CULTIVATION PATTERN AND CONSTRAINTS IN MINOR MILLETS PRODUCTION IN NORTH KARNATAKA

KAVYASHREE C. N.

DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION
COLLEGE OF AGRICULTURE, DHARWAD
UNIVERSITY OF AGRICULTURAL SCIENCES,
DHARWAD - 580 005

JULY, 2016

CULTIVATION PATTERN AND CONSTRAINTS IN MINOR MILLETS PRODUCTION IN NORTH KARNATAKA

Thesis submitted to the
University of Agricultural Sciences, Dharwad
in partial fulfillment of the requirements for the
Degree of

MASTER OF SCIENCE (AGRICULTURE)

IN

AGRICULTURAL EXTENSION EDUCATION

BY

KAVYASHREE C. N.

DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION
COLLEGE OF AGRICULTURE, DHARWAD
UNIVERSITY OF AGRICULTURAL SCIENCES,
DHARWAD - 580 005

JULY, 2016

DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION
COLLEGE OF AGRICULTURE, DHARWAD
UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD

CERTIFICATE

This is to certify that the thesis entitled "CULTIVATION PATTERN AND CONSTRAINTS IN MINOR MILLETS PRODUCTION IN NORTH KARNATAKA" submitted by Miss KAVYASHREE C. N. for the degree of MASTER OF SCIENCE (AGRICULTURE) in AGRICULTURAL EXTENSION EDUCATION to the University of Agricultural Sciences, Dharwad is a record of research work carried out by her during the period of her 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.

DHARWAD
JULY, 2016

(K. V. NATIKAR)
CHAIRMAN

Approved by :

Chairman : _____
(K. V. NATIKAR)

Members : **1.** _____
(S. DEVENDRAPPA)

2. _____
(J. A. HOSMATH)

ACKNOWLEDGEMENT

I wish to place my deep sense of profound praise, glory and honour to lord Almighty for bestowing his blessing and grace upon me to understand and appreciate his wonderful creation and also enabling to give life to my research.

I place my gratitude and sincere thanks to my chairman Dr. K.V. Natikar, Associate Director of Extension, Department of Agricultural Extension Education, College of Agriculture, Dharwad for his meticulous and infallible guidance with sustained interest, enthusiastic encouragement, kind treatment and critical appraisal throughout the period of this investigation.

I acknowledge my heartfelt thanks to members of advisory committee Dr. Devendrappa S, Programme Officer and Head, Department of Agricultural Extension Education, College of Agriculture, Dharwad, UAS Dharwad and Dr. J.A. Hosmath, Associate Professor, Department of Agronomy, UAS, Dharwad for their infallible guidance, valuable suggestions, untiring help and constant encouragement.

I am thankful to all other staff members of Department of Agricultural Extension Education for their timely help rendered during the course of study.

Words seem inadequate to express my profound sense of loving thanks and gratitude my beloved parents Mr. Narasimhappa N and Mrs. Vralakshmi M., brother Girish, sisters Geetha and Asha for their prayer, love, devotion, support and encouragement in fulfilling my task of completing the work successfully.

I would like to take this opportunity to thank my beloved classmate friends, seniors and junior friends for their direct and indirect encouragement , support and wishes

I extend my heartful thanks to M/s Anup Computers, Dharwad for corrections and neat printing of this manuscript.

DHARWAD
JULY, 2016 **(Kavyashree C. N.)**

C O N T E N T S

Contd…..

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION

Millets are traditional food grain known to human. Millets are small-seeded grasses that are hardy and grow well in dry zones as rain-fed crops, under marginal conditions of soil fertility and moisture. Millets are unique due to their short growing season and ready to harvest within 65 days. When properly stored, whole millets can be kept for two or more years.

The minor millets include little millet (*Panicum miliare*), finger millet (*Eleusine coracana*), foxtail millet (*Setaria italica*), barnyard millet (*Echenochloa frumentacea*), proso millet (*Panicum miliarceum*) and kodo millet (*Paspalum serobiculatum*). Among these, finger millet occupies about 60 % of the area and contributes 70 % to the overall small millet production. These are hardy crops and are quite resilient to a variety of agroclimatic adversities, such as poor soil fertility and limited rainfall. In view of their high adaptability .They play an important role in supporting marginal agriculture, such as that of commonly practiced in hilly and semi-arid regions of India. Among these crops, finger millet is the most important and widely grown in India, from the semi-arid plains to the foot hills of the Himalayas, up to an elevation of 3,500 MSL.

These millets are the source of important food grain in their areas of cultivation, while their straw is highly valued as fodder. Many kinds of traditional foods and beverages are made with these species across the country and hence they play an important role in the local food culture. Nutritionally, they are characterized by a high micronutrient content, particularly with regard to calcium and iron, and high dietary fibre. The grain protein is richer in sulphur-content and other essential amino acids than all other major cereals. For this reason, Prof. M.S. Swaminathan, Chairman MSSRF, Chennai had suggested to call them more appropriately as “nutritious millets”, rather than coarse grains or siridhanya in kannada.

The nutritional value of these grains, and by virtue of their high dietary fibre is receiving increasing attention. Their cheaper price, compared to that of rice and wheat makes them more accessible to the poor people and those living in economically backward mountainous and semi-arid regions of South Asia. Thus, they play an important role in the food and nutritional security of the poor. However, their presence in the Indian food basket has been declining over the years. The reasons for this declines are the increased availability of rice, wheat and maize (particularly rice and wheat under subsidized public distribution system); these grains are also neglected in research and development, the lack of modern technologies for their effective processing and utilization are the important reason for declining. There is a policy gap in all countries of the south Asian region with regard to the promotion of cultivation and consumption of these underutilized grains. All these elements have collectively contributed to the neglect and under utilization .

These millets have short growing season and can be very well fitted into multiple cropping systems both under irrigated as well as dry farming conditions. They can provide nutritious grain and fodder in a short span of time. Their long storability under ordinary conditions has made them "famine reserves". This aspect is very important as Indian agriculture suffers from vagaries of the monsoon. In other words, they refer to a group of small seeded cereal crops. finger millet (ragi), proso millet, barnyard millet, italian millet, kodo millet, little millet are the most important minor millet cultivated in India.

On global basis minor millets are cultivated on an area of 36.79 m.ha with an annual millet production of 29.20 m.t indicating the productivity of 777 kg/ha, whereas in India, millets are cultivated on an area of 13.30 m.ha producing 10.50 m.t with the productivity of 789 kg/ha (Anon., 2013)

In Karnataka, small millets are cultivated on an area of 1.25 m.ha producing 1.54 m.t with a productivity of 1,230 kg/ha. In the year 2013–14 foxtail millet (Navane) was cultivated in an area of 0.2 lakh ha producing 0.04 lakh t with productivity of 268 kg/ha. Foxtail millet is widely grown in Koppal, Bellary, Chitradurga and Belgaum districts of Karnataka. Foxtail millet (*Setaria italica*) one among the six small millets is known as navane, kangni, tenai, korra and rala in many regional names in different parts of the country. Little millet (Save) was cultivated on an area of 0.2 lakh ha producing 0.1 lakh tonne with productivity of 717 kg/ha during (2013-14) and it is widely cultivated in Haveri, Dharwad, Chitradurg, Belgaum and Tumkur districts of Karnataka.

The cultivation of foxtail millet and little millet is more seen in Madhya Pradesh, Tamil Nadu, Karnataka and Orissa. Utilization of these crops is mainly as food for human consumption. The straw is often a precious fodder for bovines.

The grain is consumed in traditional way and almost the entire produce is sold in the assured markets and transported to Maharashtra for further processing and utilization, as such the processing facilities are available only in Maharashtra. Inspite of superior nutritive value of grains, their use is limited, largely confined to rural markets and very little finds its way to urban market. The problem of pests and diseases in minor millets is negligible. Being eco-friendly crops, they are suitable for fragile and vulnerable eco-systems and regarded as preferred crops for sustainable and green agriculture. Hence the promotion of these crops can lead to efficient management of natural resources and holistic approach in sustaining precious agro-biodiversity. Common millets and foxtail millets are used in indigenous medicine; foxtail millet is specially used in snake poisoning.

Promotion of indigenous and value added millet products through demonstrations, training, exhibition, organizing cooking competitions and broadcasting through radio, TV, magazines and daily newspaper have enhanced the knowledge and readiness to incorporate millets in the daily diet to improve nutritional security. Further, awareness campaigns have improved the market structure with respect to availability of millets in retail shops, other than in weekly mandis. Majority of diabetic, cardio vascular disease and obeyse persons are accepting as healthy food in the management of diseases. Millet snacks, health foods, bakery products have potential for cottage industry at local and national market. Value added products of millets are eco-friendly and viable technologies for income generation to rural community. Thus production, marketing and promotion of value added millet products may play a pro active role in creating awareness among consumers and to combat non communicable diseases and also helps in protecting a global resource.

Millets being small seeded contain large proportions of husk and bran requires dehusking and debraning prior to consumption. Despite, their nutritional superiority utilization of millets is restricted due to non-availability of refined and processed millets in ready to eat form. Hence, millets are confined to traditional consumers and to the people of lower strata. Millets some times are mixed with rice and fermented to make beer. A majority of the millet production (80 %) although is used for human food, it is also used for feeding cage birds.

Minor millets are fair sources of protein and are limiting in lysine. In India, millets are used in many forms. Millet flour can be replaced for rice flour in the preparation of chakkali, dosa and idli. Millets are commonly used in the preparation of malt in many special ethnic foods. Millets may also be used to substitute other cereals in breakfast food, convenience foods, snacks food and also in various food preparations. The nutritive value of millets is comparable to other cereals with regard to protein, fat and mineral content but their utilization is limited due to the presence of various anti nutrients, poor digestibility of proteins and carbohydrates, low palatability, colour pigments, characteristic astringent flavour and poor keeping quality of processed products. Pearling or deranging of millets overcomes some of their constraints and improve its nutritional quality as well as consumer acceptability.

Millets contain low sugar and easily digestible carbohydrates, more of fat and dissolved salts, calcium and phosphorous it is suggested based on the research by the medical science that it is good food for the patients who are suffering from diabetes. The important varieties of Foxtail millet which are grown in Karnataka are RS-118 and S-221-1. In addition local cultivars are grown in Bellary and Koppal district. In case of little millets the cultivars which are used for growing are Sukshema, CO-2 and PRC –3 in Karnataka.

The production bottlenecks have been compounded by the still greater difficulties confronted in the marketing of agricultural commodities. Inabilities to store, due to financial pressures, small farmers have been forced to sell their produce immediately after the harvest generally at low prices. High cost of marketing, lack of adequate transportation and grading facilities, inadequate storage facilities at the farm level and lack of market intelligence topped the list of problems encountered by the producer–seller in marketing of agricultural commodities.

Keeping this in view, the study was carried out in Haveri district of Karnataka state with following specific objectives.

Objectives of the investigation

1. To assess the technological gap in adoption of improved cultivation practices
2. To analyse the extent of cultivation of minor millet
3. To find out the awareness and consumption pattern of minor millet
4. To list the marketing constraints faced by the minor millet growers
5. To document the reasons for cultivating the minor millet

Significance of the study

The study brings out the extent of knowledge of farmers about cultivation patter, constraints in minor millet and technological gap. It also focuses on awareness, and consumption pattern, marketing constraints and reasons for cultivating the minor millet by the farmer. It also provides the present status of minor millet production, Hence based on the results, suitable strategies can be developed to promote minor millets which have high nutrition value.

The study attempts to determine the reasons for cultivating minor millet at farmers' level, which helps to understand and develop suitable extension approaches to promote cultivating of minor millets.

Limitations of the study

The study was conducted in Haveri district of Karnataka state confined to only three taluks of Haveri district. The limitations of time and other resources, the student researcher was not able to cover other districts of the state. Further, the opinion expressed by the respondents may not be totally free from personal bias and prejudice. Hence, the results of the study can not be generalized beyond the limits of the study area.

2. REVIEW OF LITERATURE

A review of the existing relevant literature helped the researcher to design the theoretical frame of the study and also to assess the nature and quantum of studies already undertaken in that particular area of research. It was rather difficult to find adequate research studies exclusively relating to recommended practices of millet cultivation. However an earnest effort was made to review the available literature having direct or indirect bearing on the present study.

The reviews are presented here under the following headings in accordance with the objectives set for the study

2.1 To assess the technological gap in adoption of improved cultivation practices

2.2 To analyse the extent of cultivation of minor millet.

2.3 To find out the awareness and consumption pattern of minor millet

2.4. To list the marketing constraints faced by the minor millet growers

2.5. To document the reasons for cultivating the minor millet

2.1 Technology gap of minor millet

Jaiswal and Rathore (1985) conducted a study on technological gap in adoption of recommended technology in wheat among farmers growing irrigated and unirrigated wheat. He observed that, technological gap in wheat cultivation practices was 57.1 per cent and 72.4 per cent, respectively amongst the categories of irrigated and unirrigated farmers in Damoh, Madhya Pradesh. It was revealed that the technological gap was highest in respect of fertilizer application, seed treatment and plant protection for both categories of farmers.

Jaiswal and Dubolia (1994) conducted a study on adoption gap in wheat technology and observed that, majority of farmers were in medium to high level of adoption gap with respect to soil treatment, time of sowing, seed treatment, method of sowing, fertilizer application, irrigation, weed control and plant protection in Surguja district of Madhya Pradesh.

Patil (1995) carried out a study on technological gap in rice cultivation and reported that, mean technological gap in different cultivation practices of paddy was highest in respect of application of fertilizers to nursery (88 %) followed by seed treatment (81.75 %) application of FYM/Compost to nursery before sowing (79 %), application of FYM/Compost to main field (71.15 %), use of chemical fertilizers (57.58 %) and preparation of raised beds for nursery (37 %).

Nikhade *et al.* (1997) conducted a study on technological gap in cultivation of red gram, green gram, and bengal gram in Gulbarga district of Karnataka and reported that, a wide gap (43 %) was observed in the use of plant protection measures, followed by application of nitrogenous (31 %), phosphatic (25 %) fertilizer and seed rate (29 %) in cultivation of red gram.

Kapse *et al.* (2000) conducted a study on technological gap in summer groundnut cultivation and revealed that majority of respondents having higher technological gap in respect of application of gypsum (52.86 %) followed by use of plant protection measures (37.17 %), seed treatment (27.85 %) application of chemical fertilizers (25.42 %) and intercultural operations (21.94 %), respectively.

Dubolia and Jaiswal (2000) conducted a study on technological gap of groundnut cultivation among groundnut growers revealed that problems faced by groundnut growers of Surguja district varied practices wise that is soil treatment, seed treatment, use of culture, seed rate, fertilizer use, method of fertilizer application and inter culturing operations.

Dubolia and Jaiswal (2000) in their study on technological gap of groundnut cultivation among groundnut growers found that the overall technological gap was 75.29 per cent.

Gupta and Srivastava (2002) investigated technological gap in soybean cultivation and reported that the maximum technological gap was found in the use of seed treatment (94.50 %) whereas the lowest was found in irrigation management at 43.42 per cent.

Noorjehan *et al.* (2003) in their study on technological gap in the adoption of selected pest management practices in rice and found that, two-third of the respondents had medium technological gap (66.00 %), While one-fourth (23.00 %) fall under high technological gap and 11.00 per cent belonged to low technological gap.

Brij Bala *et al*. (2005) conducted a study on adoption gap in improved maize technology . He reported that the maximum gap was observed in micro nutrient application (99.30 %) followed by herbicide application (90.75 %), plant protection measures(84.35 %) and the balanced fertilizer use(78.33 %).

Swami (2006) in his study on technological gap and constraints in adoption of bidi tobacco cultivation in Belgaum district of Karnataka state reported that, majority of the respondents (48.34 %) were in medium technological gap, followed by equal number of respondents (25.85 %) who were in both low and high technological gap categories.

Rajashekhar (2009) carried a study on analysis of technological gap in pappaya production in Bidar and Gulbarga districts of North Karnataka and reported that, 39.17 per cent of the respondents belonged to medium technological gap category, followed by 34.16 and 26.67 of the respondents belonged to the high and low technological categories respectively.

Suresh Kumar (2009) investigated technological gap in adoption of improved cultivation practices by the soybean growers and observed that, majority of the respondents (61.33 %) belonged to medium category of technological gap, followed by low (22.67 %) and high (16.00 %) category of technological gap.

Madhu (2010) carried out a study on technological gap in turmeric production practices in Belgaum district reported that, 44.28 per cent of the turmeric growers were found in medium technological gap category, followed by low technological gap with 35.72 per cent of the respondents. Whereas, 20.00 per cent of the respondents belonged to high technological gap category.

Mahendra Singh (2011) conducted a study on yield gap and production constraints in rice-wheat system; scenario from eastern U.P. He observed that technological and socio-economic constraints have accounted for 54% and 46% of the yield gap respectively in the system.

Surendra Singh *et al.* (2013) conducted a study on enhancing rice and wheat production by bridging yield gap in western uttar Pradesh of India. He reported that the yield gap is attributed to different factors like biophysical, socio-economic, characteristics and technical factors as well as climatic factors. Yield gap is existing due to non adoption of improved farm practices, integrated pest management,climate, irrigation, biophysics and other uncertain happenings and delayed planting of wheat, transplanting of wheat, crop residues burning.

Balai *et al.* (2013) conducted a study on economic impact of front line demonstration on cereal crops in tribal belt of Rajastan. He suggested that location specific integrated approaches would be needed and the recommended package of practices was adopted to bridge the production gap of cereal crops.

Srinivas *et al*. (2014) conducted a study on yield gap analysis of sorghum through front line demonstration in tribal area of east Godavari district , AP. He reported that the yield of sorghum would be increased with the help of innovative technological interventions coupled with the proper management of pest and disease.

Joshi *et al.* (2014) conducted a study on yield gap analysis through frontline demonstration in wheat crop. He indicated that the technology index revealed the feasibility of demonstration technology as such variation in technology index (7.78to 25.92%) attributed to dissimilarity in the soil fertility condition, pest disease attack,non availability of poor quality of irrigation water and weather condition.

2.2 Extent of cultivation of minor millets

Cheryl Doss *et al.* (1999) conducted a study on adoption of maize and wheat technologies in eastern Africa. He concluded that Ethiopia shows the lowest level of adoption – 0 % to 56 % in 1996, however , adoption has increased drastically due to the introduction of a new extension system supported by the Sasakawa foundation of Japan.

Kamruzzaman *et al. (*2001) conducted a study on adoption level of wheat technology and the growers knowledge gap in Bangladesh. He suggested that wheat area, and productivity increased by about 10.14 % and 3.5 % per annum, during 1971-72 to 1991-92 . Hundred percent of the wheat acreage in the country were planted to modern varieties.

Tesfaye Zegeye (2001) conducted a study on adoption of improved bread wheat varieties and inorganic fertilizer by small scale farmers in Yelmana Densa and Farta district of Northwestern Ethiopia. He concluded that the adoption of improved varieties increased from less than 1 % in 1981 to 72 % in 1998. The adoption rate increased dramatically in the 6 years since the national extension package programme was started.

Matuschke and Matin Quim (2006) conducted a study on adoption and impact of hybrid wheat in India. The study reveals that next to rice, wheat is the most important food crops in India. Main wheat producing states are Punjab, Haryana, uttarpradesh and Rajasthan, which are located in the Northwestern zone of India.these states accounts for 78 % of the national wheat output.

Mandeep Singh and Chahal (2009) conducted a study on A study on the extent of adoption of various recommended technologies in wheat cultivation in Punjab. He suggested that the productivity of wheat crop was estimated to be 17.88q/acres in 2006-07, which increased to 18.46q/acres in 2007-08. This happened due to favourable climatic condition and secondly because of upward revision of MSP

Kumbhare and Singh (2011) conducted a study on adoption behavior and constraints in wheat and paddy production technologies. He suggested that 53.75 % respondents had adopted the wheat production technology at higher level followed by 31.25 % and 15 % respondents had adopted the wheat production technology at medium and low level respectively. Also, in paddy, 60 % of the respondents have higher level of adoption followed by 21.25 % and 18.75 % respondents had adopted the paddy production technology at medium and low level respectively.

Mohamood *et al*. (2013) conducted a study on impact assessment of improved wheat production package in sudan. He reported that the adoption rate of wheat technological package was about 53.6%. The average total costs for adopters was higher that of non adopters by 11% and marginal rate of return was about 52.9%. Therfore it recommends providing the impact for the wheat farmes at low market price.

Mahamood *et al.* (2013) conducted a study on analysis of the adoption of wheat sowing recommendations among small farmers using water saving intervention. Study revealed that extent of adoption of wheat sowing recommendations ,the well preparation of soil and best method of storage were adopted by 84.4% and 63.7% respondents respectively whereas, the respondents adopted the wheat sowing recommendations such as use of recommended seed (56.3%) and use of weedicide (55.6%) to an average extent.

2.3 Awareness and consumption pattern of minor millet

Morris *et al*. (1999) conducted a study on Adoption and Impacts of Improved Maize Production Technology: A Case Study of the Ghana Grains Development . He suggested that maize is the most widely consumed staple food in Ghana. A nationwide survey carried out in 1990 revealed that 94% of all households had consumed maize during an arbitrarily selected two-week period. An analysis based on 1987 data showed that maize and maize- based foods accounted for 10.8% of household food expenditures by the poor, and 10.3% of food expenditures by all income groups. Maize consumed in Ghana as human food is purchased from specialized food sellers as prepared food, rather than as grain. Prepared foods are particularly important in urban areas, but they are also important in rural areas. A survey conducted in 1987/88 showed that, depending on the month, between 62% and 86% of all households that produced maize for their own consumption needs also purchased some maize products.

Iren Leder (2004) conducted a study on sorghum and millets, in Cultivated Plants, Primarily as Food Source . He suggested that the stiff porridge prepared from maize or cereal mixture (maize, sorghum, pearl millet, finger millet, etc.) in Kenya, Uganda and Tanzania is commonly called ugali. The most important fermented thin porridge that is consumed in Nigeria and parts of Ghana is ogi. In much of Northern Africa a steamed, granulated product called couscous, made from cereal flours is highly popular. In West Africa, sorghum, pearl millet, maize, are used to prepare couscous, although pearl millet is preferred. Sorghum noodles are an important food product in China.

Erika Meng *et al.* (2006) conducted a study on maize in China:Production Systems, Constraints, and research priorities. He conclude that In northern China and the poorer mountainous regions, utilization of maize was primarily for farmers'own household food use, in the form of porridge or steamed bread.Maize consumption patterns remained largely stable in much of China. However, meat demand –and the corresponding demand for maize as feed.

Gulia *et al* .(2007) conducted a study on progress in grain pearl millet research and market development .He revealed that pearl millet is consumed as a feed and food grain in addition to its current use as a forage. pearl millet is equal or better than typical maize, soyabean poultry diet for broiler production. Pigs feed 50% or 75 % pearl millet reached slaughter weight 10days earlier than maize fed pigs. The replacement of maize with pearl millet gives optimal growth performance or equivalent grain and feed efficiency.

Albertson Ann *et al*. (2012) conducted a study on ready- to- eat cereal consumption pattern : the relationship to nutrient intake , whole grain intake and body mass index in an order of American population. He suggested that ready to eat breakfast cereal may contribute to the nutritional quality of the diet of older American.

Schipmann *et al*. (2013) conducted a study on consumer survey for sorghum and finger millet in Kenya and Tanzania . he reported that maize sorghum and finger millet is consumed as ugali pure, ugali blended, githeri and porridge, blended, porridge pure and chapathi.

Samar Abdalla *et al* .(2013) conducted a study on Dietry food consumption pattern in Sudan. He reported that millet consumed as a Asida, millet kisra, sorghum asid, sorghum kisra, bread wheat etc.

2.4 Marketing constraints in minor millet

Chauhan and Amit Chhabra (2005) conducted a study on marketable surplus and price spread for maize in Hamirpur district of Himachal Pradesh. Results revealed that lack of market information on arrivals and prices, high cost were major constraints faced by farmers in the study area. They suggested that providing market information on arrivals and prices of maize.

Monlruzzaman *et al*. (2009) conducted a study on agro-economic analysis of maize production in Bangladesh. The results revealed that low price of maize, high price of good seed, lack of knowledge were major constraints faced by maize growers. They suggested for improved seed available at reasonable price through research institutions, DAE and other related GO/NGO institutions.

Chahal and Poonam Kataria (2010) conducted a study on Constraints in the production and marketing of maize in Punjab. The results revealed that 66.00 per cent of the maize growers reported that they faced marketing constraints due to poor marketing fecility, absence of government agency to buy their produce in the local regulated markets and higher marketable surplus.

Balakrishnappa and Rajan (2010) conducted a study on socio-economic factors of different categories of sericulturists on bivoltine sericulture technologies in Karnataka. The results revealed that constraints faced by the farmers are lack of demand by consumer (34 %), lack of capital (34 %), marketing skills (48 %).

Raj (2012) conducted a research on economics of finger millet production and marketing in peri urban area of Pokhara valley of Nepal. The study revealed that, low social status for finger millet food items, followed by credit problems..

