seeds	kg	6	100	600
3	Rhizobium	gm	200	250	50
4	Fertilizer	Qnt.	0.4	2400	960
5	Plant protection chemicals	Lit.	0.5	586	293
6	Interest on working capital @ 8.5 %				508.3
	Total cost				2931.3
	Total variable cost				6781.3
II	**Fixed cost**				
1	Rental value of land				1500
2	Land revenue				10.50
3	Depreciation				160
4	Interest on fixed capital @ 9.5 %				158.69
Total					1829.19
Total cost (I + II)					8610.49
Gross return (3.2 q x Rs. 4970)					15904
Net returns					7293.51
B:C ratio					1.85

the cost of fertilizer was found to be more (Rs. 960/acre) followed by seeds (Rs. 600/acre), FYM (Rs. 520/acre), plant protection chemicals (Rs. 293/acre) and *Rhizobium* (Rs. 50/acre). The total fixed cost considering the components like land rent (Rs. 1500/acre), land revenue (Rs. 10.50/acre), depreciation (Rs. 160/acre) and interest on fixed capital (Rs. 158.69/acre) was summed up to Rs.1829.19.

Gross returns were accounted to be Rs. 15904 and the profit was Rs. 7293.51/acre. Hence the B:C ratio was 1.85.

4.3 Yield gap of crop and reasons for the same

4.3.1 Yield gap between yield mentioned in package of practice and realistic yield of respondents

A perusal of Table 6 showed that, there were 21.40 per cent yield gap observed between yield of package of practice and farmers field. The yield of farmers was 7.86 quintal/ ha while that of the package of practice yield was 10 quintal/ ha. Thus, there existed a gap of 2.14 quintal/ ha between the package of practice and farmers field.

4.3.2 Reasons for low yield

It can be seen from Table 7 and Fig. 6 that, majority (94.17 %) of respondents expressed erratic distribution of rainfall was the major reason for low yield followed by non availability of organic manure (45.83 %), higher infestation of pest and disease (30.00 and 28.33 %), lack of technical knowhow for management of pest and disease (24.17 %) and non availability of quality seeds in time (7.50 %), respectively.

4.4 Socio- economic profile of blackgram growers

4.4.1 Age

The data in the Table 8 and Fig. 7 reveals that, over half (52.50 %) of the respondents belonged to middle age group followed by old age with 37.50 per cent and only 10.00 per cent of them belonged to young age group.

4.4.2 Education

It is clear from the Table 8 and Fig 8 that, one fourth (25.00 %) of the respondents were educated upto high school while, 21.67 per cent educated upto middle school and 18.33 per cent were educated up to primary school. The other respondents were educated

Table 6: Overall yield gap analysis of blackgram growers

n=120

Yield at package of practice (quintal/hectare)	Average yield obtained at the farmers field (quintal/hectare)	Yield gap (quintal/hectare)	Yield gap in percentage
10	7.86	2.14	21.40

Table 7: Reasons for low yield

n=120

Sl. No.	Reasons for low yield	Respondents	
		Frequency	Percentage
1	Erratic distribution of rainfall	113	94.17
2	Non availability of organic manure	55	45.83
3	Higher infestation of disease	36	30.00
4	Higher pest incidence	34	28.33
5	Lack of technical knowhow for management of pest and disease	29	24.17
6	Non availability of quality seeds in time	9	7.50

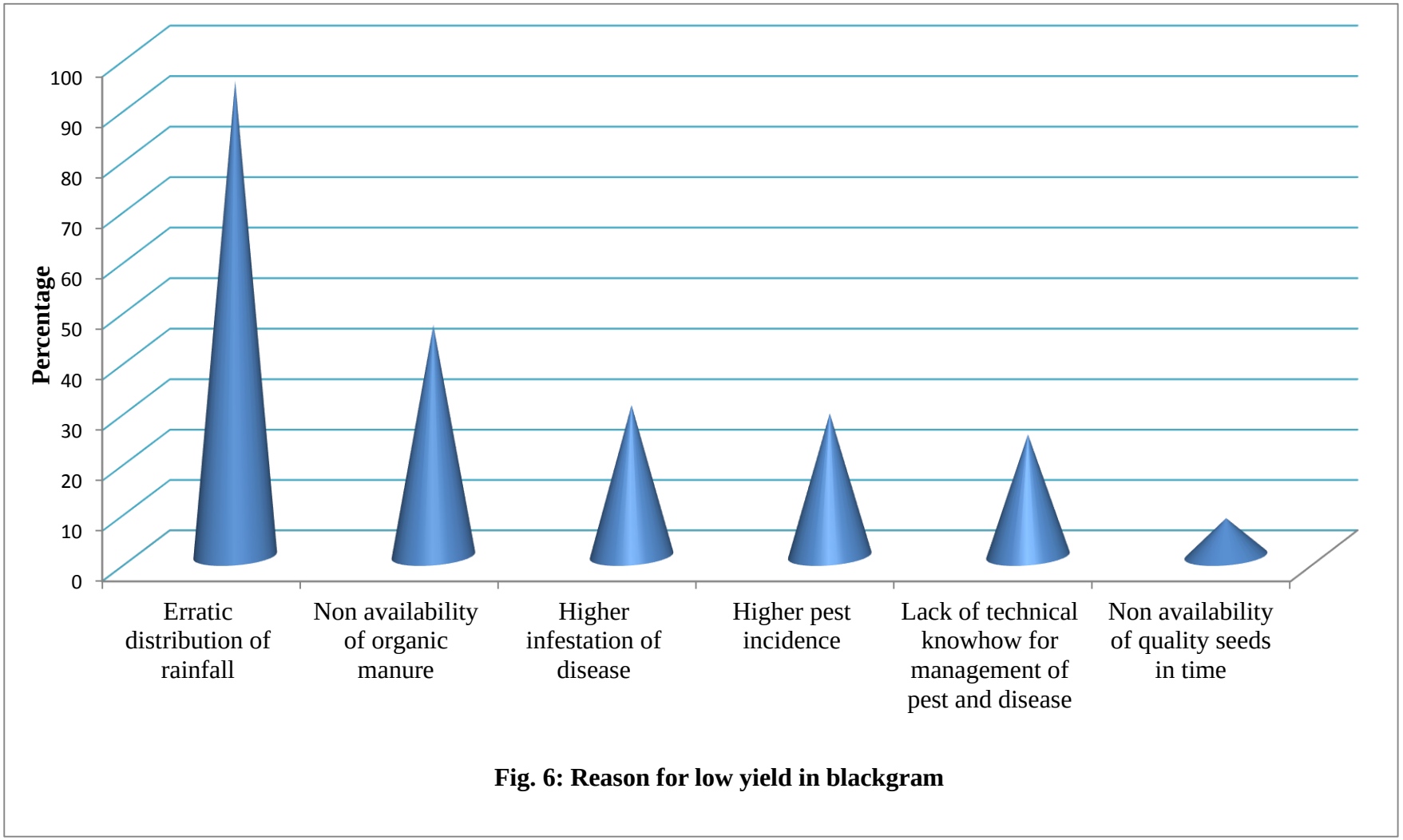

Fig. 6: Reason for low yield in blackgram

Table 8: Socio - economic profile of blackgram growers

n=120

Sl. No.	Variable	Category	Frequency	Percentage
1	Age	Young (Less than 30)	12	10.00
		Middle (Between 31 to 49)	63	52.50
		Old (Above 50 years)	45	37.50
2	Education	Illiterate	24	20.00
		Primary school	22	18.33
		Middle school	26	21.67
		High school	30	25.00
		Pre-university	11	9.17
		Graduate	7	5.83
3	Land holding	Marginal farmers (Up to 2.50 acre)	7	5.83
		Small farmers (2.51 to 5.00 acre)	19	15.83
		Semi-medium farmers (5.01 to 10.00 acre)	34	28.33
		Medium farmers (10.01 to 25.00acre)	52	43.33
		Big farmers (Above 25.00 acre)	8	6.67
4	Farming experience	Low (mean - 0.425 SD)	14	11.67
		Medium (mean ± 0.425 SD)	62	51.67
		High (mean + 0.425 SD)	44	36.67
			Mean=26.44	SD=8.98
5	Annual income	Low (Upto Rs 17,000)	13	10.83
		Semi-medium (Rs 17,000 – 34,000)	29	24.17
		Medium (Rs 34,000 – 51,000)	34	28.33
		High (Above Rs 51,000)	44	36.67
6	Cropping intensity	Low (mean - 0.425 SD)	42	35.00
		Medium (mean ± 0.425 SD)	44	36.67
		High (mean + 0.425 SD)	34	28.33
			Mean=118.75	SD=19.08
7	Achievement motivation	Low (mean – 0.425SD)	41	34.17
		Medium (mean±0.425SD)	45	37.50
		High (mean+0.425SD)	34	28.33
			Mean=7.93	SD=1.09
8	Innovativeness	Low (mean – 0.425SD)	37	30.83
		Medium (mean±0.425SD)	50	41.67
		High (mean+0.425SD)	33	27.50
			Mean=5.88	SD= 1.17
9	Management orientation	Low (mean – 0.425SD)	31	25.83
		Medium (mean±0.425SD)	46	38.33
		High (mean+0.425SD)	43	35.83
			Mean=32.75	SD=1.63

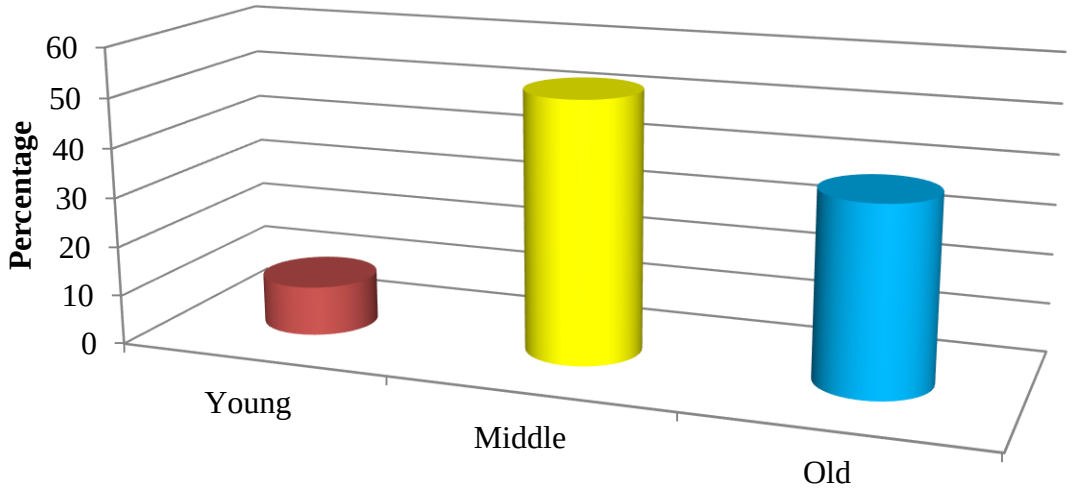

Fig. 7: Disrtibution of respondents according to their age

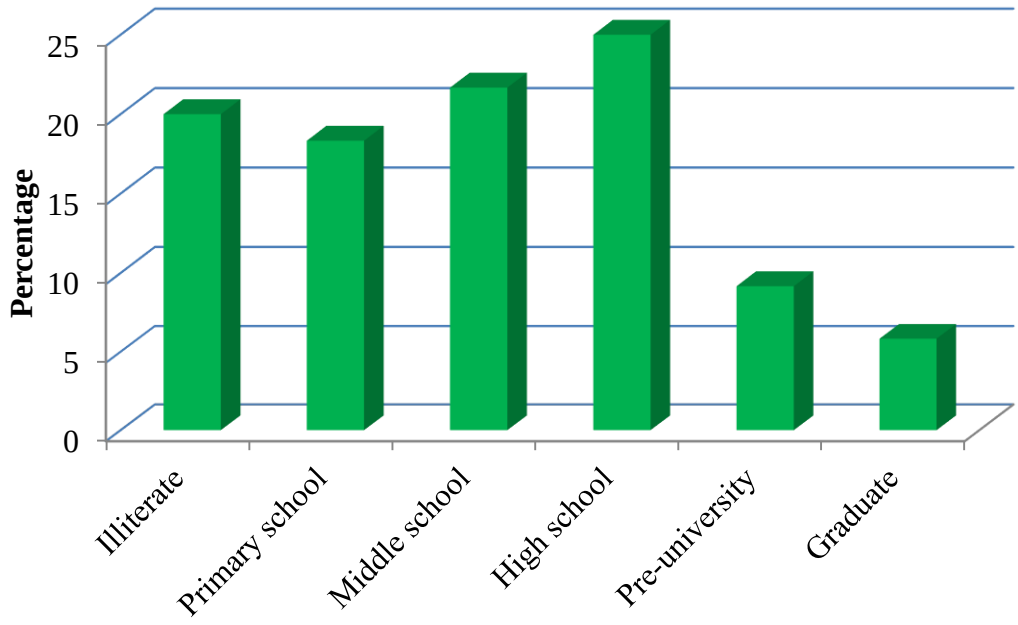

Fig. 8: Distribution of respondents according to their education level

up to PUC (9.67 %) and graduate level (5.83 %). Only 20.00 per cent of them were illiterate or not gone to any formal education institute.

