KNOWLEDGE AND ADOPTION PATTERN OF BIOFERTILIZERS BY THE FARMERS OF TUNGABHADRA COMMAND AREA

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1. INTRODUCTION

Agriculture production depends on availability and use of quality and quantity of farm inputs. The chemical fertilizer is supposed to be an essential input for boosting up agricultural production. It had played a significant role in increasing agriculture production in the country. However, the continuous use of chemical fertilizers had deteriorated soil fertility, destroyed soil microbial activity and disturbed environmental balance and ecological soundness. The biofertilizers are believed to be the potential alternative to chemical fertilizers in improvement of soil fertility for sustainable crop production (Singh, 1998). Biofertilizers are assumed to be of great significance as complement or supplement to chemical fertilizers because of significant changes in crop production system, reasonable cost and environmental friendly. They are helpful for proliferation and survival of beneficial micro-organisms in the soil. They are affordable to farmers because of low cost and economically they are very significant in making available plant nutrients like nitrogen and phosphorous (Pandy and Pandey, 2001).

Chemical fertilizers play a major role in meeting the nutrients requirement of crop. An F.A.O study indicated that, between 1965 and 1975, fertilizers were responsible for over 50.00 per cent increase in crop production in the developing agriculture and is also true with India. Over a span of five decades, there has been considerable growth with respect to the production and consumption of chemical fertilizers. In India the consumption of chemical fertilizers during 1991-1992 was 70.7 kg per ha and it had reached the level of 102.1 kg per ha during 2004-2005. In Karnataka, the consumption of chemical fertilizers during 1991-1992 was 76.6 kg per ha and it had increased to 107.3 kg per ha during 2004-2005.

Increasing demand for chemical fertilizers could be met by establishing fertilizer plants. This involves huge investment and is a burden for the economy, since it involves heavy drain on foreign exchange for getting raw materials to the fertilizers plants. In addition, these raw materials are obtained from non-renewable and constantly depleting petroleum based feed stocks. This has led to increase in the price of major inputs like naptha fuel oil, gas grid power, and coal. For promoting the use of chemical fertilizers, Government had provided subsidy to downscale the sales price of fertilizers. The subsidy amount has increased from Rs. 321 crores in 1978-79 to Rs. 8000 crores. Now, the subsidy has become a burden to the country's exchequer. In recent days, after becoming a member country to the World Trade Organization, Indian government has been directed to reduce the subsidy on chemical fertilizers which has resulted in a sharp increase in prices of fertilizers. This event has created variance in the use of chemical fertilizers in crop husbandry.

It is realized that, chemical fertilizers are playing a critical role in meeting the nutrient requirements of crop. But, the productivity has declined mainly because of low crop fertilizer response over the period. Furthermore, the health of the soil and environment has degraded because of indiscriminate use of chemical fertilizer and plant protection chemicals. To overcome the problems experienced in the discriminate use of chemical fertilizers, an integrated plant nutrient management practice comprising of using organic manures, green manures and bio fertilizers along with chemical fertilizers needed to be considered.

The constant and sustained efforts of the microbiologists and biotechnologist for isolating and standardizing the activities of microorganisms have helped to increase the production of bio fertilizers. The bio fertilizers are carrier based preparations containing effective strains of microorganisms like bacteria, algae, fungi alone or in combination with sufficient number which can provide plant nutrients through microbial activity. When these microorganisms are incorporated with seeds/seedlings and in soil they ensure enhanced crop production by way of biological nitrogen fixation, solubalization of fixed phosphate, uptake of phosphorous and other mineral nutrients and synthesis of growth promoting substances. This concept has helped in the development of bio fertilizer industries, as they do not depend on high cost and depleting raw materials. Bio fertilizers are environment friendly, less costly and non bulky. Total production of bio-fertilizers during 2010 was 24,455.00 m.t. Biofertilizers have been recommended to crops like paddy, wheat, barley, maize, jowar, oat, sugarcane, sugarbeet, tobacco, cotton, potato, brinjal, sunflower, mustered, onion, cauliflower, tomato, cabbage and many other vegetable and fruit crops.

Bhagyaraj *et al.* (1980) conducted studies in different locations of Karnataka and found that biofertilizers inoculation increased the yield of blackgram, greengram and bengalgram from 0.4 to 33.00, 1.00 to 162.00 and 0.6 to 119.00 per cent, respectively over untreated.

Jeyaraman (1990) reported that inoculation of blue green algae along with 75 kg N per ha recorded more grain yield of paddy as compared to application of 100 kg N per ha. The soil application of blue green algae had supplemented the nitrogen fertilizer to paddy which brought a saving of 25.00 per cent of recommended nitrogen. In view of the above, more emphasis must be given on efficient use of plant nutrient to achieve the objective of getting higher profits for farmers and reducing environmental pollution.

Bhattacharya and Vandana Dwivedi (19992) observed that nitrogen fixing biofertilizers has advantages such as, fixing of atmospheric nitrogen ranging from 50 kg to 200 kg per ha, improving soil fertility and water holding capacity of the soil, increasing supply of the nutrients, increasing crop yield, developing resistant to crop disease and ensuring a pollution free micro environment.

In spite of several beneficial roles imparted by bio fertilizers, their use has so far been limited. Although, biofertilizers have been promoted for the last three decades, there are no systematic studies to know the extent of use of bio-fertilizers and the constraints associated in their use. In this context there was also a demand from Karnataka State Department of Agriculture for proper feedback on the use of bio fertilizers. With this background, a research study entitled “Study on Knowledge and Adoption of Bio-fertilizers by the Farmers of Tungabhadra Command Area” was formulated with the following specific objectives.

1. To ascertain the knowledge level of farmers towards use of biofertilizers
2. To study the adoption pattern of biofertilizers by farmers
3. To ascertain the factors influencing the use of biofertilizers
4. To identify the constraints faced and obtain suggestions by the farmers in adoption of biofertilizers

Scope of the study

With the existing scenario, it is felt that a study on knowledge and adoption of bio-fertilizers by the farmers is the need of the hour. Only after gaining sufficient knowledge on bio-fertilizers, farmers would develop favorable attitude which will ultimately lead to communicate additional messages on the use of biofertilizers through various mass media. The finding about the adoption and factors influencing adoption of bio-fertilizers will throw light on the adoption behaviour of client system.

The findings on problems and constraints in the adoption of bio-fertilizers would help the planners and extension workers to find out the ways to solve them in a systematic manner.

Limitation of the study

The limitation in respect of conveyance, time and other resources which a student researcher would normally encounter were met with, in this study also. However, care has been taken to make the study objective, definite and systematic as far as possible. Hence, the result of this investigation may be generalized to such of the areas where similar situations prevail.

2. REVIEW OF LITERATURE

An acquaintance which related literature of past studies is most for sound research methodology. This chapter consists of research findings drawn from review of literature relevant to this study. Since there were very few studies relating to adoption of bio-fertilizers, an attempt has been made to present closely related and available literature on knowledge and adoption level of farmers, their personal, socio-psychological characteristics and constraints encountered by them in adoption.

To enable a lucid reading and comprehension the reviewed literature classified into different subheads and presented with reference to the objectives of the study, in the following subtopics

2.1 Knowledge level of farmers about bio-fertilizers

2.2 Adoption pattern of bio-fertilizers by the farmers

2.3 Factors influencing personal, socio-economic and psychological characteristics of the farmers

2.4 Constraints faced by the farmers

2.5 Suggestions given by the farmers

2.1 Knowledge of farmers

Menon and Doraiswamy (1975) revealed that application of fertilizers to get high yields were known by more than 60.00 per cent of the farmers.

Bhilegaonker (1978) concluded that a little over half of the farmer farmers had “medium” level of knowledge with reference of fertilizer use. The study also revealed that 21.00, 22.20 and 18.40 per cent of big, medium and small farmers belonged to the “high” knowledge category, respectively. Whereas, 22.30, 25.00 and 28.90 per cent of big, medium and small farmers respectively, were in “low” knowledge level category, respectively.

Shiva Murthy (1991) observed that in general, areca nut growers had knowledge about simple practices such as selection of seed material and raising seedlings, time and method of fertilizer and farm yard manure application, inter-cultivation, intercropping, time of harvesting, processing of nuts, time of planting and pit size for planting.

Chothe *et al.* (2000) conducted a study on constraints faced by farmers in adoption of bio fertilizers and observed that 58.67 per cent of the farmers had medium level of knowledge about bio control practices, followed by 34.67 per cent and 18.66 per cent who had high and low knowledge, respectively.

Borkar *et al.* (2000) conducted a study on characteristics of farmers influencing their knowledge about use of biofertilizers and observed that majority (58.67%) of the farmers had knowledge about the use of biofertilizers to a moderate level followed by 22.67 per cent of them had high level of knowledge and 18.66 per cent of them had low level of knowledge.

Bhople *et al. (*2001) conducted a study on evaluation of KVK under NGO’s in Vidharbha region and observed that 74.08 per cent of the respondent had knowledge in respect of neem seed kernel extract, HaNPV spraying (27.54%), trichocards (19.44%) and all bio control practices (23.92%).

Bhople and Borkar (2002) in their study on biofertilizers farmer attitude and adoption observed that majority of the farmers (84.00%) belonged to moderate level of knowledge about different kinds of bio-fertilizers and their associated practices, about one tenth of them were adequately equipped with the knowledge about bio fertilizers and appeared in high knowledge category.

Kharatmol (2006) in his study on impact of trainings conducted on vermicompost by Krishi Vigyan Kendra observed that trained farmers had knowledge about the practices like preparation of vermicompost pit (100.00%), construction of vermicompost pit (50.00%), pit filling (96.67%), sequential filling of pit layer wise (75.00%), watering pit (98.33%) and harvesting practice (95.00%).

2.2 Adoption of bio-fertilizers practices by the farmers

Shanmukappa (1978) found that 90.00 per cent of the areca nut growers of Shimoga district had adopted manuring, inter-cultivation, intercropping, drainage and plant protection measures.

Thimmappa (1981) reported that cent per cent of the coconut growers had adopted practices like variety, manuring and inter-cultivation followed by contour bunding (99.17), spacing (44.17) and irrigation (33.33).

Shivalinge Gowda *et al.* (1990) found that most crucial practices of seed treatment and fertilizer application were not adopted by 85.50 per cent and 84.46 per cent of the cardamom growers, respectively.

Nithyashree (1992) observed that majority of the big coffee planters were high in the adoption of improved practices like, sprinkler irrigation, FYM application and plant protection measures, while both big and small growers were similar in the adoption of variety, spacing and application of chemical fertilizers.

Yoganand (1992) found that majority of the big coconut growers had high adoption level as compared to small coconut growers. More than 23 per cent of the coconut growers both big and small, did not use farm yard manure in their gardens and more than 46.66 per cent did not use chemical fertilizers.

Bhople *et al*. (2001) in their study on evaluation of KVK under NGO's in Vidharbha region observed that use of neem seed extract for management of Heliothis bollworm attack on cotton was found to be 49.39 percent. The use of HaNPV against Heliothis boll worm and *Trichoderma Viridea* powder for cotton seed treatment was observed to be only about 25.00 per cent.

Wase (2001) in his study on knowledge and adoption of farmers about Jayanti chilli cultivation observed that majority (56.67%) of the farmers belonged to medium level of adoption about jayanti chilli cultivation technology. The percentage of the farmers had high level of adoption was 23.33 per cent and 20.00 per cent of farmers had low level of adoption.

Bhople and Borkar (2002) in their study on biofertilizers farmer attitude and adoption observed that majority of farmers have used recommended quantity of prescribed sticking agents (64.00%), method of drying of inoculated seeds (98.00%) and observed taking complete care during storage of bio fertilizers (54.33%).

Kharatmol (2006) conducted a study on impact of trainings conducted on vermicompost by Krishi Vigyan Kendra, Bijapur and revealed that high majority of trained farmers had fully adopted the practices of vermicompost like material used for pit construction (100.00%), pit position, material used for filling the pit and harvesting of vermicompost (95.00%), leaving worms to pit, adoption of pit size (90.00%) and meager percentage adopted the practices like pit treatment with chemical (16.67%) and preparation of vermiwash (3.33%).

2.3 Factors influencing of Personal, socio-economic and psychological characteristics of the farmers

2.3.1 Age

Chandregowda (1997) conducted a study in the eastern dry zone of Karnataka among chrysanthemum growing farmers and reported that 59.00 per cent of the farmers belonged to middle age group.

Vijayakumar (1997) indicated that 38.00 per cent of the rose growers belonged to the young age group, 45.00 per cent belonged to middle age and only 17.00 per cent of them belonged to old age.

Angadi (1999) in his study in Bagalkot district of Karnataka state reported that majority (65.00%) of the pomegranate growers were in the middle age group (35 to 50 years). The farmers below 35 years of age were 18.75 per cent, while 16.25 per cent belonged to old age group.

Birajdar (1999) stated that almost three fourth of total grape growers (74.88%) belonged to middle age category. Whereas, 14.37 and 11.25 per cent of farmers belonged to old age and young age categories, respectively.

Saxena *et al.* (1999) observed that age is one of the factors that stimulate the individual for adoption of new technology. It was found that the middle aged farmers (31 to 50 years) had more knowledge of garlic production technology than the other age groups of farmers.

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

Govindagowda and Narayana Gowda (2006) conducted a study in Bijapur and Bangalore Rural districts of Karnataka and revealed that the sizable percentage of Thompson seedless grape growers (40.00%) belonged to young age. In case of Bangalore Blue grape, 47.00 per cent of farmers belonged to middle age.

Raut (2006) conducted a study in Nagpur district of Maharashtra and indicated that more than half of the orange growers (53.33%) were middle aged, followed by old (30.00%) and young age (16.67%) group.

Gotyal (2007) inferred that 42.50 per cent of the grape growers belonged to old age category, followed by middle age (39.00%) and young age (18.50%) group.

Singh and Mankar (2007) in their study conducted on mango growers of Ratnagiri district observed that nearly two-third of the farmers were from middle age (64.55%), followed by old (20.00%) and young age (15.45%) group.

A study in Chitradurga district of Karnataka state on coconut farmers, Thippeswamy (2007) found that majority of the farmers (58.12%) belonged to middle age.

Patil (2008) conducted a study on constraints analysis of grape exporting farmers of Nashik and Sangli districts in Maharashtra state and revealed that grape growers had been spread in all the three age groups *viz.,* young age (36.00%), middle age (34.00%) and old age (30.00%) category.

Hinge (2009) in his study stated that more than 60.00 per cent of wine grape growers belonged to middle age category. Whereas, 23.12 and 15.00 per cent belonged to old age and young age categories, respectively.

2.3.2 Education

Vijayakumar (1997) in his study on rose growers in Bangalore district revealed that 22.00 per cent of the rose growers were illiterates. Majority of them studied upto high school (42.00%), followed by middle school (20.00%), pre-university college (11.00%), primary school (4.00%) and graduation (1.00%).

Angadi (1999) reported that 30.00 per cent of the pomegranate growers had studied upto middle school, followed by 20.60 per cent who had studied upto high school, while, 22.50 per cent were illiterates, only 3.75 per cent of them had received primary school education and nearly 12.00 per cent of the farmers received education upto graduation.

Nagoormeeran and Jayaseelan (1999) in their study in South Arcot district of Tamil Nadu state on shrimp farmers found that majority of the farmers received education upto high school (42.00%), followed by pre-university (22.00%) and middle school (16.00%).

Manay and Farzana (2000) studied socio-economic characteristics of rural families in Bangalore rural district of Karnataka and revealed that 33.33 per cent of them received education upto high school, followed by middle school (22.17%) and illiterates accounted for 18.67 per cent.

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

Moulasab (2004) in his study on mango growers in North Karnataka indicated that more than 23.00 per cent of growers were educated upto primary school, followed by higher secondary school (19.16%) and 14.16 per cent of the farmers were illiterates.

Thiranjangowda (2005) conducted a study in Belgaum district of Karnataka and observed that 43.75 per cent of cut flower growers had studied upto graduation, followed by pre-university (35.93%), while, 24.43 per cent of the farmers had received education upto high school.

Govinda Gowda and Narayana Gowda (2006) noticed that majority of Bangalore Blue grape growers (48.00%) were in higher education category. While, majority of Thompson Seedless grape growers (50.00%) belonged to low education category.

Gotyal (2007) observed that 43.50 per cent of the grape growers belonged to low educational level, followed by higher educational level (35.00%) and middle (21.50%) educational level.

Rajashekhar (2009) conducted a study on analysis of technological gap in papaya cultivation in Bidar and Gulbarga districts of North Karnataka and observed that 25.00 per cent of papaya growers had education upto middle school, followed by 21.67 per cent who were illiterates.

2.3.3 Land Holding

Nagaraj (1996) conducted a study on knowledge and adoption pattern of improved cultivation practices of groundnut farmers of Pavagada taluk in Tumkur district and reported that 48.00 per cent of the participant farmers belonged to medium land holding, followed by 30.67 per cent in small land holding category and only 8.00 per cent of the participants were big farmers.

Saravanakumar (1996) in his study in Dharmapuri district in Tamil Nadu observed that majority of the mango growers (64.18%) had medium land holding, while, 21.66 and 14.66 per cent had small and big land holdings, respectively.