Gopala *et al*. (2012) conducted a study on Production, Marketing and Storage Constraints of Maize Growers in district Chickaballapur Karnataka. He revealed that 91.67 per cent of participants perceive that fluctuation in the market prices as their major constraint in marketing and 83.33 per cent of non participants felt that fluctuation in market prices as their main constraint.

Kusuma *et al.(*2013) conducted a study on an economic analysis of production and value addition in foxtail millet in Bellary district of Karnataka. The study revealed that the lack of marketing information, and tough competition with existing products were the major problems faced by the farmers in marketing of foxtail millet in the study area.

Abera *et al*. (2013) conducted a study on Preferences and constraints of maize farmers in the development and adoption of improved varieties in the mid-altitude, sub-humid agro-ecology of Western Ethiopia. The study revealed that high proportion of respondents (80 %) indicated that, unpredictable grain prices are the major market constraint as 97 % of the respondents sell their maize crop in the local market only.

Nguyen Cong Than *et al.* (2013) conducted a study on rice marketing of farmers in Mekong delta. The results revealed that the constraints faced by the farmers in rice marketing were purchasing prices are not stable and low, prices are squeezed from traders. They suggested for organising regularly training for farmers and provide information on techniques for rice marketing.

Aminon *et al*. (2014) conducted a study on diversity, genetic erosion and farmers preference of sorghum varieties in North-Eastern Benin. The result revealed that the low market value (0.98 %) were problems faced by the farmers in the study area.

Nwinya *et al.* (2014) conducted a study on comparative economic analysis of upland and low land rice production in Izzi local government area of Ebonyi state. The results revealed that marketing problems, bad road network. They suggested for provision of marketing on demand and supply trend of rice to enable farmers to know how to channel their produce for maximum profit.

Zalkuwi *et al.* (2014) conducted a study on Economics of sorghum production in Guyuk local government of Adamawa state, Nigeria. The results revealed that low price of sorghum, inadequate extension support, are constraints of sorghum marketing in study area. They suggested for financial assistance to increase farm size.

Ohen and Ajah (2015) conducted a study on cost and return analysis in small scale rice production in cross over state, Nigeria. The results revealed that lack of access to finance (58.33%) was the most serious problems encountered by the farmers in the study area. They suggested for financial support through micro-credit scheme to help the farmer purchase.

2.5 Reasons for cultivating of minor millet

Iren Leder (2004) conducted a study on sorghum and millets, in Cultivated Plants, Primarily as Food Source. He conclude that The principal use of millet grain is for food (85 %), with about 9 % used for feed .Millet represents about 75 % of total cereal food consumption in Niger and it is also a staple food in Namibia and Uganda, where millet is 25 % and 20 % of total cereal consumption respectively

Youssauf *et al.* (2006) conducted a study on impact of sorghum and millet research in west and central Africa. He suggested that In West Africa millets are cultivated for, nearly 80% of the area grown to millet is in the Sahelian zone. Nigeria, Niger, Mali, Burkina Faso and Senegal produce 84 % of the millet in the region. The crop is dual purpose, with the grain mostly used for human consumption, and crop residues constituting a strategic resource for livestock feed. It is the dominant cereal crop in the drier zones and an important component of crop/livestock systems.

Erika Meng *et al*. (2006) conducted a study on Maize in China:Production Systems, Constraints, and Research Priorities. He conclude that In northern China and the poorer mountainous regions, reason for cultivating of maize as farm households through its contribution to food, feed, and income. As one of the primary sources of feed in China, it has played an important role in the rapid development of poultry and livestock industries.

Mulla.*et al .(*2009) in a study on pearl millet as a postrainy cool season crop : a case study from Gujrath and Maharastra. He reaveals that the rabi season pearl millet cultivation is very important for farm households because this provides a major source of food requirement, it's a fodder or stover, it's a good source livestock , which in turn determines the animal protein milk. It involves high in calories , phosphorous and iron.

Padulosi *et al.* (2009) food security and climate change : Role of plant genetic resource of minor millet . He reported that Several training programmes were organized as a part of human and social capital building. The themes of these trainings included improved crop management, quality seed production, variety selection, intercropping systems, soil health management, vermi-compost production, value addition and product development, packaging, account keeping and marketing.

Jeff Dahlberg *et al.*(2011) conducted a study on Assessing sorghum germplasm for new traits: food, fuels & unique uses. . He concluded that Sorghum is an ancient, old world cereal that was domesticated in Africa. Europe, at one time, knew the crop for grain production and broom manufacturing .For various reasons, European farmers moved away from sorghum and adopted other cropping system. Recently, there has been renewed interest in sorghum as a crop for European farmers, its drought toler- ance, and its wide adaptability. Moreover, new uses for sorghum in food systems and renewable energy make it a promising "new" crop for European farmers looking to diversify their farming operations and meet the challenges of feeding and fueling the world.

Pathak *et al.*(2013) conducted a study on role of millets in nutritional security of India. He concluded that reason for cultivating of millet is due to they provide food as well as fodder and can be mix cultivated with pulse and vegetable, millets are drought tolerant, crop sturdiness, short to medium duration crop, low labour requirement, minimal purchased input, resistance to pest and disease.

Todd Pfeiffer *et al.*(2013) conducted a study on Sweet Sorghum for Biofuel. He concluded that Sweet sorghum (Sorghum bicolor) is primarily grown in Kentucky for its syrup. However, this crop may some day have another use in the Commonwealth — as a bioenergy crop. From University of Kentucky researchers examined the feasibility of ethanol production from sweet sorghum. They concluded that "overall sweet sorghum would appear to be a very feasible crop for ethanol production in Kentucky.

Shukla *et al.* (2015) conducted a study on pearl and finger millets: the hope of food security. He suggested that cultivation of these millets will provide a very nutritious and economical food for a large proportion of poor people.

Rajvanshi and Nimbkar (2015) conducted a study on sweet sorghum R&D at the Nimbkar Agricultural Research Institute. He concluded that the total utilization of the sorghum plant in a balanced production of food, feed and selected industrial products will become increasingly important in the developing countries. A total utilization of all components in the sorghum plant for use in the manufacturing and food industries would increase cash flow to the farmer and thereby constitute an incentive for him to increase his production.

3. MATERIAL AND METHODS

The study was conducted during 2015-16 in Haveri district of Karnataka. In this chapter, the general typology and description of the research methods and procedures adopted in the present investigation are explained under the following major headings.

3.1 Research design

3.2 Selection of district

3.3 Selection of taluks

3.4 Selection of villages

3.5 Selection of respondents

3.6 Brief description of the study area

3.7 sampling procedure

3.8 Variables for the study

3.9 Data collection

3.10 Statistical tools used

3.1 Research design

"Ex-post facto design" was employed in the present research study as the events have already occurred and design was considered appropriate.

3.2 Selection of district

The research was conducted in Haveri district of Karnataka state, as this district ranks first in area and production of millet crop. Keeping this in view, Haveri district was purposively selected to conduct the research study

3.3 Selection of taluks

Considering maximum area under millet cultivation as criteria, the first three taluks *viz*., Shiggaon, Haveri , Savanur taluks of Haveri district were selected for conduct of study.

Accordingly, Savanur taluk had an area of 655ha and Shiggaon taluka had an area of 585ha and Haveri taluk had an area of 65ha under millet cultivation.

3.4 Selection of villages

The villages having maximum area under millet cultivation were listed in descending order in consultation with State Department of Agriculture. From the list, first four villages having maximum area were selected from each taluka as listed below.

Sl. No.	Taluk	Village
1	Shiggaon	Thimmapura Kadali Shandambi Niralgi
2	Haveri	Kurgund Baradi Guthala Basapura
3	Savanur	Manthrode Jekinkatti Chi.badni Karadagi

Fig. 1. Map showing study area

3.5 Selection of respondents

From each selected villages, 10 farmers growing millet were selected by simple random sampling procedure. Thus sample from each taluka was 40 making a total sample size of 120 respondents.

3.6 Brief description of the study area

The district is surrounded on the north by Dharwad and Gadag districts, on the east by Bellary district, on the west by Uttar Kannada district and on the South by Davangere and Shimoga districts. The total geographical area of the district is 485156 hectare. The district has seven taluks with 208 gram panchayats and 691 inhibited 7 uninhibited villages (Anon., 2009-10).

3.6.1 Features of the district

Haveri is one of the newly formed districts of Karnataka on 15th August 1997. The district is distributed in northern semi rain fed and semi malnadu agro climatic zone. The total geographical area of the district is 485156 hectare. The district has seven taluks with 208 gram panchayats and 691 inhibited 7 uninhibited villages (Anon., 2013- 14).

3.6.2 Rainfall and Temperature

The district enjoys sub tropical climate with temperatures ranging between 18^0 and 40^0 C. The rainfall varies in the district from over 903 mm in west (Hanagal) to less than 592 mm in east (Ranebennur). October is the wettest month with normal monthly rainfall of over 100 mm.The average daily maximum temperature is 34.10^0 C (Anon., 2013-14).

3.6.3 Soil Types and land utilization pattern

3.6.3.1 Soils

In the major part of the district around 65 per cent has red sandy soil is occurring, followed by the medium black soil and deep black soil. The red loamy soil and lateritic soil are seen in very small parts on southern border of the district. Apart from sand and building stones no other mineral ores are found in the district.

3.6.3.2 Land utilization

Land use pattern of an area is an indicator of the natural endowment and opportunities for growth of the area. The district is spread across an area of 4,85,156 hectare. This is 2.53 per cent of the area of Karnataka state. The net sown area is 75 per cent (3,64,625 ha.). More than once sown area is 66,498 hectare. Totally total sowing area of 4,33,569 hectare.

Net area irrigated is 75,186 hectare. Out of which canals is 8 per cent (5,878 ha.), tanks is 12 per cent (9,349 ha.), bore wells is 56 per cent (42,342 ha.), lift irrigation is 1 per cent (391 ha.), and other is 23 per cent (17,226 ha.).

3.6.3.3 Population

As per 2011 census, Haveri had population of 1,598,506 of which male and female were 8,19,295 and 7,79,211 respectively. There was change of 11.08 per cent in the population compared to population as per 2001 census. In the previous census of India 2001.

3.6.3.4 Crops and Cropping Pattern

Agriculture being the main occupation in the district, of the 4,85,156 ha of the geographical area of the district 4,33,569 ha is cultivated. Jawar, maize, cotton, rice, chilli, gram, groundnut, sunflower and sugarcane are the major crops of the district.

Details of area, production and productivity of principal crops in Karnataka

Crop	Districts	Area (ha)	Production (t)	Productivity (kg/ha)
Little millet (Save)	Haveri Chitradurga Tumkur Belgaum Dharwad	1,940 4,530 1,790 649 334	1,825 1,721 559 324 228	990 400 329 525 719
Finger millet (Ragi)	Haveri Chitradurga Tumkur Belgaum Dharwad	249 45,272 1,40,555 903 38	98 51,137 1,49,551 672 58	414 1,189 1,120 753 1,595
Pearl millet (Bajra)	Haveri Chitradurga Timkur Belgaum Dharwad	59 1,330 90 7,579 15	61 699 94 2,657 16	1,094 553 1,094 369 1,094
Foxtail millet (Navane)	Haveri Chitradurga Timkur Belgaum Dharwad	284 2,059 661 369 24	68 532 116 69 6	252 272 184 197 281

Little millet (Save) was cultivated in an area of 1940 ha producing 1825 t with productivity of 990kg/ha during (2012-13). Little millet is widely cultivated in Haveri, besides Dharwad, Chitradurga, Belgaum and Tumkur districts of Karnataka. Haveri the leading districts for little millet in North Karnataka. Foxtail millet was cultivated in an area of 284 ha producing 68 t with productivity of 252kg/ha.

3.7 Sampling procedure

The simple random sampling procedure was adopted for the investigation.

3.8 Selection of variables

3.8.1 Dependent Variables

Considering the objectives of the study, technological gap in millet production were considered as dependent variables. Critical farm operations were identified based on discussion with scientists and extension workers. The package of practices recommendations given by University of Agricultural Sciences (UAS), Dharwad was used as reference to assess the technological gap. The practices selected were as per the recommendation made in package of practices booklet of the University of Agricultural Sciences, Dharwad.

Sl No.	Name of the practice(Save, Navane)	Recommendations
1	Varieties	Foxtail millet:RS-118, HMT-1 Little millet:sukshema,CO-2,PCR-3
2	Sowing time	Summer- Foxtail millet: June-July Little millet:June-July
3	Spacing in the field	Foxtail millet Seed to seed :5-7.5 Depth :4cm Little millet Seed to seed : 22.5-30cm Depth : 4cm Plant to plant : 5-7.5cm
4	Seed rate (ha)	Foxtail millet:3.75kg/ha Little millet :8-10kg/ha
5	FYM / ha	Both Foxtail and little millet-6t/ha
6	Chemical fertilizers / ha	Foxtail millet:N:P:K 30:15:15 Little millet:N:P:K 40:20:20
7	Biofertilizer / ha	Azospirillum 1kg/ha
8	Time of application of fertilizers	Full dose of FYM and azospirillum at the time of land preparation. Before sowing application of full dose of N,P,K.
9	Weedicide / ha	) 2.5 kg 2-4 D 80% in 875 liters of water ii) 1kg Metazol 75% in 875 liter of water

10	Plant protection measures(Foxtail and little millet)		
I	Name of the pest	Chemicals	Dosage
a.	Pod borer	Redomel	Seed treatment with 1kg of seeds with 1g redomel.
b.	Stemborer	Endosulphan 35 EC	2 ml / liter of water
11	Name of the disesase	Chemicals	Dosage
a.	Brown spot disease	Redomel	For 1 kg of seeds treat with redomel in 1ltrs of water
b.	Green pod disease	Hexaconazole Or Mancozeb	75w- 2 g in 1ltrs of water.

3.8.2 Operationalization and their measurements

3.8.2.1 Dependent variables

Technological gap

Technological gap is nothing but the proportion of gap in the adoption of recommended cultivation practices and it is expressed in terms of percentage (Ray *et al*., 1995).

The package of practices recommended by the University of Agricultural Sciences, Dharwad was considered as the standard for calculating technological gap. In the present study, technological gap was operationalized by considering 10 recommended millet cultivation practices and expressed in percentage.

The technological gap of a particular practice expressed in percentage was:

$$\text{Mean technological gap} = \frac{\text{Standard score} - \text{Actual score}}{\text{Standard score}} \times 100$$

Mean technological gap was considered and the respondents were then divided into three categories as; low, medium and high.

Category	Score
Low	Less than ($\bar{X}$ - 0.425 SD)
Medium	Between ($\bar{X}$ + 0.425 SD)
High	More than ($\bar{X}$ + 0.425 SD)

3.8.3 Independent Variables

Personal, socio-economic and psychological characteristics of the respondents were taken into consideration.

3.8.3.1 Age

Age was operationalised as the chronological age of the millet growers in completed years at the time of investigation. The respondents were classified into three categories *viz*., young, middle and old by using the procedure as followed Raghavendra (2005), Suresh Kumar (2009) and Bennur (2011) with slight modification was used to quantify this variable as the following.

Category	Age (years)
Young	Below 30
Middle	31-50
Old	51 and above

3.8.3.2 Education

Education was operationalised as the extent of formal education undergone by the farmers. The respondents were grouped into different categories based on frequency and percentage. The procedure followed by Suresh Kumar (2009), Satish (2010) and Sanjota (2014) was adopted.

Education	Score
Illiterate	0
Primary school (1^{st}- 4^{th} std)	1
Middle school (5^{th}- 7^{th} std)	2
High school(8^{th}- 10^{th} std)	3
PUC	4
Graduate	5
Post graduate	6

3.8.3.3 Family size

Family size was operationalized as total number of members residing together in the family at the time of investigation. A score of one was assigned to each individual member of the family. Further,the size of the family was classified into three categories. Categorisation of the respondents was done in the following manners,as followed by Manjunath(2010) and Kudari(2014)

Sl. No.	Size of the family	Score
1	Small family	<5members
2	Medium family	5-8members
3	Large family	>8members

3.8.3.4 Land holding

It refers to the number of acres of land possessed by the farmers. The criterion prescribed by the Karnataka Land Reforms Act 38 of 1966 (Part B),99,195-196 under section 2(a) 32 as one acre of irrigated or garden land was equivalent to three 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 Maraddi (2006), Bennur (2011) and Sanjota (2014) was used and the respondents were grouped into five categories.

Category	Land holding (in acres)
Marginal farmers	Upto 2.50
Small farmers	2.51 – 5.00
Semi-medium farmers	5.01 – 10.00
Medium farmers	10.01 – 25.00
Big farmers	Above 25.00

3.8.3.5 Farming Experience

It refers to total number of years of experience in farming in general. The experience of the farmers in completed years at the time of investigation was considered. The procedure followed by Suresh Kumar (2009), Madhu (2010) and Sanjota (2014) was used to categorize respondents.

Category	Farming Experience (years)
Low	< 10
Medium	10 to 20
High	> 20

3.8.3.6 Annual Income

It was operationalised by considering the total income earned by the respondents from both agricultural and allied enterprises in one year as expressed in rupees. Based on that, respondents were grouped into four categories as per norms suggested by Ministry of Rural Development, Government of India and as followed by Binkadakatti (2008).

Sl. No.	Categories	Income Rs/annum
1	Low income group	Up to Rs. 17,000
2	Semi-medium income group	Rs. 17,001 – Rs.34,000
3	Medium income group	Rs. 34.001 – Rs.51,000
4	High income group	Above Rs.51,000

3.8.3.7 Extension Contact

The frequency of contact of a respondent with extension agency during the previous year was taken into consideration. The variable was quantified by using the procedure followed by Deepak (2003) and as followed by Kikon (2010). The score of an individual respondent was the summation of scores for all the extension personals contacted by the respondents.

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

Based on the total scores of extension contact, the respondents were classified into three categories such as 'low', 'medium' and 'high' using mean (X) and standard deviation (SD) as a measure of check

Category	Score
Low	Less than ($\bar{X}$ – 0.425 SD)
Medium	Between ($\bar{X}$ + 0.425 SD)
High	More than ($\bar{X}$ + 0.425 SD)

3.8.3.8 Economic motivation

Economic motivation was operationally defined as the degree to which a farmer was oriented towards profit maximization in farming and the relative value placed by the farmer on economic ends. The scale developed by Supe (1969) and as followed by Jadhav (2009) and Sanjota (2014) with suitable modification was used to quantify this variable. The scale consists of six statements of which one statement was negative. The responses were obtained on a three point continuum with scoring as follows.

Category	Agree	Undecided	Disagree
Score for positive statements	3	2	1
Score for negative statements	1	2	3

The maximum score an individual could obtain on this scale was 18 and minimum score was 6. Based on the total score, the respondents were classified into three categories.

Category	Score
Low	Less than ($\bar{X}$- 0.425 SD)
Medium	Between ($\bar{X}$+ 0.425 SD)
High	More than ($\bar{X}$+ 0.425 SD)

3.8.3.9 Information source consultancy pattern

Source of information refer to the frequency with which source or channels are consulted by the millet growers in order to seek information regarding marketing behavior and problem in the cultivation of millet.

To find out the pattern of extent of consultation of information source by the farmers each of these source were fitted in a three point continuum: regular, occasional and never and the scoring of 2, 1 and 0, respectively were followed. Then, these scores are tabulated based on the score obtained the respondents who in turn were grouped into three categories by taking mean and standard deviation as a measure of check.

Sl. no	Source of information	Frequency of consultancy		
		Regularly	Occasionally	Never
1.	Institutional sources			
	a)Assistant director of agriculture b)Agriculture officer c)Scientist from the research station of agricultural university	2	1	0

Sl. no	Source of information	Frequency of consultancy		
		Regularly	Occasionally	Never
2.	Localite sources			
	a)Neighbours b)Friends c)Relatives d)Private consultants	2	1	0
3.	Mass media			
	a)Radio b)Television c)Farm magazines d)Newspaper	2	1	0
4.	Any other specify			

3.8.3.10 Livestock size

It is quantified based on total numbers of livestock which include buffaloes, cow, sheep, goat and draft animals.

3.8.3.11 Cropping Pattern

Cropping pattern was operationally defined as yearly sequence and spatial arrangement of crops in a particular locality. In the present study the cropping pattern was studied by asking the respondents regarding crops in all the three seasons. The procedure followed by Bogale (2002) and also followed by Doddamani (2008) was adopted to quantify this variable. The respondents were classified based on crops grown in particular season by using frequency and percentage

3.8.3.12 Extent of cultivation of minor millet

The extent in adoption of millet crop of the study area were elicited through open ended questions. Based on the responses obtained from millet growers, percentage increase and percentage decrease were calculated for each of the respondents.

3.8.3.13 Awareness and consumption pattern of minor millet among growers

The Awareness and consumption pattern of millet crop of the study area were elicited through open ended questions. Based on the responses obtained from millet growers, frequency and percentage were calculated for each of the constraints faced by them.

3.8.3.14 Marketing Constraints faced by millet growers

Marketing constraints in adoption of millet crop of the study area were elicited through open ended questions. Based on the responses obtained from millet growers, frequency and percentage were calculated for each of the constraints faced by them.

3.8.3.15 Reasons for cultivating of minor millet

The reasons in adoption of millet crop of the study area were elicited through open ended questions. Based on the responses obtained from millet growers, frequency and percentage were calculated for each of the reason expressed by them.

3.9 Method of data collection

Keeping in view the objectives and variables of the study, a structured interview schedule was developed by consulting experts and also referring to the relevant literature like package of practices developed by University Agricultural Sciences, Dharwad. Then, Pre-testing of the schedule was

carried out in the non-sample area for its practicability and relevancy. The final schedule was prepared by making necessary modifications, additions and a deletion based on pre-testing results and was used for data collection. The final format of the interview schedule is given in Appendix I. The data were collected from the respondents through personal interview method in an informal atmosphere.

3.10 Statistical tools

The following statistical tools were used to analyze the data.

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.

Frequency: This measure was used to know the distribution pattern of respondents variable wise and to categorize the problems perceived by wheat 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.

Karl Pearson's Correlation Coefficient (r): Karl Pearson's Correlation Coefficient (r) was computed in order to know the nature of relationship between the dependent and independent variables. The values of the correlation coefficients were then tested for statistical significance.

$$r = \frac{\Sigma XY - \frac{\Sigma X \Sigma Y}{n}}{\sqrt{\left\{\Sigma X^2 - \frac{(\Sigma X)^2}{n}\right\}\left\{(\Sigma Y^2) - \frac{(\Sigma Y)^2}{n}\right\}}}$$

Where,

r = Correlation Coefficient between variables X and Y

ΣX = sum of scores of variable X

ΣY = sum of scores of variable Y

ΣXY = sum of products of variable X and variable Y

ΣX^2 =sum of squares of X variable

ΣY^2 = sum of squares of Y variable

n = paired number of observations

4. EXPERIMENTAL RESULTS

The results of the study are presented in this chapter under the following sub heads.

4.1 Profile characteristics of the respondents

4.2. To assess the technological gap in adoption of improved cultivation practices

4.3 .To analyse the extent of cultivation of minor millet

4.4. To find out the awareness and consumption pattern of minor millet

4.5. To list the marketing constraints faced by the minor millet growers and

4.6. To document the reasons for cultivating the minor millet

4.1 Profile characteristics of respondents

The data presented in Table 1 gives a detailed account of personal and socio-economic attributes of the sample respondents.

4.1 Socio-economic characteristics of millet growers

4.1.1 Age

The data in table 1 revealed that 56.67 per cent of the respondents belonged to middle age, followed by 30.83 per cent and 12.50 per cent belonged to old age category and young age category respectively.

4.1.2 Education

It is clear from the table 1 that, 36.67 per cent of the respondents were illiterates, Whereas, 22.50 per cent of respondents educated upto middle school followed by 21.67 per cent had primary school education, high school (10.83 %) and PUC (8.33 %).

4.1.3 Family size

It can be observed from table 1, that 45.00 per cent of respondents belonged to small family (<5 members), followed by 36.67 per cent of the respondents belonged to medium family size (5-8 members) and 18.33 per cent of the respondents belonged to large family size (<8 members).

4.1.4 Land holding

The data presented in table 1 revealed that, 42.50 per cent of farmers belonged to semi-medium land holding category (5.01-10.00 acres) while 35.00 per cent of them belonged to small farmers (2.51-5.00 acres) whereas, 13.33 per cent of the farmers belonged to marginal land holding category (upto 2.50 acres), Whereas 8.33 per cent of them were medium farmers (10.01–25.00 acres), 0.83 per cent were big farmers (> 25.00 acres) .

4.1.5 Farming experience

The results in table 1 indicates that, more than half (51.67 %) of the respondents had high farming experience (>20 years), while 33.33 per cent of the respondents had medium farming experience (10-20 years) and 15.00 per cent of respondents had low farming experience (<10 years).

4.1.6 Annual income

It can be observed from table 1 that, majority 80.83 per cent of the respondents had high level of annual income (> Rs. 51,000), followed by 8.33 per cent had medium level of annual income (Rs.34,000-51,000), while 5.90 per cent of them belonged to low level of annual income (upto Rs.17000) and only 5.00 per cent of them had semi medium level of annual income(Rs.17,000-34000).