4.4.3 Land holding

It is clear from Table 8 and Fig. 9 that, a considerable per cent (43.33 %) of respondents had medium land holding followed by semi-medium (28.33 %) and small (15.83 %) land holding. A least per cent (6.67 %) of them belonged to big farmers and marginal farmers (5.83 %), respectively.

4.4.4 Farming experience

It can be noticed from Table 8 and Fig. 10 that, over half (51.67 %) of respondents belonged to medium farming experience category followed by high (36.67 %) farming experience and low (11.67 %) farming experience category.

4.4.5 Annual income

The data presented in Table 8 and Fig. 11 indicated that, over one third (36.67 %) of the respondents belonged to high income group followed by medium (28.33 %) and semi medium (24.17 %) income group. Only 10.83 per cent were in low income group category.

4.4.6 Cropping intensity

A perusal of Table 8 and Fig. 12 revealed that, medium cropping intensity was exhibited by 36.67 per cent of blackgram growers followed by low cropping intensity (35.00 %) and high cropping intensity (28.33 %).

4.4.7 Achievement motivation

The data presented in the Table 8 and Fig. 13 revealed that, 37.50 per cent of the respondents were in medium achievement category, while 34.17 and 28.33 per cent of respondents were in low and high achievement motivation levels, respectively.

4.4.8 Innovativeness

It can be observed from Table 8 and Fig. 14 that, over two fifth (41.67 %) of respondents belonged to medium level of innovativeness category, while 30.83 per cent