Angadi (1999) found that majority of the pomegranate growers (62.50%) possessed land holding between 10-30 acres and 31.25 per cent possessed above 30 acres. Only 6.25 per cent of respondents had land holding below 10 acres.

Karpagam (2000) observed that majority of the farmers (40.83%) had medium land holding and 31.66 per cent of the farmers had semi medium land holding.

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

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

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

Sureshkumar (2009) in a study on technological gap in recommended soybean cultivation practices reported that 45.33 per cent of farmers belonged to medium land holding category (10.01-25.00 acres), followed by 22.67 per cent of them belonged to semi-medium land holding category (5.01-10.00 acres), 16.67 per cent of them were small farmers (2.51-5.00 acres) and 4.66 per cent were big land holding farmers.

2.3.4 Cosmopoliteness

Rogers and Shoemaker (1971) found that early adopters were more cosmopolite than late adopters in case of farming community.

Kumbar (1983) in his study on adoption behaviour and consultancy pattern of grape growers of Bijapur district in Karnataka indicated that a large majority of the farmers (63.27%) were found in high category of cosmopoliteness, while 36.73 per cent belonged to low category of cosmopoliteness.

Shashidhara (2004) conducted a study on influencing factors and constraints in drip irrigation by horticultural farmers of Bijapur district of Karnataka and found that 41.50 per cent of farmers visited the nearest town occasionally, followed by 37.50 per cent 'once in 15 days'. Whereas, farmers who visited to town for the personal or domestic purpose were 54.10 per cent followed by 35.00 per cent for new technology or agriculture purpose.

Raghavendra (2005) conducted a study on cauliflower growers of Belgaum district of Karnataka and observed that 40.50 per cent of the farmers visited the nearest town 'once in a fortnight', followed by 30.33 and 18.84 per cent who visited the town 'once in a month' and 'once in a week', respectively. Farmers who visited town for personal or domestic purpose were 50.83 per cent, followed by 43.84 per cent visited for want of new technology or information related to agriculture.

Govinda Gowda and Narayana Gowda (2006) conducted a study in Bijapur and Bangalore Rural districts and observed that more number of Thompson Seedless grape growers had medium (41.00%) and low (43.00%) cosmopoliteness. In case of Bangalore Blue grape growers, majority (62.00%) of them had high cosmopoliteness.

2.3.5 Social Participation

Patil (1990) while studying technological gap and constraints in the adoption of improved rice cultivation practices in Konkan region of Maharashtra noticed that majority (79.00%) of the paddy growers were found in medium social participation category and 14.00 per cent in low social participation followed by high social participation (2.50%), whereas only 4.50 per cent of farmers had not participated in social activities.

Saikrishna (1998) conducted a study in Raichur district on Andhra migrant farmers and reported that 6.00 per cent of farmers were members of milk co-operative society, 1.33 per cent of farmers were office bearers. Only 3.33 per cent of farmers were the members of village panchayat and no one was its office bearer, two per cent of migrant farmers were members of youth club and co-operative bank.

Vijay Kumar (2000) conducted a study on sugarcane growers in Belgaum district of Karnataka and found that 29.00 per cent of the farmers were members of co-operative society and 2.00 per cent were office bearers. Whereas, 8.00 per cent of the farmers were members of youth club and 5.33 per cent of the farmers were members of gram panchayat.

Chandracharan (2003) in a study on Sujala watershed project beneficiary farmers in Dharwad district reported that 4.00 and 2.66 per cent of the farmers were members and office bearers, respectively of gram panchayats whereas 30.00 per cent and 43.33 per cent of farmers attended the meetings regularly and occasionally, respectively.

2.3.6 Extension Contact

Belligeri (1996) conducted a study in Hanagal taluk of Dharwad district on agro-forestry practices and revealed that majority of farmers were aware of Agricultural Assistants (85.00%), followed by Assistant Agricultural Officer (64.00%), Subject Matter Specialist (41.00%), Assistant Director of Agriculture (16.00%), Forest Motivator (26.00%) and Range Forest Officer (14.00%).

Saravanakumar (1996) in his study revealed that majority (51.67%) of the mango growers never contacted Assistant Agricultural Officer, whereas, 42.50 per cent of the farmers had regular contact with village administrative officers and 50.83 per cent contacted Agricultural Officers occasionally.

Vijayakumar (1997) indicated that majority of the rose growers (54.00%) had very low extension contact followed by medium (41.00%) and high extension contact (5.00%).

Angadi (1999) found that majority of the farmers (65.62%) had contact with Agricultural Officers whenever there was a problem. Only 13.12 per cent had contact with scientists, whenever there was a problem.

Ramanna *et al.* (2000) revealed that 70.00 per cent of the farmers had medium level extension agency contact and 30.00 per cent of the farmers had high level extension agency contact.

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

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

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

2.3.7 Economic Motivation

Sreenivasreddy (1995) conducted a study on knowledge and adoption of recommended mango cultivation practices in Kolar district of Karnataka state and stated that 40.00 per cent of the mango growers had high level of economic motivation, followed by medium (34.00%) and low (26.00%) economic motivation, respectively.

Saravanakumar (1996) found that majority of the farmers (60.83%) had medium economic motivation. While, 16.67 and 22.50 per cent belonged to low and high level of economic motivation, respectively.

Chandran (1997) revealed that 46.66 per cent of the farmers belonged to medium economic motivation category.

Sawant (1999) in his study on effect of different modes of presentation of information of mushroom cultivation in Maharashtra state reported that 78.00 per cent of the farmers belonged to medium economic category.

Natikar (2001) in his study on attitude and use of farm journals by the farmers found that majority of the farmers (65.00%) had medium economic motivation. While, 18.75 and 16.25 per cent belonged to high and low level of economic motivation, respectively.

Raghavendra (2005) conducted a study on cauliflower growers of Belgaum district of Karnataka and found that more than half of the farmers (52.50%) had medium level of economic motivation. Whereas, 25.00 and 22.50 per cent belonged to high and low level of economic motivation categories, respectively.

Govinda Gowda and Narayana Gowda (2006) revealed that more number of the Thompson seedless grape growers (47.00%) and little more than half of the Bangalore Blue grape growers (51.00%) of Bijapur and Bangalore Rural districts possessed high level of economic motivation.

Gotyal (2007) indicated that nearly equal percentage of the grape growers belonged to medium (42.50%) and high (40.50%) level of economic motivation.

Patil (2008) witnessed that 58.00 per cent of the grape exporting farmers belonged to medium economic motivation category followed by high (29.00%) and low (13.00%) economic motivation categories, respectively.

Hinge (2009) indicated that the wine grape growers were distributed equally in all the three categories of economic motivation *viz.,* high (34.37%), medium (33.12%) and low (32.50%).

2.3.8 Scientific orientation

Palaniswamy and Sriram (2001) observed in their study on modernization characteristics of sugarcane growers that 70.75 per cent of farmers belonged to medium level of scientific orientation category, whereas 17.01 and 12.24 per cent of farmers belonged to high and low level of scientific orientation category, respectively.

2.3.9 Risk Orientation

Ananda (1992) in his study conducted on grape growers of Bangalore district in Karnataka indicated that 48.84 per cent of drip irrigation adopters had medium risk orientation, followed by 38.33 and 13.03 per cent of them had low and high risk orientation, respectively.

Saravanakumar (1996) observed that majority of the mango growers (70.83%) belonged to medium level of risk orientation, followed by low (15.0%) and high (19.17%) level of risk orientation, respectively.

Birajdar (1999) pointed out that medium risk orientation was exhibited by 71.88 per cent of the grape growers. While, nearly an equal per cent of the farmers belonged to high (14.37%) and low (13.75%) categories of risk orientation, respectively.

Sawant (1999) conducted a study on different modes of presentation of information on mushroom cultivation in Maharashtra and observed that majority (75.00%) of the farmers had medium risk bearing capacity. While, 17.00 per cent had high risk bearing capacity.

Natikar (2001) indicated that 67.50 per cent of farmers belonged to high risk orientation category, followed by medium risk orientation (16.86%) and low risk orientation (15.63%) categories.

Babanna (2001) conducted a study on arecanut growers of Shimoga district in Karnataka and pointed out that 37.50 per cent of arecanut growers belonged to medium category, followed by 31.66 per cent of them had high risk orientation. The remaining 30.80 per cent of them had low risk orientation.

Vedamurthy (2002) reported that 45.33 per cent of areca growers belonged to medium risk orientation category, followed by 38.00 per cent belonged to high risk orientation and 16.66 per cent belonged to low risk orientation.

Shashidhara (2003) found that an equal per cent of farmers had low (36.67%) and high (35.50%) risk orientation and the remaining 27.78 per cent possessed medium risk orientation.

Govinda Gowda and Narayana Gowda (2006) revealed that majority of both Thompson Seedless grape growers (82.0%) and Bangalore Blue grape growers (88.00%) possessed medium level of risk orientation.

Gotyal (2007) found that around half of the grape growers belonged to medium risk orientation category, followed by high risk (34.50%) and low risk (16.50%) orientation category.

Hinge (2009) revealed that nearly an equal percentage of the wine grape growers had low (36.25%) and medium (35.62%) risk orientation and the remaining 28.12 per cent of the farmers had high risk orientation.

2.4.10 Management Orientation

Visweswaran (1979) noticed that migrant farmers had better planning orientation than non-migrant farmers.

Sakharakar (1995) noticed that two third of the farmers belonged to medium category of management orientation. However, an equal number of farmers had low and high level of management orientation.

Chikhale *et al* (1996) revealed that majority of the farmers (71.00%) belonged to medium management orientation category, while 16.50 and 12.50 per cent belonged to low and high management orientation categories, respectively.

Chaudhari *et al* (1999) revealed that 50.00 per cent of farmers belonged to high management orientation category

Ninga Reddy (2005) revealed that majority of the farmers (70.66%) belonged to medium management orientation category, whereas 15.33 and 14.00 per cent of them fell under high and low level of management orientation, respectively.

2.3.11 Mass Media Utilization

Saravanakumar (1996) observed that 23.33 per cent of the mango growers of Dharmapuri district subscribed news papers, farm magazines and read them regularly. While, 42.50 and 42.86 per cent of the farmers regularly listened and viewed the agricultural programmes, respectively.

According to Birajdar (1999), a large majority (71.26%) of the grape growers in Solapur district had medium level of mass media participation, while, 14.37 per cent of each of them belonged to low and high level of mass media participation.

Dhamodaran and Vasanthkumar (2001) noticed that 53.33 per cent of the farmers had medium level of mass media exposure, followed by 40.00 per cent of the farmers with high level of mass media exposure.

From a study on arecanut growers of Shimoga district in Karnataka, Vedamurthy (2002) noticed that relatively more number of arecanut growers (48.00%) belonged to medium mass media participation category. While, 37.00 per cent had high mass media participation and 27.33 per cent fell in low mass media participation category.

Shashidhara (2003) in his study on drip irrigation farmers in Shimoga and Davanagere districts of Karnataka and reported that 41.11 per cent of the farmers belonged to medium level of mass media participation, followed by low (35.56%) and high level (23.33%) mass media participation.

Sunilkumar (2004) revealed that 59.17 per cent of the farmers were occasionally listening agricultural programmes in radio, whereas, 30.00 per cent of them viewed agricultural programmes in television occasionally. While, 70.83 and 85.00 per cent of the farmers never read the news papers and farm magazines, respectively.

Govinda Gowda and Narayana Gowda (2006) revealed that majority of Thompson Seedless grape growers (55.00%) belonged to medium mass media use category, followed by 33.00 and 12.00 per cent of the farmers who belonged to high and low mass media use categories, respectively.

Gotyal (2007) concluded that more than half of the grape growers (51.00%) had low mass media participation, 39.00 per cent had high and only 10.00 per cent had medium level of mass media participation.

Hinge (2009) reported that higher proportion of the wine grapes growers (38.75%) had medium mass media participation and nearly one third of them (32.50%) belonged to low mass media participation category. Whereas, 28.75 per cent of them belonged to high mass media participation category.

2.3.12 Innovative Proneness

Ananda (1992) noticed that 40.00 per cent of the drip irrigating grape growers of Bangalore district had medium innovative proneness, whereas, an equal proportion (30.00%) of farmers were grouped under low and high innovative proneness, respectively.

Kumar (1998) conducted a study on banana growers in Bangalore district and pointed out that 40.00 per cent of the banana growers had low innovative proneness.

Chandrashekhara (1999) reported that majority of coffee growers were almost equally divided under low (38.50%) and high (40.00%) innovative proneness categories, while, 21.50 per cent of them had medium innovative proneness.

Govinda Gowda and Narayana Gowda (2006) inferred that considerable percentage of Thompson Seedless grape growers (46.00%) belonged to medium innovative proneness category. While, a little more than 50.00 per cent of Bangalore Blue grape growers (52.00%) belonged to high innovative proneness category.

Thippeswamy (2007) inferred that majority of coconut growers (68.75%) were found in medium innovative proneness category, followed by 18.12 and 13.12 per cent of the respondents were found in high and low innovative proneness categories, respectively.

Patil (2008) in his study on organic vegetable growers in Belgaum district indicated that more than half of the organic vegetable growers had high innovative proneness (53.57%), followed by medium (32.14%) innovative proneness and only 10.29 per cent of them belonged to low innovative proneness category.

Jadhav (2009) conducted a study on technological gap in adoption of recommended practices of mango cultivation and reported that 42.00 per cent of the mango growers were found in medium innovative proneness category, followed by 31.33 and 26.67 per cent were distributed in high and low innovative proneness categories, respectively.

2.4 Constraints faced by farmers

Salam (1975) reported that high price of fertilizers, lack of financial resources and non-availability of fertilizers were the major reasons for inadequate use of fertilizers as expressed by Pakistan farmers. The reasons enumered by groundnut growers for non adoption of recommended chemical fertilizers were lack of knowledge, water scarcity, lack of money and adulteration of gypsum fertilizers (Godhandapani, 1985)

Kabi and Poi (1988) opined that for better performance of bio-fertilizers, greater emphasis should be laid on the identification and development of location specific nodulation strain. Important constraints identified in using bio-fertilizers were; ignorance of both the users and the supervising staff at grass root level, non availabity of package of practices of inoculating bio-fertilizers, lack of improved transportation of rhizobium strain.

Verma and Bhattacharya (1990) in their study indicated the factors responsible for the unsatisfactory use of bio-fertilizers as non availabity of quality inoculants, low shelf life of culture, improper soil condition and lack of education and training among farmers about the use of bio-fertilizers.

Suresh (1991) reported that the constraints inability to remember the method, quantity and time encountered by nearly two-third (63.33%) of the farmers were of application of various fertilizers. Inadequacy of organic manure was the primary constraints experienced by most (88.33) of the farmers. Non-availability of desired brand of nutrient was also a constraints faced by 79.17 per cent of the farmers and the occurrence of heavy weed growth and poor fertilizers response due to water logging were the constraints experienced by 71.67 and 65.00 per cent of the farmers respectively in the adoption of nutrient management practices.

Bhattacharya and Vandana Dwivedi (1992) observed that with several beneficial roles of bio-fertilizers, their use is still not popular due to the constraints such as lack of awareness among farmers on the inoculants, supply of poor quality culture, lack of promotion and extension work and insufficient publicity. Further, the study suggested structured programmes like field demonstrations to educate the farmers on the use of bio-fertilizers.

Kute and Patel (1993) in their study concluded that the farmers did not have proper knowledge on use of bio-fertilizers which was a pre-requisite for driving maximum benefit. They also identified that no definite pricing policy existed for bio-fertilizers. In view of these, the study suggested educating the farmers through effective demonstration on bio-fertilizers use and having a uniform pricing policy for the bio-fertilizers.

Motsara (1993) identified the constraints in using bio-fertilizers as supply of poor quality bio-fertilizers, inadequate quality control facilities at the production level, short shelf life of bio-fertilizers, improper storage and transportation facility, lack of suitable marketing system, unawareness of dealers about the usefulness of bio-fertilizers and unawareness among farmers and extension workers about potential of bio-fertilizers. In view of this, the author suggested that there was a need for standardization of production process, setting standards for different types of bio-fertilizers and periodically checking the quality to help to improve the popularity of bio-fertilizers.

Narasimha Murthy and Mahava Rao (1994) observed that the popularity of bio-fertilizers in Karnataka suffered because of inherent constraints such as non availability of location and crop specific strain of rhizobium. To popularize the bio-fertilizer use, they suggested training of departmental personal and farmers in bio-fertilizer use, to create awareness, demonstrations and trails are to be established on the farmers field.

Marwaha (1995) found that use of bio-fertilizers has not received desire at tension. This was mainly because of inadequate awareness among the extension workers and farmers about their utility. Other identified reasons for the non adoption of bio-fertilizers are short shelf life and non availabity of bio-fertilizers in time. However, proper education to the extension workers, dealers and farmers about significant and economic feasibility of their application both by seed treatment and soil application would help in promoting their adoption. This would effectively help the nutrient management in crop husbandry by combining both chemical fertilizers and bio-fertilizers.

Amarnath (1999) in his study on adoption of improved technologies in paddy, sugarcane and groundnut categorized the constraints into institutional, agronomic and social constraints. Institutional constraints included high chemical cost and non availability of input itself. Agronomic constraints included better manual operation and performing particular operation in particular variety like set treatment of sugarcane with bavistin only in seed cane. The social constraints included lack of experience, lack of conviction and non availability of labour.