Table 1: Socio-economic characteristics of millet growers

(n=120)

Sl. No.	Variable	Category	Frequency	Percentage
1	Age	Young age (below 30 yrs)	15	12.50
		Middle age (31-50 yrs)	68	56.67
		Old age (above 50 yrs)	37	30.83
2	Education	Illiterate	44	36.67
		Primary school (1^{st}- 4^{th} std)	26	21.67
		Middle school (5^{th}- 7^{th} std)	27	22.50
		High school(8^{th}- 10^{th} std)	13	10.83
		PUC	10	8.33
		Graduate	0	0.00
		Post graduate	0	0.00
3	Family size	Small family (<5 members)	54	45.00
		Medium family (5-8 members)	44	36.67
		Large family (>8 members)	22	18.33
4	Land holding	Marginal farmers (Upto 2.50 acres)	16	13.33
		Small farmers (2.51 – 5.00 acres)	42	35.00
		Semi-medium farmers (5.01–10.00 acres)	51	42.50
		Medium farmers (10.01 – 25.00 acres)	10	8.33
		Big farmers (Above 25.00 acres)	1	0.83
5	Farming experience	Low(<10 years)	18	15.00
		Medium (10 to 20 years)	40	33.33
		High (>20 years)	62	51.67
6	Annual income	Low (up to Rs 17,000)	7	5.90
		Semi medium (Rs 17,001-34,000)	6	5.00
		Medium (Rs 34,001-51,000)	10	8.33
		High (above Rs 51,000)	97	80.83

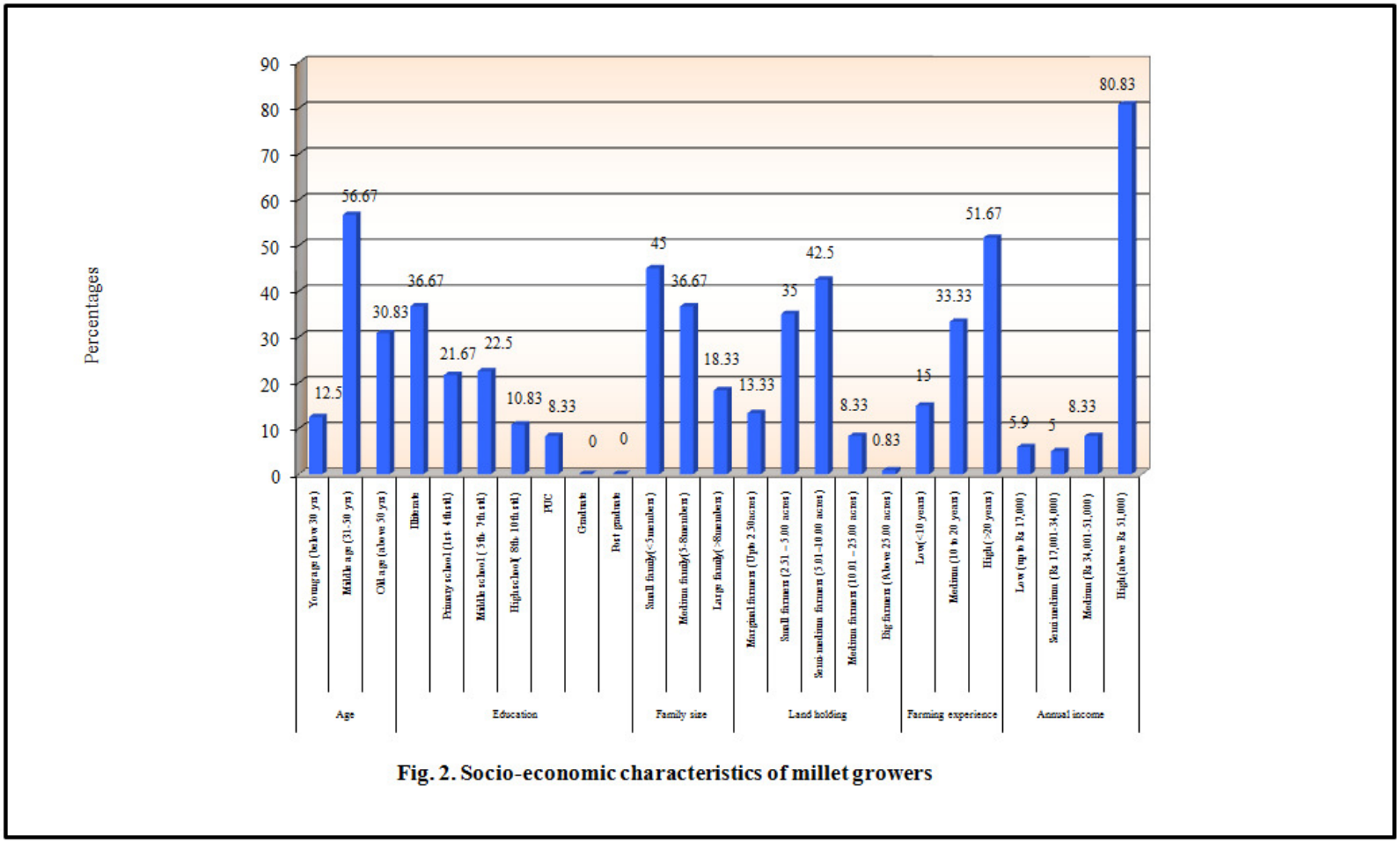

Fig. 2. Socio-economic characteristics of millet growers

Fig. 2. Socio-economic characteristics of millet growers

4.1.7 Livestock size of the farmers

The data are presented in table 2 revealed that, high (36.67 %) of the farmers possessed draft animals followed by buffaloes (33.33 %), cow (23.33 %) and sheep/goat (6.67 %), respectively.

4.1.8 Extension contact of millet growers

The data presented in table 3 revealed that, 45.83 per cent of the farmers belonged to medium extension contact category followed by high (39.17 %) and low (15.00 %) extension contact category respectively.

The results presented in table 3.1 indicates that, 41.70 per cent of the farmers contacted *'Assistant Agriculture Officer'* once in fortnight followed by 'once in week' (30.80%), 'whenever problem arises' (17.50%), and 'never' (10.00%) respectively.

It can be observed from the table that, 39.20 per cent of the farmers 'once in fortnight' contacted *'Agriculture officers'* followed by 'once in a week' (28.30 %), 'whenever problem arises' (21.70 %), and 'never '(10.80 %) respectively.

The data also indicated that, 50.80 per cent of the farmers contacted '*UAS Scientists'*, 'whenever problem arises' followed by 'once in fortnight' (37.50 %) and 'never' (7.50 %) and ' once in a week'(4.20 %) respectively.

It can be observed from the data that, 56.70 per cent of the farmers contacted '*KVK Scientists'* ' whenever problem arises', whereas, 35.00 per cent of the farmers contacted the same 'once in fortnight'. while, 5.80 per cent were 'never' contacted and only 2.50 per cent were contacted 'once in a week' respectively.

It can be observed from the data that, 55.80 per cent of the farmers contacted *'Agriculture Research Station'* 'whenever problem arises' followed by 'once in fortnight' (23.30 %), 'never' (16.70 %) and (4.20 %) once in a week respectively.

It can be observed from the data that, 50.00 per cent of the farmers 'never' contacted *'officials of NGO/other voluntary organisation'* followed by 'whenever problem arises' (20.00 %) , 'once in fortnight' (18.33 %) and 'once in a week' (11.70 %) respectively.

It can be observed from the data that, 61.70 per cent of the farmers 'never' contacted *'Private company officials'* followed by 'once in a week' (19.20 %) 'whenever problem arises'(13.30 %) and 'once in fortnight' (5.80 %) respectively.

4.1.9 Economic motivation

The data furnished in table 4 revealed that 40.83 per cent of the respondents belonged to high economic motivation category followed by 40.00 per cent and only 19.17 per cent belonged to medium and low economic motivation category respectively.

The data in table 4.1 revealed the economic motivation of millet growers. Majority of the farmers 97.50 per cent said 'agree' to the statement of '*a farmer should work towards more yield and economic profit'*, followed by 'disagree' (1.70 %) and 'undecideed' (0.80 %) respectively.

Whereas, 57.50 per cent of the respondents expressed their agreement to the statement of *'the most successful farmer is one who makes more profits'*, followed by 'undecided' (34.17 %) and 'disagree' (8.33 %) respectively.

Table 2 : Distribution of millet growers according to their livestock position

(n=120)

Animals	Number of respondents	
	F	%
Buffalo	40	33.33
Goat /Sheep	8	6.67
Cow	28	23.33
Draft animals	44	36.67

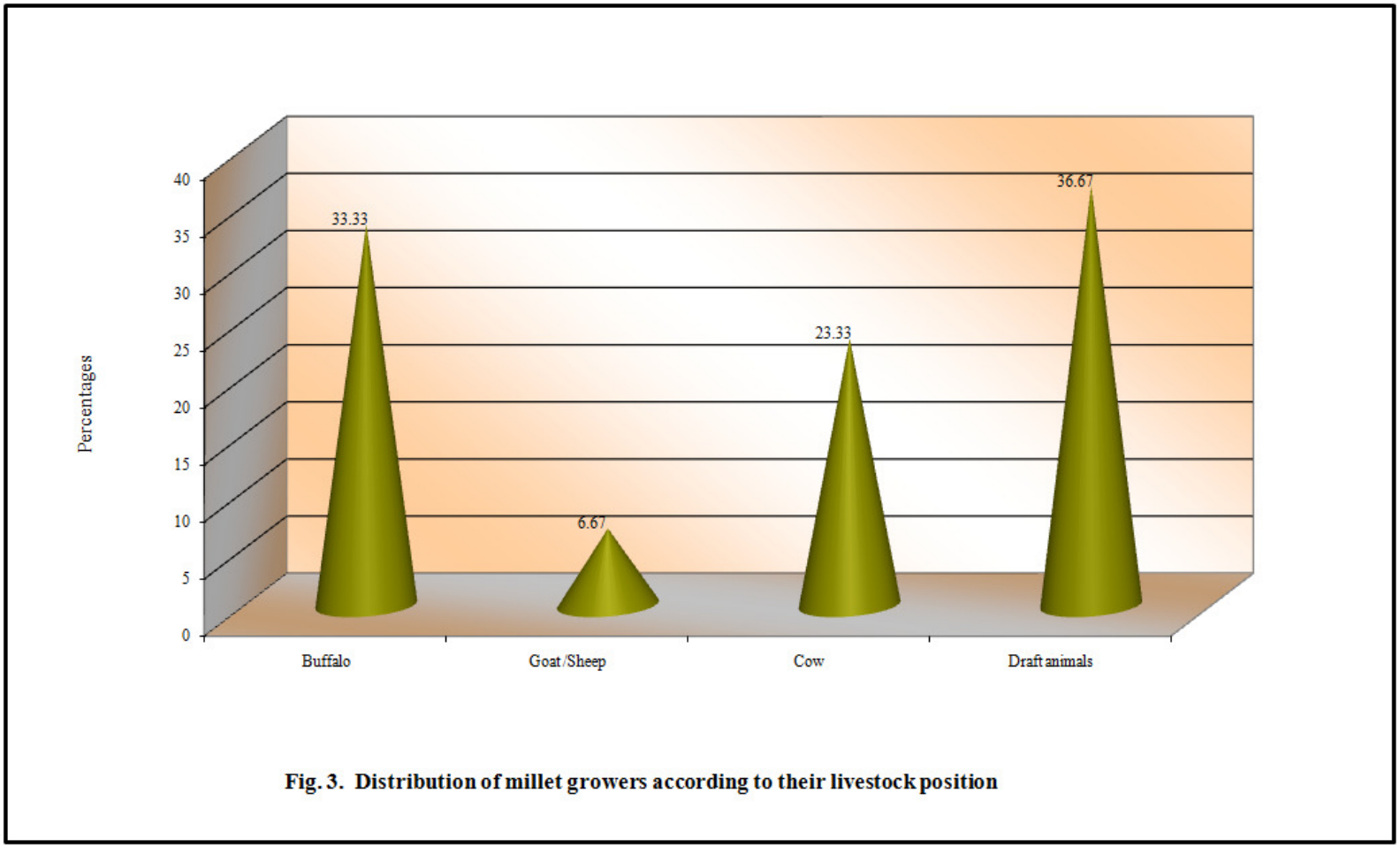

Fig. 3. Distribution of millet growers according to their livestock position

Fig. 3. Distribution of millet growers according to their livestock position

About 39.17 per cent of the respondents expressed their opinion both as 'agree' and also 'undecided' to the statement of *'the farmer should try the new farming ideas which may earn more money'*, followed by 21.66 per cent respondents expressed as 'disagree'

While, 55.83 per cent of the respondents said *'agree'* to the statement of *'a farmer should grow more cash crops to increase monetary profits in comparison to growing food crops for home consumption'*, followed by 'disagree' (24.17 %) and 'undecided' (20.00 %) respectively.

Further, 42.50 per cent of the respondents said 'agree' to the statement of *'it is difficult for the farmer's children to make good start unless he provides them with economic assistance'*, followed by 'disagree' (37.50%) and 'undecided' (20.00%) respectively.

While, 52.50 per cent of the farmers said 'disagree' to the statement of *'a farmer must earn his living but the most important thing in life cannot be defined in economic terms'* followed by, 41.67 per cent and 5.83 per cent of the respondents said 'agree' and 'undecided' to the same statement, respectively.

4.1.10 Information source consultancy pattern

The data furnished in Table 5 revealed that 36.67 per cent of the respondents belonged to medium Information source consultancy pattern category followed by 35.83 per cent and 27.50 per cent belonged to high and low Information source consultancy pattern category respectively.

The data in Table 5.1 revealed that the Information source consultancy pattern of millet growers. It indicates that 57.50 per cent of the farmers contacted *'Assistant directorate of agriculture'* 'occasionally' followed by 'never' (41.70 %), and 'regular (0.80 %) respectively

It can be observed from the table that, 58.30 per cent of the farmers 'occasionally' contacted *'agriculture officer'* followed by 'never' (41.70 %), and none of the respondents visit 'regularly' .

It can be observed from the data that, 50.00 per cent of the farmers 'never' contacted *'scientist from the research station of agricultural university'* followed by 'occasionally' (45.00 %) and 'regularly' (5.00 %) respectively.

Similarly, 54.20 percent of the respondents contacted '*neighbor'* for any information 'regularly' followed by 'occasionally' (35.80 %) and 'never' (10.00 %) respectively.

Majority of the respondents 54.20 percent of the respondents contacted '*friends'* for any information 'regularly' followed by 'occasionally' (35.80 %) and 'never' (10.00 %) respectively.

It was also found that the 54.20 percent of the respondents contacted '*relatives'* for any information 'regularly' followed by 'occasionally' (34.20 %) and 'never' (11.66 %) respectively.

It can be observed from the data that, (45.80 %) of the respondents contacted '*private consultancy'* for any information 'occasionally' followed by 'regularly' (37.50 %) and 'never' (16.70 %) respectively.

It can be observed from the data that, (45.00 %) of the respondents hear '*radio*' for any information 'regularly' followed by 'occasionally' (39.20 %) and 'never' (15.80 %) respectively.

It was also found that 44.20 per cent of the respondents watch *'TV'* for any information 'regularly' followed by 'occasionally' (40.00 %) and 'never' (15.80 %) respectively.

Majority of the respondents 44.20 per cent of the respondents read *' farm magazine'* for any information 'occasionally' followed by 'never' (29.20 %) and 'regularly' (26.66 %) respectively.

Table 3: Millet growers according to their overall extension contact

(n=120)

Sl. No.	Variable	Category	Respondents	
			Frequency	Percentage
1	Extension contact	Low (<8.06)	18	15.00
		Medium (8.06 – 10.85)	55	45.83
		High (>10.85)	47	39.17

Mean=9.45 SD=3.27

Table 3.1: Individual Extension contact of millet growers

(n=120)

Sl. No.	Extension personnel	Frequency of contact							
		Once in a week		Once in fortnight		Whenever problem arises		Never	
		F	%	F	%	F	%	F	%
1	AAO	37	30.80	50	41.70	21	17.50	12	10. 00
2	AO	34	28.30	47	39.20	26	21.70	13	10.80
3	University scientist	5	4.20	45	37.50	61	50.80	9	7.50
4	KVK Scientists	3	2.50	42	35.00	68	56.70	7	5.80
5	Agriculture Research Station scientists	5	4.20	28	23.30	67	55.80	20	16.70
6	Officials of NGO/ Other voluntary organization	14	11.70	22	18.30	24	20. 00	60	50. 00
7	Private company officials	23	19.20	7	5.80	16	13.30	74	61.70

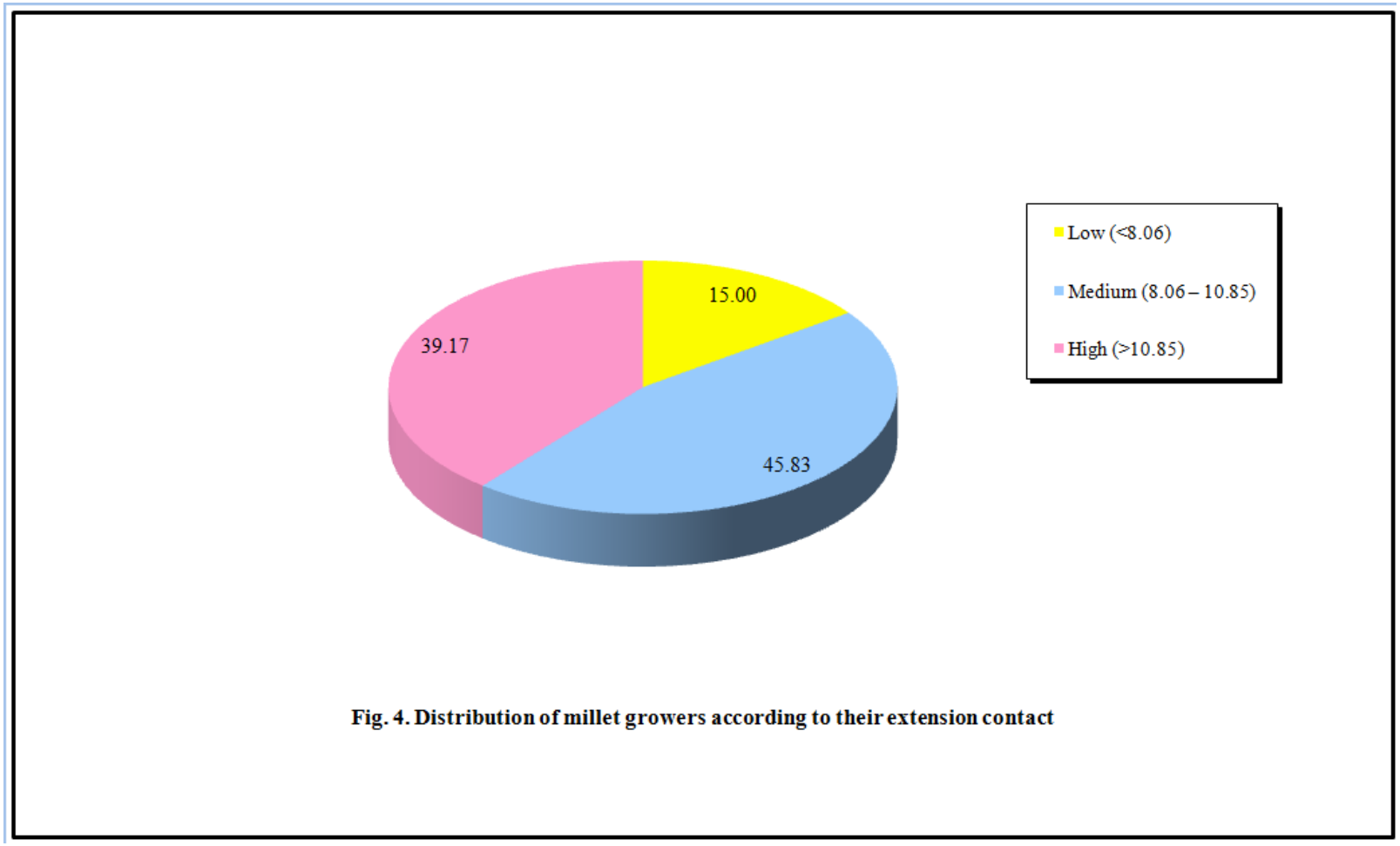

Fig. 4. Distribution of millet growers according to their extension contact

Fig. 4. Distribution of millet growers according to their extension contact

Table 4: Millet growers according to their overall economic motivation

(n=120)

Sl. No.	Variable	Category	Respondents	
			Frequency	Percentage
1	Economic motivation	Low (< 13.12)	23	19.17
		Medium (13.12-14.60)	48	40.00
		High (> 14.60)	49	40.83

Mean=13.86 SD=1.7

Table 4.1: Economic motivation of respondents towards individual items

(n=120)

Sl. No.	Statements	Agree		Undecided		Disagree	
		F	%	F	%	F	%
1	A farmer should work towards more yield and economic profit.	117	97.50	1	0.80	2	1.70
2`	The most successful farmer is the one who makes the most profit	69	57.50	41	34.17	10	8.33
3	A farmer should try any new farming idea which may earn more money.	47	39.17	47	39.17	26	21.66
4	A farmer should grow more cash crops to increase monetary profit in comparison to growing of food crops for home consumption.	67	55.83	24	20. 00	29	24.17
5	It is difficult for farmer's children to make good start unless he provides them with economic assistance.	51	42.50	24	20. 00	45	37.50
6	A farmer must earn his living but most important things in life cannot be defined in economic terms.	50	41.67	6	5. 83	63	52.50

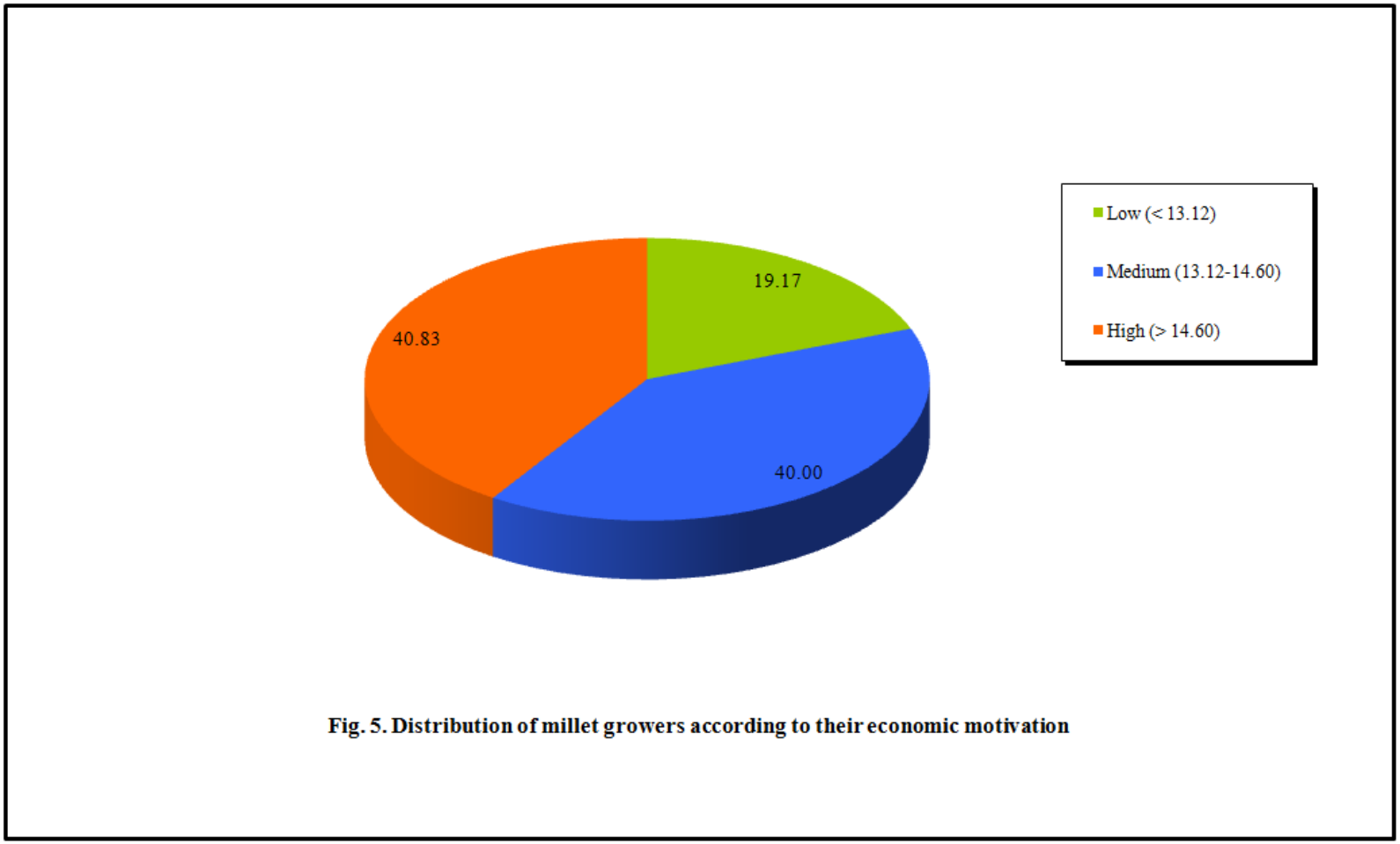

Fig. 5. Distribution of millet growers according to their economic motivation

Fig. 5. Distribution of millet growers according to their economic motivation

Table 5: Distribution of millet growers according to their information source consultancy pattern