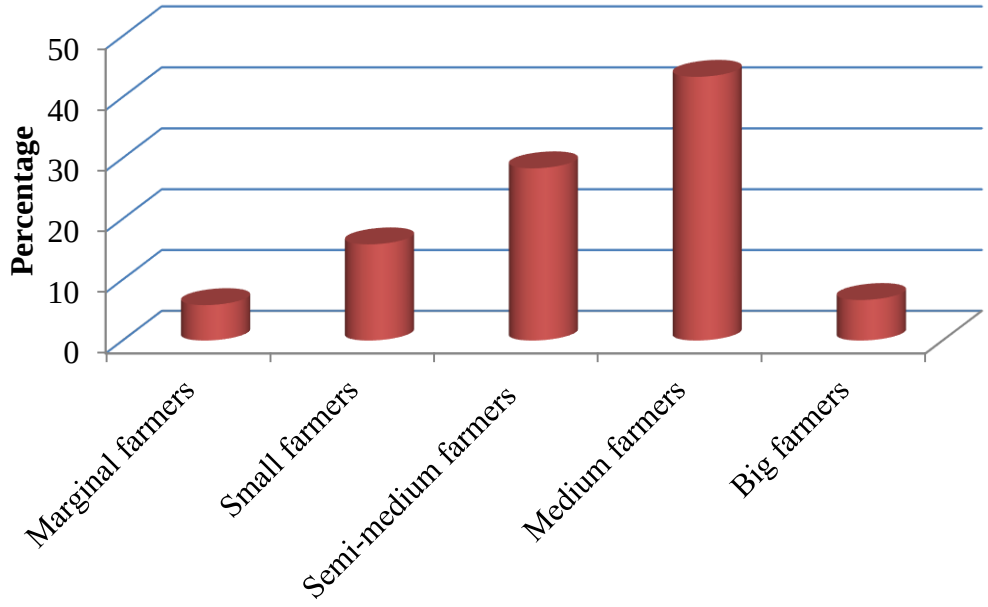

Fig. 9: Distribution of respondents according to their size of land holding

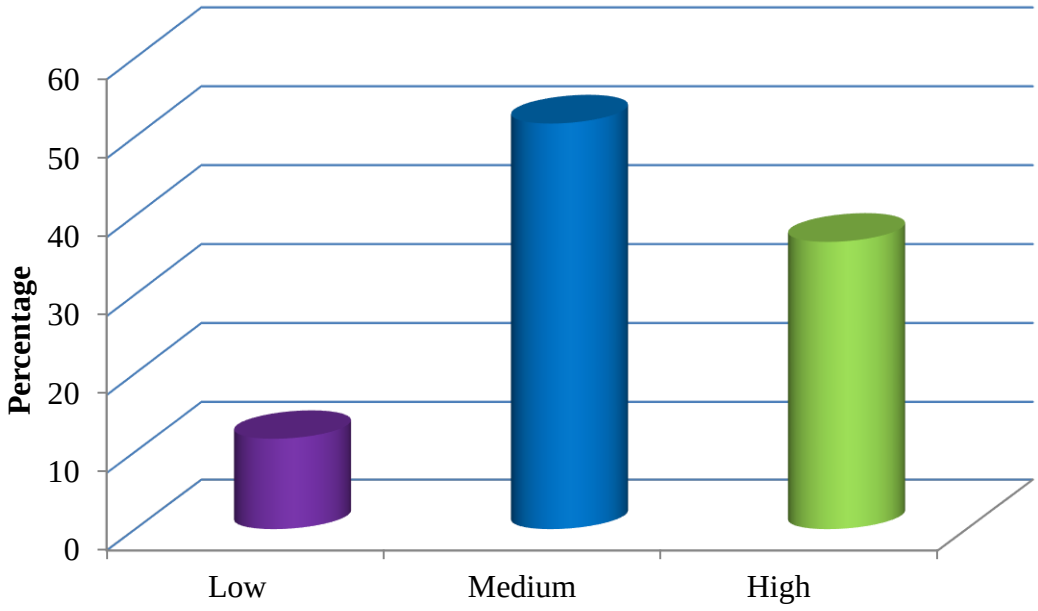

Fig. 10: Distribution of respondents according to their farming experience

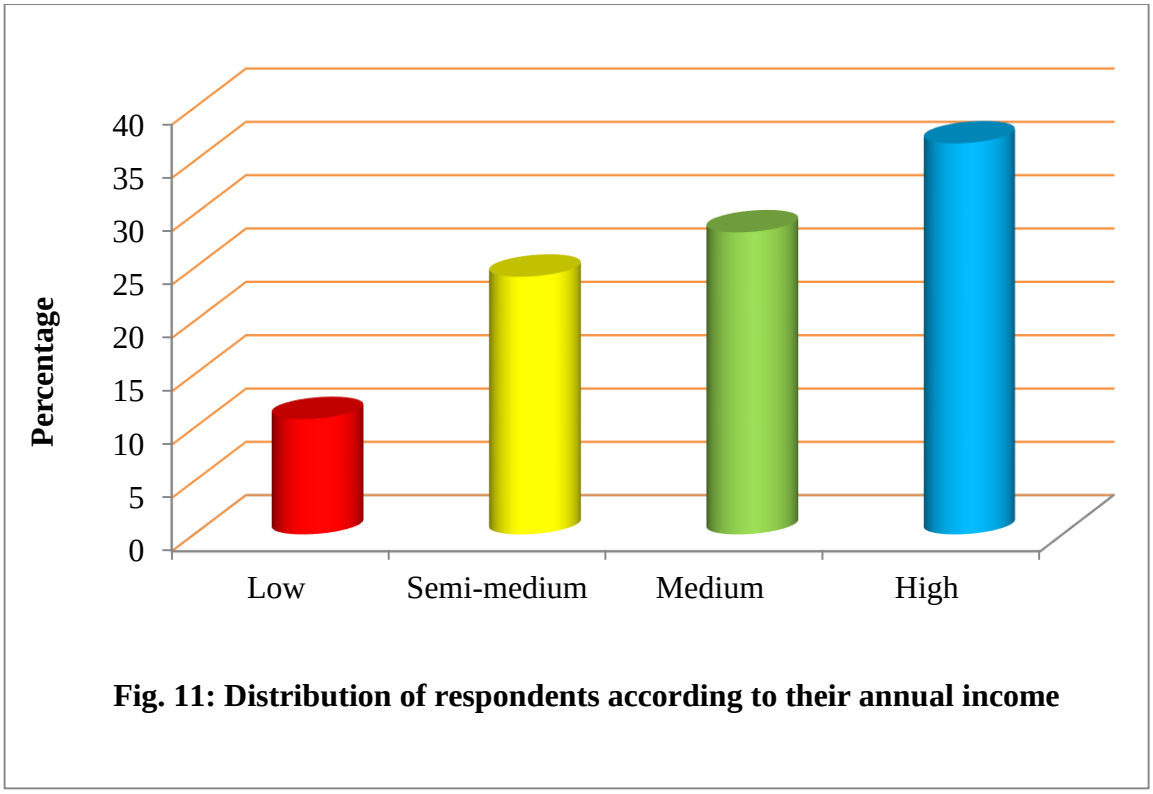

Fig. 11: Distribution of respondents according to their annual income

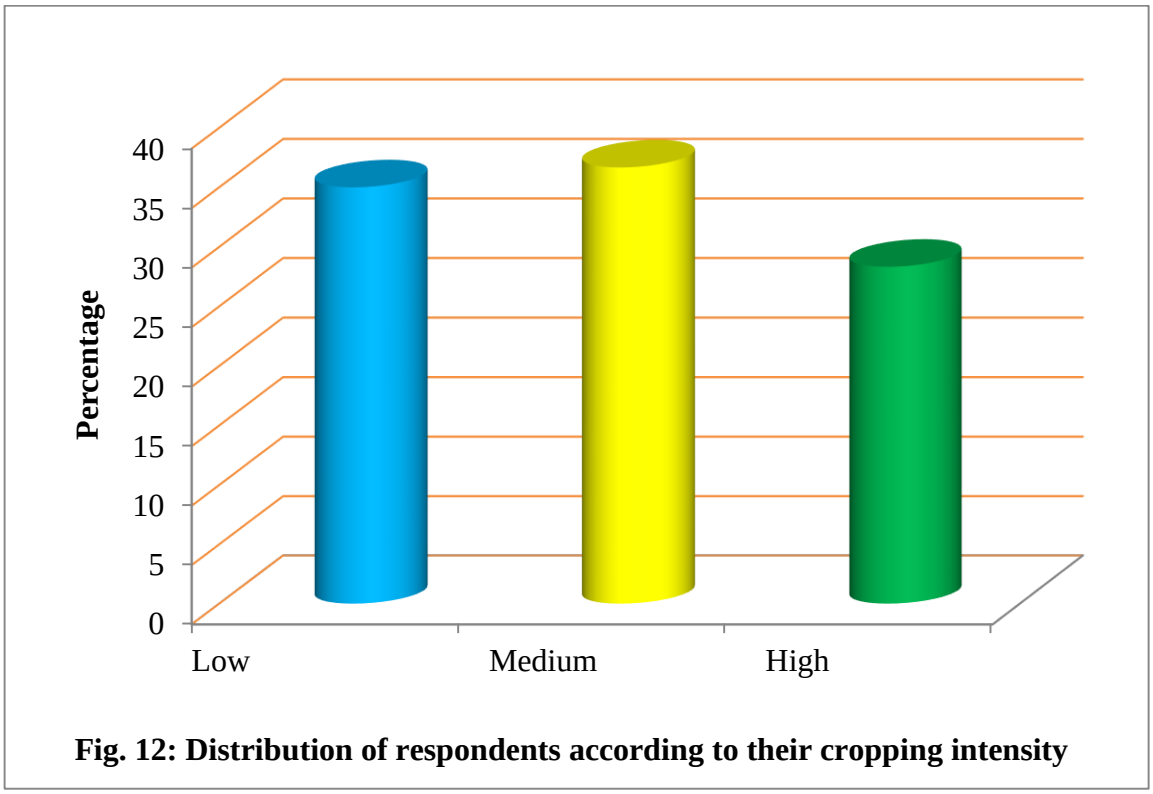

Fig. 12: Distribution of respondents according to their cropping intensity

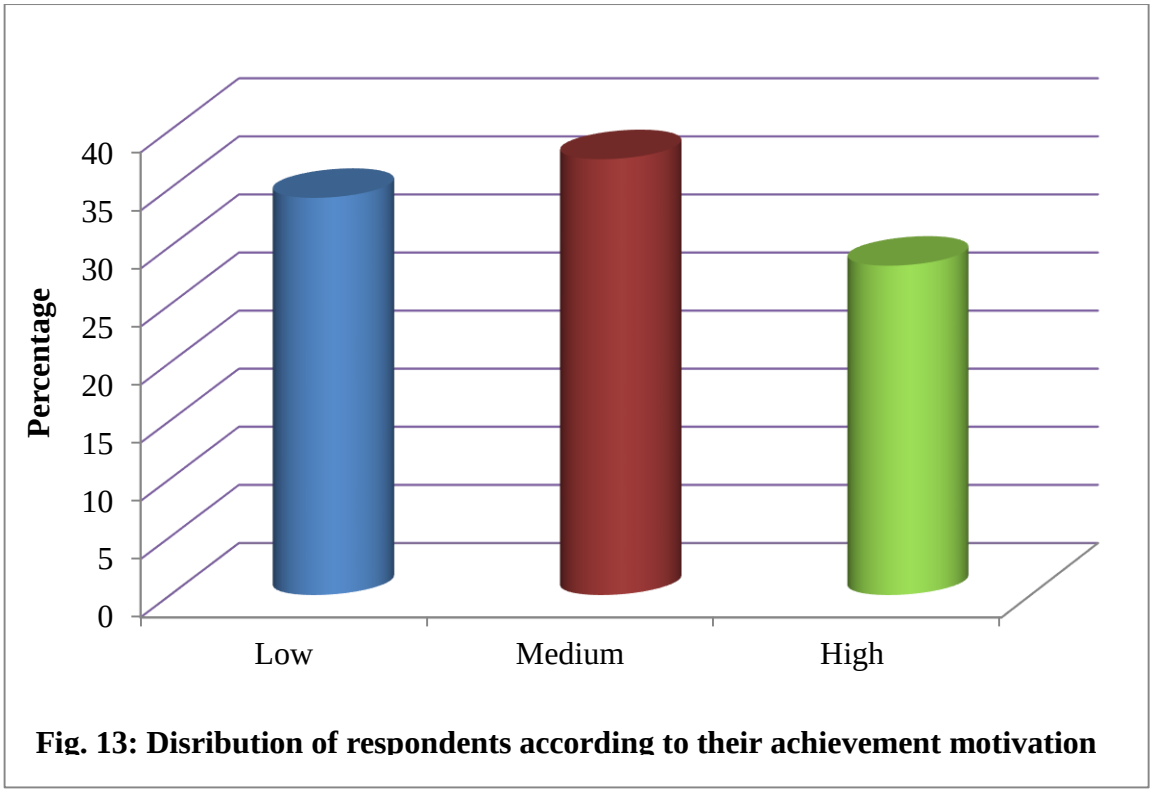

Fig. 13: Disribution of respondents according to their achievement motivation

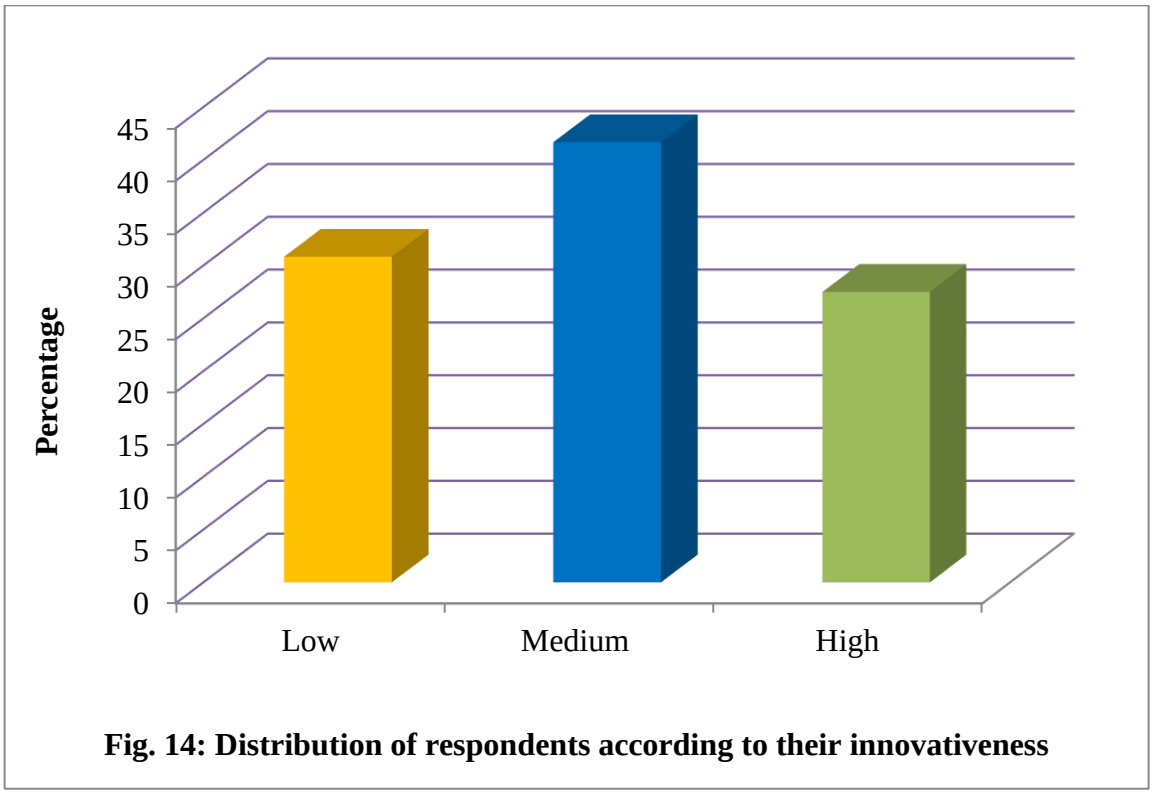

Fig. 14: Distribution of respondents according to their innovativeness

and 27.50 per cent of respondents belonged to low and high level innovativeness category, respectively.

4.4.9 Management orientation

The data in Table 8 and Fig. 15 revealed that, a considerable per cent (38.33 %) of blackgram growers had medium management orientation followed by high (35.83 %) and low (25.83 %) management orientation categories respectively.

4.4.10 Extension contact

The data in Table 9 and Fig. 16 revealed that, majority (46.67 %) of farmers contacted Assistant Agricultural Officer whenever problem occurred followed by 15.00 per cent of them contacted once in a fortnight, once in a week (10.83 %) and 27.50 per cent of them never contacted to AAO. The percentage of the respondents 'who never' contacted Agricultural Officer was 71.67 per cent followed by whenever problem occurred (11.6 %) and once in a fortnight (7.50 %).

It was found that, 72.50 per cent of the respondents never contacted the KVK Scientists but only 27.50 per cent of farmers contacted KVK scientist whenever problem occurred. Large majority (86.67 %) of farmers not contacted University Scientist, but only 13.33 per cent of them contacted whenever problem occurs.

Majority (59.67 %) of the respondents never contacted the private company field staffs. While 34.17 per cent of farmers contacted whenever problem occurred.

Regarding contact of farmers with farm facilitator, nearly one third (30.00 %) of the respondents contacted farm facilitator whenever problem occurred and 35.00 per cent farmers never contacted during the crop season.

4.4.11 Extension participation

The data presented in Table 10 and Fig. 17 indicated that, 23.33 per cent of the farmers participated occasionally in training programmes and 60.00 per cent of the respondents never participated in training programme.

The results also indicated that, 20.33 per cent of the respondents participated occasionally in demonstration and 69.67 per cent of the respondents never participated in demonstration.

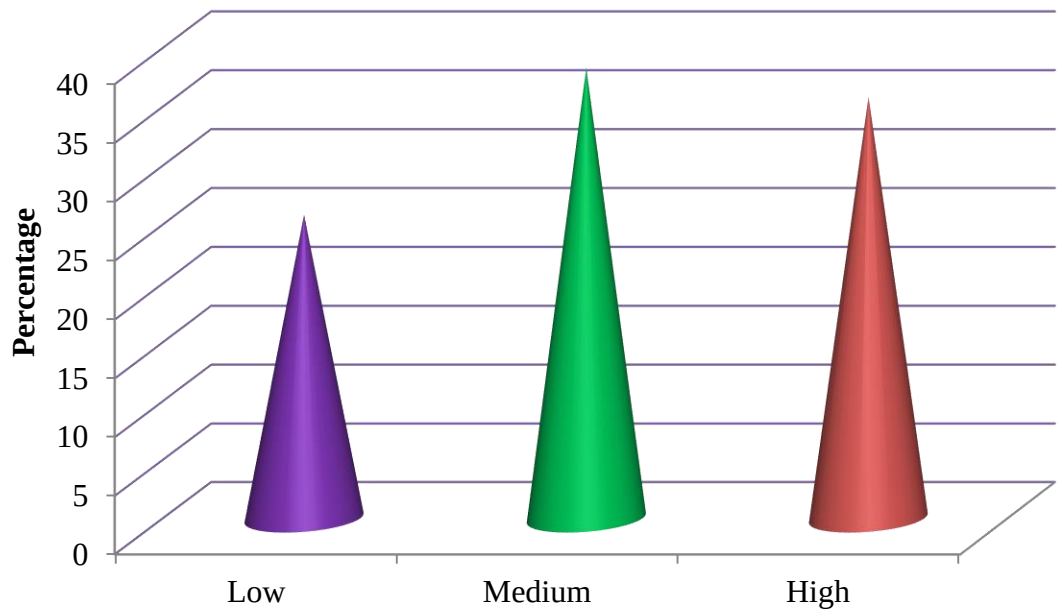

Fig. 15: Distribution of respondents according to their management orientation

Table 9: Distribution of respondents according to their extension contact

n=120

Sl. No.	Extension personnel	Frequency of contact							
		Once in a week		Once fortnight		When needed		Never	
		F	%	F	%	F	%	F	%
1	AAO	13	10.83	18	15.00	56	46.67	33	27.50
2	AO	02	1.67	9	7.50	14	11.66	86	71.67
3	KVK scientists	0	0.00	0	0.00	33	27.50	87	72.50
4	University scientists	0	0.00	0	0.00	16	13.33	104	86.67
5	Private company field staff	0	0.00	8	6.67	41	34.17	71	59.67
6	Farm facilitator	10	8.33	32	26.67	36	30.00	42	35.00

Table 10: Distribution of respondents according to their extension participation

n=120

Sl. No.	Extension activities	Extent of participation					
		Regular		Occasional		Never	
		F	%	F	%	F	%
1	Training programme	20	16.67	28	23.33	72	60.00
2	Demonstration	12	10.00	25	20.33	83	69.67
3	Field days	4	3.33	13	10.33	103	85.83
4	Field visit	4	3.33	16	13.33	100	83.33
5	Extension Group meeting	15	8.33	29	24.17	76	63.33
6	Agricultural exhibition	0	0.00	16	13.33	104	86.67
7	Krishimela	11	9.17	38	31.67	71	59.17
8	Educational tours	1	0.83	4	3.33	115	95.83
9	Farmer field school	7	5.83	15	12.50	97	80.83