Chothe and Borkar (2000) in their study on constraints faced by farmers in adoption of biofertilizers observed that lack of knowledge about biofertilizers and low income were the major constraints expressed by the farmers.

Bhople and Borkar (2002) in their study on biofertilizers farmer attitude and adoption observed that constraints encountered by the users of biofertilizers were non availability of bio fertilizers at near by place for use (51.33%).

2.5 Suggestions given by farmers

Nagpurkar (1998) observed that the cotton growers suggested that PKV technologies should be demonstrated at research stations, less expensive method could be evolved, the prices of PKV Hy-2 cotton seed should be reduced, technology requiring less labour should be evolved and detailed information and sources of information should be provided to the cotton growers from time to time.

Sagwal (1998) noted that there should be facilities for checking of seed and pesticides (100.00%), providing good quality seed pesticides at reasonable rates (100.00%), high support price (100.00%), credit for purchase of agricultural equipments and other inputs (80.00%) and sale of produce at village level (76.00%).

Gaikwad and Gunjal (2000) noted some suggestions to overcome the problems faced by farmers. More than 50.66 per cent beneficiaries from all KVKs stated that loan should be made available with lower interest rate, and low cost agricultural technologies should be recommended by extension agencies.

Hegde (2001) suggested some measures to overcome the challenges in dairy enterprise as reducing the cost on milk handling, clean milk production, effective animal husbandry extension service should be established to facilitate close dialogue with the farmers and dairy farmers associations should be established and strengthened to acquire new technologies and understand milk marketing scenario.

Parasu Ram Singh *et al.* (2004) reported that farmers did not have sufficient knowledge about the nutritive value of concentrate mixture and animals requirements. It suggested that there was an urgent need to educate the farmers about nutritive value of cereal grains, pulse grains and Pashu Ahar and their role for the optimum livestock production.

Khin Maro Oo (2005) reported that major suggestions for improvement of dairy enterprise were better milk price for the produces, the loan amount price for the purchase of dairy animals to be increased, providing water facilities by sinking open wells, tube wells or by constructing small tanks for their animals sufficiently, small scale dairy industries are to be encouraged at village level to produce dairy products, more importance to be given to educating them on improvement of dairy management practices especially on feeding of milch animals, pregnant animals and care of pregnant animals.

More than 50.66 per cent beneficiaries emphasized the formation of farmer group to make transfer of technology easy. Similarly, 25.33 to 48.00 per cent of beneficiaries suggested involvement of women in dissemination of agricultural information. More than 65.33 per cent beneficiaries from KVK demanded to have market facility nearby villages. Whereas more than 70.66 per cent suggested for availability of market information to the farmer.

Kharatmol (2006) suggested the development of community vermicompost pits to obtain sufficient raw material for vermicompost (100.00%), procedure to be made simple for availing subsidy schemes (88.33%), interest on loan should be reduced and procedure to be simplified (81.66%) and need more trainings on use of vermiwash (30.00%).

3. METHODOLOGY

The materials and methods used in the present study are presented under the following heads.

3.1 Locale of the study

3.2 Selection of the villages and respondents

3.3 Measurement of dependent variables

3.4 Measurement of independent variables

3.5 Instruments for data collection

3.6 Statistical methods

3.1 Locale of the study

This study was conducted during 2010-11 in the randomly selected villages of Raichur, Bellary and Koppal districts coming under the Tungabhadra Command Area. Raichur, Bellary and Koppal districts were purposively selected since these districts come under Tungabhadra Command Area because paddy and other pulse crops are the major crops grown in these area for which bio-fertilizers is used.

3.2 Selection of villages and respondents

The number of respondents selected for the study was 120. There was uniformity in selection of respondents from each village as the number of bio-fertilizer users. The details of the selection of taluks, villages and number of respondents are given below.

Sl. No.	Districts	Taluks	Villages	No. of respondents
1.	Raichur	Raichur	Udumgal Kanapur	10
			Matmaari	10
		Manvi	Ghorkal	10
			Sunkeshwar	10
2.	Bellary	Bellary	Bench kottal	10
			Bamblapur	10
		Shiraguppa	Ibrahimpur	10
			kududraala	10
3.	Koppal	Gangavati	Basavapatna	10
			Vaddarahatti	10
		Koppal	Munarabad	10
			Giniger	10
		Total		120

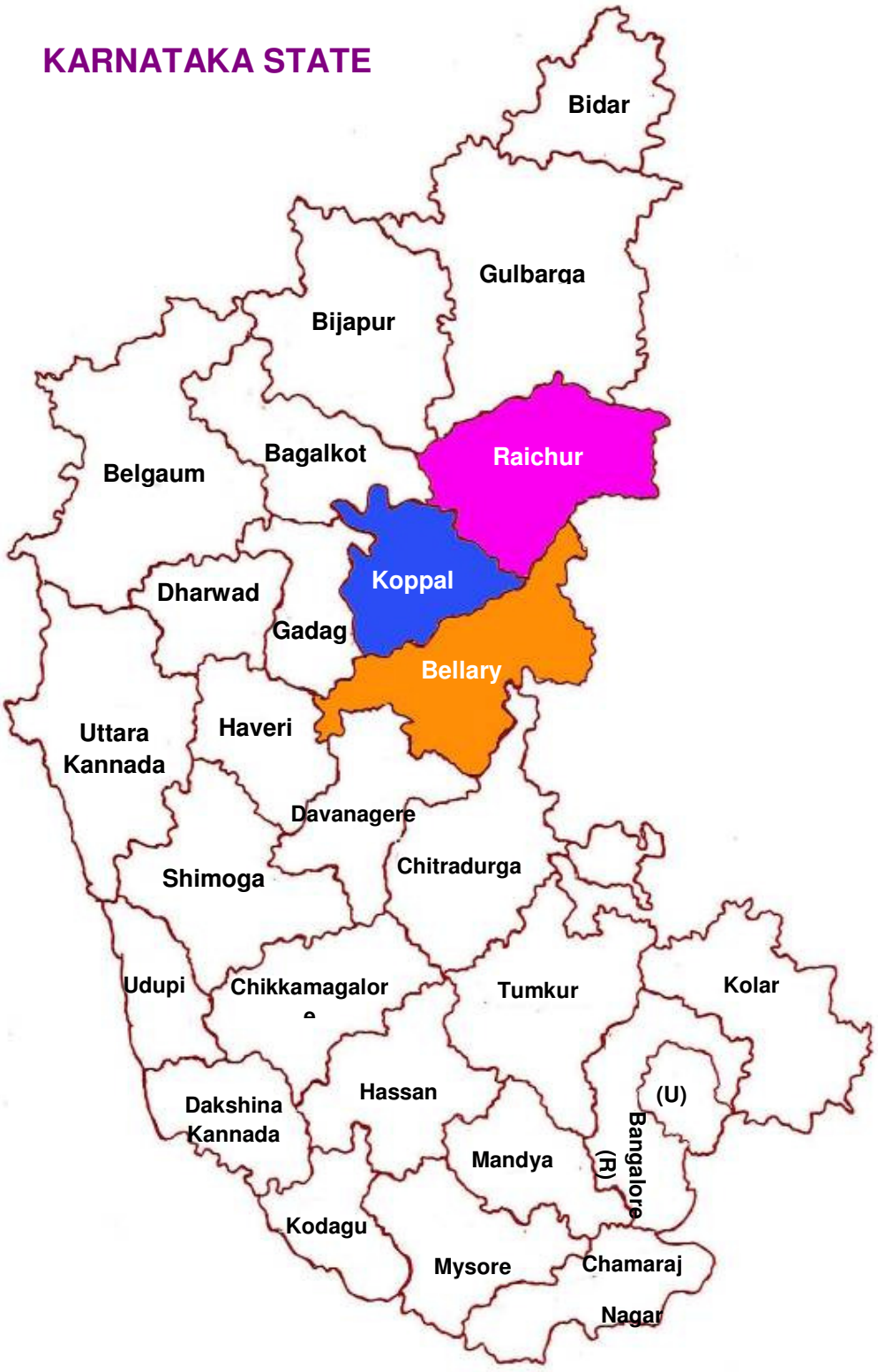

Fig. 1: Map showing the study area

3.3 Measurement of dependent variables

One of the objectives of the study was to assess the knowledge and adoption level of farmers with respect to biofertilizer technology. These variables were measured by following the procedure given below.

3.3.1 Knowledge level of farmers regarding biofertilizer technology

Knowledge refers to information possessed by an individual. It also refers to those behaviors and test situations which emphasis the remembering of some phenomenon or material by an individual either by recognition or by recall of ideas. The knowledge level in the present study has been operationalized as the extent to which an individual possesses understanding and comprehension on various dimensions of biofertilizer technology.

Knowledge was assessed through developing and using a teacher made knowledge test as suggested by Anastasi (1961). The knowledge test was constructed based on the package of practices and discussion with subject matter specialties, extension personnel of the University of Agricultural Sciences and the State Department of Agriculture.

A list of 12 items was selected for the purpose and each was administered in a question form to the respondents to obtain the response. The questions and answers pertaining to the knowledge test were carefully designed in consultation with members of the advisory committee. The answers to questions were quantified by giving one score to the correct answer and zero score to the incorrect one. As a result, the maximum score that one could get was 12 and the minimum was zero. The total knowledge score for each respondent was calculated by summing up the number of items correctly answered by an individual respondent. After computing knowledge level score, the respondents were grouped into low, medium and high knowledge categories based on the mean and standard deviation as indicated below.

Category	Score
Low	Less than $(\overline{X} - 0.425$ SD)
Medium	Between $(\overline{X} \pm 0.425$ SD)
High	More than $(X + 0.\overline{42}5$ SD)

3.3.2 Adoption level of farmers

Rogers and Shoemaker (1971) defined adoption as the decision to make full use of a new idea as the best course of action available.

As in the case of knowledge test, the important biofertilizer recommendations were listed out, finalized and narrowed down to ten practices. These practices were narrated to the respondents one by one, each time enquiring whether that practices had been adopted by them or not.

The scores were assigned for the adoption of each of the biofertilizer recommendations by farmers in the following way.

Adoption pattern	Score
Full adoption	2
Partial adoption	1

Partial adoption refers to any deviation in adoption from the normal recommendation. The total score for a respondent was obtained by summing up the score obtained on each individual practice. The maximum and minimum scores obtainable by each respondent were 14 and 7, respectively. The respondents were then grouped into low, medium and high adoption categories based on the mean and standard deviation as indicated below.

Category	Score
Low	Less than $(\overline{X} - 0.425$ SD)
Medium	Between $(\overline{X} \pm 0.425$ SD)
High	More than $(X + 0.\overline{42}5$ SD)

3.4 Measurement of independent variables

The independent variables considered in this study are,

Sl. No.	Variable	Procedure followed
1.	Age	Procedure followed by Hinge (2009)
2.	Education	Procedure followed by Hinge (2009)
3.	Land holding	Procedure followed by Patil (1990)
4.	Cosmipoliteness	Procedure followed by Hinge (2009)
5.	Social participation	Procedure followed by Trivedi (1963)
6.	Extension contact	Procedure followed by Patil (1990)
7.	Economic orientation	Scale developed by Supe (1969) and as followed by Budihal (2001)
8.	Scientific orientation	Scale developed by Supe (1969) and followed by Shashidhara (2006)
9.	Risk orientation	Scale developed by Supe (1969) and followed by Shashidhara (2006)
10.	Management orientation	Scale developed by Samanta (1977) and as followed by Govinda Gouda (2002)
11.	Mass media utilization	Procedure followed by Hinge (2009)
12.	Innovative proneness	Procedure followed by Moulik's (1965)

3.4.1 Age

Age is operationalized as the chronological age of the farmers in completed years at the time of investigation. The respondents were categorized into three age groups based on the procedure followed by Hinge (2009).

Category	Age (years)
Young	Less than 31
Middle	31 to 50
Old	More than 50

3.4.2 Education

Education refers to the number of years of formal schooling obtained by the farmers. It was quantified by using the items and weights used by Hinge (2009).

Education	Weightages
Illiterate	0
Primary school	1
Middle school	2
High school	3
Pre university / Diploma	4
Graduate	5

3.4.3 Land holding

It refers to the number of acres of land possessed by the farmer. The criterion prescribed by the Karnataka Land Reforms Act 38 of 1966 (Part B), 99, 95-96 under section 2(a) 32 as one acre of irrigated or garden land was equivalent to 3 acres of dry land.

The criterion prescribed by the Ministry of Rural Development, Government of India vide circular No.280-12/16/19 RD-III (Vol.II) dated 15th November 1991 was used and the respondents were grouped into five different categories

Category	Land holding (acres)
Marginal farmers	Up to 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

3.4.4 Cosmopoliteness

Cosmopoliteness is the degree to which an individual is oriented outside to his immediate social system. This variable was measured using the procedure followed by Hinge (2009) .Two dimensions of the variable were considered in this case are

1. The frequency of visit to the nearest town
2. The purpose of visit to the town

The items and scoring pattern followed in quantifying the frequency of visit were as follows:

Item	Score
Twice in a week	5
Once in a week	4
Once in fifteen days	3
Once in a month	2
Seldom	1
Never	0

The items and scoring pattern to quantify the purpose of visit were

Item	Score
All visits relating to agriculture	5
Some visits relating to agriculture	4
Personal / domestic	3
Entertainment	2
Other	1
No response	0

The cumulative maximum score obtainable was 10 and minimum was 0. Depending upon total score obtained by each of the respondent, they were grouped into three categories, which were 'low', 'medium' and 'high'. Mean (X) and standard deviation (SD) were used as measure of check.

Category	Score
Low	Less than $(\overline{X} - 0.425\ SD)$
Medium	Between $(\overline{X} \pm 0.425\ SD)$
High	More than $(X + 0.\overline{425}\ SD)$

3.4.5 Social participation

It is the degree of involvement of the respondents from mere membership to organizational positions and his active participation in the activities of local formal organizations. This was quantified using the method followed by Trivedi (1963) with suitable changes in items and weights. The organizations considered in the present study included Panchyats, Taluk Panchayat, Organic Farmers Club, Service Co-operative Societies and Self Help Groups. The items and weights used were as under.

(a) Membership in Organization

Sl. No.	Items	Weights
1	Not a member in any of the organization	0
2	Member in any one of the organizations	1
3	Office bearer in any one of the organizations	2

The respondents are classified into 3 groups using mean as a measure of check.

Social Participation	Criterion Scores
Low	< Mean – 0.425 SD
Medium	Mean ± 0.425 SD
High	> Mean + 0.425 SD

3.4.6 Extension contact

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

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

3.4.7 Economic motivation

Economic motivation refers to the extent to which an individual is oriented towards achievement of the maximum economic ends such as maximization of profits.

Supe (1969) has developed a scale to measure this variable. Prasad (1983) used this scale with modified scoring pattern of dichotomous pattern of responses (Yes/No) instead of a five point continuum of response as used by Supe (1969). For the present investigation, the statements considered by the above researchers were not suitable. Therefore, same number of statements which are suitable for the farmer respondents were developed and used in the present study. The first four statements were positive, while the last two were negative. A score of one was assigned for the 'Yes' response and 0 score for 'No' response in case of positive statements. The scoring procedure was reversed in the case of negative statements. The scores obtained on each statements were summed up to obtain the total scores for a respondent on this variable. The maximum score obtainable by a respondent was 6 and the minimum was 0. The respondents were classified as low, medium and high groups as per the scores obtained by the respondents mean and SD as measure of check.

Economic motivation	Score
Low	< Mean – 0.425 SD
Medium	Mean ± 0.425 SD
High	> Mean + 0.425 SD

3.4.8 Scientific orientation

This refers to the degree to which a farmer was oriented to the use of scientific methods in farming and decision making. The scientific orientation scale developed by Supe (1969), with little modification was used in the present study. This scale consists of five positive statements. The responses were elicited from the respondents on a three point continuum. The scoring procedure followed was 2, 1 and 0, for agree, undecided and disagree, respectively.

The respondents were classified as low, medium and high groups as per the scores obtained by the respondents mean and SD as measure of check.

Scientific Orientation	Score
Low	< Mean – 0.425 SD
Medium	Mean ± 0.425 SD
High	> Mean + 0.425 SD

3.4.9 Risk Orientation

It is operationalized as the degree to which a farmer is oriented towards risk and uncertainty and has courage to face the various risks involved in farming. Risk orientation was measured with the help of risk orientation scale developed by Supe (1969) and as followed by Shashidhara (2006). The scale consisted of six statements, of which first and fifth statements were negative and all others were positive. The items were rated on a five point continuum ranging from 'strongly agree', 'agree', undecided', 'disagree' and 'strongly disagree' with weightages of 5, 4, 3, 2 and 1 for positive statements and 1, 2, 3, 4 and 5 for negative statements, respectively. The scores ranged from 6 to 30.

Based on the scores, the respondents were grouped into three categories by using mean ($\underline{X}$) and standard deviation (SD) as measure of check.

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

3.4.10 Management orientation

Management orientation referred to the degree to which a farmer was oriented towards scientific farm management comprising of planning, production and marketing functions of his farm.

In order to know the respondent's management orientation, the scale developed by Samanta (1977) was used. The management orientation scale had three components viz., Technical orientation, production orientation and marketing orientation with six statements under each component. The statements with serial numbers 1, 3 and 6 related to planning, 1, 3, 4 and 5 related to production and 2, 3 and 6 related to marketing indicated positive orientation while the remaining statements indicated negative orientation.