(n=120)

Sl. No.	Variable	Category	Respondents	
			Frequency	Percentage
1	Information source consultancy pattern	Low (<22.69)	43	27.50
		Medium (22.69-25.5)	44	36.67
		High (> 25.50)	33	35.83

Mean=24.10 SD=3.29

Table 5.1: Information Source consultancy pattern

(n=120)

Sl. No.	Source of information	Extent of consultancy					
		Regularly		Occasionally		Never	
		F	%	F	%	F	%
1.	Institutional sources						
	a) Assistant director of agriculture	1	0.80	69	57.50	50	41.70
	b) agriculture officer	00. 00	00.00	70	58.30	50	41.70
	c) Scientist from the research station of agricultural university	6	5.00	54	45.00	60	50.00
2.	Locality sources						
	a) Neighbours	65	54.20	43	35.80	12	10.00
	b) Friends	65	54.20	43	35.80	12	10.00
	c) Relatives	65	54.20	41	34.20	14	11.66
	d) Private consultants	45	37.50	55	45.80	20	16.70
3.	Mass media						
	a) Radio	54	45.00	47	39.20	19	15.80
	b) Television	53	44.20	48	40.00	19	15.80
	c) Farm magazines	32	26.66	53	44.20	35	29.20
	d) Newspaper	34	28.33	31	25.83	55	45.90

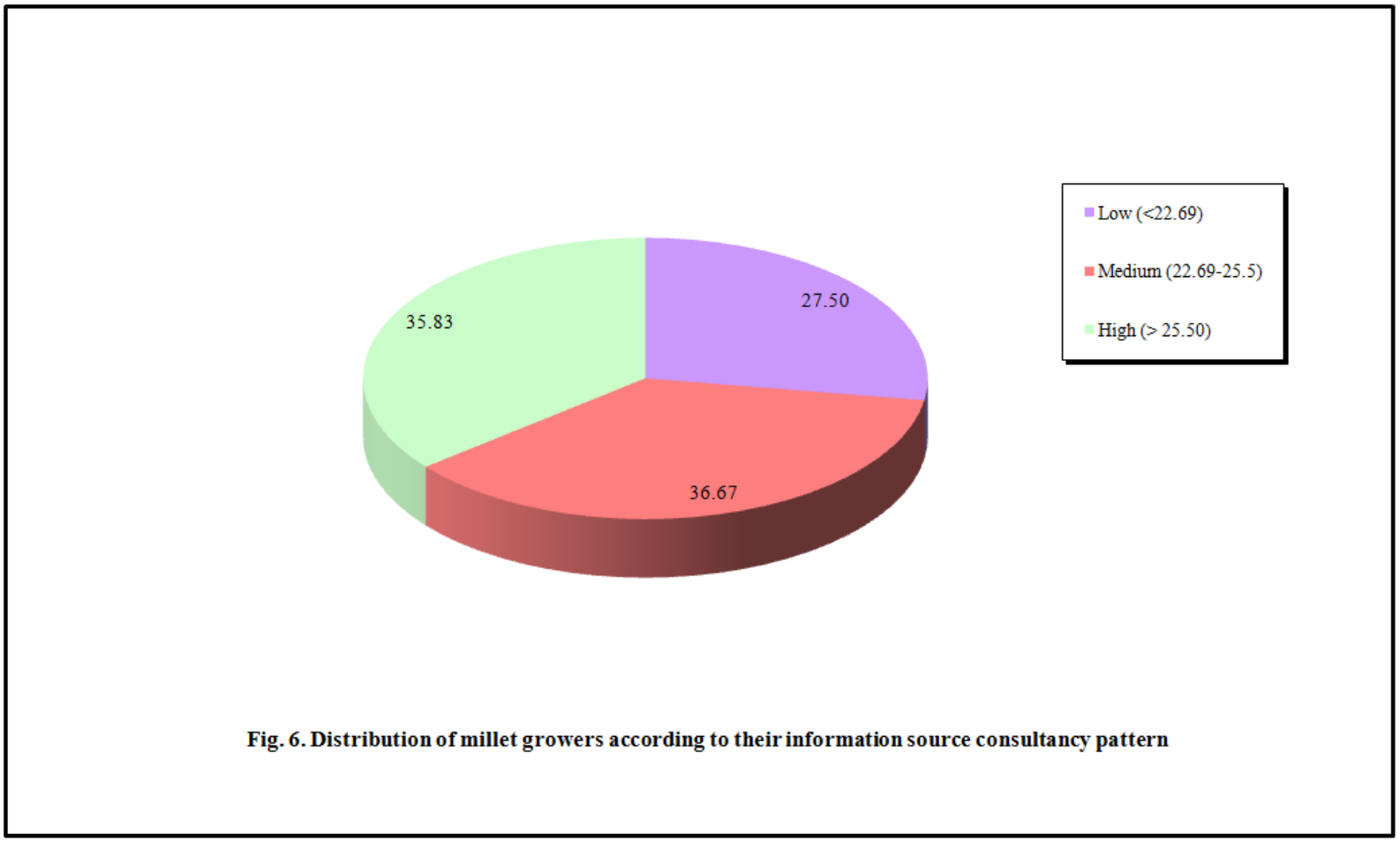

Fig. 6. Distribution of millet growers according to their information source consultancy pattern

Fig. 6. Distribution of millet growers according to their information source consultancy pattern

Table 6: Cropping pattern of millet growers

(n=120)

Sl. No.	Crops	Frequency	Percentage
I.	Kharif		
1	Millets	106	88.33
2	Onion	61	50.83
3	Cotton	105	87.5
4	Greengram	88	73.33
5	Groundnut	90	75.00
6	Chilly	36	30.00
II.	Rabi		
1	Chickpea	115	95.83
2	Sorghum	104	86.67
3	Maize	65	54.17
III.	Summer		
1.	Maize	38	31.67

Majority of the respondents 45.90 per cent 'never' read *'newspaper'* for any information followed by 'regularly' (28.33 %) and 'occasionally' (25.83 %) respectively.

4.1.11 Cropping pattern followed by millet growers

The results presented in table 6 indicate that, the crops grown by farmers during Kharif season in the order of priority were; millets (88.33%), cotton (87.50%), groundnut (75.00%), greengram (73.33%), onion (50.83%), chilly (30.00%)

It can also be observed that, the major crops grown by farmers during Rabi season were; chick pea (95.83 %), sorghum (86.67 %) and maize (54.17 %). And crops grown by the farmers on Summer season that is maize (31.67 %).

4.2. To assess the technological gap in adoption of improved cultivation practices

4.2.1 Respondents based on overall technological gap

A close observation of table 7 shows that, majority of the respondents (36.67 %) belonged to medium category of technological gap, followed by low (32.50 %) and high (30.83 %) category of technological gap.

4.2.2 Technological gap in adoption of improved cultivation practices

The data presented in Table 7.1 indicates that, the mean technological gap among the farmers, in respect of the recommended cultivation practices of millets.

It was observed that, 76.67 per cent of technological gap was found in adoption of weedicide application of foxtail millet followed by 65.00 per cent of technological gap was found in little millet with respect to weedicide application. Further , table also indicated that in case of disease control technological gap was (50.83 %) in foxtail millet, (45.00 %) was observed in little millet.

While, in case of seed treatment with azospirilum (45.00 %) of technological gap was observed in foxtail millet and in case of little millet it was 40.00 per cent, 43.33 per cent of technological gap was found with respect to chemical fertilizer application for foxtail millet (rainfed) and 37.50 per cent technological gap in little millet.

Whereas, 40.83 per cent of technological gap was with respect to recommended practice of seed depth of both foxtail millet and little millet. And (37.50 %) of technological gap was found in seed to seed spacing in foxtail millet, 39.17 per cent was found in little millet.

Further , 35.00 per cent of technological gap was found in case of FYM application and pest control in foxtail millet and 48.33 per cent in ittle millet. Further, 46.67 per cent gap found with respect to pest control in little millet respectively. 33.33 per cent technological gap was found in adopting Foxtail millet variety (HMT100-1) and 40.00 per cent of the technological gap with respect to variety of little millet (Sukshema). 21.67 per cent of technological gap was found in practice like plant to plant spacing of foxtail millet , followed by 22.50 per cent in little millet plant to plant spacing.

While, no technological gap found in sowing time of both foxtail and little millet (June-July) and seed rate application in Foxtail millet, while, 43.30 per cent of technological gap was found in seed rate of little millet.

Table 7: Overall technological gap among the millet cultivation practices

(n=120)

Sl. No.	Category	Frequency	Percentage
1	Low ($\bar{X}$ - 0.425 SD)	39	32.50
2	Medium ($\bar{X}$ $\pm$ 0.425 SD)	44	36.67
3	High ($\bar{X}$ + 0.425 SD)	37	30.83

Mean = 13.08 SD = 2.07

Table 7.1: Technological gap in adoption of recommended millet cultivation practices

(n=120)

Sl. No.	Recommended cultivation practices	Mean technological gap			
		Foxtail millet		Little millet	
		Number	Percentage (%)	Number	Percentage (%)
1	Recommended varieties				
	Foxtail millet(HMT 100-1)	40	33.33	-	-
	Little millet(Sukshema)	-	-	48	40.00
2.	Sowing time				
	Foxtail millet:June-July	0	0.00	-	-
	Little millet:June-July	-	-	0	0.00
3.	Spacing				
a.	Seed to seed:22.5-30 cm				
	Foxtail millet	45	37.50	-	-
	Little millet	-	-	47	39.17
b.	Depth: 4 cm				
	Foxtail millet	49	40.83	-	-
	Little millet	-	-	49	40.83
c.	Plant to plant 5-7.5 cm				
	Foxtail millet	26	21.67	-	-
	Little millet	-	-	27	22.50
4.	Seed rate(kg/ha)				
	Foxtail millet:3.75 kg/ha	0	0.00	-	-
	Little millet: 8-10 kg/ha	-	-	52	43.30
5	Seed treatment (Azospirulum 1kg/ha)				
	Foxtail millet	54	45.00	-	-
	Little millet	-	-	48	40.00
6.	FYM (6 tones/ha)				
	Foxtail millet	42	35.00	-	-
	Little millet	-	-	58	48.33
7.	Chemical fertilizer application				
a.	Foxtail millet(rainfed) : N:P:K-30:15:15	52	43.33	-	-
b.	Little millet(rainfed): N:P:K-40:20:20	-	-	45	37.50
8.	Weedicide application((2-4 D, Metazol)				
	Foxtail millet	92	76.67	-	-
	Little millet	-	-	78	65.00
9.	Pest control a. Measures to control pests (Redomel chemicals 500 g/ha)				
	Foxtail millet	42	35.00	-	-
	Little millet	-	-	56	46.67
10.	Disease control (Mancozeb 500 g/ha)				
	Foxtail millet	61	50.83	-	-
	Little millet	-	-	54	45.00

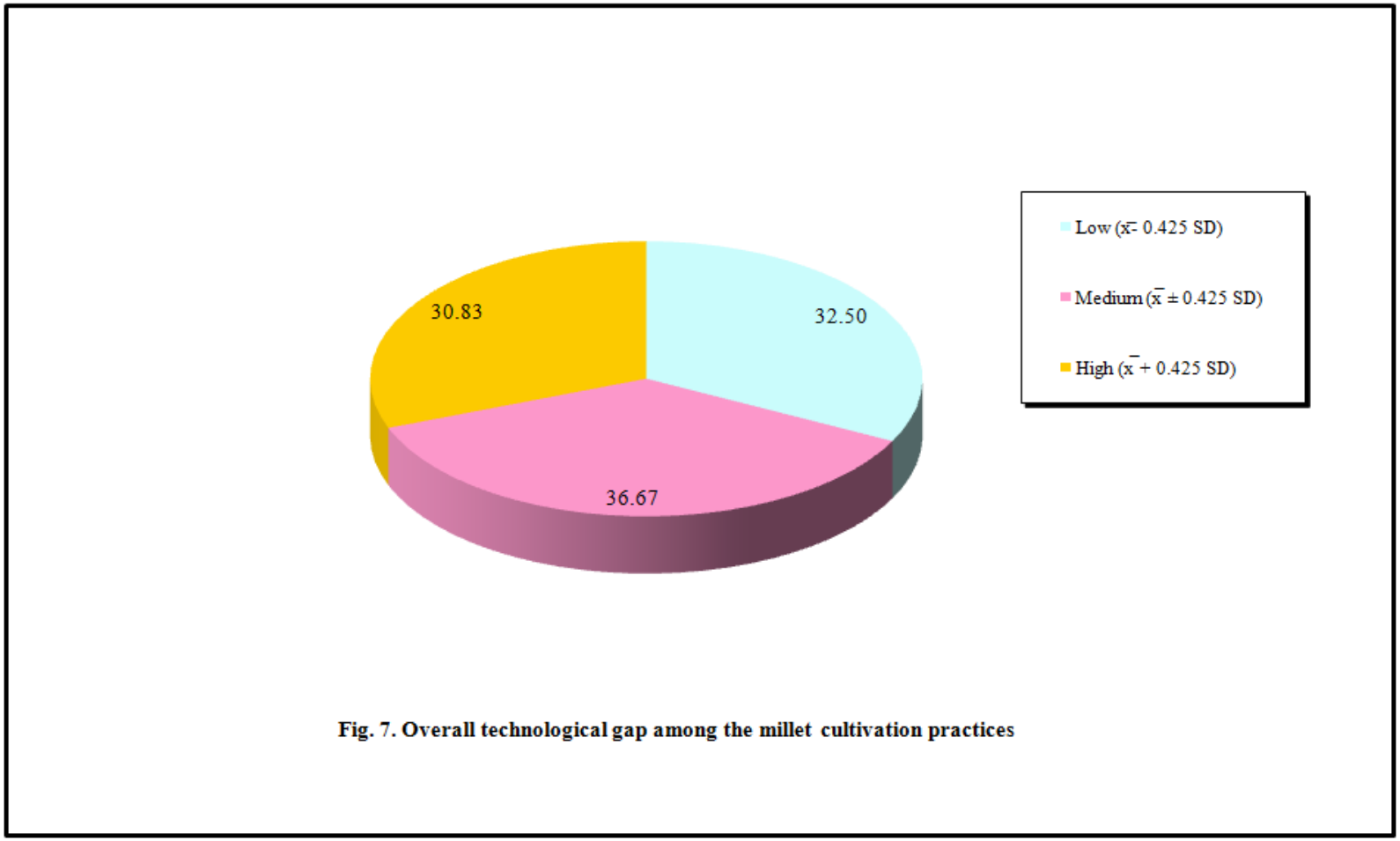

Fig. 7. Overall technological gap among the millet cultivation practices

Fig. 7. Overall technological gap among the millet cultivation practices

4.2.3 Adoption level of recommended cultivation practices of millet by the respondents

The results depicted in table 8 indicated that, 56.70 per cent of the respondents had adopted the recommended seed rate of Foxtail variety, 100 per cent of the respondents adopted the recommended seed rate of little millet variety. And also 100.00 per cent of the respondents had adopted the sowing time of both Foxtail and little millet (June-July) as per the recommendation. Regarding plant to plant spacing (78.33 %) of respondents adopted recommended practice of foxtail millet However, 77.50 per cent were adopted the same in little millet.

Regarding, foxtail millet variety (HMT100-1) 66.67 per cent of respondents adopted the recommended variety while, 60.00 per cent of the farmers adopted recommended variety in little millet variety (Sukshema). 65.00 per cent of the respondents adopted the practice of FYM and pest control measures as per the recommended practice in foxtail millet, whereas 51.67 and 53.33 per cent was with respect to FYM and pest control in little millet respectively.

It was further observed that 62.50 per cent of the respondents applied seed to seed spacing in foxtail millet as per the recommendation, 60.83 per cent of the respondents adopted the same in little millet.

Further, 59.17 per cent of the respondents adopted the recommended seed depth in both foxtail and little millet. 56.67 per cent of the respondents had adopted recommended amount of chemical fertilizer as per the recommendation in foxtail millet, whereas 62.50 per cent per cent of the respondents had adopted recommended amount of chemical fertilizer as per the recommendation in little millet.

While, 55.00 per cent of the respondents the recommended seed treatment with azospirilum in foxtail millet and in little millet it was 56.67 per cent.

The data presented in the table 8 revealed that, 49.17 per cent of the respondents applied, proper dosage of chemical for disease control whereas, (55.00 %) per cent of the respondents had applied the same in little millet.

Further only 23.33 per cent of the respondents adopted recommended weedicide application in foxtail millet while, 35.00 per cent of the respondents were adopted same in little millet.

4.3 Extent of cultivation of minor millet

The data in table 9 indicates that the percentage increase or decrease in area of foxtail millet over the year, there is an increase in area of about 31.29 per cent and there is a decrease in area of about 16.53 % per cent in the study area.

Further, the table indicates that the percentage increase or decrease in area of little millet over the year, there is an increase in area about 33.58 per cent and there is an decrease in area of about 12.72 per cent in the study area.

4.4 Awareness and consumption pattern of minor millet.

4.4.1 Awareness on minor millet

The data in Table 10 indicates the awareness pattern of farmers. In order of priority were; The respondents aware about using sorter cum grader (77.50 %), sheaving machine (65.00 %), and gravity grader (64.17 %), whereas, farmers were aware about nutritional value in order of priority were carbohydrates (60.00 %), protein (55.00 %), fat (52.50 %).

Table 8: Adoption of recommended cultivation practices by millet growers

(n=120)

Sl. No.	Recommended practices	Adoption level			
		Foxtail millet		Little millet	
		Adopted		Adopted	
		No.	%	No.	%
1	Recommended varieties				
	Foxtail millet (HMT 100-1)	80	66.67	-	-
	Little millet (Sukshema)	-	-	72	60.00
2.	Sowing time				
	Foxtail millet:June-July	120	100.00	-	-
	Little millet:June-July	-	-	120	100.00
3.	Spacing				
a.	Seed to seed:22.5-30 cm				
	Foxtail millet	75	62.50	-	-
	Little millet	-	-	73	60.83
b.	Depth: 4cm				
	Foxtail millet	71	59.17	-	-
	Little millet	-	-	71	59.17
c.	Plant to plant 25-30 cm				
	Foxtail millet	94	78.33	-	-
	Little millet	-	-	93	77.50
4.	Seed rate (kg/ha)				
	Foxtail millet:3.75 kg/ha	68	56.70		
	Little millet:8-10 kg/ha			120	100.00
5	Seed treatment (Azospirulum) 500 g/ha				
	Foxtail millet	66	55.00	-	-
	Little millet	-	-	68	56.67
6.	FYM (6 tones/ha)				
	Foxtail millet	78	65.00	-	-
	Little millet	-	-	62	51.67
7.	Chemical fertilizer				
a.	Foxtail millet(rainfed) N:P:K- 30:15:15	68	56.67	-	-
b.	Little millet(rainfed) N:P:K- 40:20:20	-	-	75	62.50
8.	Weedicide application(2-4 D, Metazol)				
	Foxtail millet	28	23.33	-	-
	Little millet	-	-	42	35.00
9.	Pest control a.Measures to control pests (Redomel chemicals 500 g/ha				
	Foxtail millet	78	65.00	-	-
	Little millet	-	-	64	53.33
10.	Disease control (Mancozeb 500 g/ha)				
	Foxtail millet	59	49.17	-	-
	Little millet	-	-	66	55.00

Table 9: Extent of cultivation of minor millet

(n=120)

Sl. No.	Cultivated area over the year (from 2005-2016)	Percentage (%)
	1) Foxtail millet	
1	Increase in area	31.29
2	Decrease in area	16.53
	2) Little millet	
1	Increase in area	33.58
2	Decrease in area	12.72

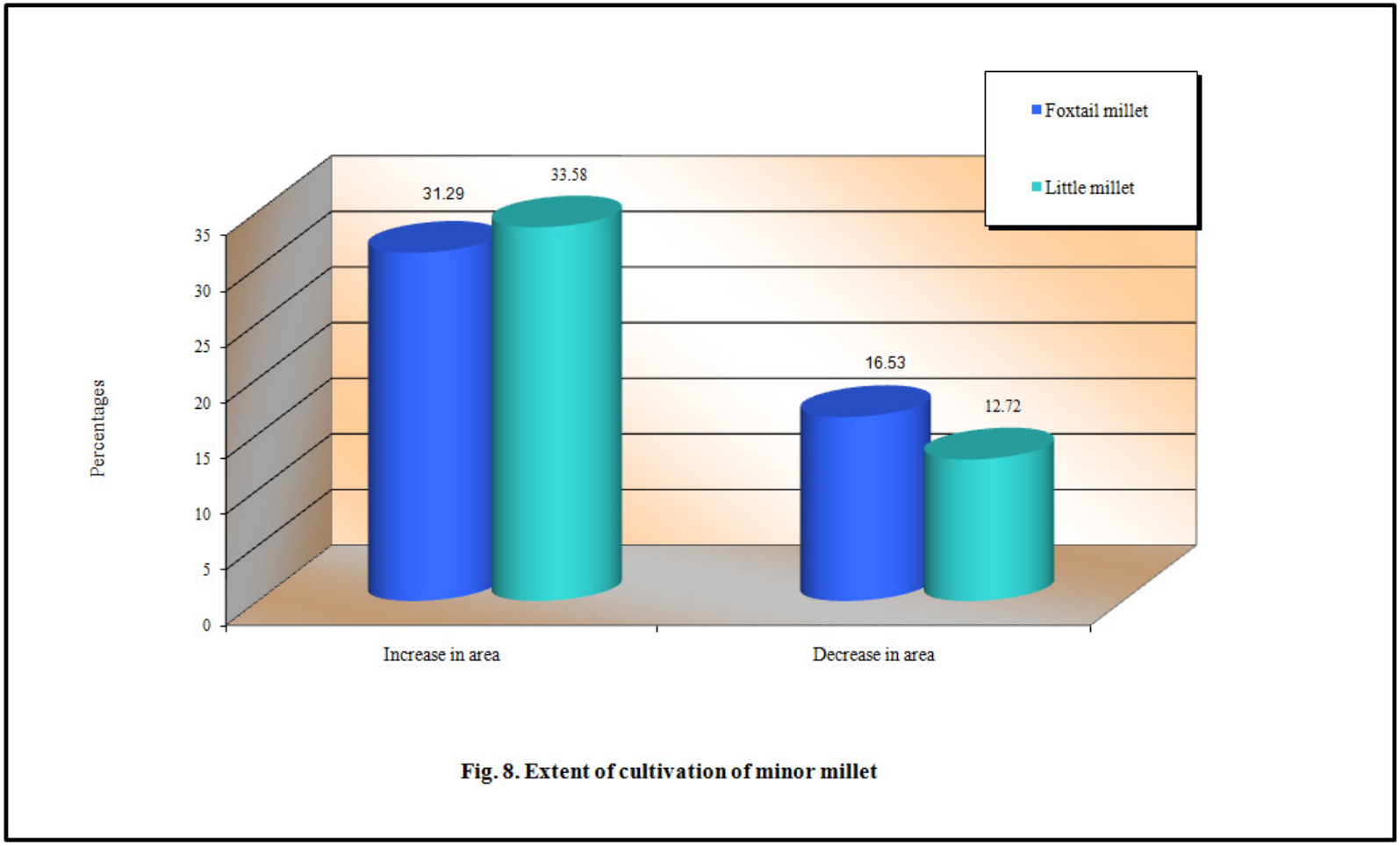

Fig. 8. Extent of cultivation of minor millet

Fig. 8. Extent of cultivation of minor millet

Table 10: Awareness pattern of minor millet

(n=120)

Technologies	Awareness			
	Aware		Not aware	
	Number	Frequency	Number	Frequency
1. Primary processing by machinery i) Sorter cum grader	93	77.50	27	22.50
ii) Sheaving machine	78	65.00	42	35.00
iii) Gravity grader	77	64.17	43	35.83
2.Nutritional value of millet i) Carbohydrates	72	60.00	48	40.00
ii) Fat	63	52.50	57	47.50
iii) Protein	66	55.00	54	45.00
3. Drudgery reducing technology i) Seed drill	97	80.80	23	19.20
ii) Sickle	90	75.00	30	25.00
iii) Leveler	66	55.00	54	45.00
iv) Hand weeder	56	46.70	64	53.30
v) Thresher	58	48.30	62	51.70
vi) Rotavator	58	48.30	62	51.70
4.Market prices	93	77.50	27	22.50
5.Market information sources	53	44.20	67	55.80
6.Value addition techniques	69	57.50	51	42.50

The farmers were aware about drudgery reducing technology in order of priority were; seed drill (80.80 %), sickle (75.00 %), leveler (55.00 %), hand weeder (46.70 %), thresher and rotavator (48.30 %) respectively. Market prices (77.50 %), value addition techniques (57.50 %), market information source (44.20 %).

4.4.2 Consumption pattern of minor millet

The data in table 10.1 of consumption pattern indicates that 41.70 per cent of farmers consume millet as breakfast 'once in a month' as daily consumption followed by 24.16 per cent consume 'once in a week', (17.50 %) consume 'once in three month', 10.00 per cent and 6.67 per cent consume 'rarely' and 'Everyday' respectively.