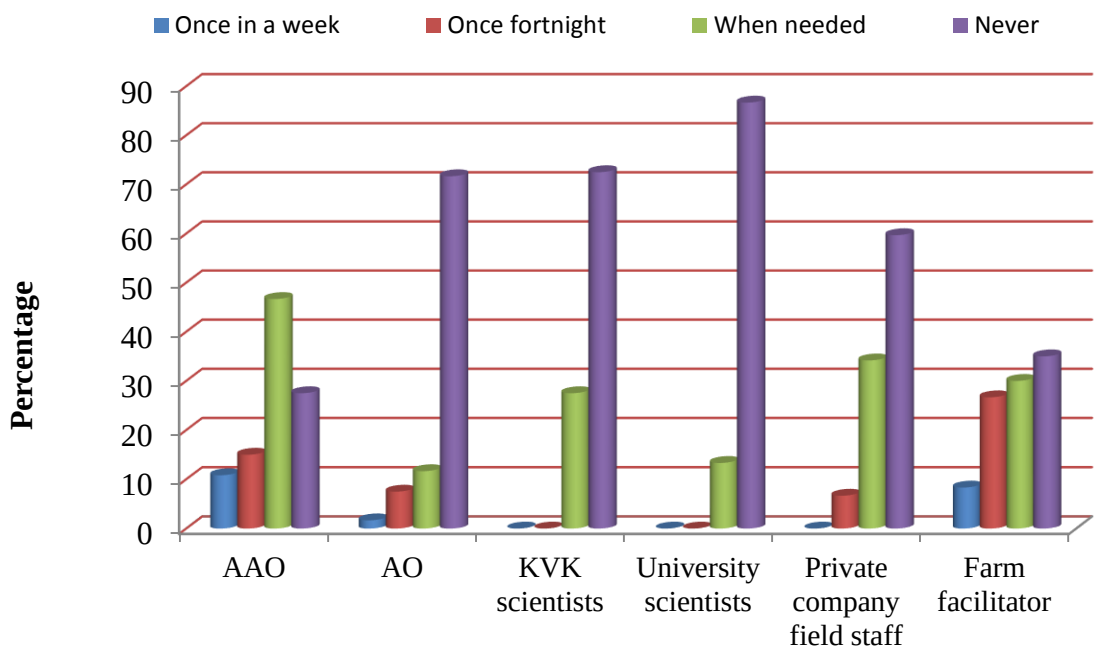

Fig. 16: Distribution of respondents according to their extension contact

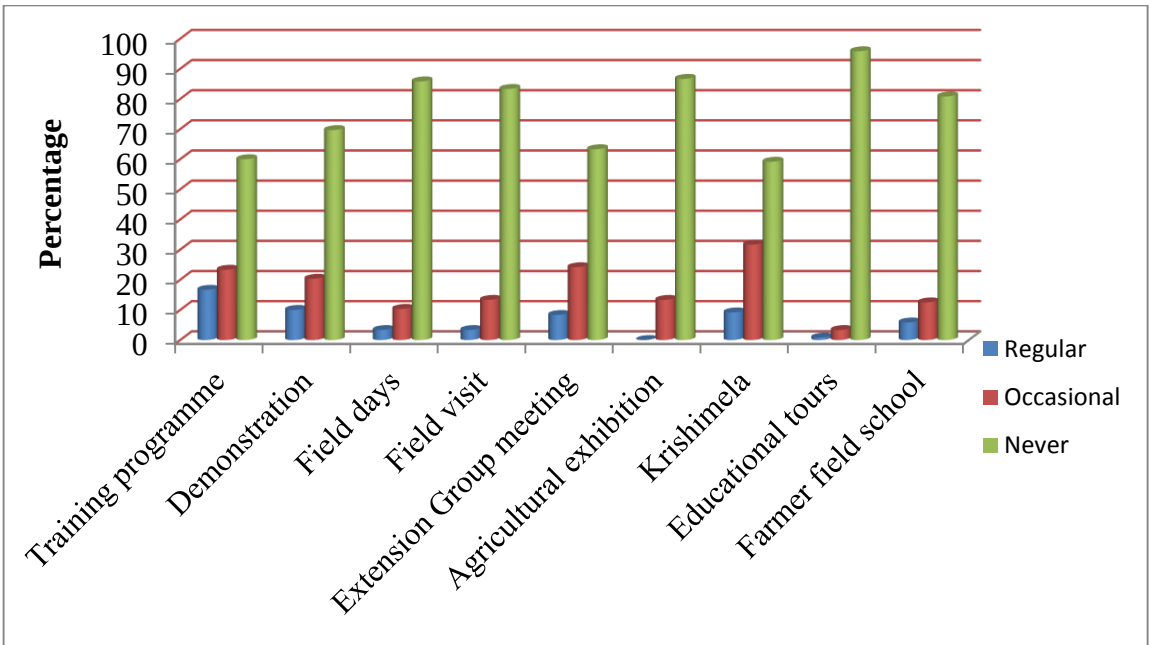

Fig. 17: Distribution of respondents according to their participation in extension activities

With respect to field days it was observed that, 85.83 per cent of the respondents never participated. Whereas, 10.33 per cent had occasionally participated. In case of field visits, large majority (83.33 %) of respondents never participated in field visit only 13.33 per cent farmers participated occasionally.

With respect to extension group meeting, 24.17 per cent of the respondents participated occasionally in meetings and 63.33 per cent were never participated in extension meeting. In case of agricultural exhibition, 13.33 per cent of respondents participated occasionally and majority (86.67 %) of respondents never participated. Regarding krishimela, 31.67 per cent of the respondents visited occasionally and 59.17 per cent never visited krishimela.

Regarding educational tour, a large majority (95.83 %) of the respondents never participated. Further, it can be observed that, 12.50 per cent of the respondents participated occasionally in farmer field school.

4.4.12 Information seeking behaviour

The data recorded in Table 11 and Fig. 18 showed that, major sources for information seeking behaviour by the farmers were informal sources, majority (74.17 %) of farmers frequently consulted friends/relatives followed by neighbours (69.17 %) and family members (63.33 %). Whereas, majority (68.33 %) of them rarely consulted progressive farmers.

Among formal sources, majority (50.83 %) of farmers consulted frequently with agro input agencies. Whereas 22.50 per cent of farmers occasionally consulted with RSK followed by rarely consulted with Scientists from Agriculture University (20.00 %) and marketing officials (19.17%). Among mass media information sources, large majority (98.33 %) of farmers never consulted radio followed by farm literature (96.67 %), newspaper (95.00 %) and TV (86.67 %).

It is also clear from Table 12 and Fig. 19 that, considerable (40.83 %) per cent of farmers had medium information seeking behaviour. In the low and high categories, it was found to be 34.17 and 25.00 percentages, respectively.

Table 11: Distribution of respondents according to their information seeking behaviour

n=120

Sl. No.	Information sources	Degree of contact							
		Frequently		Occasionally		Rarely		Never	
		F	%	F	%	F	%	F	%
I	**Informal sources**								
1	Family members	76	63.33	35	29.17	5	4.17	4	3.33
2	Friends/ relatives	89	74.17	22	18.33	7	5.83	2	1.67
3	Neighbours	83	69.17	19	15.83	12	10.00	6	5.00
4	Progressive farmers	4	3.33	17	14.17	82	68.33	17	14.17
II	**Formal sources**								
1	Gram panchayat member	0	0.00	2	1.67	5	4.17	113	94.17
2	RSK	3	2.50	27	22.50	18	15.00	72	60
3	Scientists from agriculture university	0	0.00	4	3.33	24	20.00	92	76.67
4	Agro input agencies	61	50.83	27	22.50	15	12.50	17	14.17
5	Marketing officials	0	0.00	12	10.00	23	19.17	85	70.83
6	Bank officials	0	0.00	3	2.50	8	6.67	109	90.83
III.	**Mass media**								
1	News papers	0	0.00	1	0.83	5	4.17	114	95.00
2	Radio	0	0.00	0	0.00	2	1.67	118	98.33
3	Television	0	0.00	6	5.00	10	8.33	104	86.67
4	Farm literature	0	0.00	1	0.83	3	2.50	116	96.67

Table 12: Distribution of respondents according to their overall information seeking behaviour

n=120

Categories	Frequency	Percentage
Less than (mean – 0.425*SD)	41	34.17
Between (mean ± 0.425*SD)	49	40.83
More than (mean + 0.425*SD)	30	25.00
	Mean= 10.27	SD= 1.85

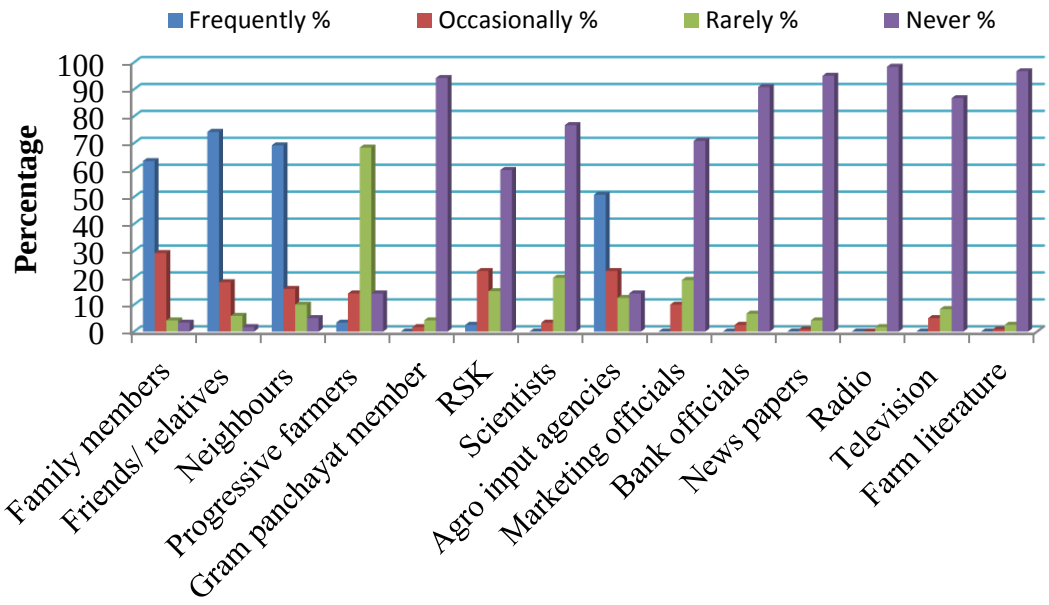

Fig. 18: Distribution of respondents according to their information seeking behaviour

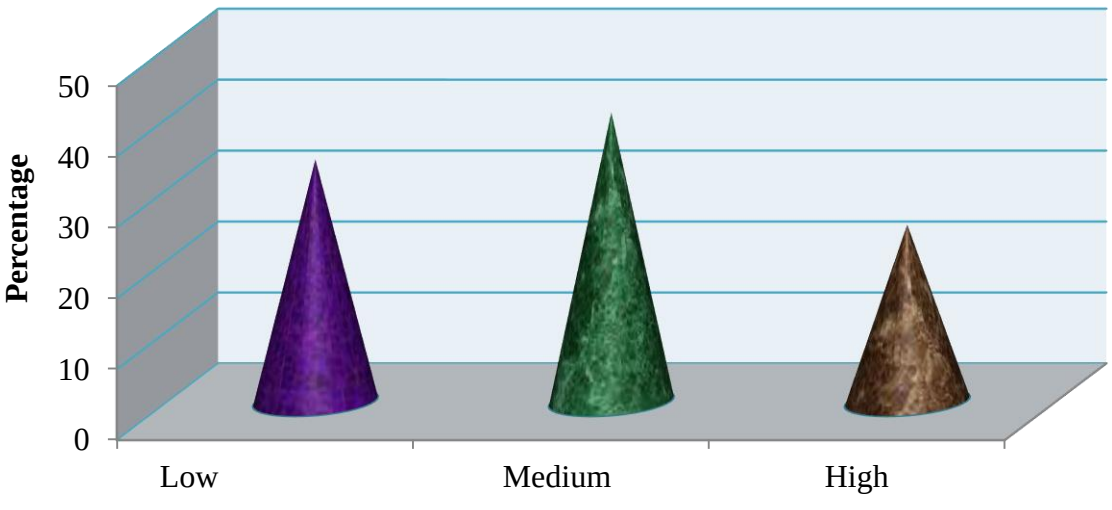

Fig. 19:Distribution of respondents according to their overall information seeking behaviour

4.5 Constraints encountered by blackgram growers in adoption of recommended cultivation practices

The data in Table 13 and Fig. 20 indicates the constraints faced by the respondents in adoption of recommended cultivation practices. In order of priority, majority (85.83 %) of the respondents indicated shortage of labours and high cost of inputs (64.17 %). Whereas, 55.83 per cent of the respondents expressed financial constraints and 52.50 per cent of the respondents expressed non-availability of FYM. Over half (50.00 %) of the respondents expressed lack of knowledge about pest management (51.67 %) followed by fluctuation in marketing price (48.33 %), lack of knowledge about disease management (47.50 %), heavy risk due to failure of monsoon rains (40.00 %), high wages of labours (35.83 %). And some of them also expressed lack of knowledge about different cultivation practices (14.17 %), lack of timely advisory service (13.33 %) and non availability seeds at right time (7.50 %) as some of the constraints of blackgram farmers.