Each statement was provided with four point response categories. The positive statements were given scores for strongly agree 4, agree 3, disagree 2 and strongly disagree 1. Scoring pattern was reversed for the negative statements. The management orientation score of an individual was the sum of scores obtained by him for all the statements in the scale. Thus, the maximum and minimum scores for each respondent were 72 and 18, respectively. Higher score revealed a favourable management orientation of the respondent.

Taking into consideration the total scores obtained by the respondents, they were grouped into three categories with mean and SD as a measure of check.

Category	Score
Low (X - 0.425 SD)	<37.05
Medium (X $\pm$ 0.425 SD)	37.05 – 76.03
High (X + 0.425 SD)	>76.03

3.4.11 Mass media utilization

This variable is operationalized as the exposure of an individual to different mass media channels such as newspaper, farm magazine, radio, television and degree of participation in them. The respondent was asked to indicate whether he subscribed to or owned the channel said above. Then, the respondent was asked to indicate his degree of participation in terms of reading habit, listening behavior and viewing habit. This variable was quantified on the basis of the procedure followed by Hinge (2009).

Subscription / Possession	Score
Subscriber / Owned	1
Non-subscriber / Not-owned	0
Reading / Listening / Viewing habit	Score
Regular	2
Occasional	1
Never	0

Based on the total scores of mass media participation, the respondents were classified into three categories such as 'low', 'medium' and 'high' by considering mean (X) and standard deviation (SD) as measure of check.

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

The cumulative maximum score obtainable was 10 and minimum was 0. Depending upon total score obtained by each of the respondent, they were grouped into three categories, which were 'low', 'medium' and 'high'. Mean (X) and standard deviations (SD) were used as measure of check.

3.4.12 Innovative Proneness

It refers to the behavior pattern of an individual who has interest and desire to seek changes in farming techniques and ready to introduce such changes when practical and feasible. For quantifying this variable, Moulik's (1965) "Self rating innovative proneness scale" was used. The scale consisted of three sets of statements. Each set of statement contained three sub-statements with weights 3, 2 and 1 indicating high, medium and low degree of

innovative proneness. After obtaining the respondents 'most like' and 'least like' responses for each of the three sets of statements, a score of 3 was given to 'most like' response and score 1 for 'least like' response. The final scoring was arrived by summing up the scores of the weights of the 'most like' statements and the weights of the 'least like' statements. The scores ranged from 18 to 54.

Then, the respondents were categorized based on mean (X) and standard deviation (SD) as measure of check.

Innovative proneness	Criterion Scores
Low	< Mean – 0.425 SD
Medium	Mean ± 0.425 SD
High	> Mean + 0.425 SD

3.5 Instruments for data collection

The information was elicited from the respondents with the help of the structured schedule. A copy of this schedule is furnished in Appendix. Data collection was done during January-March, 2011 by interviewing the farmers personally in Raichur, Bellary and Koppal districts.

3.6 Statistical methods

The following statistical methods were used to analyze and interpret the data.

1. Frequently and percentages were used to explain the different personal, socio-psychological characteristics of bio-fertilizer users.

2. Simple correlation test was used to find out the nature of relationship between independent variables and dependent variables.

4. RESULTS

In this chapter, the results of the study are presented under the following headings.

4.1 Knowledge of farmers about biofertilizer technology

4.2 Adoption of biofertilizer practices by the farmers

4.3 Personal and socio-psychological characteristics of farmers

4.4 Mass media utilization by the farmers

4.5 Social participation by the farmers

4.6 Extension contact by the farmers

4.7 Factors influencing use of bio-fertilizers

4.8 Relationship between dependent and independent variable

4.9 Constraints encountered in the adoption of bio-fertilizer pattern by the farmers

4.10 Suggestions by the farmers in adoption of bio fertilizers

4.1 Knowledge of farmers about biofertilizer technology

4.1.1 Overall knowledge level of farmers

A perusal of results in Table 1 indicates that more number of respondents (38.33%) had medium level of knowledge about bio-fertilizers, whereas 32.50 and 29.16 per cent had low and high level of knowledge, respectively (Fig. 2).

4.1.2 Knowledge of farmers about specific aspects of biofertilizer usage

A perusal of results in Table 2 indicates that majority of respondents had correct knowledge on type of bio fertilizer used (65.83%),source of availability of biofertilizers (64.16), method of application (56.66%), quantity required for one hectare (65.83%), time of application (69.16%), nutrient supplied by bio fertilizer (60.83%), using bio fertilizer without mixing with chemical fertilizer (87.50%), using bio fertilizer before expiry date (80.00%), and advantage of bio fertilizer usage (80.00%) (Fig. 3). A meager number of them were not aware of quantity available in packets (24.16%), cost of bio fertilizer (23.33%) and time gap within which the treated seeds to be sown (43.33%).

4.2 Adoption of biofertilizer practices by the farmers

4.2.1 Overall adoption of biofertilizer pattern by the farmers

A close examination of Table 3 indicates that a considerable percentage (37.50%) of respondents belonged to medium level of adoption, whereas 52.50 per cent and 10.00 per cent of biofertilizer users were in the low and high level categories of adoption, respectively (Fig. 4).

Table 1: Overall knowledge level of farmers about biofertilizer technology

(n=120)

Category	Frequency	Percentage
Low (<7.18)	39	32.50
Medium (7.18-8.92)	46	38.34
High (>8.92)	35	29.16
	Mean = 8.05	SD = 2.04

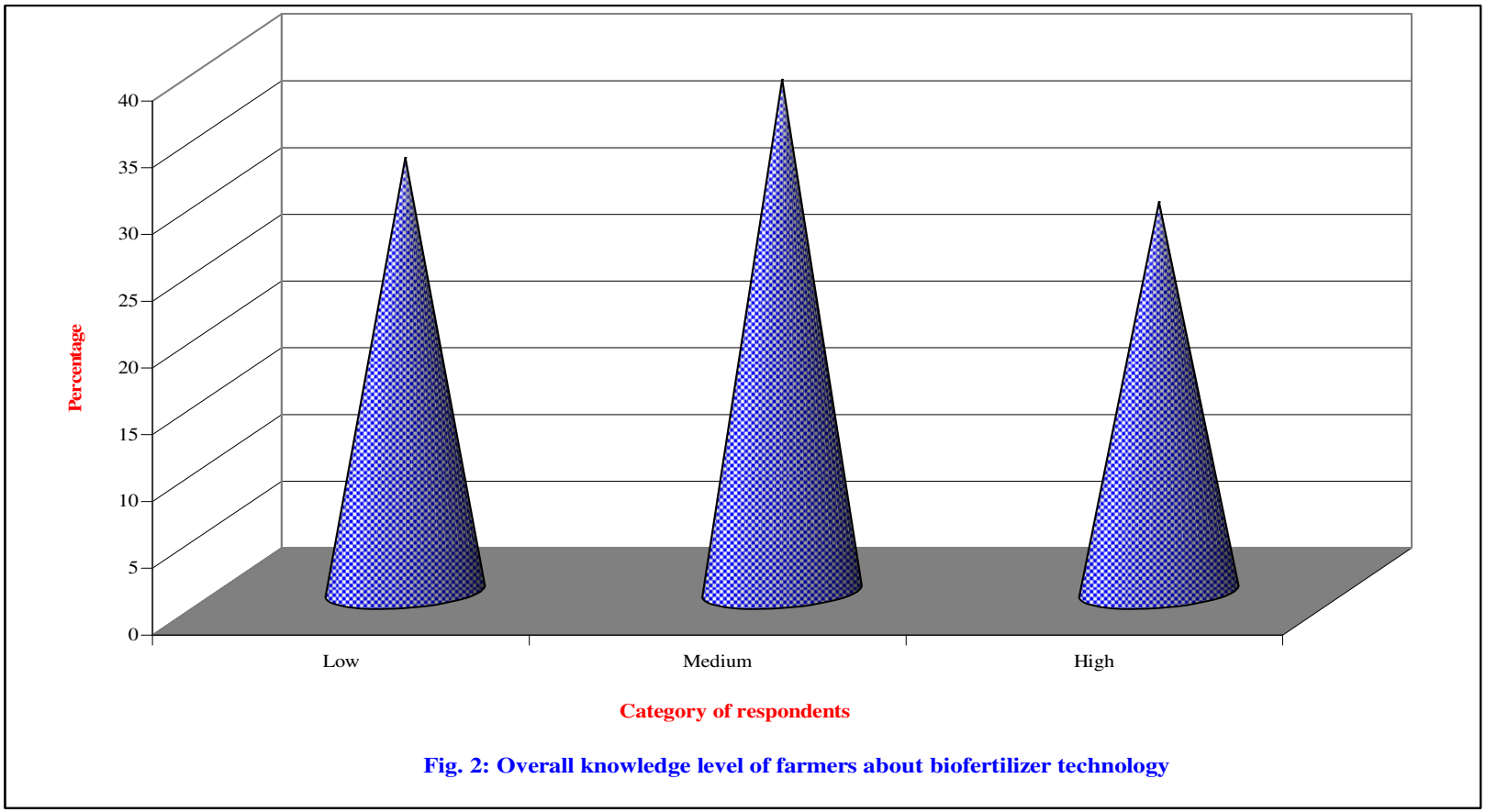

Fig. 2: Overall knowledge level of farmers about biofertilizer technology

Table 2: Knowledge of farmers about specific aspects of biofertilizer usage*

(n=120)

Sl. No.	Specific knowledge about biofertilizer usage		Knowledge level	
			F	%
1	Type of the biofertilizer used	Rhizobium	65	54.16
		Azospirillum	57	47.50
		PSB	73	60.28
		Azolla	79	65.83
		Others	15	12.50
2	Source of availability	Agricultural University	59	49.16
		RSK	67	55.83
		Fertilizer shop	77	64.16
		Others	19	15.83
3	Method of application	Seed treatment	58	48.33
		Seedling dipping	47	39.16
		Broadcasting	68	56.66
		Split application	63	52.50
4	Quantity required for one hectare	1 kg	61	50.83
		10 kg	69	57.50
		500 gm	63	52.50
5	Time of application	Before sowing	83	69.16
		After sowing	78	65.00
6	Time gap with in which the treated seeds to be sown		108	90.00
7	Using biofertilizer without mixing with chemical fertilizer		105	87.50
8	Using biofertilizer before expiry date		96	80.00
9	Nutrient supplied by the biofertilizers	Nitrogen	70	58.33
		Phosphorus	50	41.66
		Both	73	60.83
10	Quantity available in packets	250 gm	27	22.50
		500 gm	29	24.16
		1 kg	10	8.33
11	Cost of biofertilizers	Rs. 50/kg	26	21.66
		Rs. 70/kg	28	23.33
		Rs. 50/kg	24	20.00
12	Advantage of biofertilizers usage		96	80.00

* Multiple responses possible

4.2.2 Adoption of specific biofertilizer practices by the farmers

An observation of Table 4 and Fig. 5 shows that more number of the respondents had adopted practices namely, type of bio fertilizer (33.33%), quantity of bio fertilizer used for one hectare (25.83%), time of application (34.16%), method of application (34.31%), per cent of yield increased by using bio fertilizer (37.59%), using bio fertilizer before expiry date (32.50%) and using bio fertilizer without mixing with chemical fertilizer (39.16%). Thus, the result indicates that there was considerable variation in the extent of adoption of specific biofertilizer practices by the farmers.

4.3 Personal and socio-psychological characteristics of farmers

Under this heading the characteristics of respondents namely, age, education, land holding, cosmopoliteness, social participation, extension contact, economic motivation, scientific orientation, risk orientation, management orientation, mass media use and innovation proneness are dealt.

Details on these aspects are given in Table 5. It is seen from the above table that the majority of the respondents belonged to middle age group (48.33%), had medium level of education (32.50%), had semi medium land holders (45.00%) belonged to social participation (42.50%), economic motivation (74.16%) and mass media used (51.66%).

Regarding other variables, like cosmopoliteness, extension contact, scientific orientation, risk orientation, management orientation and innovative proneness the respondents were more or less equally scattered in all the three categories namely low, medium and high.

4.4 Mass Media Utilization by the farmers

It could be seen from Table 6 that majority of the respondents possessed television (85.00), 58.33 per cent subscribed news papers. It can also be seen that 48.33 per cent of respondents possessed radio and 18.33 per cent of respondents reads farm literature (Fig. 6).

Whereas very high percentage (81.66%) of respondents regularly viewed television followed by 12.50 and 5.83 per cent of respondents viewed occasionally and never, respectively.

However 30.83 per cent of respondents regularly read news paper followed by 51.66 and 17.50 per cent of respondents reading new paper occasionally and never, respectively.

4.5 Social participation by the farmers

It could be seen from Table 7 indicates that more number of respondents were members in co- operative society (27.50) followed by self help groups (22.50%) and few were in organic farmers club (18.33). It can also be seen from the table that 20.83 per cent of respondents regularly participated in self help groups followed by occasionally (1.66%).

However 16.66 per cent of respondents regularly participated in co- operative society followed by 8.33 and 6.66 per cent, who participated occasionally and never respectively.

4.6 Extension contact by the farmers

Data presented in the Table 8 revealed that more number of respondents contacted inputs dealers once in a week (12.50%), once in a fort night (46.66%), once in a month (25.83%), occasionally (10.00%) and never (5.00%) contacted.

Whereas very few respondents contacted once in a week (6.66%), once in a fort night (16.83%), once in a month (19.16%) occasionally (26.66%) and never (36.66%) contacted Agriculture Assistant.

4.7 Factors influencing use of bio fertilizers

It could be seen the Table 9 and Fig. 7 that factors influencing respondents for use of fertilizers increase in yield (81.66%), followed by others factors which are regular supply (78.33%), easy to procure (70.83%), low price (64.16%), enhance in soil fertility (45.00%) and eco friendly (25.00%).

Table 3: Overall adoption level of farmers about biofertilizer practices

(n=120)

Category	Frequency	Percentage
Low (<3.54)	63	52.50
Medium (3.54-4.65)	45	37.50
High (>4.65)	12	10.00
	Mean=4.1	SD=1.30

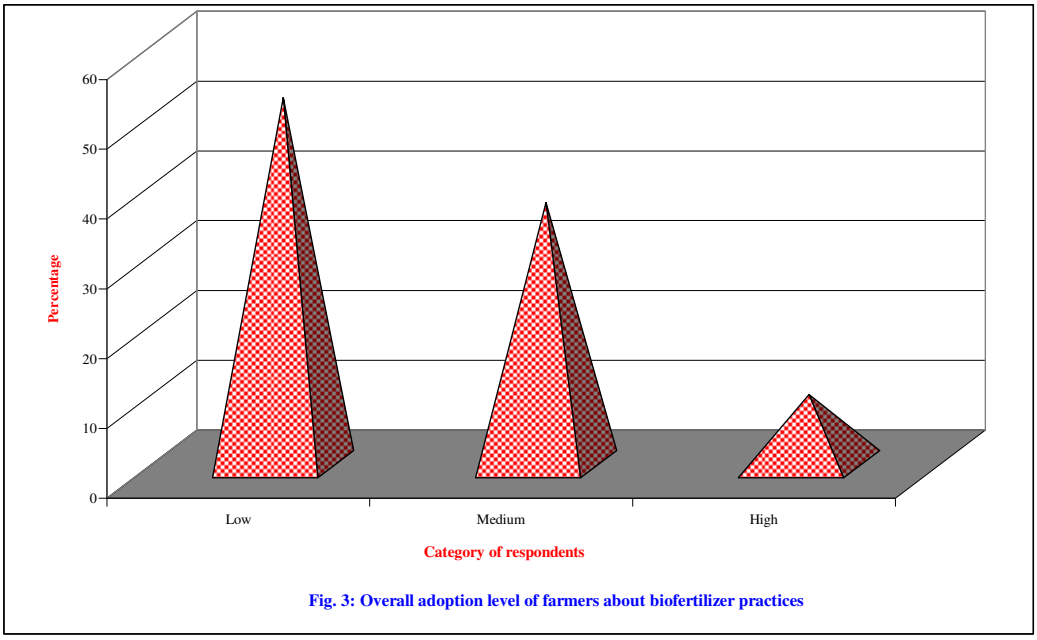

Fig. 3: Overall adoption level of farmers about biofertilizer practices

Table 4: Adoption of specific biofertilizer practices by the farmers

(n=120)

Sl. No.	Adoption of specific practices of biofertilizers usage		Adoption level	
			F	%
1	Type of biofertilizer used	Rhizobium	32	26.66
		Azospirillum	23	19.16
		PSB	37	30.83
		Azolla	40	33.33
		Others	5	4.16
2	Quantity of biofertilizers used for one hectare	200-400 gm	23	19.16
		1 kg	27	22.50
		25 kg	31	25.83
3	Time of application	Before sowing	38	31.66
		After sowing	41	34.16
4	Using biofertilizer without mixing with chemical fertilizers		47	39.16
5	Using biofertilizers before expiry date		39	32.50
6	Method of application	Seed treatment	34	28.83
		Seedling dipping	23	19.16
		Broadcasting	41	34.31
		split application	31	25.83
7	Percent of yield increased by using biofertilizer	2%	45	37.50
		5%	39	32.50

Table 5: Personal and socio-psychological characteristics of farmers

(n=120)

Sl. No.	Characteristics	Frequency	Percentage
1	**Age**		
	Young (less than 31 years)	36	30.00
	Middle (31 to 50 years)	58	48.34
	Old (more than 51 years)	26	21.66
2	**Education**		
	Illiterate	18	15.00
	Primary school	14	11.67
	Middle school	39	32.50
	High school	28	23.33
	Pre-university/ Diploma	16	13.34
	Graduate	5	04.16
3	**Land holding**		
	Marginal farmers	14	11.67
	Small farmers	23	19.16
	Semi medium farmers	54	45.00
	Medium farmers	17	14.17
	Big farmers	12	10.00
4	**Cosmopoliteness**		
	Low (<5.46)	42	35.00
	Medium (5.46-6.73)	31	25.84
	High (>6.73)	47	39.16
	Mean=6.1	SD=1.49	
5.	**Social participation**		
	Low (<2.90)	38	31.66
	Medium (2.90-4.54)	51	42.50
	High (>4.54)	31	25.84
	Mean=3.72	SD=1.91	
6	**Extension contact**		
	Low (<1.62)	40	33.34
	Medium (1.62-3.17)	50	41.66
	High (>3.17)	30	25.00
	Mean=2.4	SD=1.83	

Contd…..