Whereas, the table indicates that 39.20 per cent of farmers consume millet as fermented product 'once in a month', followed by (21.70 %) 'once in three month', (20.00 %) consume 'once in a week', 10.80 per cent and 8.33 per cent consume millet in 'rarely' and 'Everyday' respectively.

The results also reported that (49.17 %) consume millet as fried snacks 'once in three month', followed by(37.50 %) consume 'once in a month', (7.50 %) consume 'rarely', 4.17 per cent and 1.66 per cent consume millet as 'once in a week', and 'Everyday' respectively.

Majority of the farmers indicated that (54.17 %) consume millet as sweet product 'once in three month', (35.00 %) consume 'once in a month', 5.80 per cent consume 'rarely', and only (2.50 %) consume 'Everyday'.

Whereas more than half of the respondents (51.67 %) consume millet as papad and fryum 'once in three month', (23.33 %) expressed 'once in a month',(16.70 %) opinion 'rarely', only 4.20 per cent and 4.16 per cent expressed that they consume millet as 'once in a week', and 'Everyday' respectively.

While, half of the respondents expressed that they consume 'rarely' as bakery products, (20.00 %) 'once in three month',(14.16 %)'once in a month', (11.70 %) 'once in a week', and 4.17 per cent consume 'Everyday'.

Majority of the respondents (61.70 %) expressed they consume millet as products with therapeutic value 'rarely', (19.20 %) 'once in a week', (10.00 %)'rarely' (5.80 %) 'once in a month', and only 3.33 per cent expressed they consume millet 'Everyday'.

4.5. Marketing constraints faced by the minor millet growers

The data in Table 11 indicates that the marketing constraints faced by farmers regarding millet production and in order of priority were; Farmers indicated less buyers of produce (55.80%), more number of middlemen (55.00 %), lack of price information (53.30 %) and high commission charges (47.50 %) as major constraints. Whereas, 45.83 per cent of the farmers expressed fluctuation in market prices and 43.30 per cent of the farmers expressed inadequate market information.

While, 41.67 per cent of the farmers expressed that there is a low customer demand or market demand. (35.00 %) expressed high cost of transportation and (32.50 %) of the farmers indicated that lack of transportation facility.

Table 10. 1 Consumption pattern of minor millet

n=120

Products	Everyday		Once in a week		Once in a month		Once in three month		Rarely	
	F	%	F	%	F	%	F	%	F	%
1. Breakfast and daily consumption	8	6.67	29	24.16	50	41.70	21	17.50	12	10.00
2. Fermented products	10	8.33	24	20.00	47	39.20	26	21.70	13	10.80
3. Fried snacks	2	1.66	5	4.17	45	37.50	59	49.17	9	7.50
4. Sweet product	3	2.50	3	2.50	42	35.00	65	54.17	7	5.80
5. Papad and fryum	5	4.16	5	4.20	28	23.3	62	51.67	20	16.70
6. Bakery product	5	4.17	14	11.70	17	14.16	24	20.00	60	50.00
7. Products with therapeutic qualities	4	3.33	23	19.20	7	5.80	12	10.00	74	61.70

Table 11: Marketing constraints faced by millet growers

(n=120)

Sl. No.	Constraints	Respondents			
		Yes		No	
		Number	Percentage	Number	Percentage
1	Lack of transportation facility	39	32.50	81	67.50
2	High cost of transportation	42	35.00	78	65.00
3	Fluctuation in market price	55	45.83	65	54.17
4	Lack of price information	64	53.30	56	46.70
5	Less buyers of produce	67	55.80	53	44.20
6	More number of middlemen	54	55.00	66	45.00
7	Low customer demand or market demand	50	41.67	70	58.33
8	Inadequate market information	52	43.30	68	56.70
9	High commission charges	57	47.50	63	52.50

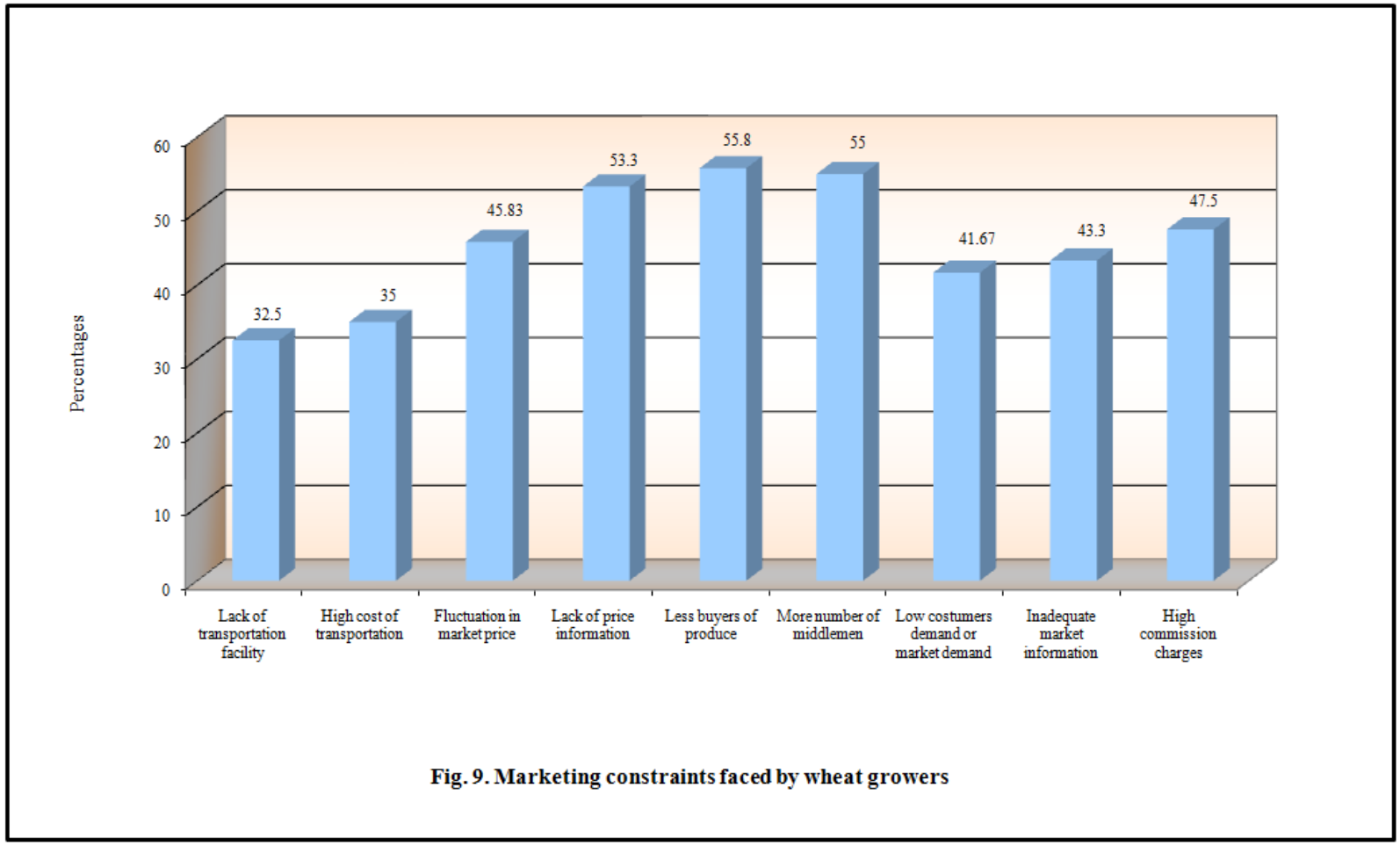

Fig. 9. Marketing constraints faced by wheat growers

Fig. 9. Marketing constraints faced by wheat growers

Table 12 : Reasons for cultivating of minor millet

Sl. No.	Reasons	Respondents			
		Yes		No	
		Number	Percentage	Number	Percentage
1	Food requirement	108	90.00	12	10.00
2	Nutritional supplement	58	48.30	62	51.70
3	Fodder	76	63.30	44	36.70
4	Feed for poultry	57	47.50	63	52.50
5	Source of livestock	77	64.20	43	35.80
6	Intercropping system	43	35.80	77	64.20
7	Soil health management	23	19.17	97	80.83

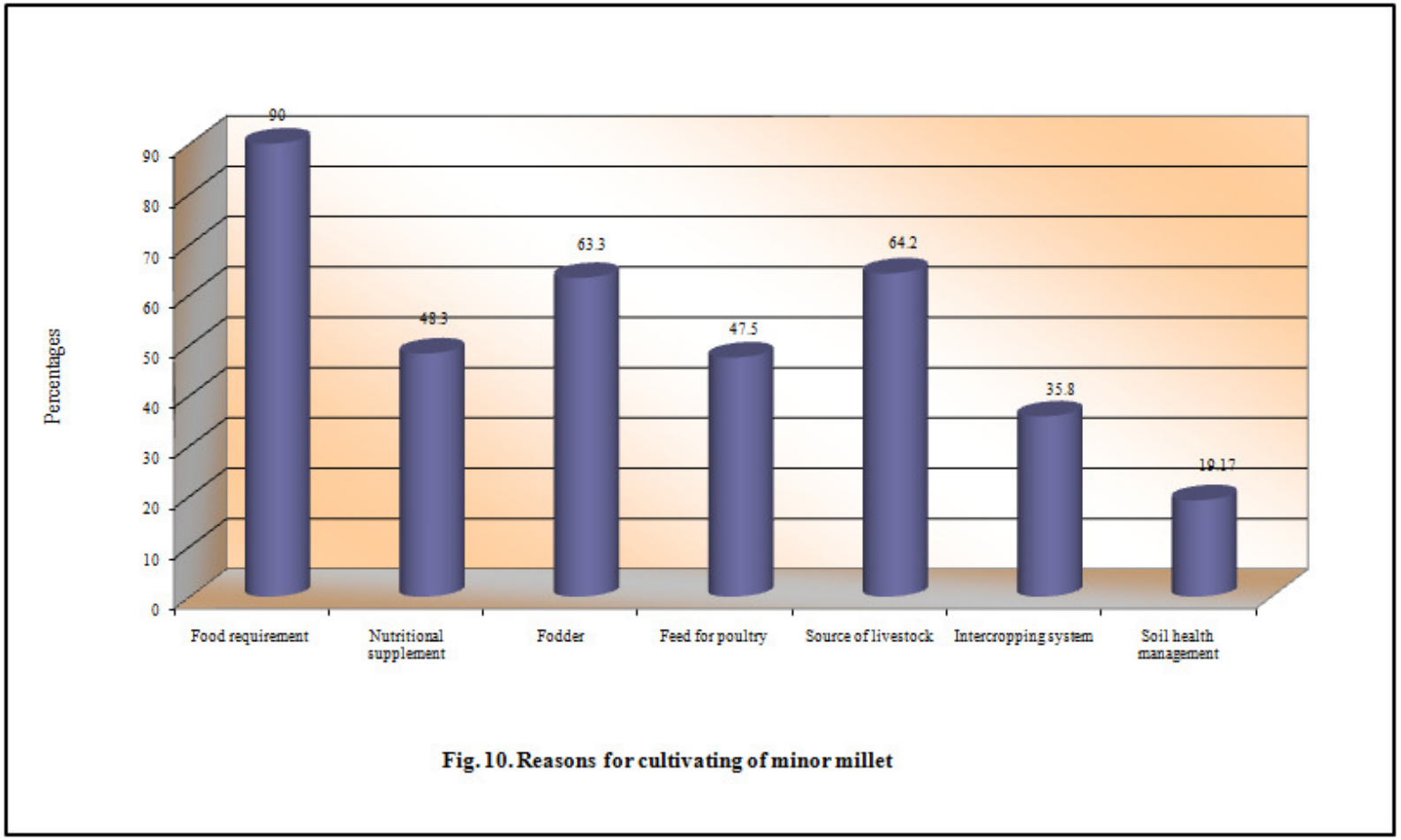

Fig. 10. Reasons for cultivating of minor millet

Fig. 10. Reasons for cultivating of minor millet

4.6. Reasons for cultivating the minor millets

The data in Table 12 indicates the reasons for cultivating of millet in order of priority the farmers were; 90.00 per cent, 64.20 per cent, 63.30 per cent and 48.30 per cent millet were cultivated as, source of food requirement, source of livestock fodder and nutritional supplement respectively. Whereas, 47.50 per cent as feed for poultry, 35.80 per cent intercropping system and only 19.17 per cent of farmers expressed millet production were useful for soil health management.

5. DISCUSSION

The results of the study are presented in this chapter under the following sub headings.

5.1 Profile characteristics of the respondents

5.2 To assess the technological gap in adoption of improved cultivation practices

5.3.To analyse the extent of cultivation of minor millets

5.4 To find out the awareness and consumption pattern of minor millets

5.5. To list the marketing constraints faced by the minor millets growers

5.6. To document the reasons for cultivating the minor millets

5.1 Socio-economic characteristics of millet growers

5.1.1 Age

The results presented in Table 1 revealed that, 56.67 per cent of respondents were found to be middle age category (31-50 years). About 30.83 per cent of the respondents belonged to old age category of (>50 years) and 12.50 per cent of the respondents belonged to young age category (18-30 years).

Farmers of middle age with more farming experience work more efficiently than older and younger ones. Further, individuals of 31 to 50 years of age shoulder more family responsibility than the younger ones.

The results are in line with the findings of Bheemappa (2001), Amol (2006), Suresh Kumar (2009) and Sanjota (2014).

5.1.2 Education

It is clear from the Table 1 that, 36.67 per cent of the respondents were illiterates, While, 22.50 per cent had middle school education. The other respondents were (21.67 %) had primary school education, high school (10.83 %), PUC (8.33 %).

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 centers from village also might have prevented the parents providing higher education to their children.

These findings are in line with the studies of Kanavi (2000), Sunil Kumar (2004), Swami (2006) and Kikon (2010), and Sanjota (2014).

5.1.3 Family size

It can be observed from table 1 that 45.00 per cent of respondents beloged to small family (<5 members), followed by 36.67 percent of the respondents belonged to medium family size (5-8 members) and 18.33 percent of the respondents belonged to large family size(>8 members). Small size of the land holding, trend of owing for only one child or two children and migration of children for job after education might be the reason for increased number of small families. Sample farmers may be concentrating on higher education and know the role of education in empowering the human being. Only after completing of education children are concentrating on farm activities or they may go for job to get higher income might be the other reason for small size families.

The above results are in line with the study conducted by Manjunath (2010) and Kudari (2014), who observed that majority of the respondents were belonged to small size family category.

5.1.4 Land holding

The data presented in table 1 revealed that, 42.50 per cent of farmers belonged to semi medium land holding category (5.01-10 acres), while 35.00 per cent of them belonged to small land holding category (2.51- 5.0 acres). Whereas 13.33 per cent of them were marginal farmers (upto 2.50 acres), 8.33 per cent were medium land holding farmers (10.01-25 acres) and 0.83 per cent belonged to big land holding category (>25 acres).

The possible reason might be that due to increase in trend of nuclear families, this increase in trend of nuclear families leads to fragmentation of ancestors land from generation to generation might have led to semi-medium and small land holdings.

The results has the support with the findings of Sanjota (2014).

5.1.5 Farming experience

The results in table 1 indicates that, 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 more than 20 years of farming experience. Some of the farmers (33.33%) had fall under (10-20) years of farming experience probably they might have started agriculture occupation at an old age.

Further, it was observed that only (15.00 %) of the farmers had farming experience less than 10 years. As they have studied upto middle and high school level. After completing their education they might have started agriculture as their occupation. Hence, majority of them belonged to high category of farming experience.

This result has the support with the findings of Natikar (2001), Raghavendra (2007), Suresh Kumar (2009) and Madhu (2010).

5.1.6 Annual income

The results regarding the annual income of the respondents in table 1 indicated that, 80.83 per cent had high level of annual income of above Rs. 51,000. The possible reason might be that due to their large size land holdings, practice of income generating subsidiary occupations and growing commercial crops. The existence of families with more number of earning members in different occupations other than agriculture might have also contributed for this kind of result.

About 8.33 per cent of respondents belonged to medium income group between Rs. 34,001 to 51,000. The possible reason may be that small land holdings where, people mainly depend on agriculture and also due to possession of dry lands with low productivity might have caused to earn medium level of annual income.

It is also found that 5.90 percent of respondents belonged to low income of upto Rs. 17, 000 and very less percentage of respondents (5.00 %) had income (Rs.17, 000-34,000). It may be due to their lower socio-economic status and might not having other sources of income.

The above findings are in conformity with the findings of Vedamurthy (2002), and Suresh Kumar (2009), Sanjota(2014).

5.1.7 Livestock size of the farmers

The results presented in the table 2 revealed that ,it was found that majority of the farmers possessed draft animals. As the majority of farmers were having 1ha to 2 ha of land holding and livestock farms an important activity. They had maintained the draft animals.

The buffaloes and cows were maintained since they provide additional income in terms of milk and manure. However less per cent of farmers possessed sheep and goats.

The results are in consonance with Charan (2005) and Ningareddy (2005).

5.1.8 Extension contact

The contents expressed in table 3 clearly indicated that, 45.83 per cent of the farmers belonged to medium extension contact category followed by high (39.17 %) and low (15.00 %) extension contact category respectively.

Medium level of extension contact might be due to different subsidies provided by under various agricultural development programmes, encouraging farmers to be in touch with the extension officials to avail various benefits. Further, the respondents might have good transportation facility, vehicle and telephone etc. to meet and contact the extension agencies. Even, extension personnel's might be available at all the time to provide information. New recommendations and technologies may adopted by the farmers due to higher income level and higher education level of the farmers. High income getting farmers may try new practices in his field and educated farmers can understand pros and consequences of technologies suggested by extension personnel in a better way.

As depicted in the table 3.1, indicates that (41.70 %) of the respondents were contacting the extension personals once in fortnight. Majority of the farmers contacted '*Agricultural Assistant officer'* once in a week (30.80 %), whenever problem arises (17.50 %), never (10 %). This reason may be due they are near to the villages for any information.

It is clear from the table that, 39.20 per cent of the farmers contacted *'Agriculture officer'* 'once in fortnight', followed by 'once in a week' (28.30%), 'whenever problem arises' (21.70 %) and 'never' (10.80 %) respectively. While 50.80 per cent of the farmers contacted *'university scientists'* 'whenever problem arises', followed by 'once in fortnight' (37.50 %), 'never' (7.50 %), and 'once in a week' (4.20 %) respectively.

Whereas majority of the respondents 56.70 per cent had contacted '*KVK scientists*' 'whenever problem arises' as it is located at a distant place which might have prevented them to contact frequently. (35.00 %) of the farmers contacted KVK 'once in fortnight', followed by (5.80 %) 'Never', (2.50 %) 'once in a week'. This reason may be due to KVK's are far away from the villages to get an information.

Further, 55.80 per cent of the farmers contacted *'ARS'*, 'whenever problem arises' followed by 'once in a fortnight' (23.30 %), 'never' (16.70 %) and 'once in a week' (4.20 %) respectively. It can be observed from the data that, 50.00 per cent of the farmers 'never' contacted *'officials of NGO/other voluntary organization'* followed by 'whenever problem arises' (20.00 %) , 'once in fortnight' (18.33 %) and 'once in a week' (11.70 %) respectively.

This may be due to their easy accessibility to the respondents. Where as no respondents were found to have no contact with any officials of NGO's or other voluntary organizations. This may be due to the absence of active voluntary organizations in the research area.

Whereas majority of the respondents (61.70%) 'never' contacted the '*private company officials'*,(19.20 %) contacted 'once in a week', (13.30 %) 'whenever problem arises',(5.80 %) 'once in a fortnight' respectively. This may be due to the absence of active private company officials in the research area.

The results get support from the findings of Kapse (2000), Palaniswammy and Sriram (2001), Sunil Kumar (2004) and Bheemudada (2015).

5.1.9 Economic motivation

A perusal of data furnished in table 4 revealed that 40.83 per cent of the respondents belonged to high economic motivation category followed by 40.00 per cent and only 19.17 per cent belonged to medium and low economic motivation category respectively.

The data in table 4.1 revealed the economic motivation of millet growers. About 97.50 per cent of the farmers said 'agree' to the statement of '*a farmer should work towards more yield and economic profit'*, followed by 'disagree' (1.70 %) and 'undecided' (0.80 %) respectively.

Whereas, 57.50 per cent of the respondents expressed their agreement to the statement of *'the most successful farmer is one who makes more profits'*, followed by 'undecided' (34.17 %) and 'disagree' (8.33 %) respectively.

About 39.17 per cent of the respondents expressed their agreement and also undecided to the statement of *'the farmer should try the new farming ideas which may earn him more money'*, followed by 21.66 per cent of the respondents indicated 'disagree' with this statement respectively.

While, 55.83 per cent of the respondents said *'*agree*'* to the statement of *'a farmer should grow more cash crops to increase monetary profits in comparison to growing food crops for home consumption'*, followed by 'disagree' (24.17%) and 'undecided' (20.00 %) respectively.

Further, 42.50 per cent of the respondents said *'*agree*'* to the statement of *'it is difficult for the farmer's children to make good start unless he provides them with economic assistance'*, followed by 'disagree' (37.50%) and 'undecided' (20.00 %) respectively.

While, 52.50 per cent of the farmers said 'disagree' to the statement of *'a farmer must earn his living but the most important thing in life cannot be defined in economic terms'* followed by, 41.67 and 5.83 per cent of the respondents said 'agree' and 'undecided' to the same statement, respectively.

The possible reason may be that as majority of them belonged to high income group and more land holdings and risk orientation nature might have made them to earn more. It is quite natural that, individual with capabilities would like to earn more and improve his standard of living.

The findings are in agreement with the findings of Deepak (2003), Raghavendra (2005), Suresh Kumar (2009) and Madhu (2010).

5.1.10 Information source consultancy pattern

A perusal of data furnished in table 5 revealed that 36.67 per cent of the respondents belonged to medium Information source consultancy pattern category followed by 35.83 per cent and 27.50 per cent belonged to high and low Information source consultancy pattern category respectively.

The data in table 5.1 revealed the Information source consultancy pattern of millet growers. Indicates that 57.50 per cent of the farmers contacted *'Assistant directorate of agriculture'* 'occasionally' followed by 'never' (41.70 %), and 'regularly' (0.80 %), respectively

It can be observed from the table that, 58.30 per cent of the farmers 'occasionally' contacted *'agriculture officer'* followed by 'never' (41.70 %), and none of the respondents visit 'regularly' .

It can be observed from the data that, 50.00 per cent of the farmers 'never' contacted *'scientist from the research station of agricultural university'* followed by 'occasionally' (45.00 %) and 'regularly' (5.00 %) respectively.

Similarly, 54.20 per cent of the respondents contacted '*neighbour'* for any information 'regularly' followed by 'occasionally' (35.80 %) and 'never' (10.00 %) respectively.

Majority of the respondents 54.20 per cent of the respondents contacted '*friends'* for any information 'regularly' followed by 'occasionally' (35.80 %) and 'never' (10.00 %) respectively.

It was also found that the 54.20 per cent of the respondents contacted '*relatives'* for any information 'regularly' followed by 'occasionally' (34.20 %) and 'never' (11.66 %) respectively.

It can be observed from the data that, (45.80 %) of the respondents contact 'private *consultancy'* for any information 'occasionally' followed by 'regularly' (37.50 %) and 'never' (16.70 %) respectively.

It can be observed from the data that, (45.00 %) of the respondents hear '*radio*' for any information 'regularly' followed by 'occasionally'(39.20 %) and 'never' (15.80%) respectively.

It was also found that the 44.20 per cent of the respondents watch *'TV'* for any information 'regularly' followed by 'occasionally' (40.00 %) and 'never' (15.80 %) respectively.

Majority of the respondents 44.20 per cent of the respondents read *'magazine'* for any information 'occasionally' followed by 'never' (29.20 %) and 'regularly' (26.66 %) respectively.

Majority of the respondents 45.90 per cent 'never' read *'newspaper'* for any information followed by 'regularly' (28.33 %) and 'occasionally' (25.83 %) respectively.

It is evident from the findings of the study friends, neighbour, and relatives served as an important source of information. The reason might be that these source available to farmer at local level and it is the tendency of the farmer to share their ideas with farmers, friends, and relatives than any other outside sources. They have easy accessibility with their neighbour , friends and relatives to get the information.

The results are in accordance with the findings of Bhople and Borker (2002).

5.1.11 Cropping pattern of millet growers

The results presented in table 6 indicate that, the crops grown by farmers on Kharif season in the order of priority were; millets (88.33%), cotton (87.50%), groundnut (75.00%), greengram (73.33%), onion (50.83%), chilly (30.00%)

It can also be observed that, the major crops grown by farmers on Rabi season were; Chickpea (95.83 %), sorghum (86.67 %) and maize (54.17 %). And crops grown by the farmers on summer season that is maize(31.67 %).

The reason might be that, millets is grown in both irrigated and rainfed conditions and plays a major role as food and fodder and also very much suitable to the region and season. Maize and sorghum are the most important crops of North Karnataka and it can be grown both in dry land and irrigated conditions. Further, cotton, onion and chilly being commercial crops and also due to the suitability in this area, the farmers might have selected to grow them. Further, it can be also observed that farmers also have grown groundnut important oil seeds, probably due to its suitability to seasons and also crops come up well without pests and diseases and both these crops are getting good price without much fluctuation.