Table 13: Constraints encountered by blackgram growers in adoption the recommended cultivation practices

n=120

Sl. No.	Constraints	Respondents	
		Frequency	**Percentage**
1	Shortage of labour	103	85.83
2	High cost of inputs (seeds, fertilizer, chemicals)	77	64.17
3	Financial constraints	67	55.83
4	Non availability of FYM	63	52.50
5	Lack of knowledge to pest management	62	51.67
6	Fluctuation in marketing price	58	48.33
7	Lack of knowledge to disease management	57	47.50
8	Heavy risk due to failure of monsoon rains	48	40.00
9	High wages of labours	43	35.83
10	Lack of knowledge about different cultivation practices	17	14.17
11	Lack of timely advisory service	16	13.33
12	Non availability seeds at right time	9	7.50

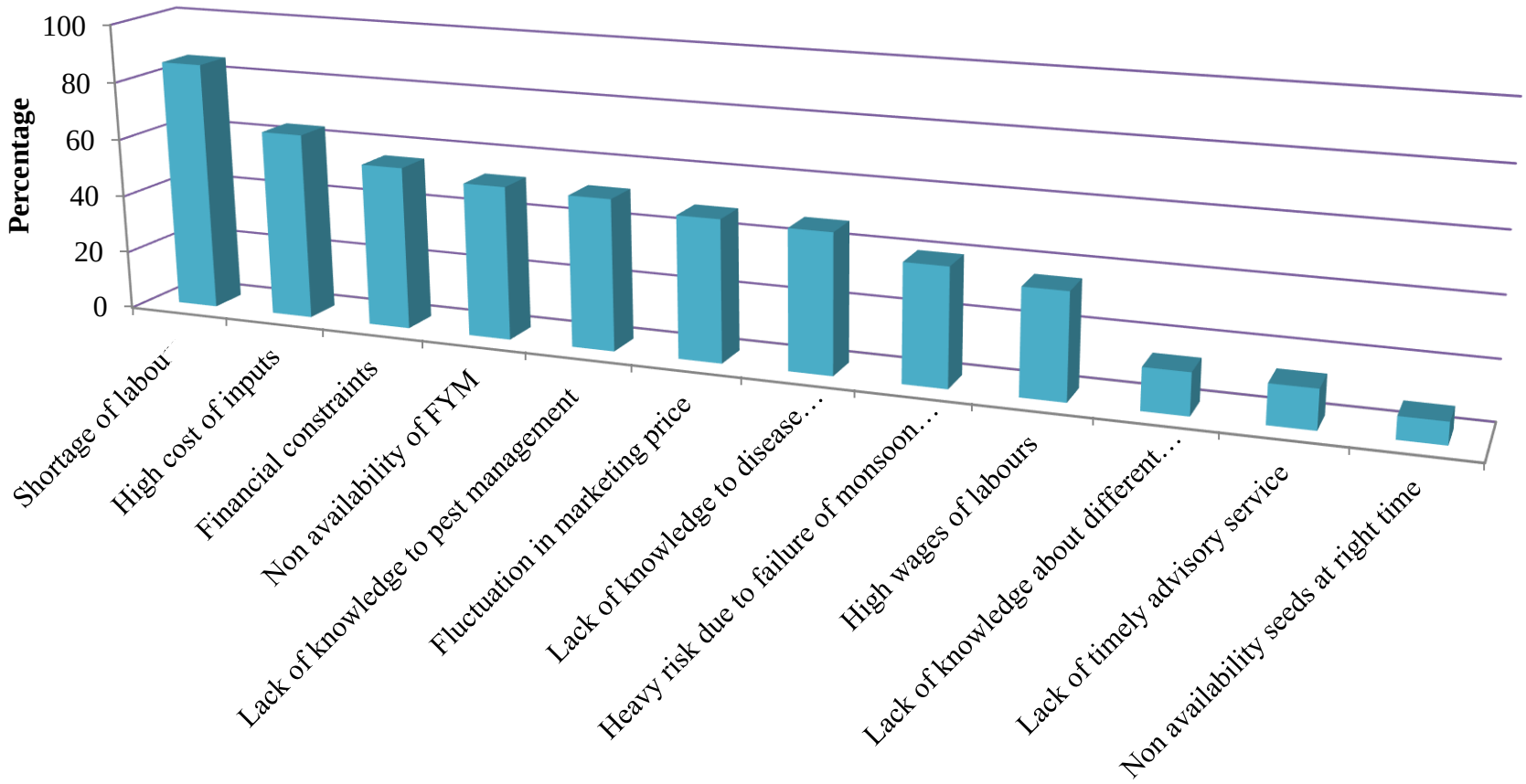

Fig. 20: Constrains encontered by by blackgram growers

V. DISCUSSION

The findings of the present study in line with the objectives set forth are presented under the following headings.

5.1 Knowledge of blackgram growers about the recommended cultivation practices

5.2 Adoption of blackgram growers about recommended cultivation practices

5.3 Yield gap of crop and reasons for the same

5.4 Socio- economic profile of blackgram growers

5.5 Constraints encountered by blackgram growers in adoption of recommended cultivation practices

5.1 Knowledge of blackgram growers about the recommended cultivation practices

5.1.1 Overall knowledge of blackgram growers about recommended cultivation practices

A perusal of the data in Table 1 indicated that, majority (50.83 %) of the respondents belonged to medium knowledge category about recommended cultivation practices of blackgram followed by high (27.50 %) and low (21.67 %) knowledge level categories respectively. Majority of them were middle aged, educated upto high school. Another reason could be that, majority of respondents *i.e* 51.67 per cent farming experience of the respondents had medium level of farming experience followed by high farming experience. It is a fact that, as the experience increases, corresponding of knowledge level also increases. Respondents with more farming experience would able to know the strengths and weaknesses of the recommended practices of blackgram cultivation.

The findings were in conformity with the findings of Sidram (2008), Tidke *et al.* (2012) and Khare *et al.* (2013) who reported that majority of the farmers had medium level of knowledge about recommended cultivation practices of blackgram.

5.1.2 Practice-wise knowledge of blackgram growers about recommended cultivation practices

A perusal of Table 2 depicts that, cent per cent of the respondents had full knowledge about recommended sowing time for their region.

A large majority (97.50 %) of the blackgram respondents had full knowledge about recommended varieties and intercropping followed by seed rate (75.83 %), spacing (71.67 %) and seed treatment (60.80 %). Nearly half (49.17 %) of the respondents had full knowledge about chemical fertilizer dosage for seed treatment.

Regarding fertilizer, cent per cent of respondents had full knowledge about time of application of chemical fertilizer followed by time of FYM application (92.50 %). Whereas over three fourth (76.67 %) of respondents had partial knowledge about quantity of FYM application followed by quantity of chemical fertilizer application (51.67 %) and 48.33 per cent of respondents had full knowledge about quantity of chemical fertilizer application.

With respect to weed management and intercultural operations, cent per cent of respondents had full knowledge about hand weeding followed by 77.50 per cent had full knowledge about intercultivation. Whereas an equal per cent (80.83 %) of the respondents had no knowledge about herbicide and time of application.

With respect insect pest management, majority (80.00 %) of respondents had partial knowledge about pod borer followed by agromicide fly (60.00 %), aphids (59.17 %) and thrips (55.83 %). Whereas, over one third (34.17 %) of the respondents had full knowledge about aphid as a major pest with its management measures followed by agromicide fly (32.50 %) and thrips (30.83 %).

Regarding disease management, majority (69.17 %) of respondents had partial knowledge about mosaic and its management measures followed powdery mildew (64.17 %) and leaf spot (60.83 %). Further, nearly one third (31.67 %) of the respondents had full knowledge about the occurrence of powdery mildew and its management measures followed by leaf spot (21.67 %). In case of yield, nearly three fourth (74.17 %) of respondents had full knowledge about yield.

This trend of results might be due to the fact that, farmers might have acquired knowledge about recommended cultivation practices since the respondents had medium farming experience, better education, large land holdings and better extension contact and high income.

Another reason might be more exposure to various training programmes, awareness programmes, demonstration and krishimela. All these factors might have

influenced the respondents to acquire more knowledge. It is quite natural that, if the individual is having higher education, high land, more farming experience with higher income naturally, one would like to have more knowledge about new technologies and would like to earn more profit.

Another reason may be that the blackgram is an important crop grown by farmers in this region. The attack of pests and diseases is also said to be more in blackgram. Hence, farmers have better knowledge about blackgram cultivation practices, pests and diseases to overcome problem for getting higher yields. Reasons for the lack of knowledge about the pesticide and fungicide may be illiteracy among farmers or low level education, lack of technical know how about pesticides, insufficient knowledge about recommended dosage of pesticides, lack of skill involved in spraying of pesticides may be the reason on the part of farmers.

These findings are in line with the findings of Kanavi (2000), Budihal (2001), Raghavendra (2004), Tidke *et al.* (2012) and Khare *et al.* (2013)

5.2 Adoption of blackgram growers about recommended cultivation practices

5.2.1 Overall adoption of blackgram growers about recommended cultivation practices

Overall adoption of recommended cultivation practices of blackgram by the selected respondents is presented in Table 3. The results revealed that, majority (45.00 %) of respondents had medium level adoption category followed by 29.17 per cent and 25.83 per cent of the respondents in low and high level adoption categories, respectively.

The reason might be that, majority of the farmers had high school level education, medium land holding, medium level achievement motivation, medium innovativeness and medium level management orientation. Hence, all these factors might have influenced them to fall under medium adoption category. Further, as the land holding and income increases naturally and they prove towards economical returns. Good education level and farming experience might have increased their knowledge level and hence fell in medium adoption category so as to gain more income.

The findings are in conformity with the findings of Venkataramalu (2003), Sunil Kumar (2004), Moulasab (2004), Tripathi *et al.* (2006), Upma *et al.* (2010) and Dwivedi *et al.* (2011).

5.2.2 Practise-wise adoption of blackgram growers about recommended cultivation practices

The adoption of any technology and recommended cultivation practices of blackgram in particular depends on various factors such as awareness about practices, extent of change agencies efforts, complexity of practices, timely availability of inputs, characteristics of farmers *etc*. However, it is true that all the recommended practices will not be adapted to some degree by all the members in a given social system. The findings with respect to adoption of blackgram cultivation practices by the respondents which are presented in the Table 4.

Cent per cent of the respondents fully adopted recommended sowing time for their region followed by variety (95.83 %). Whereas, nearly three fourth (73.33 %) of respondents not adopted seed treatment and dosage. However, majority (69.17 %) of respondents fully adopted seed rate followed by intercropping (68.33 %), spacing (60.83 %), seed treatment with *Rhizobium* (26.67 %) and seed treatment dosage (17.50 %).

The reasons for adoption of these practices as recommended are the simplicity and low cost of the practices which can be practiced by making use of mere knowledge and their own resources without reliance on any external agency. Further, farmers as a result of their farming experience have themselves realized the usefulness of these practices.

Regarding fertilizer, an equal per cent (73.33 %) of respondents not adopted FYM and time of application. Whereas only 20.00 per cent of respondents fully adopted FYM and followed time of application. The possible reason might be that high cost and non-availability of the FYM.

Large majority (96.97 %) of respondents fully adopted timely application of chemical fertilizer. However, more than half (52.50 %) of respondents partially adopted chemical fertilizer. Whereas 44.17 per cent of respondents had fully adopted chemical fertilizer. This might be due to less knowledge about quantity of chemical fertilizer.

With regard to weed management and intercultural operations, 57.50 per cent of respondents adopted intercultivation. With regard to hand weeding, 94.17 per cent of respondents carried weeding during crop period. However, 94.17 per cent of respondents not adopted herbicides. This may be due to lack of knowledge about herbicide use and high cost.

With respect to insect pest management, majority (73.33 %) of respondents partially adopted the chemical measures for pod borer followed by an equal per cent (63.33 %) of respondents followed it partially for the pest like agromicide fly and aphid and 50.83 per cent of respondents partially adapted management measures for thrips.

With respect to disease management, majority (79.17 %) of the respondents not adopted the recommended management measures for leaf spot followed by mosaic (77.50 %) and powdery mildew (35.00 %). However, 49.17 per cent of respondents partially adopted management measures for powdery mildew. The reason might be low level education and lack of knowledge about the management of pest and diseases.

The findings of the present study are in consonance with the results of Vedamurthy (2002), Raghavendra (2004) Upma *et al.* (2010), Dwivedi *et al.* (2011) and Vashishtha *et al.* (2011).

4.2.3 Cost and returns of blackgram cultivation

The total cost of cultivation was Rs. 8610.49/acre out of total cost of cultivation, the labour cost accounts to be major share (Rs. 3850/acre). Because for the operations like land preparation, weeding, harvesting and intercultivation. Since this pulse crop has more problems with respect to weeds, there was requirement of more labour for weed management operations. The material input such as fertilizer, seeds and FYM/compost were observed as the major inputs which occupied major share in material cost.