Sl. No.	Characteristics	Frequency	Percentage
7	**Economic motivation**		
	Low (<17.90)	15	12.50
	Medium (17.90-21.92)	89	74.16
	High (>21.92)	16	13.34
	Mean=19.91	SD=4.72	
8	**Scientific orientation**		
	Low (<6.87)	32	26.66
	Medium (6.87-8.72)	40	33.34
	High (>8.72)	48	40.00
	Mean=7.8	SD=2.16	
9	**Risk orientation**		
	Low (<3.14)	53	44.16
	Medium (3.14-4.38)	30	25.00
	High (>4.38)	37	30.84
	Mean=3.76	SD=1.46	
10	**Management orientation**		
	Low (<6.81)	43	35.84
	Medium (6.81-8.80)	41	34.16
	High (>8.80)	36	30.00
	Mean=7.81	SD=2.34	
11	**Mass media use**		
	Low (<5.12)	33	27.50
	Medium (5.12-6.15)	62	51.66
	High (>6.15)	25	20.84
	Mean=5.60	SD=1.20	
12	**Innovative proneness**		
	Low (<3.69)	38	31.66
	Medium (3.69-4.73)	31	25.84
	High (>4.73)	51	42.50
	Mean=4.21	SD=1.21	

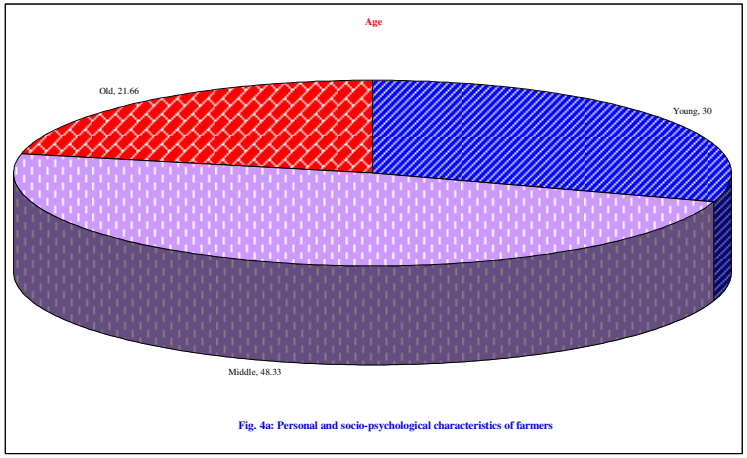

Fig. 4a: Personal and socio-psychological characteristics of farmers

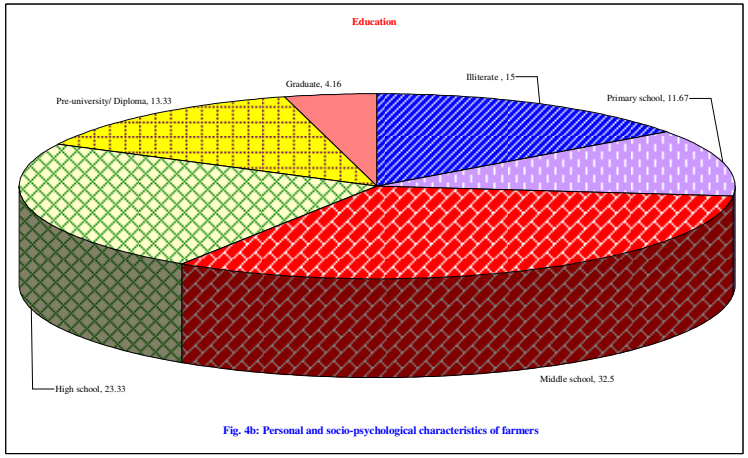

Fig. 4b: Personal and socio-psychological characteristics of farmers

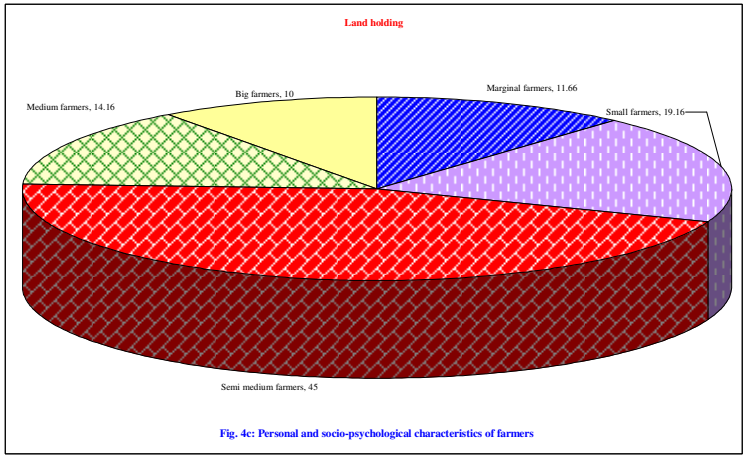

Fig. 4c: Personal and socio-psychological characteristics of farmers

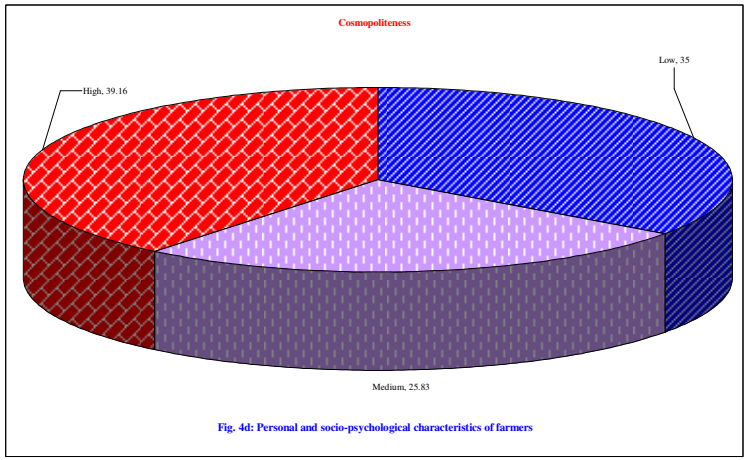

Fig. 4d: Personal and socio-psychological characteristics of farmers

Fig. 4: Personal and socio-psychological characteristics of farmers

Fig. 4 Contd….

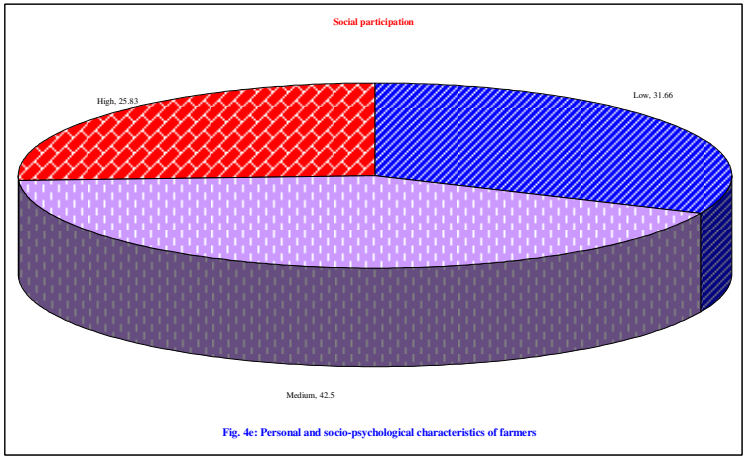

Fig. 4e: Personal and socio-psychological characteristics of farmers

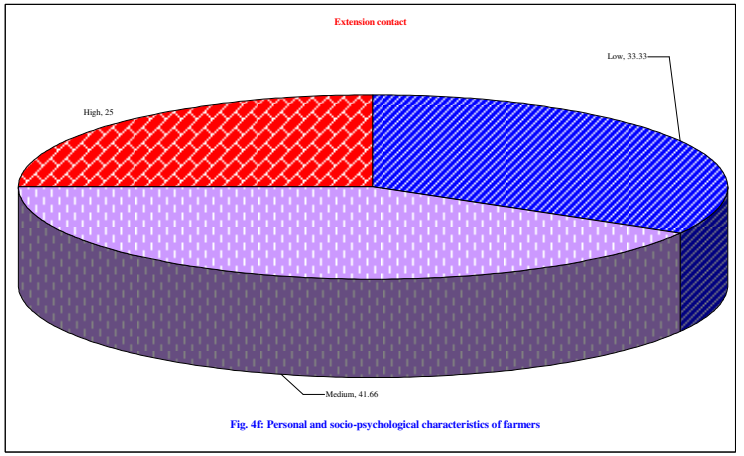

Fig. 4f: Personal and socio-psychological characteristics of farmers

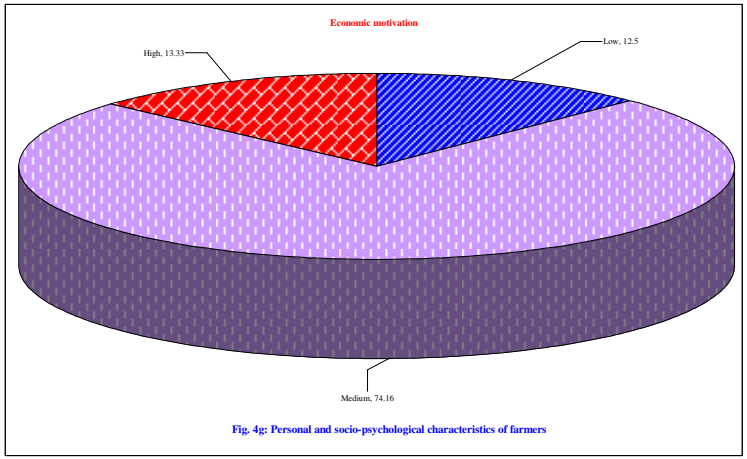

Fig. 4g: Personal and socio-psychological characteristics of farmers

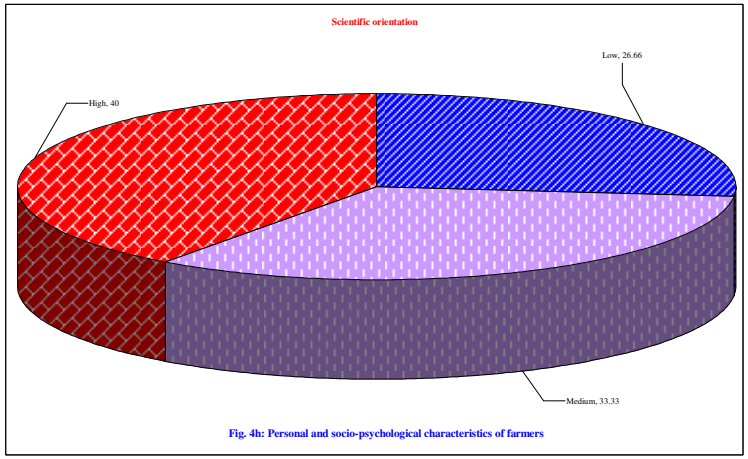

Fig. 4h: Personal and socio-psychological characteristics of farmers

Fig. 4 Contd…

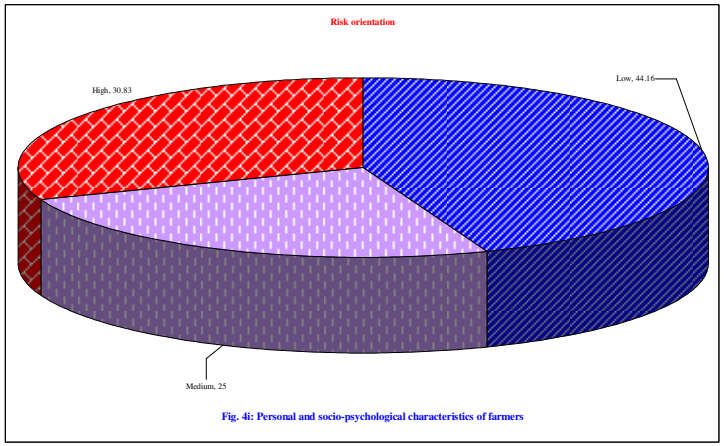

Fig. 4i: Personal and socio-psychological characteristics of farmers

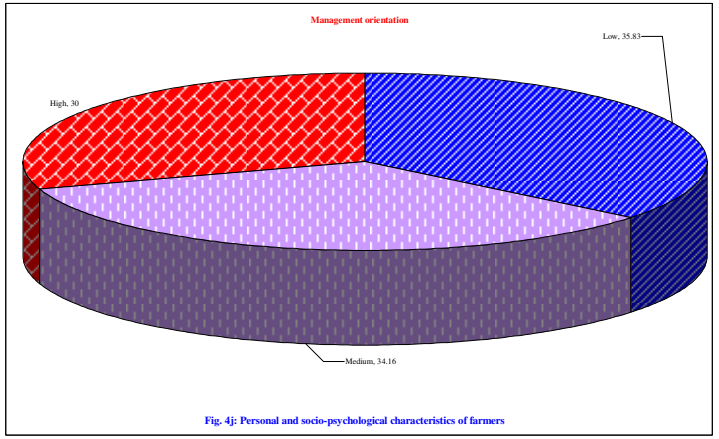

Fig. 4j: Personal and socio-psychological characteristics of farmers

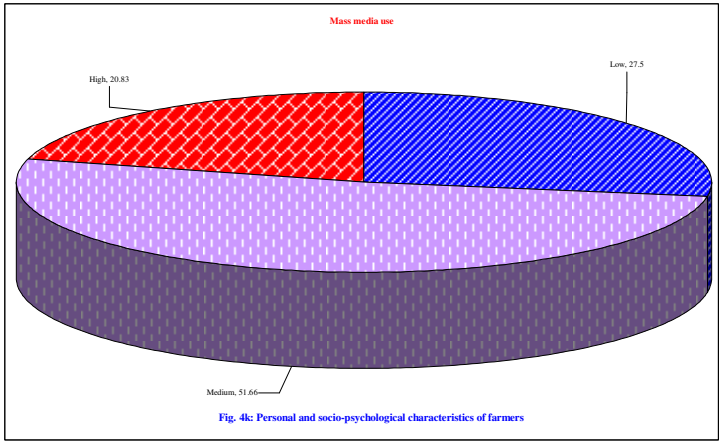

Fig. 4k: Personal and socio-psychological characteristics of farmers

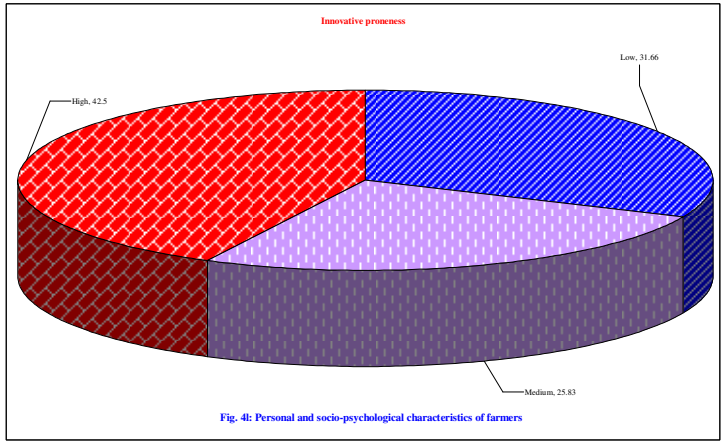

Fig. 4l: Personal and socio-psychological characteristics of farmers

Table 6: Mass Media Utilization by farmers

(n=120)

Mass media	Subscription /possession		Extent of Utilization					
			Regularly		Occasionally		Never	
	F	%	F	%	F	%	F	%
Newspaper	70	58.33	37	30.83	62	51.66	21	17.50
Farm literature	22	18.33	10	8.33	21	17.50	89	74.16
Radio	58	48.33	12	10.00	28	23.33	80	66.66
T V	102	85.00	98	81.66	15	12.50	7	5.83