The above results are in accordance with Prasad (1998), Gautam (1998), Ghosh (2001), Bogale (2002),

5.2. To assess the technological gap in adoption of improved cultivation practices

5.2.1 Overall technological gap among millet growers about improved cultivation practices

It was evident from the Table 7 that, majority of the respondents (36.67 %) belonged to medium category of technological gap, followed by low (32.50 %) and high (30.83 %) category of technological gap.

Majority of respondents had adopted simple practices and there were two groups of respondents who adopted most of the practices and who did not adopted even simple practices. The possible reasons for medium technological gap of the respondents may be due to medium knowledge of the respondents regarding recommended millet cultivation practices. This clearly shows that, there is immense scope for intensified extension efforts to increase the millet production. This indicates the need for strengthening of extension efforts by the concerned extension agency to increase the knowledge and in turn increase adoption of recommended cultivation practices and ultimately reducing technological gap.

The findings of the study were in agreement with the findings of Kiran (2003), Thorat (2003), Santosh Swamy (2006), Rajashekhar (2009) , Madhu (2010). Sanjotha (2014)

5.2.2 Technological gap in adoption of recommended millet cultivation practices

The adoption of any technology in general and millet cultivation practices 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 same degree by all the members in a given social system. The finding of present study are also having link with these factors with respect to adoption of millet cultivation practices by the respondents. Table 7.1 highlights the technological gap in adoption of recommended millet cultivation practices by the respondents.

It was observed from the Table 7.1 that, 76.67 per cent of technological gap was found in adoption of weedicide application of foxtail millet followed by 65.00 per cent of technological gap was found in little millet. Further , results indicated that in case of disease control, the technological gap was (50.83 %) in foxtail millet, (45.00%) was observed same in little millet. The possible reason may be due to lack of knowledge with respect to weedicide application.

While, in case of seed treatment with azospirilum (45.00 %) of technological gap was observed in foxtail millet and in case of little millet it was 40.00 per cent and 43.33 per cent of technological gap was with respect to chemical fertilizer of Foxtail millet (rainfed) and 37.50 per cent technological gap in little millet. As the farmers use to sow these millets more in rainfed condition hence, they might not have felt necessary to apply fertilizer.

Whereas, 40.83 per cent of technological gap was with respect to recommended practice of seed depth of both foxtail millet and little millet. And (37.50 %) of technological gap was found in seed to seed spacing in foxtail millet, 39.17 per cent was found in little millet.

Further, 35.00 per cent of technological gap was found in case of FYM application and pest control in foxtail millet ,48.33 per cent and 46.67 per cent was found in FYM and pest control in little millet respectively. While, 33.33 per cent technological gap was found in Foxtail millet variety (HMT100-1) and 40.00 per cent of the technological gap with respect to variety of little millet (Sukshema). 21.67 per cent of technological gap was found in practice like plant to plant spacing of foxtail millet , followed by 22.50 per cent in little millet plant to plant spacing.

The possible reason may be due to lack of knowledge, non-availability of organic manure and high transportation cost, lack of extension contact, non availability of inputs in time of need and also the high cost of inputs . These may be the probable reasons for the high technological gap among the millet growers.

The results are in close agreement with the findings of Sabi (2012), Rajashekhar (2009) and Madhu (2010), Bheemudada (2015).

5.2.3 Adoption of recommended millet cultivation practices by the respondents

The results depicted in table 8 indicated that, 56.70 per cent of the respondents had adopted the recommended seed rate of foxtail millet variety, 100.00 per cent of the respondents adopted the recommended seed rate of little millet variety. This might be because the respondents thought that recommended practice of seed rate helps to increase the yield level and proper knowledge regarding the practice.

Further, 100.00 per cent of the respondents had adopted the sowing time of both Foxtail and little millet (June-July) as per the recommendation. This might be because the respondents thought that early sowing prevents the attack of green pod disease and it also helps to increase the yield level.

Regarding plant to plant spacing 78.33 per cent of respondents adopted recommended practice of foxtail millet. However, 77.50 per cent were adopted the same in little millet. The reasons for adoption of these practices as recommended were 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 also, most of the respondents were convinced about the profitability and practicability of these recommendations.

Regarding, Foxtail millet variety (HMT100-1) 66.67 per cent of respondents adopted the practice, while 60.00 per cent of the farmers adopted the practice in little millet variety (Sukshema). The reasons may be that, the entire belt of Haveri district are well suited for millet cultivation and growing of these variety comparatively profitable and more remunerative price.

While, 65.00 per cent of the respondents adopted the practice of FYM. and pest control measures as per the recommended practice in Foxtail millet, whereas 51.67 and 53.33 per cent was with respect to FYM and pest control in little millet respectively. The reason for adoption might be continuation of traditional farming methods and also due to the availability of FYM in the households. And also plant protection measures was against pod borer and stem borer of millet crop in the study area. It was noticed that there was not much pest for this crop.

was further observed that 62.50 per cent of the respondents applied seed to seed spacing in foxtail millet as per the recommendation, 60.83 per cent of the respondents adopted the same in little millet. The possible reason may be it is a simple practice and proper knowledge regarding the practice and to prevent the weed population in the field.

Further, 59.17 per cent of the respondents adopted the recommended seed depth in both foxtail and little millet. This reason might be that recommended seed depth will increase the yield level and also proper root development of the crop which improves the better growth of the crop.

While, 56.67 per cent of the respondents had adopted recommended amount of chemical fertilizer as per the recommendation in foxtail millet, whereas 62.50 per cent per cent of the respondents had adopted recommended amount of chemical fertilizer as per the recommendation in little millet. The reason might be that remarkable effects and reliance on organic manure made majority of farmers not to adopt chemical fertilizers and inadequate guidance regarding nutrient management might be the other reason.

While, 55.00 per cent of the respondents had adopted the recommended seed treatment with azospirilum in foxtail millet and in little millet it was 56.67per cent. More technological gap was may be due to lack of knowledge and also non-availability of azospirillum culture in the village, fear of reduction in yield and high cost.

The data presented in the table 8 revealed that, 49.17 per cent of the respondents applied, proper dosage of chemical for disease control whereas , 55.00 per cent of the respondents had applied the same in little millet. The major reason attributed for taking up plant protection measures was pod borer, steam borer and green pod diseases were severe problem in the research area during recent years.

Further only 23.33 per cent of the respondents adopted recommended weedicide application in foxtail millet while, 35.00 per cent of the respondents were adopted same in little millet. High technological gap was found in some of the practice like weedicide application. It may be due to lack of knowledge and also non-availability of the weedicide in the village, high cost and non- availability at the time of need.

5.3 Extent of cultivation of minor millet.

The results presented in the table 9 shows that decreasing trends in the area of Foxtail and little millet. Reason for decrease in the area of little millet (12.72%) and foxtail millet(16.53%) is due to the reason like economic returns are low from the these two crops as compared to other crops like cotton, maize, groundnut, which have encroached the foxtail millet and little millet area during recent years.

Further, rain interrupts the harvesting of these two millets leads severe loss in grains as well as fodder has also one of the cause to switch over to other crops by the farmer. And also price fluctuation might be another reason for reduction in the area of millet.

5.4 Awareness and consumption pattern of minor millets.

5.4.1 Awareness of millet millets

The data in Table 10 indicated that awareness and consumption pattern of millet faced by farmers. Farmers aware of processing by machinery in order of priority were; using sorter cum grader (77.50 %), sheaving machine (65.00 %), and gravity grader (64.17 %), whereas, farmers were aware about nutritional value in order of priority were carbohydrates (60.00 %), protein (55.00 %), fat (52.50 %).

The farmers were aware about drudgery reducing technology in order of priority were; seed drill (80.80 %), sickle (75.00 %), leveler (55.00 %), hand weeder (46.70 %), thresher and rotavator (48.30 %) respectively. Market prices (77.50 %), value addition techniques (57.50 %), market information source (44.20 %).

Majority of the farmers were aware about all the technologies regarding millet processing practices. This might be because of more exposure to outer source that is information source consultancy pattern like mass media, information acquisition from relatives and friends, finally more extension contact regarding all practices of millet.

5.4.2 Consumption pattern of minor millet

The data in table 10.1 of consumption pattern indicates that 41.70 per cent of farmers were consume millet as breakfast and daily consumption ‘once in a month’ followed by 24.16 per cent consume ‘once in a week’, (17.50 %) consume ‘once in three month’, 10.00 per cent and 6.67 per cent consume ‘rarely’ and ‘Everyday’ respectively.

Whereas, the results in table revealed that 39.20 per cent of farmers were consume millet as fermented product ‘once in a month’, followed by (21.70%) ‘once in three month’, (20.00 %) consume ‘once in a week’, 10.80 per cent and 8.33 per cent consume millet in ‘rarely’ and ‘Everyday’ respectively.

Further, 49.17 per cent, consume fried snacks ‘once in three months’ followed by ‘once in a month’ (37.50 %).

Whereas, 54.17 per cent and 51.67 per cent consume sweet product and papad ‘once in three month’ respectively. And 50.00 per cent and 61.70 per cent of the respondents consume bakery products and products with therapeutic qualities ‘rarely’.

This is because of individual eating habits and according to their preference, some are aware of nutritional value and health benefits of the millet so, that group of respondents eat millet products atleast, once in week as a breakfast in their daily consumption. And some group of the respondents not aware of that nutritional value so, they avoid these products as consumption in their diet.

5.5. Marketing constraints faced by the minor millet growers.

The results presented in table 11 indicated the Marketing constraints faced by farmers in adoption of recommended cultivation practices of millets in order of priority were; Farmers indicated less buyers of produce (55.80 %), more number of middlemen (55.00 %), lack of price information (53.30 %) and high commission charges (47.50 %) as major constraints. Whereas, 45.83 per cent of the farmers expressed fluctuation in market prices and 43.30 per cent of the farmers expressed inadequate market information.

Whereas, 41.67 per cent of the farmers expressed that there is a low customer demand or market demand. 35.00 per cent , expressed high cost of transportation. And farmers indicated that lack of transportation facility (32.50 %).

The possible reason might be that, there was lot of variation in price that prevails at the beginning of the season and also that prevails at the time of harvesting. Another reason may be that lack of contact with the extension personnel, thus lacking technical guidance from them at the appropriate time like storage and selling etc.

The constraints expressed by farmers are based on their experiences, hence they need to be resolved by taking appropriate strategies to sustain production of millets.

The findings are supported by the studies of Jadav (2009), Madhu (2011) .

5.6. Reasons for cultivating the minor millets

The data in Table 12 indicate that, reasons for cultivating millet farmers in order of priority were; Farmers indicated that, millet were cultivated because of it is a source of food requirement (90.00 %), source of livestock (64.20 %), fodder (63.30 %) and nutritional supplement (48.30 %). Whereas, 47.50 per cent of the farmers expressed that, it is useful for feed for poultry, 35.80 per cent intercropping system and only 19.17 per cent of the farmers expressed millet production is useful for soil health management.

The results made it clear that, millet are grown mainly for fulfilling food requirement, fodder requirement of livestock and for feed for poultry. Because the crop suitability to rain fed as well as low rainfall and also poor soil condition had also influenced farmers to cultivate this crop and as well these millet crops will be grown by using low inputs and low cost, less labour work with good yield. These factors might have influenced the farmers to cultivate millet.

6. SUMMARY AND CONCLUSIONS

Agriculture is the back bone of India and about 70-75 per cent of the working population depends on agriculture for their livelihood. In order to feed the millions and provide raw-materials for industry, agricultural production should be increased. However, there are three major issues, which need to be tackled to face the challenges of millet trade in the international market. These three issues are quality, cost and appearance. It is also realized that sustaining the millet productivity is essential to provide food security to the population of India, which by the years 2020 AD will be about 1.25 billion.

It is therefore, felt necessary to study the extent of technological gap of recommended practices by the farmers. Keeping the above facts in view, the present study was undertaken with the following specific objectives.

1. To assess the technological gap in adoption of improved cultivation practices
2. To analyse the extent of cultivation of minor millet
3. To find out the awareness and consumption pattern of minor millet
4. To list the marketing constraints faced by the minor millet growers
5. To document the reasons for cultivating the minor

The study was conducted during 2015-16 in Haveri district of Karnataka. The district was selected purposively because millet is the principal kharif crop growing in the district. Further, no research study has been conducted in Haveri district on technological gap on millet cultivation practices. Haveri district consists of seven taluks, considering maximum area under millet cultivation as criteria, the first three taluks *viz*., Shiggaon, Savanur, and Haveri were selected for conducting the study.

From the three taluks, four villages having maximum area under millet cultivation were listed. From each selected villages, 10 farmers growing millet were selected by simple random sampling procedure. Thus sample from each taluk was 40 making a total sample size of 120 respondents.

The dependent variables selected for the study were technological gap while, age, education, family size, size of land holding, farming experience, livestock size, annual income, extension contact, economic motivation, source consultancy pattern were the independent variables selected for the study.

A schedule was developed and personal interview method was administered to collect the information in the light of objectives of the study. Package of practices recommended by University of Agricultural Sciences, Dharwad for the cultivation of millet 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 of the respondents (56.67 %) were middle aged, whereas 36.67 per were illiterates, 22.50 per cent had middle school education
- 45.00 per cent of the respondents belongs to small family size. 42.50 per cent had belongs to semi-medium landholding category.

- More than fifty per cent of the respondents (51.67 %) were engaged in agriculture for the last above 20 years and majority of them (80.83 %) had high annual income.
- 45.83 per cent of them were found to have medium level of extension contact. And 40.83 per cent of them were found to have high level of economic motivation.
- 36.67 per cent of the respondents were found to have medium level of source consultancy pattern.
- Overall technological gap that is majority of the respondents (36.67 %) belonged to medium category of technological gap, followed by low (32.50 %) and high(30.83 %) category respectively.
- 76.67 per cent of technological gap was found in adoption of weedicide application of foxtail millet followed by 65.00 per cent of technological gap was found in little millet.
- Further , the results indicated that in case of disease control, the technological gap was (50.83 %) in foxtail millet, (45.00 %) was observed in little millet.
- while, in case of seed treatment with azospirilum (45.00 %) of technological gap was observed in foxtail millet and in case of little millet it was 40.00 per cent and
- Further, 43.33 per cent of technological gap was with respect to chemical fertilizer application to foxtail millet (rainfed) and 37.50 per cent technological gap in little millet.
- 33.00 per cent technological gap was found in Foxtail millet variety (HMT100-1) and 40.00 per cent of the technological gap with respect to variety of little millet (Sukshema).
- Further, 21.67 per cent of technological gap was found in practice like plant to plant spacing of foxtail millet , followed by 22.50 per cent in little millet plant to plant spacing.
- There is an increase in area in the study area of 31.29 per cent with respect to foxtail millet and also decrease in the area about 16.53 per cent. Further, the area of little millet is increased to 33.58 per cent and decreased to 12.72 per cent.
- consumption pattern indicates that 41.70 per cent of farmers consume millets as breakfast and daily consumption ‘once in a month’as daily consumption followed by 24.16 per cent consume ‘once in a week’, (17.50 %) consume ‘once in three month’, 10.00 per cent and 6.67 per cent consume ‘rarely’ and ‘Everyday’ respectively.
- The marketing problems indicated were less buyers of produce (55.80 %), more number of middlemen (55.00 %)
- Farmers indicated that, millets were cultivated as a source of food requirement (90.00 %).
- Since, the technological gap with respect to variety, N:P:K application, disease control , spacing was observed; it is important from the point of increasing production and profit it warrants that, the appropriate extension education activities like organizing trainings, demonstraints, exhibition field day needs to be conducted to increase the knowledge level of millet growers.
- The study pin points that the extension agencies should not wait for a technology to take it’s own time to “trickledown” in a social system, but they are suppose to contact farmers belonging to different category and pursue them to adopt the innovations in the shortest possible time.

- Financial difficulty was the major hurdle for non adoption of complex and important practices which involves high cost. Therefore crop loan need to be made available to the farmers at right time and also necessary inputs like seeds, fertilizer, azospirillum culture and plant protection chemicals to be arranged in advance and made it available to the farmers in time in local primary co-operative societies which have direct link with farmers. The repayment of loan may be made in easy installments.
- It was observed that high income, large land holding, higher educational level would narrow down the technological gap. Hence, special attention needs to be given to illiterate farmers and farmers having low income, small land holdings while educating through demonstrations, trainings and use recent extension methodology like farmers field school.
- Policy makers, administrators and extension personnel need to concentrate more on small farmers, low and medium adopters in order to increase the yield level because their contribution is more perceptual.
- Government should make policy decision for enhancing the area of minor millet by providing first line or frontline demonstration.

Future line of work

The present study was limited only to three taluks of Haveri district. Therefore, it is suggested that, further investigation may be taken up in other districts also, that, the change agencies can make use of the findings to improve millet cultivation. Further, action research to demonstrate the technologies at farmers' field on a large scale may be organized to convince farmers about potential yield realizations with the existing technology itself. To make a meaningful generalization, there is need for comprehensive research in other areas also.

REFERENCES

Abera W., Hussein S., Derere J., Woru M. and Lasing M.D, 2013, Preferences and constraints of maize farmers in the development and adoption of improved varieties in the mid-altitude, sub-humid agro-ecology of Western Ethiopia., *African. J. Agric. Res*., 8(14): 1245-1254

Aduba, J.J., Mohammed, B.T., Jilasaya, I. and Ozumba, I.C, 2013, An economic analysis of sorghum production among sorghum farmers in Kwara state Nigeria. *Global J. Current Res.,* 1(4): 116-123.

Albertson Ann M., Christine Wold A. and Nandan Joshi, 2012, Ready- to- eat cereal consumption pattern : The relationship to nutrient intake , whole grain intake and body mass index in an order of American population., *J. Aging Res.,* 12: 8

Amarendra Reddy A., Bantilan, M.C.S. and Geetha Mohal, 2013, Pulse production scenario policy and technological option. 26 : 431-444.

Aminon, Laura, Y.L., Arlette, A., Alexandre, D., Maruthamuthu, E., Pashupati, C., Raymond Vodouhe and Ambaliou, S., 2014, Diversity, genetic erosion and farmers preference of sorghum varieties in North-eastern Benin. *Int. J. Current Microbiology Applied Sci*., 3(10): 531-552.

Amol, A. N., 2006, A study on indigenous technical knowledge about rice cultivation and bovine health management practices in Konkan region of Maharashtra. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Anonymous, 2013, Final estimates of area, production and average yield of principal crops in Karnataka for 2012-13, Directorate of economics and statistics, Bangalore.

Anonymous, 2013, Haveri district at a glance, Government of Karnataka.

Anonymous, 2011, Millets-future of food and farming, Millet network of India, Deccan Development Society, India.

Balai, C.N., Bairwal R.K., Verma L.N., Roat B.L. and Jalwania R., 2013, Economic impact of frontline demonstration on cereal crops in tribal belt of Rajasthan. *Int. J. Agric. Sci.,* 3(7): 566-570.

Balakrishnappa, Y.K. and Rajan, R.K., 2010, Socio-economic factors of different categories of sericulturists on bivoltine sericulture technologies in Karnataka*. Res. Agric. Sci.,*1(4): 380-384.

Bennur, A., 2011, Study on entrepreneurial qualities and adoption behaviour of Banana growers. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Bheemappa, A., 2001, Comparative analysis of knowledge and technological gap in adoption of paddy and cotton cultivation practices between migrant and non-migrant farmers of TBP command area in Karnataka. *Ph. D. Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Bheemudada A. Bhirde., 2015, Technological gap in ginger production., *M. Sc.(Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Bhople, R. S. and Borker, R. D., 2002, Biofertilizers farmer attitude and adoption. *Agric. Ext .Rev*., 14: 21-22.

Binkadakatti, J., 2008, Impact of Krishi Vigyan Kendra (KVK) trainings on use of bio fertilizers and bio-pesticides by red gram farmers in Gulbarga district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Bogale Sandeep, 2002, An economic analysis of cropping systems in Bidar district of Karnataka. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Brij Bala., Sharma S.D. and Sharma R.K., 2005, Adoption gap in the improved maize technology. *Indian . J. Agric. Res*., 39(3): 208-212

Chahal, S.S. and Poonam Kataria., 2010, Constraints in the production and marketing of maize in Punjab., *Dept of Eco and Sociology,* Punjab Agric. Univ., Ludiana (Punjab) India. 1(5):228-236.

Charan, V., 2005, Profile of sujala watershed project beneficiary farmers in Dharwad district. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.

Chauhan, S.K. and Amit Chhabra., 2005, Marketable surplus and price spread for maize in Hamirpur district of Himachal Pradesh*. Agric. Eco. Res Rev,* 18(2): 39-49.

Chethan, M. G., 2011, A study on knowledge and adoption of cardamom cultivation practices by the farmers of chikmagalur district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Cheryl Doss., Wilfred Mwangi., Hugo Vekuijl. and Hugo de groote., 1999, Adoption of maize and wheat technologies in Eastern Africa., Economic working paper, pp. 3-9.

Deepa R., Bandyopadhay A. K. and Abhishek Ghosh., 2013, Identification of technological gap in pineapple cultivation in some selected areas of West Bengal. *Int. J. Sci. Eniv. Tech.,* 3: 443-448.

Deepak, M. P., 2003, A study on perception of benefeciaries and non-beneficiaries towards WYTEP programme in Dharwad district. *M. Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Doddamani, P. A., 2008, Knowledge and adoption of land reclamation practices by farmers of Malaprabha command area. *M. Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Dubolia, S. R. and Jaiswal, P. K., 2000, Technological gap of groundnut cultivation among groundnut growers. *Maharashtra J. Extn. Edun.,* (19) : 216-221.

Erika Meng C.H., Ruifu Hu., Xiaohuashi. and Shihauang zhang., 2006, Production system constraints and research priority, 2: 25-28

Gautam, D. S., 1998, Problems influencing adoption of production resources in soyabean cotton belt of central Narmada valley. *Maharashtra J. Extn. Edu.* (18):65-69.

Ghosh, S., Kannan, K., Ravender Singh and Kundur, D. K., 2001, Socio-economic profile and cropping pattern in canal command area in Khunda district of Orissa, *Indian. J. Extn. Edu*., 38 (1) 99-103.

Gopala, Y. M., Krishnamurthy B. and Bharathkumar T.P., 2012, Production, marketing and storage constraints of maize growers in district Chickaballapur, Karnataka. *Res. J. Agric. Sci*., 3(4):873-875

Gulia S. K., Wilson J.P., Caster J and Singh B.P., 2007, progress in grain pearl millet research and marketing development., issue in new crops and uses., *ASHS Pre,* Alexandria.

Gupta, A. K. and Shrivastava, J. P., 2002, Technological gap in soybean cultivation. *Bioved*., 13(1&2) : 145-146.

Hanan Saliman Mohamed and Samar Abdalla., 2014, Impact assessment of improved wheat production package in Sudan., Natural resource , Agricultural Development and food security. *Int. Res. Network NAF-IRN.,* 1:3.

Ira Matuschke and Matin Qaim., 2006, Adoption and impact of hybrid wheat in India., Dept. of Agric. Eco and Social Sci., University of Hohenheim,

Iren Leder, 2004, Sorghum and millets, in cultivated plants, primarily as Food Sources, In *Encyclopedia of Life Support Systems* (EOLSS), Developed under the Auspices of the UNESCO, Eolss Publishers, Oxford ,UK, [http://www.eolss.net]

Jadav, B.A., 2009, Technological gap in adoption of recommended mango cultivation. *M. Sc (Agri) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka, India.

Jaiswal, D. K. and Rathore, A. K., 1985, Technological gap in adoption of recommended technology in wheat among farmers growing irrigated and unirrigated wheat. *Maharashtra J. Extn. Edu.,* 4: 147-149.

Jaiswal, P. K. and Dubolia, S. R., 1994, Adoption gap in wheat technology. *Maharashtra J. Extn. Edu.,* (13) : 63-66.

Jeff Dahlberg., Janos Berenji., Vladimir Sikora and Dragana Latkovic., 2011, Assessing sorghum [*Sorghum bicolor* (L) Moench] germplasm for new traits: food, fuels & unique uses., *Univ. California, Kearney Agric Res Ext (KARE), Parlier, CA, 93648, USA.* Maydica (19): 56-1750

Joshi. N.S., Bariya M.K. and Kunjadia B.B., 2014, Yield gap analysis through frontline demonstration in wheat crop, *Inter J. Sci .Res. Pub*. 4: 15-19.

Kamruzzaman M., Fakhrul Islam S.M. and Bagum M.A.,2001, Adoption level of wheat technologies and the growers knowledge gap in Bangladesh., *Pakistan J. Bio Sci.,* 4(1):1-6

Kanavi, V. P., 2000, Knowledge and adoption behaviour of sugarcane growers in Belgaum district of Karnataka. *M. Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Kapse, P. S., Pimprikar, Y. K. and Wangikar, S. D, 2000, Technological gap in summer groundnut cultivation. *Maharashtra J. Extn. Edu.,* (19) : 56-58.