The total variable cost was found to be chunk share (Rs. 6781.3/acre) in total cost of cultivation. Among fixed cost components, the rental value of land involved more cost.

Gross returns in blackgram production was 15904/acre and hence the profit incurred was (Rs. 7293.51/acre) higher. The B:C ratio was 1.85 which is more than one, indicating by spending one rupee. 1.85 rupees of returns can be generated by farmers.

5.3 Yield gap of crop and reasons for the same

5.3.1 Yield gap between yield mentioned in package of practice and realistic yield of respondents

A perusal of Table 6 showed that, there were 21.40 per cent yield gap observed between yield mentioned in package of practice and realistic yield of respondents. The yield of farmers was 7.86 quintal/ ha while that of the package of practice yield was

10 quintal/ ha. Thus, there existed a gap of 21.40 quintal/ ha between the package of practice and farmers field.

This existence of yield gap was because the farmers failed to adopt recommendations for important practices like seed treatment (*Rhiziobium* and PSB), FYM application, vermicompost, management measures for pests like pod borer, aphid, aromicide fly and thrips and diseases like powdery mildew, leaf spot and mosaic. Moreover they did not follow seed treatment.

5.3.2 Reasons for low yield

It can be seen from Table 7 that, majority (94.17 %) of respondents expressed erratic distribution of rainfall was the major reason for low yield, it is beyond human control. However, it is a challenge to the scientists to develop drought tolerant high yielding varieties, which would certainly mitigate the inadequacy and uncertainty of rainfall. Some of also respondent express non availability of organic manure (45.83 %) due to low knowledge about organic manure and not available in time, higher infestation of disease (30.00 %), higher pest incidence (28.33 %), lack of technical knowhow for management of pest and disease (24.17 %) and non availability of quality seeds in time (7.50 %).

Another reason might be timely not taken management measures for insect pest and diseases and due to lack of knowledge to manage pest and diseases.

5.4 Socio- economic profile of blackgram growing farmers

5.4.1 Age

The data from Table 8 reveals that, 52.50 per cent of the respondents belonged to middle age group, followed by old age with 37.50 per cent and only 10.00 per cent belonged to young age group.

Middle aged farmers are more enthusiastic have more knowledge and more farming experience regarding blackgram cultivation. Respondents of middle age group generally have more physical vigour, active in adoption of agricultural practices and also have more responsibility towards family than younger ones and old. Thus, most of the blackgram growers were from middle age group that could be justified. The above findings got support from the studies conducted by studies of Babanna (2001) and Vedamurthy (2002).

5.4.2 Education

It is clear from the Table 8 that, one fourth (25.00 %) of the respondents were educated upto high school while, 21.67 per cent educated upto middle school and 18.33 per cent were educated up to primary school. The other respondents were educated up to PUC (9.67 %) and graduate level (5.83 %). Only 20.00 per cent of them were illiterate or not gone to any formal education institute.

The rural social environment was the major cause for such trend. As the rural people are still traditional bound they generally do not prefer to send their children to colleges and they except their children to assist in farm and house hold activities. The distance of higher study centres from village also might have prevented the parents from providing higher education to their children.

These findings are in line with the studies of Kanavi (2000), Sunil Kumar (2004) and Amol (2006).

5.4.3 Land holding

It is clear from Table 7 that, a considerable per cent (43.33 %) of respondents had medium land holding followed by semi-medium (28.33 %) and small (15.83 %) land holding. A least per cent (6.67 %) of them belonged to big farmers and marginal farmers (5.83 %), respectively.

The possible reasons for this trend might be due to the fact that, being agriculture as main occupation and their way of life, so they always would like to possess more and more acres of land. These findings are in line with the studies of Karpagam (2000), Nagaraj (2002) and Raghavendra (2004).

5.4.4 Farming experience

It can be noticed from Table 8 that, over half (51.67 %) of respondents belonged to medium farming experience category followed by high (36.67 %) farming experience and low (11.67 %) farming experience category.

The majority of the respondents were educated upto high school and middle school education level later on they might have started practicing agriculture as their main occupation and probably they might have been the member of joint families, under such a situation independence is delayed. These factors might have contributed for

51.67 per cent of farmers to fall under the category of 10-20 years of farming experience. Some of the farmers had more than 20 years of farming experience probably they might have started agriculture occupation at an early age. Further, it was observed that only 11.67 per cent of the farmers had farming experience upto 10 years. As they have studied upto PUC and graduation level. After completing their education they might have started agriculture as their occupation.

Hence, majority of them belonged to medium farming category and has the support with the findings of Natikar (2001) and Thiranjangowda (2005).

5.4.5 Annual income

The data presented in Table 8 indicated that, over one third (36.67 %) of the respondents belonged to high income group followed by medium (28.33 %) and semi medium (24.17 %) income group. Only 10.83 per cent were in low income group category.

The possible reason might be the large land holdings coupled with growing two crops in a year along with some commercial crops also. Both *kharif* and *rabi* crops are taken up by the farmers. Some of the farmers of the area are highly skilful and following recommended cultivation practices. All these factors could have favourably influenced the respondents to obtain better income. These results were in line with the results of Vedamurthy (2002) and Nayak (2007).

5.4.6 Cropping intensity

A perusal of Table 8 revealed that, medium cropping intensity was exhibited by 36.67 per cent of blackgram growers followed by low cropping intensity (35.00 %) and high cropping intensity (28.33 %).

The incidence of medium cropping intensity might be due to more dependence on *rabi* crops like chickpea and short duration crops. Similar results regarding cropping intensity were observed in findings of Maraddi (2006).

5.4.7 Achievement motivation

The data presented in the Table 8 revealed that, 37.50 per cent of the respondents were in medium achievement category, while 34.17 and 28.33 per cent of respondents were in low and high achievement motivation levels, respectively.

The reasons could be again their education level, land holding and farming experience. Rainfed farming which majority of the respondents practice could also be one of the reasons. The findings were in conformity with the results of the studies conducted by Budihal (2001) and Maraddi (2006).

5.4.8 Innovativeness

It can be observed from Table 8 that, over two fifth (41.67 %) of respondents belonged to medium level of innovativeness category, while 30.83 per cent and 27.50 per cent of respondents belonged to low and high level innovativeness categories, respectively. Reason could be the medium level of education, medium level of achievement motivation, medium level farming experience, extension contact, extension participation and medium level of information seeking behaviour. The results are in accordance with the findings of Reddy (2006).

5.4.9 Management orientation

The data in table 8 revealed that 38.33 per cent of blackgram growers had medium management orientation followed by high (35.83 %) management orientation and low (25.83 %) management orientation category. Medium level education, medium level of information seeking behaviour, medium extension paricipation, medium level contact with extension personnel and medium level of farming experience is one of the reasons for medium level of management. Above reasons hold good for the findings. The findings get support from the studies conducted by Sahana (2002) and Nagesh (2005).

5.4.10 Extension contact

The data in Table 9 revealed that, the percentage of the respondents contacted the government agency extension personnel, majority of farmer contacted Assistant Agricultural Officer (46.67 %) at the time of problem occurred.

The percentage of the respondents ‘who never’ contacted Agricultural Officer was 71.67 per cent. Whenever problem occurred, 11.67 per cent of farmer consulted Agricultural Officer. It was found that the 72.50 per cent of the respondents ‘never’ contacted the KVK Scientists but only 27.50 per cent of farmer contacted whenever problem occurred.

The 86.67 per cent of farmer not contacted to University Scientist, but whenever problem occurred in field they contacted only 13.33 per cent. It was found that the 59.67 per cent of the respondents 'never' contacted the Private company field staff. While 34.17 per cent of farmers contacted whenever problem occurred.

Regarding contact of farmers with farm facilitator, it was observed from the Table 9 that, during cropping season, 30.00 per cent of the respondents contacted farm facilitator whenever problem occurred followed by once fortnight (26.67 %).

The possible reasons for once fortnight contact with farm facilitators, Assistant Agriculture Officers and Agriculture Office could be their availability at village and hobli level, respectively. Relatively when problem arises contact was observed with Scientists of K.V.K and University as they are providing technical know-how of management practices of blackgram crop. Whereas, Private agency field staff were consulted as farmers required continuous supervision regarding maintenance.

The results are in conformity with findings of Ramanna *et al.,* (2000), Palaniswamy and Sriram (2001) and Sunilkumar (2004) who reported that majority of the farmers had medium contact with extension agency.

5.4.11 Extension participation

It was evident from the Table 10 that, high majority of the respondents had not participated in extension activities like educational tour (95.83 %), agriculture exhibition (86.67 %), field day (85.83 %), field visit (83.33 %), demonstration (69.67 %), extension group meeting (63.33 %), training programme (60.00 %) and krishimela (59.17 %). The possible reasons could be conducting such activities by the concerned departments either less frequently or with less popularity. The lack of initiation or interest on the part of the respondents could also be the reason for the present finding. Most of the respondents participated in activities like krishimela (40.83 %), training programme (40.00 %), extension group meetings (32.50 %), demonstration (30.33 %), field visit (16.33 %), agriculture exhibition (16.33 %), field day (13.67 %) and 18.33 per cent of respondents also participated in the activity like farmer field school. Krishimela is conducted every year at fixed month that enables the farmers' to plan their activities and participate in it. Demonstrations are usually laid in farmer's field and many of them might have participated in it. Similar could be the reason for field visits. Another reason might be

training programme conducted by the government agencies on the crop production which is motivating farmers to increase crop yield and profit.

The above findings were in accordance with the findings of study conducted by Shashidhara (2004).

5.4.12 Information seeking behaviour

It was evident from the Table 11 that, majority of respondents consulted friends /relatives, neighbours and family members frequently and progressive farmers were occasionally consulted as a source of information. In families, every member shares their views for betterment of the family activities. Good relation with the relatives and also with the friends was the reason to consult them frequently. To seek technical information progressive farmers are next best important source of information so they might have consulted progressive farmers frequently for seeking technical information.

Among formal sources, agro input agencies, RSK, marketing officials, gram panchyat member, Scientist from Agriculture University and bank officers were consulted occasionally and rarely for the source of information, which shows the good relationship between agro input agencies, RSK officials, marketing officials, gram panchyat member, scientist from agriculture university and bank officers and respondents.

Mass media sources such as television, farm literature, newspaper and radio occasionally and rarely used as source of information by majority of the respondents, followed by radio, farm literature, news paper and television were never used as source of information by most of the respondents, because of less education level, medium level of extension contact and medium level participation in extension activities. The findings of the study are in conformity with the findings of Tripathi (2001).

It is clear from Table 12 that, most of the farmers (40.83 %) had low medium information seeking behaviour. In the low and high categories, it was found to be 34.17 and 25.00 percentages, respectively.

The probable reasons for majority of farmers to fall in medium information seeking behaviour category might be due to their less education level and medium level of innovativeness, medium level of extension contact and medium level participation in extension activities. Another possible reason might be that, they may feel the information

they have is enough to carry out farm operations. The above results are supported by the results of Suresh (2004).

5.5 Constraints encountered by blackgram growers in adoption of recommended cultivation practices

It is clear from Table 13 that, the most important constraint faced by blackgram growers was shortage of the labourers as expressed by 85.83 per cent of the respondents. It is generally felt at the time of sowing and harvesting stages. This could be due to migration of labours to nearby industrial cities and most of the younger generation gets engaged in non agricultural operations.

As high as 64.17 per cent of the respondents expressed high cost of inputs like seeds, fertilizer and chemicals as the major constraint in the blackgram cultivation. In recent years, the price of inputs have gone up and naturally it has attracted the attention of many farmers, especially the small and medium land holders, the cost of inputs does not commensurate with the low price they get for the produce.

The other constraint faced by farmers was the ‘financial constraints’ (55.83 %) because most of the respondents belonged to medium and semi-medium land holding categories. Most (52.50 %) of the respondents expressed that non availability of FYM because of gradual reduction in the livestock numbers kept by farm households could be the reason for non availability of FYM.

Fifty seven per cent of the respondents faced ‘lack of knowledge about insect pest management’ and 47.50 per cent had faced problem like lack of knowledge about disease management, since many years the blackgram crop was severely affected by powdery mildew (Budi roga) disease many respondents expressed that once disease enters into their field within few days whole field is going to be affected and so, it reduces more than 30 per cent of the yield. Reason might be that, more respondents were illiterates or low level of education and lack of knowledge to manage the diseases.