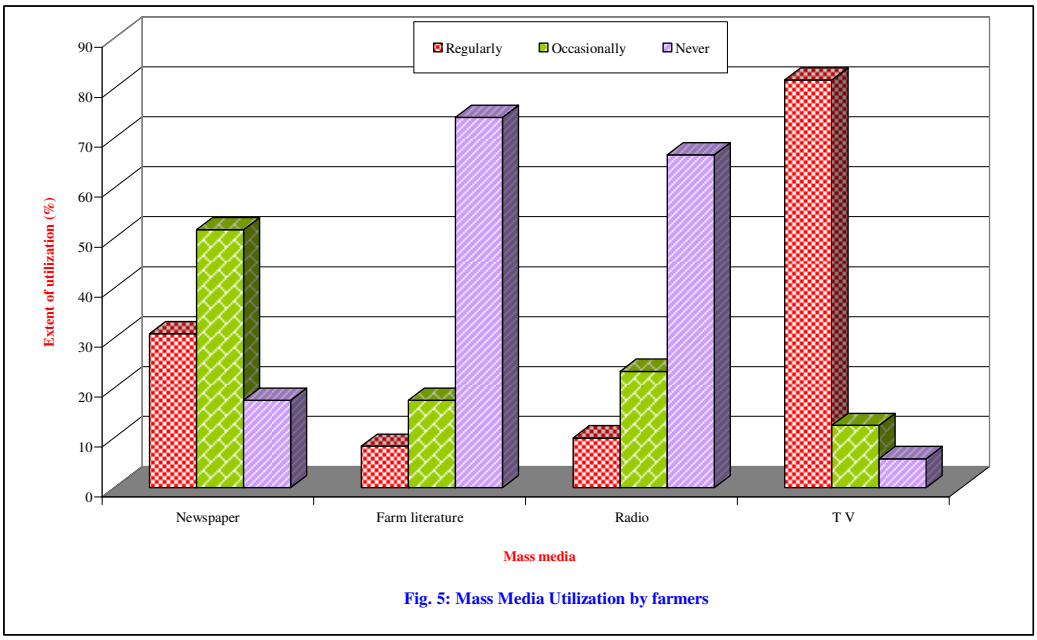

Fig. 5: Mass Media Utilization by farmers

Table 7: Social participation by farmers

(n=120)

Sl. No	Organization	Nature of membership				Extent of Participation					
		Member		Office bearer		Regularly		Occasionally		Never	
		F	%	F	%	F	%	F	%	F	%
1.	Co-operative society	33	27.50	5	4.16	20	16.66	10	8.33	8	6.66
2.	Youth club	17	14.16	2	1..66	5	5.00	8	6.66	6	5.00
3.	Taluk panchayat	5	4.16	0	0.00	4	3.33	1	0.83	0	0.00
4.	Organic farmers club	22	18.33	3	2.50	13	10.83	8	6.66	4	3.33
5.	Self Help Groups	27	22.50	0	0.00	25	20.83	2	1.66	0	0.00

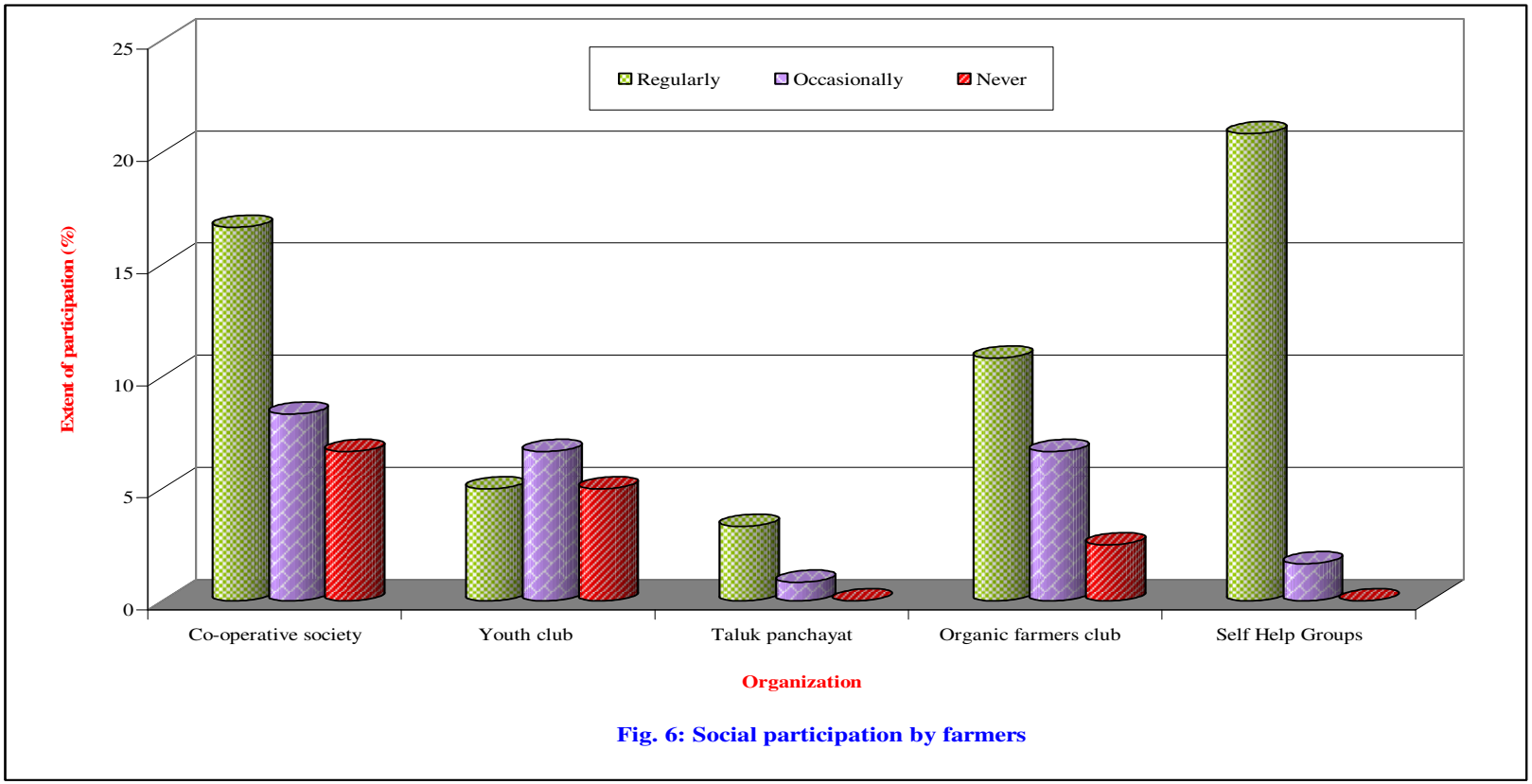

Fig. 6: Social participation by farmers

4.8 Relationship between dependent and independent variables

4.8.1 Relationship between personal and socio-psychological characteristics of farmers and their knowledge

The correlation coefficient (r) with respect to 12 variables are presented in Table 10 which revealed that out of 12 independent variables, 9 variables, namely education, social participation, extension contact, economic motivation, scientific orientation, risk orientation, management orientation, mass media use and innovative proneness had positive and significant relationship with the knowledge level of farmers. Whereas age and cosmopoliteness had negative and significant relationship with their knowledge level.

However, the variables namely land holding and economic motivation were not significantly related to the knowledge level of the respondents.

4.8.2 Relationship between personal and socio-psychological characteristics of farmers and their adoption

The correlation coefficients presented in Table 11 and Fig. 8 revealed that education, social participation, extension contact, economic motivation, scientific orientation, risk orientation, management orientation, mass media use and innovation proneness had positive and significant relationship with the adoption level of respondents. Age and land holding were found to be negatively associated with their adoption. Other variables namely cosmopoliteness were not significantly related to the adoption level of respondents.

4.9 Constraints encountered in the adoption of biofertilizer practices by the farmers

Constraints encountered in the adoption of biofertilizer technology by the respondents were analysed and presented in Table 12 and Fig. 9. Majority of the respondents expressed that lack of reinforcement efforts from the department (85.00%) was the major constraint encountered in the adoption of bio fertilizer technology. The other constraints were inability to understand the details of the bio fertilizers (77.50%), lack of finance (70.00%), lack of knowledge about practices (54.16%) and non availability of bio fertilizers locally at times when needed (67.50%).

Non availability of extension literature on bio fertilizers usage (41.66%), improper soil condition (16.66%) and low shelf life of bio fertilizers (5.00%) were also expressed by some respondents

4.10 Suggestions offered by the farmers in adoption of bio fertilizers

Suggestions offered by the farmers in adoption of bio fertilizer were analysed and presented in Table 13 and Fig. 10. Majority of the respondents expressed that bio fertilizer usage can be increased if they are provided free of cost was the major suggestion offered by the farmers to adopt bio fertilizer technology. The other suggestions were availability of bio fertilizers in villages (76.66%), subsidy for bio fertilizers (71.66%).

Technical aspects on bio fertilizers should be provided by extension agencies (25.00%) and awareness campaign on popularization of bio fertilizer (12.50%) were also expressed as suggestions by some respondents.

Table 8: Extension Contact by farmers

(n=120)

Sl. No	Extension Workers	Frequency of Contact				
		Once in a week	**Once in a fortnight**	**Once in a month**	**Occasionally**	**Never**
1	Agriculture Assistant	8 (6.66)	13 (10.84)	23 (19.17)	32 (26.67)	44 (36.66)
2	Assistant Agriculture Officer	4 (3.34)	10 (8.34)	15 (12.50)	17 (14.16)	74 (61.66)
3	Assistant Horticulture Officer	2 (1.66)	6 (5.00)	18 (15.00)	22 (18.34)	72 (60.00)
4	Assistant Director of Agriculture	3 (2.50)	11 (9.16)	24 (20.00)	25 (20.84)	57 (47.50)
5	Agricultural Scientists	0 (0.00)	4 (3.34)	20 (16.67)	44 (36.66)	52 (43.33)
6	Input dealers	15 (12.50)	56 (46.66)	31 (25.84)	12 (10.00)	6 (5.00)
7	Extension personnel of private companies	0 (0.00)	12 (10.00)	32 (26.66)	40 (33.34)	36 (30.00)

Note : Figure in the parentheses indicate percentage

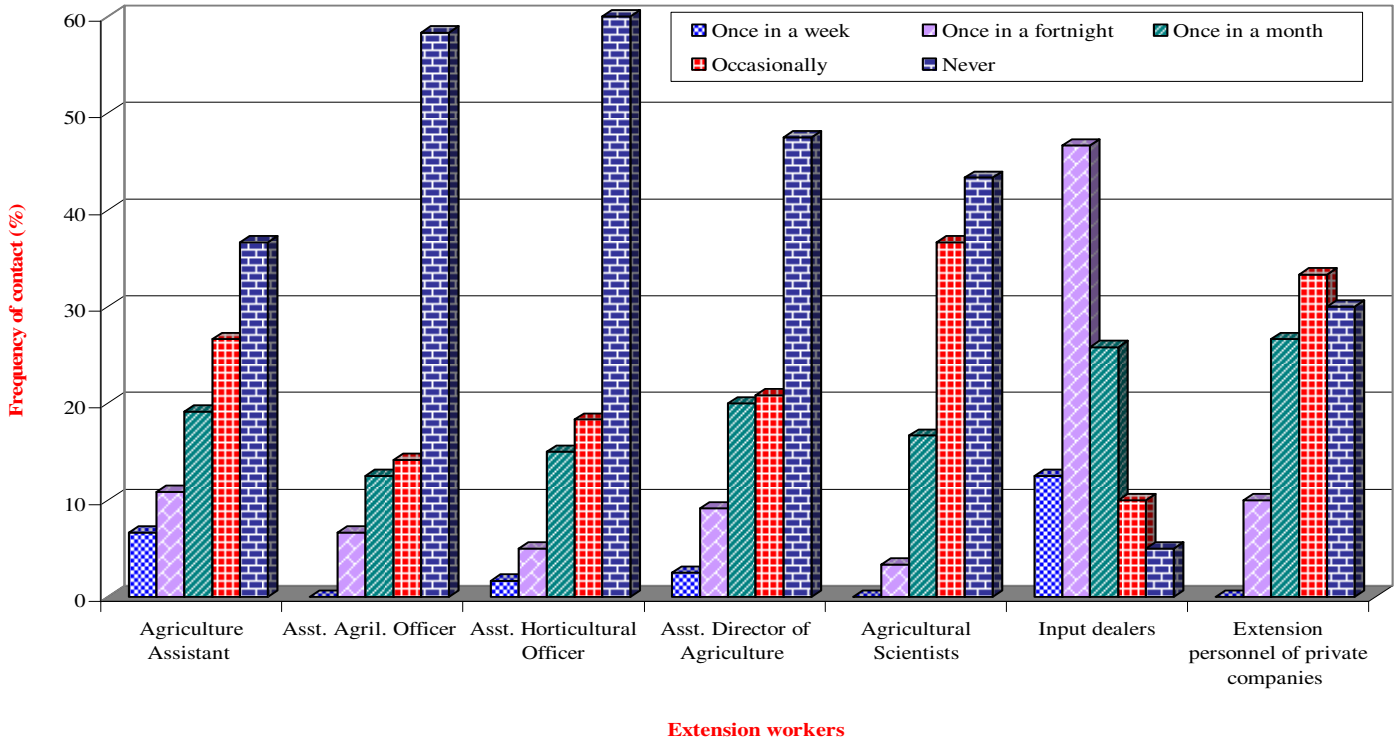

Fig. 7: Extension Contact by farmers

Fig. 7: Extension Contact by farmers

Table 9: Factors influencing the use of biofertilizers by farmers

(n=120)

Sl.No	Factors	Frequency	Percentage
1	Regularly supply	94	78.33
2	Low price	77	64.16
3	Easy to procure	85	70.83
4	High yield	98	81.66
5	Enhances soil fertility	54	45.00
6	Eco friendly	30	25.00

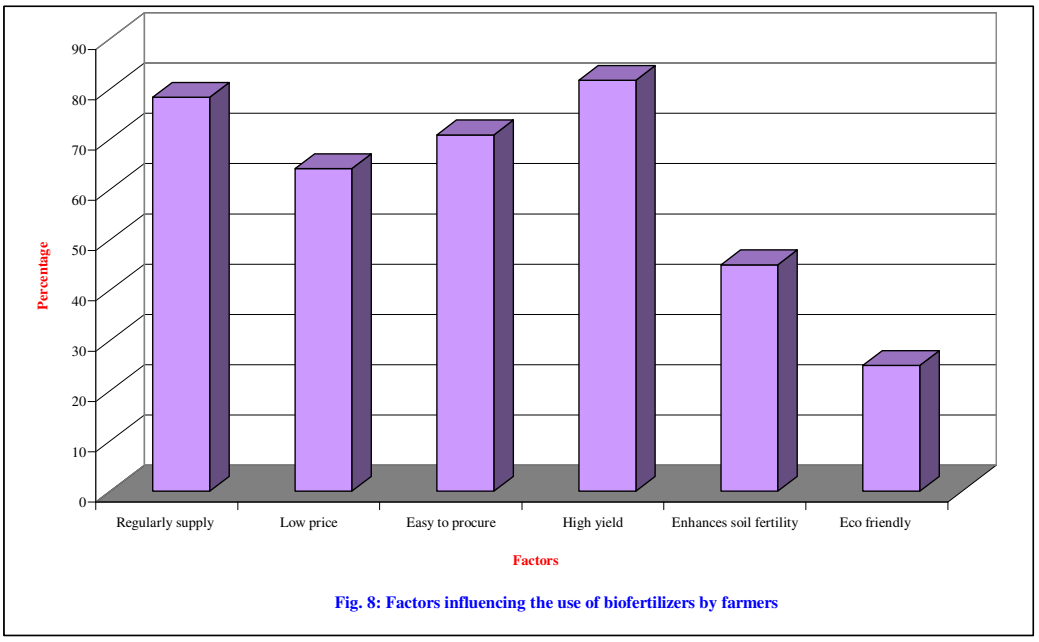

Fig. 8: Factors influencing the use of biofertilizers by farmers

Table 10: Relationship between personal and socio-psychological characteristics of farmers and their knowledge

(n=120)

Sl. No.	Characteristics	Correlation coefficient (r)
1	Age	-0.013
2	Education	0.074*
3	Land holding	0.031^{NS}
4	Cosmopoliteness	-0.038*
5	Social participation	0.101*
6	Extension contact	0.324**
7	Economic motivation	0.535**
8	Scientific orientation	0.280*
9	Risk orientation	0.453**
10	Management orientation	0.356**
11	Mass media use	0.276*
12	Innovative proneness	0.201*

NS=Non-significant
**=Significant at 1 per cent level
*=Significant at 5 per cent level

Table 11: Relationship between personal and socio-psychological characteristics of farmers and their adoption

(n=120)

Sl. No.	Characteristics	Correlation coefficient (r)
1	Age	-0.043^{NS}
2	Education	0.228*
3	Land holding	-0.088^{NS}
4	Cosmopoliteness	0.040^{NS}
5	Social participation	0.258*
6	Extension contact	0.520**
7	Economic motivation	0.507**
8	Scientific orientation	0.490**
9	Risk orientation	0.109*
10	Management orientation	0.456**
11	Mass media use	0.618**
12	Innovative proneness	0.187*

NS=Non-significant
**=Significant at 1 per cent level

Table 12: Constraints encountered in the adoption of biofertilizer by the farmers

(n=120)