Kikon. W., 2010, Adoption gap in groundnut production in northern transition zone of Karnataka. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Kiran, S. T., 2003, A study on technological gap and constraints in adoption of recommended practices of mango growers. *M. Sc (Agri.) Thesis,* Punjabrao Deshmukh Krishi Vidyapeth, Akola, (India)

Kubde, V. R., Bhople, R. S. and Tekale, V. S., 2000, Knowledge and adoption of cultivation and increase storage practices of potato. *Maharashtra J. Ext. Edu.,* (19): 293-298.

Kudari, M.B., 2014, A study on perception of precision farming by the farmers. *M.Sc.(Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka, India.

Kumbhare N. V. and Singh K., 2011, Adoption behavior and constraints in wheat and paddy production technologies. *Indian Res. J.Ext.Edu.*, 11(3): 41-44.

Kusuma, D.K., Jayashree, H. A. and Kumara, B.R., 2013, An economic analysis of production and value addition in foxtail millet in Bellary district of Karnataka. *Inter Res. J. Agric. Eco. Stat*, 4(1): 68-72.

Madhu, B. M., 2010, Technological gap in turmeric production practices in Belgaum district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Mahendra Singh., 2011, Yield gap and production constraints in rice –wheat system ; scenario from eastern UP., *Bangladesh. J. Agric. Res.* 36(4): 623-632.

Mandeep Singh and Chahal S.S., 2009, Extent of adoption of various adoption technologies in wheat cultivation in Punjab. *Agric Eco Res Rev*., (22) : 349-354.

Manjunath, T., 2010, A study on knowledge and adoption of plant protection measure by paddy growers of Raichur district. *M.Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Maraddi, G. N., 2006, An analysis of sustainable cultivation practices followed by sugarcane growers in Karnataka. *Ph.D. Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Matuschke and Matin Quim., 2006, Adoption and impact of hybrid wheat in India. Dept of Agric. Eco. and Soc Sci., University of Hohenheim.

Meng, E.C.H., Ruifa Hu., Xiaohua Shi and Shihuang Zhang., 2006, Maize in China: Production systems, constraints, and research priorities. Mexico, D.F: CIMMYT.

Mohamood N., Ali T., Bajwa M.S., Shahbaz M and Chattha M.B., 2013, Analysis of the adoption of wheat sowing recommendations among small farmers using water saving interventions. *J. Animal Plant Sci.,* 23(1): 309-312

Monlruzzaman, Rahman, M.S., Karim, M.K. and Alam, Q.M., 2009, Agro-economic analysis of maize production in Bangladesh. *Bangladesh J. Agric.. Res*., 34(1): 15-24.

Morris, M.L., Tripp R. and Dankyi. A.A., 1999, Adoption and Impacts of Improved Maize Production Technology: A Case Study of the Ghana Grains Development Project. Economics Program Paper : 99-101. Mexico, D.F: CIMMYT

Mulla R.P., Rai K.N., Dangaria C.J and Kulkarni M.P., 2009, Pearl millet as a postrainy cool season crop: case studies from Gujarat and Maharashtra, *Indian J. of SAT Agric. Res*., 24: 29-35.

Nagaraj, K. H., 1996, Knowledge and adoption pattern of improved cultivation practices of groundnut among farmers of Pavagada taluk in Tumkur district. *M. Sc. (Agri) Thesis,* Univ. Agric. Sci., Dharwad, (India).

Natikar, K. V., 2001, Attitude and use of farm journal by the subscriber farmer and their profile. A critical analysis. *Ph. D. Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Nguyen Cong Thanh ., Bui Dinh Duong., Tran Van Hien., Nguyen Huu Minh and Manish Singh., 2013, Study on rice production and marketing of farmers in mekong delta *Institute Agric. Sci. Southern Vietnam.,* (19): 224-236.

Nikhade, D. M., Bhople, R. S. and Kale, N. M., 1997, Technological gap in cultivation of red gram, bengalgram in Gulbarga district of Karnataka. *Indian. J. Ext. Edu.*, 33(1-2) : 72-75.

Ningareddy, P., 2005, A study on knowledge, extent of participation and benefits derived by participant farmers of the watershed development programme. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Noorjehan, A. K., Hanif and Ganesan., 2003, Technological gap in adoption of selected pest management practices in rice. *J. Ext. Res.,* 5:58.

Nwinya, C.E., Obienusi, E.A. and Onuoha, D.C., 2014, Comparative economic analysis of upland and low land rice production in Izzi local government area of Ebonyi state., *J. Eco. Sustainable Develop.*, 5(17): 144-159.

Ohen, S.B. and Ajah, E.A., 2015, Cost and return analysis in small scale rice production in cross river state, Nigeria. *Int. Res. J. Agric. Sci Soil Sci.,* 5(1): 22-27.

Padulosi, S., Bhag Mal., Bala Ravi S., Gowda J., Gowda KTK., Shanthakumar.G., Yenagi N. and Dutta M., 2009., Food security and climate change: Role of plant genetic resources of minor millets *Indian J. Plant Genet. Resource* , 22(1): 1-16 .

Palaniswamy, K. and Sriram, M. S., 2001, A scale to measure extension participation of farmers. *Indian. J. Ext. Edu,* (19): 325-328.

Pathak H.C. and Dev Prakash Shastry., 2013, Role of millets in nutritional security of *Indian. National Academy Agri Sci.,* policy paper 66.

Patil, J. B., 1999, Evaluation of land treatment for in-situ conservation in maize and sesamum crop on medium deep soil. *M. Sc. (Agri.) Thesis,* Dr. Panjabrao Deshmulch Krishi Vidhtapeeth, Akola, Maharashtra, (India).

Patil, V. G., 1995, Technological gap in rice cultivation. *Maharashtra J. Extn. Edu.,* 14 : 185-187.

Prasad, C. H., 1998, Implementation process of women development programme (IFAD)- An experimental model. *J. Rural Develop.*, 17 (4): 789-791.

Raghavendra, M. R., 2004, Knowledge and adoption level of post harvest technologies by redgram cultivators in Gulbarga district of Karnataka. *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Raghavendra, R, 2005, Knowledge and adoption of recommended cultivation practices of cauliflower growers in Belgaum district of Karnataka. *M. Sc.(Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Raj, K.A., 2012, Economics of finger millet production and marketing in urban area of Pokhara valley of Nepal. *J. Dev. Agric. Eco.,* 4(6): 151-157.

Rajashekar, T. B., 2009, An analysis of technological gap in papaya cultivation in Bidar and Gulbarga districts of North Karnataka. *M. Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Rajvanshi, A. K. and Nimbkar, N., 2015., Sweet sorghum, R & D at the Nimbkar *Agric. Res. Institute.*

Ray, G. L., Chatterjee, P. and Banerjee, S.N., 1995, *Technological Gap and Constraints in Agricultural Technology Transfer,* Naya Prakash, Calcutta., p.27.

Sabi S., 2012, Knowledge and technological gap in wheat production, *M. Sc.(Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Samar Abdalla., Ingrid and Ute Leonhauser., 2013, Dietary food consumption pattern in Sudan., *Basic Res J.*, 2(9):180-185.

Sanjota, K. P., 2014, Technological gap in pepper cultivation in Uttar Kannada district, *M.Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad. Karnataka (India).

Santosh Swamy., 2006, A study on technological gap and constraints of bidi tobacco cultivation in Belgaum district, Karnataka state. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Satish, H. S., 2010, Farmers perceptions, preferences and utilization of SRI and traditional paddy straw for livestock, *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Schipmann., Schwarze A., Mafuru, J. and Mulinge .W., 2013, Consumer survey for sorghum and finger millet in Kenya and Tanzania., *ICRISAT*., Nairobia, A org@cgiar.org. p.10.

Sharma, O. H., Yadav, R. and Nahatkar, S. B., 2005, Adoption pattern and constraints of soybean production technology in Malwa plateau of Andhra Pradesh, *Agric. Situ. India.,* 62 (10) : 671-676.

Shukla., Adarsh Lalit., Vinay Sharma., Sharad Vats and Afroz Alam., 2015, Pearl and finger millets: The hope of food security., *Applied Res. J*., 1:59-66.

Srinivas A., Govardhan Rao V and Jyothi Swaroop V., 2014, Yield gap analysis of sorghum through frontline demonstration in tribal area of east Godavari, AP. *Int. J. Engg. Sci. Inno Tech.,* (IJESIT): 3

Sunil Kumar, G. M., 2004, A study on farmers knowledge and adoption of production and post-harvest technology in tomato crop of Belgaum district in Karnataka. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka

Supe, S.V., 1969, Factors related to different degree of rationality in decision making among farmers, *Ph.D. Thesis*, IARI, New Delhi.

Surendra Singh., Ram Kumar Singh and Randhir Singh., 2013, Enhancing rice and wheat production by bridging yield gap in western UP., *Indian. Society for Advancement of Wheat Res . J.,* 5(2): 43-57

Suresh Kumar., 2009, Technological gap in adoption of improved cultivation practices by the soybean growers. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Swami, S., 2006, A study on technological gap and constraints of bidi tobacco cultivation in Belgaum District, Karnataka state*. M. Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Tesfaye Zegeye., 2001, Adoption of improved bread wheat varieties and inorganic fertilizer by small scale farmers in Yelmana Densa and Farta district of Northwestern Ethiopia., CIMMYT *Institutional Multimedia Publication Repository*., 1-19.

Thippeswamy, R., 2007, A study on knowledge and adoption of plant protection measures in coconut cultivation by farmers of Chitradurga district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Thorat., 2003, A study on technological gap and constraints in adoption of recommended cultivation practices of mango growers. *M. Sc. (Agri.) Thesis,* Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli.

Todd Pfeiffer., Michael Montross., Michael Barrett and Steve Patton., 2013, Sweet sorghum for Biofuel., Univ of Kentucky Ag Communications.

Vedamurthy, H. S., 2002, A study on arecanut management practices in Shimoga district in Karnataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, India

Youssauf Camara., Bantilan MCS and Jupiter Ndjeunga., 2006, Impacts of sorghum and millet research in west and central Africa. *ICRISAT*, p.2.

Zalkuwi, J.W., Adebayo, E.F., Moses, J.D. and Gwandi, O., 2014, Economics of sorghum production in Guyuk local government of Adamawa state, Nigeria. *Inter J. Commerce, Business Management*, 3(5): 19-21.

APPENDIX

INTERVIEW SCHEDULE

CULTIVATION PATTERN AND CONSTRAINTS IN MINOR MILLETS PRODUCTION IN NORTH KARNATAKA

General Information

1. Name of farmer :_____ village_____

taluka_____ and district_____

2. Personal characteristics

i)Age : ----------

ii)Education : Illiterate / literate

a. Primary school(1^{st}-4^{th} std) b. Middle school(5^{th}-7^{th} std)

c. High school(8^{th}- 10^{th} std) d. Pre- university(10^{th}+12^{th} std)

e. Graduate and above

3. Family size

i)Number of members in the family:

a)Male _____ b) Female_____ total_____

ii) Occupation (put tick mark)

a) agriculture ( ) b) agrobased subsidiary- dairy, poultry etc( )

c) business ( )

4. Land holding

Please indicate details regarding land holding

Sl no.	Type of land	Area (acres)	Soil type
1.	Rainfed		
2.	Irrigated		
3.	total		

5. Farming experience (no of years of experience)_____years.

6. livestock position

Please indicate your livestock details

sl.no	Particulars	Numbers	Economic returns
1.	Buffalo		
2.	Cattle		
3.	Sheep		
4.	Goat		
5.	Draft animal		
6.	Others(specify)		

7. Annual income

a. Income from agriculture Rs:_____

b. Income from livestock Rs:_____

c. Income from other source Rs:_____

TOTAL Rs _____

8. Extension contact

How often you contact for agriculture advice/ information

sl. no	Extension personnel	Frequency of contact			
		Once in a week	Once in fortnight	Whenever problem arises	Never
1.	AAO				
2.	AO				
3.	University scientists				
4.	KVK scientists				
5.	ARS scientists				
6.	Officials of NGO/ other voulantary organization				
7.	Private company officials				
8.	Others (specify)				

9. Economic motivation

Please indicate your opinion about each of the following item

Sl.no	Statement	Agree	undecided	Disagree
1.	A farmer should work more towards more yield and economic profit			
2.	The most successful farmer is the one who makes the more profit			
3.	A farmer should try any new farming idea which may earn more money			
4.	A farmer should grow more cash crop to increase monetary profit in comparison to growing of food crops for home consumption			
5.	It is difficult for farmer children to make good start unless he provides them with economic assistance			
6.	A farmer must earn his living but most important thing in life cannot be defined in economic terms.			

10. Cropping pattern

Give details of crop grown during the following season.

Kharif				Rabi				Summer			
crop	area	yield	Net return	crop	Area	yield	Net return	crop	area	yield	Net return
1.				1.				1.			

11. Information Source consultancy pattern

How often you consult the following source for millet information.

Sl. no	Source of information	Extent of consulted		
		Regularly	Occasionally	Never
1.	Institutional sources			
	a) Assistant director of agriculture b)agriculture officer c)Scientist from the research station of agricultural university			
2.	Localite sources			
	a)Neighbours b)Friends c)Relatives d)Private consultants			
3.	Mass media			
	a)Radio b)Television c)Farm magazines d)Newspaper			
4.	Any other specify			

12. Farming system

Different forming system

A)Agriculture

Season	Crops	Area (acres)	RF /IR	Soil type	Cropping system (M/IC/MC)	Yield qt/acre	Rate /qts (Rs)	Total expenditure (Rs)	Total income (Rs)
Kharif					1)				
					2)				
Rabi					1)				
					2)				
Summer					1)				
					2)				
Vegetable									
Flower crops									

B)Horticulture and forestry

Trees	Scatered/ block	Area /type	Soil type	Expenditure(rs)		Yield/season/ year	Price (Rs)	Total income (Rs)
				Establishment cost	Maintenance cost			

C)Livestock

Type of animals	No of animals	Economic yield					Expenditure/month(Rs)	Manure produce annually		Total income (Rs)
		Milk			Income from animal sale			qty	Rate (Rs)	
		Milk yield /month	How many month	Rate (Rs)	No	Rate (Rs)				
Cows Adults calf										
Buffaloes Adults calf										

D)Vermicompost

Type of vermicompost	Size	Nor of pits	Yields/ pits/ years	utilization			Total expenditure	Total income
				Self	Sale			
					qty	Rate(Rs)		

PART-I

Technological gap(little millet and foxtail millet)

Sl. No	Recommended practices	Adoption level		Reasons for non adoption
		Adopted	Not adopted	
1	Varieties			
	i Navane			
	RS-118			
	HMT 100-1			
	TNAU-43			
	ii.Save			
	Sukshema			
	CO-2			
	PRC-3			
2.	Sowing season			
	June-july			
3.	Spacing			
	Line spacing (22.5-30 cm)			
	Depth (4 cm)			
	Plant-plant(7.5-10cm)			
4.	Seed rate per hectare			
	10-12 kg/ha			
5.	Seed treatment			
	a)Assospirulum-500g/ha			
6.	FYM/hectare			
	7.5/ha			
7.	Chemical fertiliser			
	Rainfed(Navane)			
	N:P:K 30:15:15			
	Irrigated N:P:K 40:20:20			
	Save N:P:K 30:15:15			

Sl. No	Recommended practices	Adoption level		Reasons for non adoption
		Adopted	Not adopted	
8.	Pest control			
	a)pest observed 1. stem borer 2. green ear			

Measures to control pests					
			Adoption level		Reason for non adoption
			Adopted	Not adopted	
Name of the pest	Control measures				
a.stem borer	Sowing crops in right time				
(9)Disease control					
i.Major disease observed					
a.kernel smut/grain smut					
b.downymildew c.green ear disease					
ii.Name of the disease	Chemical used for control	dosage			
a)kernel smut	Seed treatment with thiram or emission	2 g/kg			
b)downymildew disease	Mix emizon or mancozeb	0.2 %			
c) green ear	Rhidomyl 2g/kg	2 g/kg			

PART-II

Extent of cultivation of minor millet

Whether the area under millet has been increased or decreased over a period of time ?

give details

1) Whether the area under millet has been increased or decreased over 10 years- yes give details

Crop	Area under crop in the beginning		Increase in area in previous year (acres)	Decrease in area in previous year (acres)	Percentage increase in area	Which crop has been replaced (acres)
	Year	Area (acres)				
1.Foxtail millet (navane) 2. Little millet (Save)						i) ii) iii) iv) i) ii) iii) iv)

PART-III

Awareness and consumption pattern of minor millet

1.Awareness on millet

Technologies	Awareness	
	Aware	Not aware
1.Primary processing by machinery i)sorter cum grader ii)shieving machine iii)gravity grader iv)colour grader		
2.Nutritional value of millet i)carbohydrates ii)fat iii)protein		
3. Drudgery reducing technology i)seed drill ii)sickle iii)leveler iv)hand weeder v)thresher vi)rotavator		
4.Market prices		
5.Market information sources		
6.Value addition techniques		

2. Consumption pattern

Products	Everyday	Once in a week	Once in a month	Once in three month	Rarely
1.Breakfast and daily consumption Idli,dosa,upma,rice flakes,puffed rice, chapathi etc					
2.fermented products porridge,idli, dosa,paddu,little millet dokla,little millet uttappa					
3.fried snacks Chakli,kodubale,nippatu,tengalu, Shev etc					
4. sweet product Little millet payasam,foxtail millet shankarpoli, halwahurakki holige.					
5.papad and fryum little millet tomoto papad,little milletchilly papad,little millet palak papad,sandige.					
6. bakery products Foxtail millet butter buiscuit,foxtail millet coconut buiscuit,foxtail millet groundnut biscuit.foxtail millet muffins, toast,rusk.					
7.products with therapeutic qualities Little millet vegetable upma,garlic flavoured little millet pulav,foxtail millet roti,foxtail millet malt.					

PART –IV

Marketing constraints involved in minor millet production

Sl. No	Marketing constraints	Remarks	
		yes	No
1.	Lack of transportation fecility		
2.	High cost of transportation		
3.	Fluctuations in market price		
4.	Lack of price information		
5.	Less buyers of produce		
6.	More nor of middlemen		
7.	Low costumer demand or market demand		
8.	Inadequate market information		
9.	High commission charges		
10.	Any other specify		

PART-V

Reasons for cultivating of minor millet

Reasons	Remarks	
	yes	No
1.Food requirement		
2. nutritional supplement		
3.Fodder		
4.Feed for poultry		
5.Source of livestock		
6.Intercropping system		
7. Soil health management		

ಉತ್ತರ ಕರ್ನಾಟಕದಲ್ಲಿ ಸಣ್ಣ ಧಾನ್ಯಗಳ ಉತ್ಪಾದನೆಯ ಮಾದರಿ ಮತ್ತು ಅವುಗಳ ನಿರ್ಬಂಧತೆಯ ಕ್ರಮಗಳು

ಸಂದರ್ಶನಾ ಪ್ರಶ್ನಾವಳಿ

ಸಾಮನ್ಯ ಮಾಹಿತಿ

1. ರೈತನ ಹೆಸರು: _____ ಹಳ್ಳಿ: _____
ತಾಲೂಕು: _____ಮತ್ತು ಜಿಲ್ಲೆ _____

2. ವೈಯಕ್ತಿಕ ಗುಣಲಕ್ಷಣಗಳು

1) ವಯಸ್ಸು:

2) ಶಿಕ್ಷಣ: ಅನಕ್ಷರಸ್ಥ/ಸಾಕ್ಷರ

1. ಪ್ರಾರ್ಥಮಿಕ ಶಾಲೆ (1–4ನೇ ವರ್ಗ), 2. ಮಧ್ಯಮ (5–7ನೇ ವರ್ಗ)
3. ಹೈಸ್ಕೂಲ್ (8–10ನೇ ವರ್ಗ) 4. ಪದವಿಪೂರ್ವ (10–12ನೇ ವರ್ಗ)
5. ಪದವಿ ಮತ್ತು ಮೇಲೆ

3. ಕುಟುಂಬದ ಗಾತ್ರ

1. ಕುಟುಂಬದಲ್ಲಿ ಸದಸ್ಯರ ಸಂಖ್ಯೆ :

1. ಪುರುಷ _____ 2. ಮಹಿಳೆ _____ 3. ಒಟ್ಟು _____

2. ಉದ್ಯೋಗ (✓ಈ ಚಿನ್ಹೆಯನ್ನು ಬಳಸಿರಿ)

1. ಕೃಷಿ 2. ಕೃಷಿ ಆಧಾರಿತ ಅಂಗಸಂಸ್ಥೆ: ಡೈರಿ, ಕೋಳಿ ಇತ್ಯಾದಿ 3. ವ್ಯಾಪಾರ

4. ಭೂ ಹಿಡುವಳಿ

ದಯವಿಟ್ಟು ಭೂ ಹಿಡುವಳಿ ಬಗ್ಗೆ ವಿವರಗಳನ್ನು ಸೂಚಿಸಿರಿ

ಕ್ರಮ ಸಂ.	ಭೂಮಿ ಮಾದರಿ	ಪ್ರದೇಶ (ಎಕರೆ)	ಮಣ್ಣಿನ ವಿಧ
1.	ಮಳೆ ಆಧಾರಿತ		
2.	ನೀರಾವರಿ		
3.	ಒಟ್ಟು		

5. ಕೃಷಿ ಅನುಭವ (ಅನುಭವದ ವರ್ಷಗಳು) _____ ವರ್ಷಗಳು

6. ಜಾನುವಾರು ಸ್ಥಾನವನ್ನು ಸೂಚಿಸಿ
ನಿಮ್ಮ ಜಾನುವಾರುಗಳ ವಿವರಗಳ ಸೂಚನೆ

ಕ್ರಮ. ಸಂ.	**ವಿವರಗಳು**	**ಸಂಖ್ಯೆಗಳು**	**ಆರ್ಥಿಕ ಅದಾಯ**
1.	ಎಮ್ಮೆ		
2.	ಜಾನುವಾರು		
3.	ಕುರಿ		

ಕ್ರಮ. ಸಂ.	ವಿವರಗಳು	ಸಂಖ್ಯೆಗಳು	ಆರ್ಥಿಕ ಅದಾಯ
4.	ಮೇಕೆ		
5.	ಡ್ರಾಪ್ಟ್ ಪ್ರಾಣಿ		
6.	ಇತರೆ (ಸೂಚಿಸಿ)		

7. ವಾರ್ಷಿಕ ಆದಾಯ

1. ಕೃಷಿ ಆದಾಯ (ರೂ.) _____

2. ಜಾನುವಾರುಗಳಿಂದ ಬರುವ ಆದಾಯ (ರೂ.) _____

3. ಇತರ ಮೂಲದಿಂದ ಬರುವ ಆದಾಯ (ರೂ.) _____

ಒಟ್ಟು ಆದಾಯ (ರೂ.) _____

8. ವಿಸ್ತರಣೆ ಸಂಪರ್ಕ

ಎಷ್ಟು ಬಾರಿ ನೀವು ಕೃಷಿ ಸಲಹೆ/ಮಾಹಿತಿಗಾಗಿ ಸಂಪರ್ಕಿಸುತ್ತೀರಿ

ಕ್ರಮ. ಸಂ.	ವಿಸ್ತರಣೆ ಸಿಬ್ಬಂದಿ	ಸಂಪರ್ಕದ ಪುನರಾವರ್ತನೆಯು			
		ಒಮ್ಮೆ ಒಂದು ವಾರದಲ್ಲಿ	ಒಮ್ಮೆ ಹದಿನೈದು	ಯಾವಾಗ ಸಮಸ್ಯೆ ಉದ್ಭವವಾಗುತ್ತದೆ	ಎಂದಿಗೂ
1.	ಎ.ಎ.ಓ.				
2.	ಎ.ಓ				
3.	ವಿಶ್ವವಿದ್ಯಾಲಯದ ವಿಜ್ಞಾನಿಗಳು				
4.	ಕೆ.ವಿ.ಕೆ. ವಿಜ್ಞಾನಿಗಳು				
5.	ಎ.ಆರ್.ಎಸ್. ವಿಜ್ಞಾನಿಗಳು				
6.	ಎನ್.ಜಿ.ಓ. ಅಧಿಕಾರಿಗಳು/ ಇತರ ಸ್ವಯಂಪ್ರೇರಿತ ಸಂಸ್ಥೆ				
7.	ಖಾಸಗಿ ಕಂಪೆನಿ ಅಧಿಕಾರಿಗಳು				
8.	ಇತರೆ (ಸೂಚಿಸಿ)				

9. ಆರ್ಥಿಕ ಪ್ರೇರಣೆ

ಕೆಳಗಿನ ಹೇಳಿಕೆಯ ಬಗ್ಗೆ ನಿಮ್ಮ ಅಭಿಪ್ರಾಯ ಸೂಚಿಸಿ

ಕ್ರಮ. ಸಂ.	ಹೇಳಿಕೆ	ಒಪ್ಪುತ್ತೇನೆ	ತೀರ್ಮಾನವಾಗಿಲ್ಲದ	ಒಪ್ಪುವುದಿಲ್ಲ
1.	ಒಬ್ಬ ರೈತ ಹೆಚ್ಚು ಇಳುವರಿ ಮತ್ತು ಆರ್ಥಿಕ ಲಾಭ ಕಡೆಗೆ ಹೆಚ್ಚು ಕೆಲಸ ಮಾಡಬೇಕು			
2.	ಅತ್ಯಂತ ಯಶಸ್ವಿ ರೈತ ಹೆಚ್ಚು ಲಾಭ ಮಾಡುವದು ಒಚಿದಾಗಿದೆ			

ಕ್ರಮ. ಸಂ.	ಹೇಳಿಕೆ	ಒಪ್ಪುತ್ತೇನೆ	ತೀರ್ಮಾನವಾಗಿಲ್ಲದ	ಒಪ್ಪುವುದಿಲ್ಲ
3.	ಒಬ್ಬ ರೈತ ಹೆಚ್ಚು ಹಣ ಪಡೆಯಲು ಯಾವುದೇ ಹೊಸ ಕೃಷಿ ಕಲ್ಪನೆ ಯತ್ನಿಸಬೇಕು			
4.	ಒಬ್ಬ ರೈತ ಮನೆ ಬಳಕೆಗಾಗಿ ಆಹಾರ ಬೆಳೆಗಳ ಬೆಳೆಯುವ ಹೋಲಿಸಿದರೆ ವಿತ್ತೀಯ ಲಾಭ ಹೆಚ್ಚಿಸಲು ಹೆಚ್ಚು ನಗದು ಬೆಳೆ ಬೆಳೆಯಲು ಬೇಕು			
5.	ಇದು ಅವರ ಆರ್ಥಿಕ ನೆರವು ಅವುಗಳನ್ನು ಒದಗಿಸುತ್ತದೆ ಹೊರತು ರೈತ ಮಕ್ಕಳು ಉತ್ತುಮ ಆರಂಭ ಮಾಡಲು ಕಷ್ಟ			
6.	ಒಬ್ಬ ರೈತ ತನ್ನ ದೇಶ ಸಂಪಾದಿಸಬೇಕು ಆದರೆ ಜೀವನದಲ್ಲಿ ಪ್ರಮುಖ ವಿಷಯ ಆರ್ಥಿಕ ಪರಿಭಾಷೆಯಲ್ಲಿ ವ್ಯಾಖ್ಯಾನಿಸಲು ಸಾಧ್ಯವಿಲ್ಲ			

10. ಕೃಷಿ ಮಾದರಿ

ಮುಂಗಾರು ಹಿಂಗಾರು ಬೇಸಿಗೆ

ಬೆಳೆ	ಪ್ರದೇಶ	ಇಳುವರಿ	ನವ್ವಳ ಲಾಭ	ಬೆಳೆ	ಪ್ರದೇಶ	ಇಳುವರಿ	ನವ್ವಳ ಲಾಭ	ಬೆಳೆ	ಪ್ರದೇಶ	ಇಳುವರಿ	ನವ್ವಳ ಲಾಭ
1.				1.				1.			