The other constraint faced by farmers was ‘fluctuation in market price’ (48.33 %). The farmers expressed that, there was a lot of variation in the prices that prevail at the beginning of the season and that prevail at the time of harvesting. Thus the government should think of announcing the minimum support price based on actual cost of cultivation well in advance of the season in order to enable the farmers to plan properly and adopt the recommended practices.

Whereas, 40.00 per cent of the respondents expressed the problem of ‘heavy risk due to failure of monsoon rains’ it is quite genuine and is beyond human control. However, it is a challenge to the scientists to evolve drought tolerant high yielding varieties, which would certainly mitigate the inadequacy and uncertainty of rainfall. High wages of labourers was a problem to 35.83 per cent of the respondents. It is related directly to the non availability of labour as the shortage of any goods escalates its cost. Some of them also expressed lack of knowledge about different cultivation practices (14.17 %), even the extension system should be oriented to educate farmers in this direction.

Some of them also expressed that lack of timely advisory service (13.33 %) as a constraint. Agriculture department and extension personnel should advise to farmers at the time of sowing and give training on different cultivation practices. Whereas, non availability seeds at right time (7.50 %) were also expressed by the respondents, government should take action on it and seeds should be made available at right time to farmers. The above results are supported by the results of Jat *et al.* (2011) and Shashikant *et al.* (2011).

VI. SUMMARY AND POLICY IMPLICATIONS

India is one of the ancient countries in the world growing wide range of pulse crops as a prime source of protein. Indeed, it is the leading country in pulse area and contributes 25 and 27 per cent of the world's pulse production and consumption, respectively. It is also the largest importer of pulses with a contribution of 34 per cent of the global food use. Among diverse pulse crops, blackgram (*Vigna mungo* L.) is one of the important legumes after chickpea and pigeonpea. India shares 70 per cent of the world blackgram and greengram. India is the world's largest producer as well as consumer of blackgram.

In Karnataka, blackgram is grown in the area of 1.26 lakh hectares and production is 0.64 lakh tonnes with the productivity of 507.94 kg per hectares. The reasons for lower productivity might be growing of traditional cultivars and traditional way of cultivation practices followed by the farmers. With the development of high yielding varieties and better management practices, there is a much scope for further increase in yield. The different socio-economic strata of farming as well as show the attributes of farmers play a significant role in adoption of recommended package of practices. This study will be carried out to know the various socio-economic attributes of farmers which are associated with adoption of scientific blackgram production technology. Therefore, the present study will be undertaken with the following specific objectives.

6. To study the knowledge of blackgram growers about the recommended cultivation practices
7. To measure the extent of adoption of blackgram growers about the recommended cultivation practices
8. To know the extent of yield gap and reasons for the same
9. To study the socio- economic profile of blackgram growers
10. To elicit the constraints encountered by blackgram growers in adoption of recommended cultivation practices

The study was conducted during the year 2014-15 in Bidar and Kalaburgi districts of Karnataka state as these stood first and second in area and production of blackgram in North Eastern Karnataka. Among five talukas of Bidar district, Bhalki taluka had the

maximum area under blackgram. Similarly, among seven talukas of Kalaburgi district Chincholi taluka had maximum area. Hence, Bhalki taluka from Bidar district and Chincholi taluka from Kalaburgi district were purposively selected for the study. The list of villages having highest area under blackgram in Bhalki and Chincholi talukas were obtained from Department of Agriculture. Considering the highest area under blackgram cultivation, the list of villages was prepared. From this, three villages from each taluka were selected based on maximum area under blackgram crop. The list of villages selected from each taluka for the study. From each selected village a list of farmers cultivating blackgram was prepared with the help of Agricultural Assistant of Karnataka State Agriculture Department. Then 20 blackgram growers from each village were randomly selected to constitute the total sample size of 120 respondents. The dependent variables selected for the study were knowledge and adoption, while, age, education, size of land holding, farming experience, annual income, cropping intensity, extension contact, extension participation, achievement motivation, innovativeness, information seeking behavior, management orientation were the independent variables selected for the study.

A schedule was developed to collect the information in the light of objectives of the study. Package of practices recommended jointly by University of Agricultural Sciences, Raichur and Karnataka State Department of Agriculture for the cultivation of blackgram crop was considered for the study. The data collected were tabulated and analysed by using suitable statistical tools.

Major findings of the study are as follows

- More than half (50.83 %) of the respondents had medium knowledge about recommended cultivation practices of blackgram.
- Large majority (97.50 %) of the respondents had full knowledge about recommended varieties.
- Cent per cent of the respondents had full knowledge about the sowing time and 75.83 per cent of respondents had full knowledge about use of recommended seed rate.
- More than three fourth (60.83 %) of respondents had full knowledge about seed treatment chemicals and 49.17 per cent had knowledge about recommended seed treatment dosage.

- 71.67 per cent of the respondents had full knowledge about spacing.
- Large majority (97.50 %) of respondent had full knowledge about intercropping.
- Over three fourth (76.67 %) of respondents had partial knowledge about quantity of FYM application and 92.50 per cent of respondents know the proper time for application of FYM.
- About 48.33 per cent of the respondents had full knowledge about use of recommended quantity of chemical fertilizers, in case of partial knowledge 51.67 per cent and cent per cent of respondents had complete knowledge about the time of application of chemical fertilizers.
- Cent per cent of respondent had full knowledge about hand weeding and 77.50 per cent had knowledge about intercultivation.
- Majority of the respondents with varying percentage between 55.33 to 80.00 per cent possessed partial knowledge about agromicide fly, aphid, thrips and pod borer with its management measures.
- Majority of respondents had partial knowledge about mosaic (69.17 %) followed by powdery mildew (64.17 %) and leaf spot (60.83 %) and its management measures. Only 31.67 per cent of respondents had full knowledge about powdery mildew and its management measures.
- Majority (74.17 %) of respondents had full knowledge about yield of blackgram.
- Most of the respondents (45.00 %) belonged to medium level of adoption category.
- Large majority (95.83 %) of the respondents had fully adopted the recommended varieties. Cent per cent of the respondent had fully adopted sowing time.
- Most (69.17 %) of the respondents had fully adopted seed rate as per the recommendation.
- Nearly three fourth (73.33 %) of the respondent not adopted recommended seed treatment chemical and dosage.
- Most (60.83 %) of the respondents fully adopted recommended spacing and over two third (68.33 %) of the respondents had fully adopted intercropping.

- Over half (52.50%) of respondents had partially adopted recommended quantity of chemical fertilizer and 96.67 per cent of respondents had fully adopted the time of application of chemical fertilizer.
- Most (57.50 %) of the respondents had fully adopted intercultivation and 42.50 per cent had partially adopted.
- Large majority (94.17 %) of respondents had fully adopted hand weeding. While 94.17 per cent of respondents had not adopted herbicides and time of application.
- Majority of respondents had partially adopted management measures for manage of pod borer (73.33 %), agrommicide fly (63.33 %), aphids (63.33 %) and thrips (50.83 %).
- Only few of the respondents took recommended management measures fully for powdery mildew (15.83 %), while 79.17 per cent of respondent had not adopted management measure for leaf spot followed by mosaic (77.50 %) and powdery mildew (35.00%). Whereas, nearly half (49.17 %) of respondent had partially adopted management measures for powdery mildew.
- Gross returns were accounted to be Rs. 15904 and the profit was Rs. 7293.51/acre. Hence the B:C ratio was 1.85.
- About 21.40 per cent of yield gap was found between the package of practices and farmers field. The yield of farmers was 7.86 q/ ha while that of the package of practice yield was 10 q/ ha thus there existed a gap of 2.14 q/ ha between package of practice and farmers field.
- Around 94.17 per cent of respondents were expressed that, erratic distribution of rainfall was major reason for low yield followed by non availability of organic manure (45.83%), higher infestation of disease (30.00%) and higher pest incidence (28.33%).
- Majority (52.50 %) of the respondents were middle aged.
- Majority of the respondents had high school education (25.00 %) and middle school education 21.67 per cent and 20.00 per cent were illiterate or not went to formal education.

- Medium land holder's category occupied the highest percentage (43.33 %).
- More than fifty per cent (51.67 %) of the respondents had medium level forming experience.
- Most (36.67 %) of the respondents had high annual income (>Rs. 51,000/year) group.
- Most (36.67 %) of the respondents had medium cropping intensity.
- Most (37.50 %) of them belonged to medium level of achievement motivation.
- More than two third (41.67 %) of the respondents were found to have medium level of innovativeness. while, 38.33 per cent of them belonged to medium level of management orientation.
- Most (46.67 %) of the respondents contacted AAO when problem was occurred. Only 11.66 per cent of respondents contacted to Agriculture Officer when problem was occurred.
- Most (27.50 %) of the respondents contacted KVK scientist when problem occurred and 13.33 per cent of respondents contacted University scientist when problem was occurred.
- 34.17 per cent of respondents contacted private company field staff whenever problem occurred. While 30. 00 per cent of respondents contacted farm facilitators for solution of their problems.
- Majority of the respondents participated occasionally in krishimela (31.67 %), extension group meeting (24.17 %), training programme (23.33 %), demonstration (20.33 %), field visits and agricultural exhibition (13.33 %), farmer field school (12.50 %) and field day (10.33%), respectively.
- Majority of respondents frequently consulted informal sources *i.e.,* friends/ relatives (74.17 %), neighbours (69.17 %) and family members (63.33 %). While 68.33 per cent of respondents rarely consulted to progressive farmers.
- Majority (50.83 %) of respondent frequently consulted with agro input agencies. Whereas 22.50 per cent of respondents occasionally consulted RSK.

- Majority of the respondents (40.83 %) belonged to the medium level information seeking behaviour followed by 34.17 per cent of respondent's low level and 25.00 per cent are in high category.
- Majority of them expressed the constraints like shortage of labours (85.83 %), high cost of inputs (64.17 %), financial constraints (55.83 %), non-availability of FYM (52.50 %), lack of knowledge about pest management (51.67 %), fluctuation in marketing price (48.33 %), lack of knowledge about disease management (47.50 %), heavy risk due to failure of monsoon rains (40.00 %) and high wages of labours (35.83 %).

Implications and recommendations

In the light of findings of the study and researchers own observations, the following implications are made for effective blackgram cultivation.

1. Majority of the respondents belonged to medium level knowledge category in respect of recommended cultivation practices of blackgram. Hence, it is imperative that the State Department of Agriculture and Government of Karnataka can make still more efforts to provide the required knowledge about recommended cultivation practices by way of undertaking extension activities like conducting trainings, demonstration, field visits, exposure visits, field trails, farmer field school and other educational activities.
2. There is a need for providing guidance on market avenues, weather reports, demand of specific crop and price fluctuations from time to time to farmers through mass media like news paper, radio, mobile messages and televisions.
3. Efforts to popularize organic method of cultivation in view of high cost of chemical inputs though intensive education activities
4. Establishing a strong network of blackgram growers, scientists, extension workers, marketing agencies and other stake holders to tackle the problems involved in production, and marketing of the produce.
5. Public and private agencies should take necessary steps to minimize cost of inputs like seeds, fertilizers, plant protection chemicals and also provide subsidies on farm equipments.

Future line of work

1. This study was conducted only in North Eastern districts of Karnataka, therefore, generalization based on this alone may not be meaningful. Therefore, it is very important that the study has to be extended to other parts of the state as well as other states in order to generalize the findings to a greater utility.

2. The present study is restricted to knowledge and adoption level of cultivation aspects and hence there is a need to study on technological gap in blackgram cultivation practices in future research.

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A STUDY ON KNOWLEDGE AND ADOPTION OF RECOMMENDED CULTIVATION PRACTICES OF BLACKGRAM GROWERS IN NORTH-EASTERN REGION OF KARNATAKA

Instructions:

I) The information given will be used purely for educational purpose

II) The provided information will not be revealed to any one or any to other purpose

Part-A

Interview schedule

Schedule No:

I. General Information

1. Name of the farmer_____

2. Village_____ **3.Taluk**_____

4. District: _____

II. Personal and Socio-economic characteristics

1. Age: _____

2. Education:_____

3. Size of the land holding (acre)**:**

Sl. No	**Particulars**	**Area (acres)**
1	Irrigated	
2	Dry land	
3	Others	
Total		

4. Farming Experience: _____years

5. Annual income (Rs**):_____**

Agriculture: _____

Subsidiary : _____

TOTAL:

6. Cropping intensity

Sl. No.	Season	Dry lands	Area(acres)	Irrigated	Area(acres)
1	Kharif				
2	Rabi				
3	Summer				

7. Extension Contact: How often do you contact the extension personnel?

Sl. No.	Extension personnel	Frequency of contact			
		Once in a Week	Once fortnight	When needed	Never
1	AAO				
2	AO				
3	KVK scientists				
4	University scientists				
5	Private company field staff				
6	Others (specify)				

8. Extension participation:

Please indicate your answer about the extension activities organized in your area during the last year and extent of participation in these activities.