Sl. No.	Constraints	Frequency	Percentage
1	Lack of reinforcement efforts from the department	102	85.00
2	Inability to understand the details of biofertilizers	93	77.50
3	Lack of finance	84	70.00
4	Non availability of biofertilizer locally at times when needed	81	67.50
5	Lack of knowledge about practices	65	54.16
6	Non-availability of extension literature on biofertilizer usage	50	41.66
7	Improper soil condition	20	16.66
8	Low shelf life of biofertilizer	6	5.00

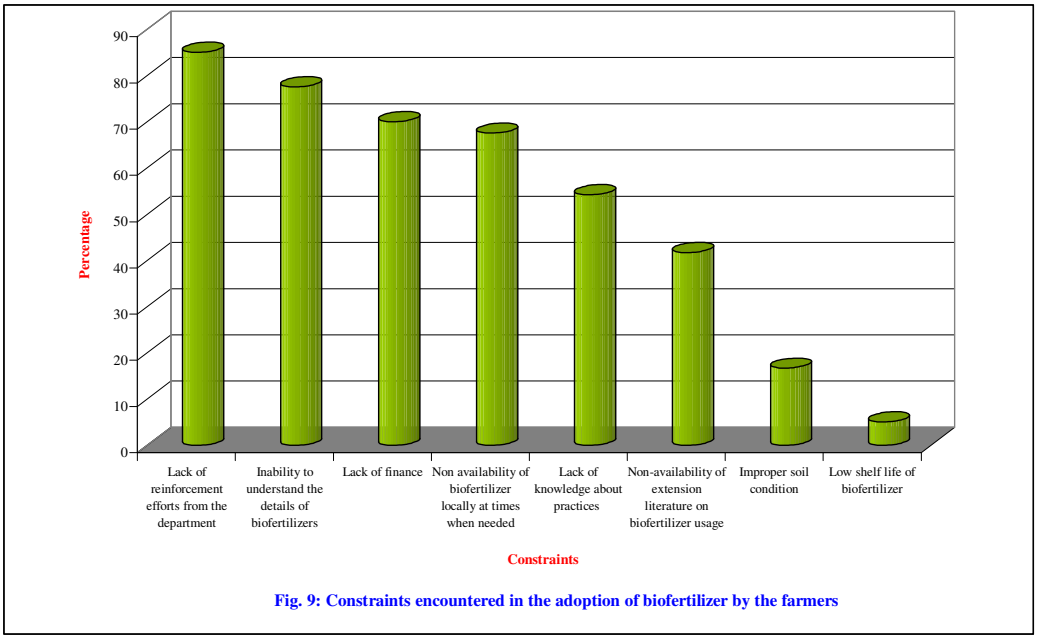

Fig. 9: Constraints encountered in the adoption of biofertilizer by the farmers

Table 13: Suggestions by the farmers for adoption of biofertilizers

(n=120)

Sl. No	Suggestions	Frequency	Percentage
1.	Bio fertilizers usage can be increased if they are provided free of cost	103	85.83
2.	Availability of bio fertilizers in villages	92	76.66
3.	Subsidy on bio fertilizers	86	71.66
4.	Technical aspects on biofertilizer should be provided by extension agencies	30	25.00
5.	Awareness campaign on popularization of biofertilizers	15	12.50

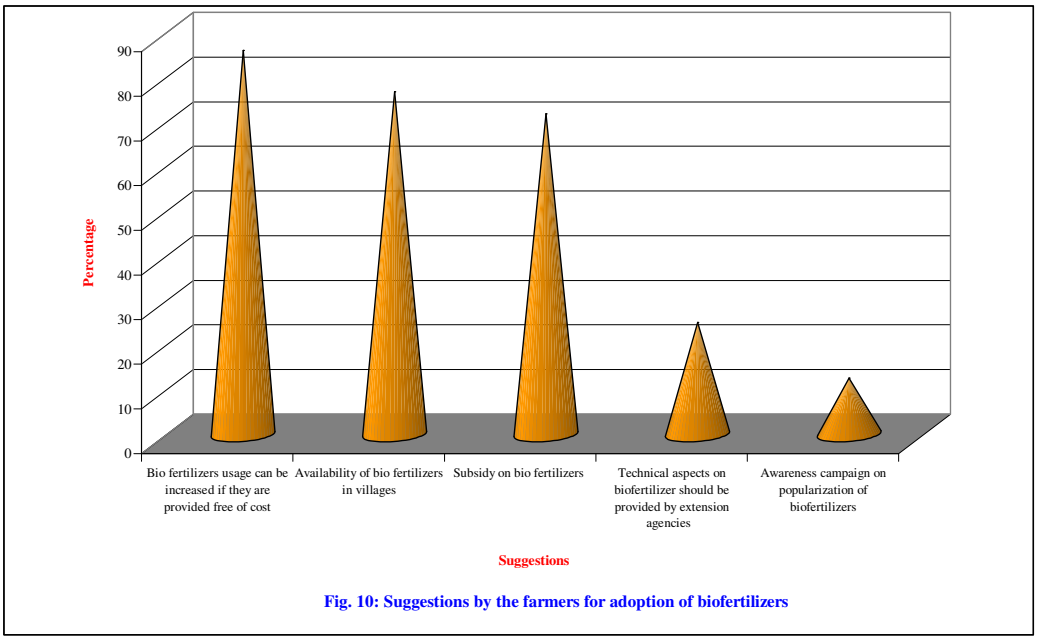

Fig. 10: Suggestions by the farmers for adoption of biofertilizers

Fig. 10: Suggestions by the farmers for adoption of biofertilizers

5. DISCUSSION

The results of the present study are discussed in this chapter under the following six sub-sections.

5.1 Knowledge of farmers about bio fertilizer technology

5.2 Adoption of bio fertilizer practices by the farmers

5.3 Personal and socio-psychological characteristics of farmers

5.4 Mass media utilization by the farmers

5.5 Social participation by the farmers

5.6 Extension contact by the farmers

5.7 Factors influencing to use of bio-fertilizers

5.8 Relationship between dependent and independent variable with their knowledge and adoption level

5.9 Constraints encountered in the adoption of bio-fertilizer pattern by the farmers

5.10 Suggestions by the farmers for adoption of bio fertilizers

5.1 Knowledge of farmers about biofertilizer technology

5.1.1 Overall knowledge of farmers

A perusal of Table 1 reveals that majority of respondents (38.33%) belonged to "medium" knowledge level category while 32.50 per cent and 15 per cent belonged to 'low' and 'high' knowledge categories, respectively. These findings are in agreement with the findings of Sunderraj (1978), Kantaraj (1980), Kantharaju (1989) and Balasubramani (1997) which indicated that more number of farmers belonged to medium knowledge category.

Acquisition of knowledge is the first step in the use of any innovation. Since most of the respondents had medium to high educational level as can be seen from Table 3. They might have exposed themselves to more of print media which carry the information about new agricultural technology. Besides, their contact with locally available extension workers is also instrumental in acquiring medium to high level of knowledge and also TV.

The possible reasons for some of the respondents to be in low level of knowledge category is that some aspects of biofertilizer technology involved difficult technical aspects which might have come in the way of acquiring needed information. This was also due to difference in personal attributes of the respondents.

5.1.2 Knowledge of farmers about specific aspects of biofertilizer usage

An appraisal of Table 2 indicates that majority of the respondents had correct knowledge about the source of availability. This is due to the fact that Department of Agriculture is the major organization promoting biofertilizer technology among farmers through different schemes. The same organization provides biofertilizer free of cost or on subsidy basis to farmers.

Majority of the respondents had correct knowledge about various practices namely, method of application both in paddy and pulse crops, time of application in paddy and using biofertilizer without mixing with chemical fertilizers. Since these practices are important ones, the Agricultural Assistant might have educated farmers specifically on the above crucial practices. Hence, majority of the respondents were aware of these aspects on biofertilizer technology.

Less number of the respondents were aware of name of the biofertilizer used. This may be due to the technical name of the biofertilizers. The words, *Rhizobium* and *Azospirillum* are difficult to pronounce by respondents.

Majority of the respondents had knowledge about the impact on yield by usage of biofertilizer, quantity required for one hectare of paddy crop and time of application. This may be also due to the correct guidelines given by Agricultural Assistant of the respective area on these aspects to the respondents.

A meager number of the respondents had correct knowledge about quantity of biofertilizer required for one hectare crop and nutrients supplied by the biofertilizer. This may be due to poor grasping power of the farmers on application of biofertilizer in two splits. In addition easy taking tendency of respondents about the “principles knowledge” has yielded this result.

Majority of the respondents had knowledge about cost of biofertilizer, impact of biofertilizer use and quantity of biofertilizer available in packets. This may be due to the fact that farmers while getting the biofertilizer from the Department they would have purchased in small packets and got the material along with the required guidelines on the usefulness of biofertilizers.

5.2 Adoption of biofertilizer practices by the farmers

5.2.1 Overall adoption of biofertilizer practices by the farmers

The results presented in Table 3 reveals that considerable percentage of respondents (37.50%) belonged to the medium adoption category, while 52.50 per cent and 10.00 per cent of the respondents belonged to the ‘low’ and ‘high’ adoption categories, respectively. This finding is in conformity with the findings of Kantaraj (1980), Shivamurthy (1981) and Balasubramani (1997) who found that more number of farmers belonged to adoption category. However, Sutha (1989), Nithyashree (1992) and Yogananda (1992) found that a majority of the farmers had high adoption level as compared to “medium” and “low” adoption level which contradict the above finding.

5.2.2 Adoption of specific practices in biofertilizer usage

The inference that could be derived from Table 4 shows that majority of the respondents had adopted the practices namely, using biofertilizer before its expiry date (38.00%), time of its application of (34.00%) and quantity of biofertilizer required for one hectare of paddy crop (25.83%). Majority of them had not adopted the practices namely, quantity of bio-fertilizer without mixing the chemical fertilizers.

It is a well known fact that all improved practices cannot be adopted by all growers simultaneously. The adoption of farm practices or farm innovations as complex process which needs mental thinking, capacity to implement, responsibility as well as risk bearing ability. Further, some practices are influenced by the factors like relatively low cost, compatibility and local availability. In addition to these agro-climatic factors, personal and socio-psychological factors also play a major role in the adoption of agricultural innovations.

Details on the adoption of specific biofertilizer practices by the respondents are presented in Table 4. It is evident from the table that there is a differential adoption of individual recommended practices.

Paddy being the major crop in the Tungabhadra command Area, Department of Agriculture promoting biofertilizer technology might have given full details and guidelines to the time of application and quantify required for one hectare of paddy and other crop. Since they were the major biofertilizer supplying agency and they might have educated farmers regarding using biofertilizer before its expiry date. Farmers might have applied biofertilizer along with the chemical fertilizers as it is an easy and time saving process.

5.3 Personal and socio-psychological characteristics of farmers

By the examination of the Table 5 indicates that majority of the respondents belonged to middle age group (48.33%), had medium level of education (32.50%), economic motivation (74.16%) and management orientation (34.16%). In respect of land holding almost equal number of respondents were found in marginal, small and big farmer categories. Regarding other variables, the respondents were more or less equally scattered in all the three categories namely, low medium and high.

The results are quite obvious because farmers with some years of experience in farming might have oriented themselves for using biofertilizer. That means to have some farming experience they must have attained above 40 years of age. Hence majority of them were in the middle aged group. Similarly such farmers must have been member/office bearers in some social organization and participated in social and extension activities. In this process they might have got good contact with extension agency. Hence they possess these characteristics at higher level.

It was further observed that 33.00 per cent of respondents had medium level of education. This factor might have influenced the farmers to have medium level of other psychological characteristics mainly management orientation, risk orientation, innovation proneness scientific orientation, economic motivation and cosmopoliteness.

In respect of other characteristics such as mass media use, the respondents were scattered in all the three levels. Such behavior might have resulted as majority of them had medium level of education.

5.4 Mass Media Utilization by the farmers

It could be seen from table 6 that majority of the respondents viewed television (85.00%) followed by news paper (58.33%). It can also be seen that 48.33 percent of farmers listened radio and 18.33 percent of respondents read farm literature.

This might be due to the reason that common can easily afford to possess television as a one of the communication media.

Whereas very high percentage (81.66%) of respondents regularly viewed the television followed by 12.50 and 5.83 per cent of respondents viewed occasionally and never respectively.

This may be due to in recent years television being one of the most popular media used by the majority of the respondents and this is the only single entertainment media for farmers.

Occasional reading was found in most of the subscribers. Reason for this might be the majority of the farmers were functional literates but might not have realized the importance of news paper.

5.5 Social participation by the farmers

It could be seen from Table 7 indicates that more number of respondents were member in co- operative society (27.50%) followed by self help groups (22.50%) and organic farmers club (18.33%).

This might be mainly because co-operative work on the principle of democracy and service as the main motto.

It can also be seen from the table that 20.83 percent of respondents regularly participate in self help groups followed by occasionally (1.66%).

The reason might be self help groups created by themselves so they participate from their own interest.

5.6 Extension contact by the farmers

By the examination of Table 8 revealed that more number of respondents contacted inputs dealers once in a week (12.50%), once in a fort night (46.66%), once in a month (25.83%), occasionally (10.00%) and never (5.00%).

The reason is that they have to visit input dealers frequently in order to get inputs and necessary information from input dealers.

Whereas a very few respondents contacted Agriculture Assistant once in a week (6.66%), once in a fort night (16.83%), once in a month (19.16%) occasionally (26.66%) and never (36.66%).

This may be due to the fact that Agricultural Assistant headquarters in villages only.

5.7 Factors influencing to use of bio-fertilizers

It could be seen the Table 9 that factors influencing biofertilizer use were increase in the yield (81.66%), followed by others factors they are regular supply (78.33%), easy to procure (70.83%), low price (64.16%), enhance in soil fertility (45.00%) and eco friendly (25.00%).

The possible reason for above findings may be increase in the yield over previous years after using biofertilizes and another reason is Government schemes are initiating new programmes like Bhuchetana, which provides biofertilizer free of cost or on subsidy basis.

5.8 Relationship between personal and socio-psychological characteristics of farmers with their knowledge and adoption behavior

5.8.1 Relationship between personal and socio-psychological characteristics of farmers and their knowledge

The characteristics namely age, education, social participation, extension contact, economic orientation, scientific orientation, risk orientation, management orientation, mass media use and innovation proneness had significant relationship with their knowledge level. However, other characteristics namely, land holding had non significant association with the knowledge level of farmers (Table 10).

5.8.1.1 Age and knowledge

There was negative and significant relationship between age and knowledge level of farmers. The probable reason for this finding was that, the young farmers were more receptive to new ideas and they make efforts to gain higher knowledge to put them into practice. The older farmers because of their low retention and retrievable capacities of acquired information might have possessed less knowledge on biofertilizer technology. This finding is in conformity with findings of Nataraja and Channegowda (1986). However, Vijaya Kumar (1997) observed non-significant association between age and knowledge level of farmers. Thus the present findings suggest that the extension workers to reach large number of people in a short time should first tackle young people who are receptive to new ideas and then concentrate on old people who take more time to change.

5.8.1.2 Education and knowledge

Education was positively and significantly related with the knowledge level of farmers. Educated farmers will have better opportunity to acquire more scientific information by way of mass media contact, exposure to print media, interaction with scientists and extension workers to get clarification on various scientific aspects of biofertilizer usage. The present finding is in line with the findings of Ningappa (1988), Ratnakar and Reddy (1993) and Vijayakumar (1997). However, the result reported by Kadian (1992) did not support this finding. This suggests that formal education is instrumental in enhancing the knowledge of the farmers on biofertilizer technology. Extension workers can take a clue from this finding.

5.8.1.3 Land holding and knowledge

The relationship between land holding of farmers and their knowledge level was non-significant. Since biofertilizer is a cheaper and eco-friendly technology, land holding is not a criterion to know about improved practices. Profitability of raising a crop makes farmers know about improved technology irrespective of the size of farm. This finding is in conformity with that of Raghavendra (1997). However, contradicting results were also reported by Ningappa (1998) and Srinivasa Reddy (1995). This implies that farmers irrespective of their farm size are interested to know about new technology. Hence there is no need for extension workers to stratify farmers irrespective of their farm size are interested to know about new technology. Hence there is no need for extension workers to stratify farmers while educating them on biofertilizer and other similar technology while working with them.

5.8.1.4 Cosmopoliteness and knowledge

There was negative and significant relationship between cosmopoliteness and knowledge level of farmers. The possible reason could be that cosmopolite individuals will have greater contact with the society and this might have broadened their mental horizons, thereby motivating the respondents to try new technology. This finding supported by the findings of Ravishankar (1995) and Raghavendra (1997).

5.8.1.5 Social participation and knowledge

There was positive and significant relationship between social participation and knowledge level of farmers. This may be due to the fact that interaction with office bearers of many organizations have increased the knowledge of respondents. Also, it is possible that more frequency information helped them to share ideas and information among themselves. This finding is in agreement with the findings of Ningappa (1988), Ratnakar and Reddy (1993) and Vijaya Kumar (1997). Thus, it is clear that more the social participation more will be the knowledge. It is therefore suggested that extension agencies work towards organizing co-operatives, youth club and farmers organizations to facilitate effective interaction among themselves.

5.8.1.6 Extension contact and knowledge

There was positive and significant relationship between extension contact and knowledge level of farmers. The farmers contacted the extension personnel of different departments. This might have helped them to gain more knowledge on the biofertilizer usage. This finding is supported by the findings of Kantaraj (1980) and Vasantha Kumar (1999).