11. ಮಾಹಿತಿ ಮೂಲ ಸಲಹಾ ಮಾದರಿ

ಎಷ್ಟು ಬಾರಿ ನೀವು ರಾಗಿ ಮಾಹಿತಿಗಾಗಿ ಕೆಳಗಿನ ಮೂಲ ಸಂಪರ್ಕಿಸುತ್ತೀರಿ

ಕ್ರಮ. ಸಂ.	ಮಾಹಿತಿಯ ಮೂಲ	ಸಲಹೆ ವ್ಯಾಪ್ತಿ		
		ನಿಯಮಿತವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಎಂದಿಗೂ
1.	ಸಾಂಸ್ಥಿಕ ಮೂಲಗಳು			
	ಎ. ಕೃಷಿ ಸಹಾಯಕ ನಿರ್ದೇಶಕ ಬಿ. ಕೃಷಿ ಅಧಿಕಾರಿ ಸಿ. ಕೃಷಿ ವಿಶ್ವವಿದ್ಯಾಲಯದ ಸಂಶೋಧನೆ ನಿಲ್ದಾಣದಿಂದ ವಿಜ್ಞಾನಿ			

2.	**ಸ್ಥಳೀಯ ಮೂಲಗಳು**			
	ಎ. ನೆರೆಹೊರಿಯವರು ಬಿ. ಸ್ನೇಹಿತರು ಸಿ. ಸಂಬಂಧಿಗಳು ಡಿ. ಖಾಸಗಿ ಸಲಹೆಗಾರರು			
3.	**ಸಮೂಹ ಮಾಧ್ಯಮ**			
	ಎ. ರೇಡಿಯೋ ಬಿ. ಟೆಲಿವಿಜನ್ ಸಿ. ಫಾರ್ಮ ನಿಯತಕಾಲಿಕೆಗಳು ಡಿ. ಪತ್ರಿಕೆ			
4.	**ಇತರೆ (ಸೂಚಿಸಿ)**			

12. ಕೃಷಿ ವ್ಯವಸ್ಥೆ

ವಿವಿಧ ರೂಪಿಸುವ ವ್ಯವಸ್ಥೆ

ಎ. ಕೃಷಿ

ಋತು	ಬೆಳೆಗಳು	ಪ್ರದೇಶ (ಎಕರೆ)	ಆರ್‌ಎಫ್/ಐಆರ್.	ಮಣ್ಣಿನ ವಿಧ	ಕೊಯ್ಲು ವ್ಯವಸ್ಥೆ (ಎಮ್/ಐಸಿ/ಎಮ್.ಸಿ.)	ಇಳುವರಿ ಪ್ರಮಾಣ /ಎಕರೆ	ದರ /ಪ್ರಮಾಣ (ರೂ)	ಒಟ್ಟು ವೆಚ್ಚ (ರೂ)	ಒಟ್ಟು ಆದಾಯ (ರೂ)
ಮುಂಗಾರು					1)				
					2)				
ಹಿಂಗಾರು					1)				
					2)				
ಬೇಸಿಗೆ					1)				
					2)				
ತರಕಾರಿ									
ಹೂ ಬೆಳೆಗಳು									

ಬಿ) ತೋಟಗಾರಿಕೆ ಮತ್ತು ಅರಣ್ಯ

ಮರಗಳು	ಚದುರಿದ/ ಬ್ಲಾಕ್	ಪ್ರದೇಶ /ರೀತಿ	ಮಣ್ಣಿನ ವಧ	ವೆಚ್ಚ (ರೂ)		ಇಳುವರಿ/ಋತುವಿನ ವರ್ಷ	ಬೆಲೆ (ರೂ)	ಒಟ್ಟು ಆದಾಯ (ರೂ)
				ಸ್ಥಾಪನೆ ವೆಚ್ಚ	ನಿರ್ವಹಣಾ ವೆಚ್ಚ			

ಸಿ) ಜಾನುವಾರು

ಪ್ರಾಣಿಗಳ ಕೌಟುಂಬಿಕತೆ	ಪ್ರಾಣಿಗಳ ಸಂಖ್ಯೆ	ಆರ್ಥಿಕ ಇಳುವರಿ					ವೆಚ್ಚ/ತಿಂಗಳು (ರೂ)	ಗೊಬ್ಬರವನ್ನು ವಾರ್ಷಿಕವಾಗಿ ಉತ್ಪಾದಿಸಲು		ಒಟ್ಟು ಆದಾಯ (ರೂ)
		ಹಾಲು			ಪ್ರಾಣಿ ಮಾರಾಟದಿಂದ ಆದಾಯ			ಪ್ರಮಾಣ	ದರ (ರೂ)	
		ಹಾಲು ಇಳುವರಿ / ತಿಂಗಳು	ಎಷ್ಟು ತಿಂಗಳು	ದರ (ರೂ)	ಯಾವುದೇ	ದರ (ರೂ)				
ಹಸುಗಳ ವಯಸ್ಕರ ಕರು										
ಎಮ್ಮೆಗಳ ವಯಸ್ಕರ ಕ್ವರು										

ಡಿ) ಎರೆಗೊಬ್ಬರ

ವರ್ಮಿ ಮಾದರಿ	ಗಾತ್ರ	ಹೊಂಡ ಬಿಟ್ಟು	ಇಳುವರಿ/ ಹೊಂಡ/ ವರ್ಷಗಳ	ಬಳಕೆ			ಒಟ್ಟು ವೆಚ್ಚ	ಒಟ್ಟು ಆದಾಯ
				ಸ್ವಯಂ	ಮಾರಾಟ			
					ಪ್ರಮಾಣ	ದರ (ರೂ)		

ಭಾಗ 1

ತಂತ್ರಜ್ಞಾನದ ಅಂತರ (ನವಣೆ ಮತ್ತು ಸಾವೆ)

ಕ್ರಮ ಸಂ.	ಶಿಫಾರಸು ಅಚರಣೆಗಳು	ದತ್ತು ಮಟ್ಟದ		ಅಲ್ಲದ ದತ್ತು ಕಾರಣಗಳು
		ಅಳವಡಿಕೆ	ಅಳವಡಿಸಿಕೊಂಡಿಲ್ಲ	
1	**ವಿಧಗಳು**			
	ಎ. ನವಣೆ			
	ಆರ್.ಎಸ್. 118			
	ಎಚ್.ಎಮ್.ಟಿ. 100–1			
	ಟಿ.ಎನ್.ಎ.ಯು–43			
	ಬಿ. ಉಳಿಸಲು			
	ಸುಕ್ಷೇಮ			
	ಸಿ.ಓ. 2			
	ಪಿಆರ್‌ಸಿ–3			
2.	ಬಿತ್ತನೆ ಋತು			
	ಜೂನ್–ಜುಲೈ			
3.	ಅಂತರ			
	ಸಾಲಿನ ಅಂತರ (22.5–30 ಸೆ.ಮಿ.)			
	ಆಳ (4 ಸೆ.ಮಿ.)			
	ಸಸ್ಯದಿಂದ–ಸಸ್ಯ (7.5–10 ಸೆ.ಮಿ.)			
4.	ಹೆಕ್ಟೇರಿಗೆ ಬೀಜ ದರ			
	10–12 ಕೆಜಿ/ಹೆ			
5.	ಬೀಜೋಪಚಾರ			
	ಎ. ಅಜೋಸಪ್ರೋಲಿಯಂ – 500 ಗ್ರಾಂ/ಹೆ			
6.	ಎಫ್.ವಾಯ್.ಎಮ್. 7.5/ಹೆ.			
7.	ರಾಸಾಯನಿಕ ಗೊಬ್ಬರ			
	ಮಳೆ ಆಧಾರಿತ (ನವಣೆ)			
	ಎನ್:ಪಿ:ಕೆ 30:15:15			
	ನೀರಾವರಿ ಎನ್:ಪಿ:ಕೆ 40:20:20			
	ಉಳಿಸಿ ಎನ್:ಪಿ:ಕೆ 30:15:15			
8.	**ಕೀಟ ನಿಯಂತ್ರಣ**			
	ಎ. ಕೀಟ ಆಚರಿಸಲಾಗುತ್ತದೆ 1. ಕಾಂಡ ಕೊರೆಯುವ 2. ಹಸಿರು ಕಿವಿ			

ಕೀಟ ನಿಯಂತ್ರಿಸಲು ಕ್ರಮಗಳು					
			ದತ್ತು ಮಟ್ಟ		ಅಲ್ಲದ ದತ್ತು ಕಾರಣ
			ಅಳವಡಿಕೆ	ಅಳವಡಿಸಿಕೊಂಡಿಲ್ಲ	
ಕೀಟಹೆಸರು	**ನಿಯಂತ್ರಣ ಕ್ರಮಗಳು**				
ಕಾಂಡ ಕೊರಕ	ಸರಿಯಾದ ಸಮಯದಲ್ಲಿ ಬಿತ್ತನೆ ಬೆಳಗಳು				
9. ರೋಗ ನಿಯಂತ್ರಣ					
ಎ. ಪ್ರಮುಖ ರೋಗ ಆಚರಿಸಲಾಗುತ್ತದೆ					
ಕರ್ನಲ್ ಕಾಡಿಗೆ/ ಧಾನ್ಯ ಕಾಡಿಗೆ					
ಬಿ. ಬಯಲು ಮೇಲಿನ ಶಿಲೀಂಧ್ರ ಸಿ. ಹಸಿರು ಕಿವಿ ರೋಗ					
ಬಿ. ರೋಗದ ಹೆಸರು	**ರಾಸಾಯನಿಕ ನಿಯಂತ್ರಣ ಬಳಸಲಾಗುತ್ತದೆ**	**ಡೋಸೇಜ್**			
ಎ. ಕರ್ನಲ್ ಕಾಡಿಗೆ	ಥೈರಮ್ ಅಥವಾ ಹೊರಸೂಸುವ ಉತ್ತಮ ಬೀಜ ಚಿಕಿತ್ಸೆ	2 ಜಿ/ಕೆಜಿ			
ಬಿ. ಬಯಲು ಮೇಲಿನ ಶಿಲೀಂಧ್ರ ರೋಗ	ಎಮಿಜೋನ್ ಅಥವಾ ಮನಕೊಜೆಬ್	0.2 %			
ಸಿ. ಹಸಿರು ಕಿವಿ	ರೈಡೊಮೈಲ್	2ಜಿ/ಕೆಜಿ			

ಭಾಗ 2

ಕೃಷಿ ವಿಸ್ತಾರ

ವಿಸ್ತೀರ್ಣ ಹೆಚ್ಚಾಗಿದೆ ಅಥವಾ ಸಮಯ ಕಡಿಮೆಯಾಗಿದೆ ಎಂದು ? ವಿವರಗಳನ್ನು ನೀಡಿ

ಹತ್ತು ವರ್ಷದಿಂದ ಸಾವೆ ಅಥವಾ ನವಣೆ ಬೆಳೆಗಳ ಉತ್ಪನ್ನ ವಿಸ್ತೀರ್ಣದ ವಿವರಗಳನ್ನು ಸೂಚಿಸಿ.

ಬೆಳೆ	ಆರಂಭದಲ್ಲಿ ಬೆಳೆ ವಿಸ್ತೀರ್ಣ		ಹಿಂದಿನ ವರ್ಷದ ವಿಸ್ತೀರ್ಣ (ಎಕರೆ)	ಹಿಂದಿನ ವರ್ಷದ ಪ್ರದೇಶದಲ್ಲಿ ಎಷ್ಟು ವಿಸ್ತೀರ್ಣ (ಎಕರೆ)	ಪ್ರದೇಶದಲ್ಲಿ ಹೆಚ್ಚಾಗಿರುವ ವಿಸ್ತೀರ್ಣ	ಬೆಳೆ ಬದಲಾಯಿ ಸಲ್ಪಟ್ಟಿದೆ (ಎಕರೆ)
	ವರ್ಷ	ಪ್ರದೇಶ (ಎಕರೆ)				
1. ಫಾಕ್ಸೆಟಲ್ಲ್ ರಾಗಿ (ನವಣೆ)						ಎ. ಬಿ ಸಿ. ಡಿ.
2. ಲಿಟಲ್ ರಾಗಿ (ಸಾವೆ)						ಎ. ಬಿ ಸಿ. ಡಿ.

ಭಾಗ 3

ನವಣೆ ಮತ್ತು ಸಾವೆಯ ಜಾಗೃತಿ ಮತ್ತು ಬಳಕೆ ಮಾದರಿ

1. ರಾಗಿ ಮೇಲೆ ಜಾಗೃತಿ

ತಂತ್ರಜ್ಞಾನಗಳು	ಜಾಗೃತಿ	
	ಅರಿವು	ಅರಿವು ಇಲ್ಲ
1. ಪ್ರಾಥಮಿಕ ಸಂಸ್ಕರಣೆ ಯಂತ್ರಗಳು ಎ. ಸಾರ್ಟರ್ ಜೊತೆ ದರ್ಜೆ ಬಿ. ಶಿವಿಂಗ ಯಂತ್ರ ಸಿ. ಗುರುತ್ವ ದರ್ಜೆ ಡಿ. ಬಣ್ಣ ದರ್ಜೆ		
2. ರಾಗಿ ಪೌಷ್ಟಿಕಾಂಶ ಎ. ಕಾರ್ಬೋಹೈಡ್ರೇಟಗಳು ಬಿ. ಕೊಬ್ಬು ಸಿ. ಪ್ರೋಟಿನ್		
3. ಡ್ರುಡಜರಿ ಕಡಿಮೆ ತಂತ್ರಜ್ಞಾನ ಎ. ನೇಗಿಲ ಸಾಲು ಬಿ. ಕುಡಗೋಲು ಸಿ. ಸಮಕಾರಕ ಡಿ. ಕೈ ಕಳೆಕೀಳು ಇ. ಒಕ್ಕು ವಿ. ರೋಟಾವೇಟರ್		
4. ಮಾರುಕಟ್ಟೆ ಬಲೆಗಳು		
5. ಮಾರುಕಟ್ಟೆ ಮಾಹಿತಿ ಮೂಲಗಳು		
6. ಮೌಲ್ಯ ಜೊತೆಗೆ ತಂತ್ರಗಳು		

2. ಬಳಕೆ ಮಾದರಿ

ಉತ್ಪನ್ನಗಳು	ಪ್ರತಿ ದಿನ	ಒಮ್ಮೆ ಒಂದು ವಾರದಲ್ಲಿ	ಒಮ್ಮೆ ಒಂದು ತಿಂಗಳಲ್ಲಿ	ಒಮ್ಮೆ ಮೂರು ತಿಂಗಳಲ್ಲಿ	ವಿರಳವಾಗಿ
1. ತಿಂಡಿ ಮತ್ತು ದೈನಂದಿನ ಬಳಕೆಗಾಗಿ ಇಡ್ಲಿ, ದೋಸೆ, ಉಪ್ಪಿಟ್ಟು, ಅಕ್ಕಿ ಚಕ್ಕೆಗಳು, ಮಂಡಕ್ಕಿ, ಚಪಾತಿ ಇತ್ಯಾದಿ					
2. ಹುದುಗಿಸಿದ ಉತ್ಪನ್ನಗಳು – ಗಂಜಿ, ಇಡ್ಲಿ, ದೋಸೆ, ಫಡ್ಡು, ಸ್ವಲ್ಪ ರಾಗಿ ಡೊಕ್ಲಾ, ಸ್ವಲ್ಪ ರಾಗಿ ಉತ್ತಪ್ಪ					
3. ಹುರಿದ ತಿಂಡಿಗಳು – ಚಕ್ಕುಲಿ, ಕಡುಬೆಳೆ, ನಿಪ್ಪಟ್ಟು, ತೆಂಗುಲು, ಶೆವ, ಇತ್ಯಾದಿ					

ಉತ್ಪನ್ನಗಳು	ಪ್ರತಿ ದಿನ	ಒಮ್ಮೆ ಒಂದು ವಾರದಲ್ಲಿ	ಒಮ್ಮೆ ಒಂದು ತಿಂಗಳಲ್ಲಿ	ಒಮ್ಮೆ ಮೂರು ತಿಂಗಳಲ್ಲಿ	ವಿರಳವಾಗಿ
4. ಸಿಹಿ ಉತ್ಪನ್ನ – ಲಿಟಲ್ ರಾಗಿ ಪಾಯಸ, ಫಾಕ್ಸ್‌ಟೈಲ್ ರಾಗಿ, ಶಂಕರಪಾಳಿ, ಹಲ್ವಾ, ಹುರಕ್ಕಿ, ಹೊಳಿಗೆ					
5. ಹಪ್ಪಳ ಮತ್ತು ಫ್ರೈಮ, ಸ್ವಲ್ಪ ರಾಗಿ ಟೋಮೆಟೋ ಹಪ್ಪಳ, ಸ್ವಲ್ಪ ಮಿಲೆಟ್ ಮೆಣಸಿನ ಹಪ್ಪಳ, ಸ್ವಲ್ಪ ರಾಗಿ ಪಾಲಕ ಹಪ್ಪಳ, ಸಂಡಿಗೆ					
6. ಫಾಕ್ಸ್‌ಟೈಲ್ ರಾಗಿ ಬೆಣ್ಣೆ ಬಿಸ್ಕತ್ತು, ಫಾಕ್ಸ್‌ಟೈಲ್ ರಾಗಿ ತೆಂಗಿನ ಬಿಸ್ಕತ್ತು, ಫಾಕ್ಸ್‌ಟೈಲ್ ರಾಗಿ ನೆಲಗಡಲೆ ರಾಗಿ ಮಫಿನ್ಸ್‌ಗಳು, ಟೋಸ್ಟ, ರಸ್ಕ ಬಿಸ್ಕತ್ತು,					
7. ಔಷಧೀಯ ಗುಣಗಳ ಉತ್ಪನ್ನಗಳು ಲಿಟಲ್ ರಾಗಿ ತರಕಾರಿ ಉಪ್ಪಿಟ್ಟು, ಬೆಳ್ಳುಳ್ಳಿ ಸ್ವಲ್ಪ ರಾಗಿ ಪಲಾವ, ಫಾಕ್ಸ್‌ಟೈಲ್ ರಾಗಿ ರೋಟಿ, ಫಾಕ್ಸ್‌ಟೈಲ್ ರಾಗಿ ಮಾಲ್ಟ ಸುವಾಸನೆ					

ಭಾಗ 4

ಸಣ್ಣ ರಾಗಿ ಉತ್ಪಾದನೆ ಒಳಗೊಂಡಿರುವ ಮಾರುಕಟ್ಟೆ ನಿರ್ಬಂಧಗಳು

ಕ್ರಮ. ಸಂ.	ಮಾರುಕಟ್ಟೆ ನಿರ್ಬಂಧಗಳು	ಟೀಕೆಗಳು	
		ಹೌದು	ಇಲ್ಲ
1.	ಸಾರಿಗೆ ಸೌಲಭ್ಯದ ಕೊರತೆ		
2.	ಸಾರಿಗೆ ಹೆಚ್ಚಿನ ವೆಚ್ಚ		
3.	ಮಾರುಕಟ್ಟೆ ಬೆಲೆ ಏರುಪೇರುಗಳಿಗೆ		
4.	ಬೆಲೆ ಮಾಹಿತಿ ಕೊರತೆ		
5.	ಉತ್ಪನ್ನಗಳು ಕಡಿಮೆ ಖರೀದಿದಾರರು		
6.	ಹೆಚ್ಚು ಅಥವಾ ಮಧ್ಯವರ್ತಿಗಳ ಸಮಸ್ಯೆ		
7.	ಕಡಿಮೆ ಗ್ರಾಹಕರ ಬೇಡಿಕೆ ಅಥವಾ ಮಾರುಕಟ್ಟೆ ಬೇಡಿಕೆ		
8.	ಅಸಮರ್ಪಕ ಮಾರುಕಟ್ಟೆ ಮಾಹಿತಿ		
9.	ಹೆಚ್ಚಿನ ಆಯೋಗದ ಆರೋಪಗಳು		
10.	ಇತರೆ (ಸೂಚಿಸಿ)		

ಭಾಗ 5

ಸಣ್ಣ ರಾಗಿ ಸಾಗುವಳಿ ಕಾರಣಗಳು

ಕಾರಣಗಳು	ಟೀಕೆಗಳು	
	ಹೌದು	ಇಲ್ಲ
1. ಆಹಾರ ಅವಶ್ಯಕತೆಗಾಗಿ		
2. ಪೋಷಣೆಯ ಪೂರಕ್ಕಾಗಿ		
3. ಮೇವಿಗಾಗಿ		
4. ಕೋಳಿಮಾಂಸ ಆಹಾರವಾಗಿ		
5. ಜಾನುವಾರುಗಳ ಮೂಲವಾಗಿ		
6. ಅಚಿತರ ವ್ಯವಸ್ಥೆಗಾಗಿ		
7. ಮಣ್ಣಿನ ಆರೋಗ್ಯ ನಿರ್ವಹಣೆಗಾಗಿ		

CULTIVATION PATTERN AND CONSTRAINTS IN MINOR MILLETS PRODUCTION IN NORTHERN KARNATAKA

KAVYASHREE C. N. **2016** **Dr. K. V. NATIKAR**
MAJOR ADVISOR

ABSTRACT

A study was conducted in Haveri district of Karnataka during 2015-16 with a sample of 120 millet growers. The data was collected by personal interview method using structured schedule to assess the technological gap, extent of cultivation of minor millet, awareness and consumption pattern, marketing constraints, reasons for cultivating of minor millet. Majority of the respondents (36.67 %) had belonged to medium level category of technological gap. More than fifty per cent of technological gap was found in practice like weedicide application in foxtail millet (76.67 %), little millet (65.00 %) and technological gap in disease control in foxtail millet (50.83 %), little millet (45.00 %). There is decrease in the area about 16.53 per cent in foxtail millet over a period of ten years. Further, the area of little millet decreased to 12.72 per cent over a period of ten years. The respondents were aware about using sorter cum grader (77.50 %), sheaving machine (65.00 %) and gravity grader (64.17 %) for processing purpose. The respondents were aware about nutritional value in order of priority *viz*., carbohydrates (60.00 %), protein (55.00 %) and fat (52.50 %). The results with respect to consumption pattern indicated that 41.70 per cent farmers consume millets as breakfast 'once in a month' followed by 24.16 per cent consume 'once in a week' (17.50 %), consume 'once in three month', 10.00 per cent and 6.67 per cent consume 'rarely' and 'everyday'. The important marketing problems indicated were less demand for the products (55.80 %), more number of middlemen (55.00 %), as major constraints. Farmers indicated that, millets were cultivated as a source of food requirement (90.00 %) and as a feed for livestock (64.20 %).