Sl. No.	Extension activities	Participated		Extent of participation		
		Yes	No	Regular	Occasional	Never
1	Training programme					
2	Demonstration					
3	Field day					
4	Field visit					
5	Extension Group Meeting					
6	Agriculture exhibitions					
7	Krishimelas					
8	Educational tours					
9	Others (specify in any)					

9. Achievement motivation:

Please indicate your degree of agreement or disagreement to the following statements

Sl. No.	Statement	A	UD	DA
1	Work should come first even if one cannot get proper rest in order to achieve ones goals			
2	It is better to be content with whatever little one has, than to be always struggling for more (N)			
3	No matter what I have done I always want to do more			
4	I would like to try hard at something which is really difficult even if it proves that I cannot do it			
5	The way things are now-a-days, discourage one to work hard (N)			
6	One should succeed in occupation even if one has to neglect his family.			

A – Agree, UD – Undecided, DA – Disagree

10. Innovativeness

Please indicate your degree of agreement or disagreement to the following statements

Sl. No.	Statements	A	UD	DA
1	I am very much interested in adopting new cultivars of blackgram			
2	Since I am not sure of success of new cultivars of blackgram, I would like to wait till others adopt.			
3	Since new cultivar of blackgram is not profitable, I am not interested in it.			
4	I try to keep myself well informed about any new cultivars of the blackgram and try to adopt as soon as possible.			
5	New cultivars of blackgram are not easily adoptable and hence I do not adopt.			

A – Agree, UD – Undecided, DA – Disagree

11. Information seeking behaviour

Please state that, what are the sources you have utilized in general for getting farm information and the degree of contact with them.

Sl. No.	Information sources	Degree of contact			
		Frequently	**occasionally**	**Rarely**	**Never**
I.	**Informal sources**				
1	Family members				
2	Friends/ relatives				
3	Neighbours				
4	Progressive farmers				
5	Others (Specify)				
II.	**Formal sources**				
1	Village panchayat member				
2	RSK				
3	Scientists from agriculture university				
4	Agro input agencies				
5	Marketing officials				
6	Bank officials				
III.	**Mass media**				
1	News papers				
2	Radio				
3	Television				
4	Farm literature				
5	Others (specify)				

12. Management Orientation:

Sl. No.	Statements	Response category		
		Agree	**Undecided**	**Disagree**
I	**Planning orientation**			
1	Every year one should think afresh about the crops to be cultivated in each type of land			
2	It is not necessary to make prior decisions about the variety of crops to be cultivated in land			

3	Selection of crop does not depend upon the availability of rain water			
4	The amount of inputs such as seeds, fertilizers and plant protection chemical needed for raising a crop should be assessed before cultivation			
5	It is not necessary to think ahead of the cost involved in raising a crop			
6	It is possible to increase the yield through farm production plan			
II	**Production orientation**			
1	Timely planning of a crop ensures good yield			
2	One should use as much manures/fertilizers as he can			
3	Determining fertilizer dose by soil testing saves money			
4	Seed rate should be given as recommended by specialists			
5	It is not necessary to consult a specialist during crop growing			
6	For timely weed control one should use suitable herbicides			
III	**Market orientation**			
1	Marketing news is not so useful to a farmer			
2	A farmer can get good price by grading his produce			
3	Warehouses can help the farmers to get better price of his produce			
4	One should sell his produce to the nearest market irrespective of price			
5	It is of little value to record cost and return of particular crop			
6	One should grow those crops which have more marketing demand			

Part – B

Knowledge test questions for recommended cultivation practices of Blackgram

A) Seeds and sowing

1) Do you know the recommended variety of blackgram? Yes/ No

   a) What is the recommended variety of blackgram cultivation_____

      (DU-1 and TAU-1)

2) What is right time of sowing :_____ (May-June)

3) What is the recommended seed rate per acre :_____

   DU-1 (6-7.2 kg/acre) and TAU-1 (6-6.4 kg/acre)

4) What is the recommended seed treatment chemical :_____

   (Soak the seeds in 2% $CaCl_2$ solution for half an hour then shade dry for 7 hrs, after that treat the seeds with Rhizobium)

5) What is the dosage of seed treatment chemical: _____

6) What is the recommended spacing: _____ (30X10 cm)

7) Intercropping: _____

   (Blackgram+redgram, Blackgram+bajra, Blackgram+jawar)

B) Manures and Fertilizers

1) Do you apply FYM? Yes/No

   a) If applied, what was the recommended quantity of FYM / acre in____(2 tons/ acre)

   b) When do you apply FYM: _____ (2-3 Week before sowing)

   c) What method you follow for application of FYM: _____

2) Do you apply chemical fertilizers? Yes/No

   a) If applied, Name the fertilizer and quantity: _____(10:20:0 kg NPK /acre)

   b) What method you followed for fertilizer application: _____

3) Do you apply recommended Bio-Fertilizer? Yes/No

   a) If applied, Name the Bio-Fertilizer and quantity: _____

      (Rhizobium- 200gm/acr and PSB- 200gm/acr)

C) Weed management and Intercultural operation

1) Do you follow intercultural operation? Yes/ No

a) How many time intercultural operation: _____(2 times - Within 40 DAS)

b) At what time you will go for Intercultural operation: _____

2) Do you follow hand weeding? Yes/No

a) What was the time of hand weeding: _____(20- 25 DAS)

3) Do you follow recommended chemical weed control? Yes/ No

a) Chemicals used _____ml/lit.:_____

b) Time of application:_____

(Pre-emergent: Fluchoralin 45 EC @ 3 lt and Allachlore 50 EC@ 4 lt Proper moisture should be maintained while spraying)

(Post-emergent: Quizolopop Ethyl 5 EC@ 1.40 ml/lt and Propoquiziphop 10 EC @ 50 gm/lt. Mix above post emergent chemicals with adjuvant (Dhanuvit / Indatran @ 1 ml)

D) Plant protection measures

1) What are the important pests in blackgram and how do you manage?

	Pests	**Chemicals and Dosage (per lt)**	**Pests**	**Management**
i)	Agromicide fly	Dimethoate@1.7 ml or Phosphomidan@0.5 ml or Imidachloprid@0.3 ml or Thiomethoxam@0.2 g		
ii)	Aphids	Dimethoate@1.7 ml or Methyl parathion@1 ml		
iii)	Thrips	Methyl parathion@ 1ml or Monocrotophos@ 1 ml or Dimethoate@1.7 ml		
iv)	Pod borer	Methyl parathion@ 1 ml		

a) Time of application _____

b) Number of sprays given_____/crop

2) What are the important diseases in blackgram crop and how do you manage?

	Disease	Chemicals and dosage (per lt)	Diseases	Management
i)	Leaf spot	Mancozeb@2g or COC@3 g		
ii)	Powdery mildews	Sulphur(WP)@3g or Carbondenzim@1g or Hexaconazole@1ml		
iii)	Mosaic	Dimethoate@1.7ml or Phosphomidan@0.5ml		

a) Time of application_____

b) Number of sprays given_____/crop

E) Yield

1) What was the yield obtained per acre: _____

Part – C

Adoption level questions for recommended cultivation practices of Blackgram

A. Seeds and sowing

1) Name the Recommended Varieties you have grown: _____(DU-1 and TAU-1)

2) When did you sow the crop: _____ (May to June)

3) What is the recommended seed rate per acre: _____

DU-1 (6-7.2 kg/acre) and TAU-1(6-6.4 kg/acre)

4) What is the recommended seed treatment chemical: _____

(Soak the seeds in 2% $CaCl_2$ solution for half an hour then shade dry for 7 hrs, after that treat the seeds with Rhizobium)

5) What is the dosage of seed treatment chemical: _____

6) What is the recommended spacing: _____(30X10 cm)

7) Intercropping: _____

(Blackgram + redgram, Blackgram + bajra, Blackgram + jawar)

B) Manures and Fertilizers

1) Did you applied FYM? Yes/No

a) What was the recommended quantity of FYM applied/ acr in_____ tonnes

(2 tons/ acre)

b) When did you applied FYM: _____(2-3 Week before sowing)

c) What method you followed for application of FYM: _____

2) Quantity of recommended NPK applied (kg/ha): _____ (10:20:0 kg NPK /acre)

3) Name the recommended Bio-Fertilizer: _____

(Rhizobium- 200g/acr and PSB- 200g/acr)

C) Weed management and Intercultural operation

1) Did you follow intercultural operation? Yes/ No

a) How many time intercultural operation followed: _____(2 times - Within 40 DAS)

b) At what time you will go for Intercultural operation: _____

2) Did you followed hand weeding? Yes/No

a) What was the time of hand weeding: _____(20- 25 DAS)

3) Did you followed recommended chemical weed control? Yes/ No

a) Chemicals used _____ml/lit._____

b) Time of application:_____

(Pre-emergent: Pendamithelin, Fluchoralin 45 EC @ 3 lt and Allachlore 50 EC@ 4 lt Proper moisture should be maintained while spraying)

(Post-emergent: Quizolopop Ethyl 5 EC@ 1.40 ml/lt and Propoquiziphop 10 EC @ 50 gm/lt. Mix above post emergent chemicals with adjuvant (Dhanuvit / Indatran @ 1 ml)

D) Plant protection measures

1. What are the important pests in blackgram and how did you managed?

	Pests	**Chemicals and Dosage (per lt)**	**Pests**	**Management**
i)	Agromicide fly	Dimethoate@1.7 ml or Phosphomidan@0.5 ml or Imidachloprid@0.3 ml or Thiomethoxam@0.2 g		
ii)	Aphids	Dimethoate@1.7 ml or Methyl parathion@1 ml		
iii)	Thrips	Methyl parathion@ 1ml or Monocrotophos@ 1 ml or Dimethoate@1.7 ml		
iv)	Pod borer	Methyl parathion@ 1 ml		

a. Time of application _____

b. Number of sprays given_____/crop

2. What are the important diseases in blackgram crop and how do you manage?

	Disease	**Chemicals and dosage (per lt)**	**Diseases**	**Management**
i)	Leaf spot	Mancozeb@2g or COC@3 g		
ii)	Powdery mildews	Sulphur(WP)@3g or Carbondenzim@1g or Hexaconazole@1ml		
iii)	Mosaic	Dimethoate@1.7ml or Phosphomidan@0.5ml		

a) Time of application_____

b) Number of sprays given_____/crop

Yield (per acre):

Reason for low yield:

1.

2.

3.

4.

5.

Constraints encountered by blackgram growers in adoption recommended cultivation practices

1.

2.

3.

4.

5.

A study on knowledge and adoption of recommended cultivation practices of blackgram growers in North Eastern region of Karnataka

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ABSTRACT

A study on knowledge and adoption of recommended cultivation practices of blackgram growers in North Eastern region of Karnataka was carried out during 2014-15 by following simple random sampling 120 respondents were selected from the districts. The data was elicited through personnel interview method and analyzed using frequency and percentage.

The major findings of study revealed that, half (50.83 %) of the respondents belonged to medium level of knowledge category about recommended cultivation practices of blackgram followed by high (27.50 %) and low (21.67 %) knowledge level categories. Majority (45.00 %) of respondents had medium level adoption followed by 29.17 per cent and 25.83 per cent of the respondents had low and high level adoption categories. There was 21.40 per cent yield gap observed between yield of package of practice and farmers field.

Over half of the respondents belonged to middle age group (52.50 %), medium farming experience (51.67 %), medium land holding (43.33 %), medium level of innovativeness (41.67 %), medium information seeking behaviour (40.83 %), medium management orientation (38.33%), medium achievement motivation (37.50 %) and medium cropping intensity (36.67 %). Over one third (36.67 %) of the respondents belonged to high income group and 25.00 per cent of the respondents were educated up to high school.

Majority of the respondents expressed shortage of labours (85.83 %) and high cost of inputs (64.17 %). financial constraints (55.83 %), non-availability of FYM (52.50 %), lack of knowledge about pest and disease management (51.67 % and 47.50 %), price fluctuation (48.33 %), heavy risk due to failure of monsoon rains (40.00 %) and high wages of labours (35.83 %) as constraints in adoption of recommended cultivation practices in order of priority.