5.8.1.7 Economic motivation and knowledge

Economic motivation was significantly related with the knowledge level of farmers. This is due to the fact that impact of biofertilizer technology is fast. Farmers with high economic motivation will try biofertilizers which is immediately rewarding. This finding is in line with the findings of Sakharkar (1991) and Bindu Chandran (1997).

5.8.1.8 Scientific orientation and knowledge

The scientific orientation was positively and significantly related with the knowledge level of farmers. The possible reason could be that the respondents with higher scientific orientation would try to gather more information which could be applied to the field for increasing production. Similar findings were reported by Sreedevi and Mruthyunjayam (1993) and Ratnakar and Reddy (1993). However, it was not supported by the finding of Balasubramani (1997).

5.8.1.9 Risk orientation and knowledge

The risk orientation was positively and significantly associated with the knowledge level of farmers. This could be explained by the fact that high risk oriented farmers try newer technologies like biofertilizer. This finding is in line with that of Srinivasa Reddy (1995) and Balasubramani (1997). However, it was not supported by the findings of Ravishankar (1995).

5.8.1.10 Management orientation and knowledge

Management orientation of farmers was positively and significantly associated with their knowledge. This may be due to the fact that management orientation involves planning, production and marketing. It is quite natural that the farmers who intentionally plan better for production will contact several agencies and seek information on any new technology. In fact, getting scientific information is part of the planning process, which is included in the management orientation. Therefore, the management orientation was found to be positively and highly significant with the knowledge level of farmers. This is in conformity with the findings of Jagannatha Rao (1995) and Srinivasa Reddy (1995).

5.8.1.11 Mass media use and knowledge

There was a positive and significant relationship between mass media use and knowledge level of farmers. The reason for this could be that regular flow of technical information through print media such as leaflets and folders published by the Department of Agriculture and other organizations to promote biofertilizer technology. Such technical

information might have increased the knowledge level of farmers. This finding is in conformity with the findings of Balasubramani (1997) and Raghavendra (1997). However, it was not supported by Srinivasa Reddy (1995) findings. This implies that the extension workers can make effective use of the mass media to put up scientific information to the farmers.

5.8.1.12 Innovation proneness and knowledge

There was a positive and significant relationship between innovation proneness and knowledge level of farmers. The farmers who are prone to innovations generally will have higher orientation towards risks, scientific technology and competition. These factors do naturally influence their knowledge level and hence the significant relationship was observed. This finding is in confirmation with the findings of Geethakutty (1982), and Vasantha Kumar (1999). However, it was not in agreement with the findings of Kantharaju (1989) and Vijaya Kumar (1997).

5.8.2 Relationship between personal and socio-psychological characteristics of farmers and their adoption

An appraisal of Table 11 indicates that characteristics namely age, education, social participation, economic orientation, extension contact, scientific orientation, risk orientation, management orientation, mass media use and innovation proneness of respondents had positive and significant relationship with their adoption level. However, other characteristics namely land holding and cosmopoliteness had non-significant relationship with the adoption level.

5.8.2.1 Age and adoption

Age was negatively and significantly related with the adoption level of respondents. This may be due to the fact that the young farmers were more receptive to new ideas and tried most of the new technologies. Therefore, it is suggested that Department of Agriculture may take confidence of older farmers, also to bring about greater adoption level of biofertilizer technology. This finding is supported by that of Vijaya Kumar's (1997) finding.

5.8.2.2 Education and adoption

There was positive and significant relationship between education and adoption level of farmers. The possible reason could be that educated farmers will have a better opportunity to acquire more scientific information by way of exposure to mass media, printed material, interaction with scientists and extension worker to know about biofertilizer technology. Their knowledge level was also more. This might have promoted them to adopt biofertilizer technology. This finding is supported by that of Sakharkar (1995) and Ranganath (1997). However, contradictory finding were reported by Jagannatha Rao (1995).

5.8.2.3 Land holding and adoption

There was a non-significant relationship between land holding and adoption level of the farmers. Since land holding was not related to knowledge, it has not lead to adoption. Hence the result is quite obvious. The findings by Sakharkar (1995) and Ranganatha (1997) support this finding. However, contradictory findings were reported by Sreedevi and Murthyunjayam (1993).

5.8.2.4 Cosmopoliteness and adoption

Cosmopoliteness of respondents had non-significant relationship with their adoption level of farmers. Contact with different extension agents provides them enough knowledge about the technology which in turn motivates them to adopt. Finding of this study is in conformity with the findings reported by Jagannatha Rao (1995) and Balasubramai (1997). However the finding of Kantharaju (1989) does not support the present finding.

5.8.2.5 Social participation and adoption

There was a positive and significant relationship between social participation and adoption level of the respondents. Respondents who were members might have got the technical information on the usage of biofertilizers.

This fact might have influenced the adoption level of respondents to a large extent. Finding of this study is in agreement with the findings reported by Sutha (1989) and Sreedevi and Mruthyunjayam (1993) and is contradictory to the findings of Jaganatha Rao (1995) and Vijaya Kumar (1997).

5.8.2.6 Extension contact and adoption

The extension contact was significantly associated with adoption behaviour of the farmers. It is obvious that constant contact with Agricultural Assistant, A.A.O and A.D.A provides necessary and timely guidance and reinforcement to the farmers and motivate them to initiate action. It is expected that respondents contact with officials will naturally influence adoption behaviour to a large extent their. This finding is in line with the findings of Kantharaju (1989) and Balasubramani (1997). However, contradictory finding was reported by Jagannatha Rao (1995).

5.8.2.7 Economic motivation and adoption

The economic motivation exhibited positively significant relationship with the adoption level of the farmers. Since impact of biofertilizer technology is fast and visible, farmers with high economic motivation adopted biofertilizer technology. Hence, the significant relationship was observed. This finding was supported by the findings of Sakharkar (1991) and Bindu Chandran (1997). However, this finding is in agreement with the finding of Sakharkar (1995).

5.8.2.8 Scientific orientation and adoption

Scientific orientation had positive and significant relationship with the adoption of farmers. To manage farms, efficiently farmers should be highly scientific oriented. Scientific and economic operations will bring them success for their efforts. Similar results were also observed in the present study and this finding are in conformity with those of Vijayaraghavan (1977) and Ranganatha (1997) findings. However, the present finding is contradictory to the findings of Jayaraghavendra Rao (1988) and Balasubramani (1997).

5.8.2.9 Risk orientation and adoption

A positive and significant relationship existed between risk orientation and adoption level of the farmers. Risk orientation of the respondents had direct influence on adoption of technology. Because, risk relates to the extent of painstaking by a farmer to achieve greater success. Hence, risk orientation of the respondents had significant effect on their adoption level of biofertilizer technology. The findings of Ajay Kumar (1989), Jagannatha Rao (1995) and Ranganatha (1997) were in conformity with the finding of this study, while the finding of Balasubramani (1997) did not support the finding.

5.8.2.10 Management orientation and adoption

There was a positive and significant relationship between management orientation and adoption level of farmers. The possible reason could be that managerial ability of planning, production and marketing activities of respondents do help in achieving success in a particular operation. So, respondents with high management orientation are better in their adoption of new technology that the average farmers. This finding is in conformity with the findings of Shanmukappa (1978), Jagannatha Rao (1985) and Vijaya Kumar (1997) and is contradictory to the finding of Nidagundi (1981).

5.8.2.11 Mass media use and adoption

There was positive and significant relationship between mass media uses and adoption level of the farmers. Now days, mass media carry more information on biofertilizer technology. It is likely that farmers were adequately exposed to mass media and were motivated to adopt the technology. Hence, the positive relationship was observed. This finding is supported by that of Gangappa (1975), Nagaraj (1996) and Ranganatha (1997) and contradictory to the finding of Kantharaju (1989).

5.8.2.12 Innovation proneness and adoption

There was positive and significant relationship between innovation proneness and adoption level of farmers. This may be due to the fact that the innovators are always interested in taking up new practices in their fields so that they can improve their farm income. Innovators always try to excel others.

The finding of this study is in agreement with those of Ranganatha (1997) and Vijaya Kumar (1997) and is in disagreement with the findings of Kantharaju (1989) and Balasubramani (1997).

5.9 Constraints encountered in the adoption of biofertilizer practices by the farmers

It is revealed by the respondents in Table 12 that majority of the respondents expressed that lack of reinforcement efforts from the department (85.00%) was the major constraint encountered in the adoption of biofertilizer technology. Though the Department of Agriculture and other organizations publish booklets, leaflets and folders on improved package of practices, specific extension literature on biofertilizer use is very much limited. The necessity of such literature solely on biofertilizer is truly reflected in the form of constraints encountered by the farmers. Hence, it is suggested that the Department of Agriculture and other concerned agencies to publish specific extension literature and concerned demonstrations on biofertilizer use.

The other important constraints encountered by the farmers were lack of extension literature on bio fertilizers usage, lack of finance, non-availability of biofertilizer locally at time when needed and improper soil condition. These results are obvious due to the following reasons.

1. Agricultural Assistant provides guidelines while giving/selling biofertilizer to farmers. His participation and guidance seems to be very much limited at the field level.
2. Some private companies arrange to sell bio-fertilizer in large quantities with higher prices which may not be within reach of farmers.
3. Due to the Government policy, bio-fertilizers might have been stocked only in villages having cooperative societies. This might have come in the way of other neighboring village farmers to have accessibility to the biofertilizers. Added to this, biofertilizers available with the private agency are costly. Stocking of biofertilizer also sometimes gets delayed when the season is almost coming to an end.
4. Improper soil conditions like waterlogged soils, dry areas and problematic soils might have hindered the adoption of biofertilizer technology which is truly reflected in the form of constraints.

Low shelf life and non-availability of specific strains of biofertilizer and inability to understand the details were also expressed as constraints by some farmers. Perhaps these respondents might have not fully grasped the detailed guidelines given by the Department of and other organizations.

5.10 Suggestions by the farmers for adoption of bio fertilizers

Suggestions offered by the farmers in adoption of bio fertilizer were analysed and presented in Table 13 and Fig. 9. Majority of the respondents expressed that bio fertilizer usage can be increased if they are provided free of cost was the major suggestion offered by the farmers to adopt bio fertilizer technology. The other suggestions were availability of bio fertilizers in villages (76.66%), subsidy for bio fertilizers (71.66%).

The reason may be due to cost of bio fertilizers may not meet out by the farmers and another reason for low usage of bio fertilizers was non availability of the bio fertilizer in time in villages.

Non-availability of extension literature on bio fertilizers usage (41.66%), improper soil condition (16.66%) and low shelf life of bio fertilizers (5%) were also expressed as constraints by some respondents

On above findings this can be conclude like training for the farmers on bio fertilizers usage should be give more and also awareness programmes can be conducted.

6. SUMMARY AND POLICY IMPLICATIONS

Plant nutrients are important components of crop production. The quantum jump desired to achieve the mounting demands for food in our country requires rationalizing the nutrient application for different crops, particularly paddy and other pulse crops. Efforts have to be made to harvest the benefit of positive interaction among the different biofertilizers.

Several research studies have revealed that there was a wide variation among farmers in the adoption of package of practices in particular. This study was taken up to analyses the two main dimensions namely the knowledge and adoption level of farmers about biofertilizers and the personal and socio-psychological characteristics influencing them. Therefore, the present study was formulated to assess these aspects in detail with the following specific objectives.

1. To ascertain the knowledge level of farmers towards use of biofertilizers
2. To study the adoption pattern of biofertilizers by farmers
3. To ascertain the factors influencing the use of biofertilizers
4. To identify the constraints faced and obtain suggestions by the farmers in adoption of biofertilizers

Methodology

The study was conducted in Raichur, Bellary and Koppal districts coming under Tungabhadra Command Area. In each district, two taluks were selected. The total sample for the study was 120. There were two dependent variables namely “knowledge” and “adoption”. There were 12 independent variables *viz.,* 1) Age, 2) Education, 3) Land holding, 4) Cosmopoliteness, 5) Social participation, 6) Extension contact, 7) Economic motivation, 8) Scientific orientation, 9) Risk orientation, 10) Management orientation, 11) Mass media use and 12) Innovation proneness. Apart from this, constraints encountered in the adoption of biofertilizers and suggestions for use of bio fertilizers by the farmers were also studied.

To measure these dependent and independent variables, appropriate scientific tools were used in the study. The data was collected from the respondents through interview schedule by personal interview technique. They were analysed by using percentage and simple correlation.

Major findings of the study

- Nearly 50.00 per cent of the respondents belonged to middle age group followed by young and old age group. More numbers of farmers (32.50%) received education up to middle school followed by high school (23.33%).
- About 45.00 per cent of the respondents belonged to semi-medium land holding followed by almost equal percentage of marginal (11.66%), small (19.16%), medium (14.16%) and big farmers (10.00%). In case of cosmopoliteness, 39.00 per cent of farmers belonged to high cosmopoliteness followed by low (35.00%) and medium (25.83%). Among total number of respondents 42.00 per cent fall under medium social participation followed by low and high.
- More than 40.00 per cent of farmers belonged to medium extension contact followed by low (33.33%) and high (25.00%). Majority (74.16%) of farmers belonged to medium economic motivation followed by high (13.33%) and low (12.50%). In mass media utilization, 51.00 per cent of farmers fell under medium category, followed by low and high.
- More number (57.50%) of respondents had correct knowledge about quantity of biofertilizers required for one hectare.
- Nearly 45.00 per cent of the respondents had medium level of knowledge, while 63.00 per cent and 12.00 per cent of the respondents had low and high level of knowledge, respectively.

- More than half (52.50%) of the respondents belonged to low adoption category, followed by medium (37.50%) and high (10.00%).
- High yield (81.66%) and regular supply (78.33%) were the major factors which influences use of biofertilizers by the farmers.
- Age was negatively and significantly related to the knowledge and adoption level of respondents. While land holding were not significantly related to the knowledge and adoption levels of the respondents.
- Lack of reinforcement efforts from the Department (85.00%) and inability to understand the details of biofertilizers (77.50%) were the major constraints encountered by the farmers in adoption of biofertilizers.
- Education, social participation, extension contact, scientific orientation, risk orientation management orientation, mass media use and innovative proneness of respondents were found to be positively significant with knowledge and adoption levels of the farmers.

Implications and recommendations

The findings of the present study indicates that very few farmers were under high knowledge level and adoption category of biofertilizer technology, leaving a wide gap both in knowledge and adoption of recommended biofertilizer technology. Hence concerted efforts are required to promote this low cost and eco-friendly technology among farmers.

1. Timely ensuring local availability of biofertilizers at the village level would enable the farmers in adopting the biofertilizer technology.
2. Training programmes have to be organized exclusively on biofertilizer use in different crops for farmers, extension workers and input dealers .
3. At least, a minimum number of demonstrations and field days around demonstrations are to be organized taluk wise to convince farmers on the usefulness of biofertilizer technology.
4. Publication of folders, leaflets, posters on biofertilizer technology and its coverage through radio, television and news paper is needed to educate farmers and other concerned.

Suggestions for future research

1. An exclusive study on constraints in the adoption of biofertilizers may be attempted.
2. A detailed study on efficiency of various information sources in disseminating biofertilizer technology could be taken up.
3. A separate study on training needs of farmers on biofertilizer technology may be undertaken.
4. A comparative study on the knowledge and extent of adoption of biofertilizer by small and big farmers may be taken up.

REFERENCES

Ajaykumar, P., 1989, A study on adoption behaviour and information consultancy pattern of grape growers in Ranga Reddy district of Andhra Pradesh. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

Amarnath, J. S. and Jeyalakshmi, N., 1999, Adoption of improved technologies . *J. Ext. Edu.,* **10** (2) : 2453-2456

Ananda, T. N., 1992, Farmers perception of drip irrigation efficiency in grapes in Bangalore district in Karnataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

Anastasi, A., 1961, Psychological Testing. The McMillan Company, New York.

Angadi, S. C., 1999, A study on knowledge, adoption and marketing pattern of pomogranate growers in Bagalkot district in Karnataka State. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Babanna, T., 2001, Information source consultancy and training needs of farmers in arecanut cultivation under Tungabhadra command area in Shimoga district. *M. Sc. (Agri.) Thesis.,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Balasubramani, N., 1997, Knowledge and adoption behaviour of rubber growers in Belthangady taluk of Dakshina Kannada district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Belligeri, S. B., 1996, A study on knowledge, adoption and perception of usefulness of agro-forestry practices by the farmers of Hanagal taluka, Dharwad district. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Bhattacharya, P. and Vandana Dwivedi, 1992, “Heal the soils at least cost”. *Intensive Agric.,* **29** : 12-16.

Bhilegonkar, M. G., 1978, A study of fertilizer behavior of farmers and communication pattern and constraints *Ph. D., 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

Bhople, R. S., Shinde, P. S. and Dhule, S. S., 2001, Knowledge and adoption of bio control pest mane gent in cotton . *Maharashtra J. Ext. Edu.,* **20** : 19

Bindu Chandran, 1997, A study on knowledge and adoption of farmers cultivating tapioca in Ernakulam district of Kerala state. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Birajdar, S. R., 1999, A study on knowledge and adoption behaviour of grape growing member farmers of Maharashtra Rajya Drasha Bagiatdar Sangh, Solapur. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Borker. M. M., Chothe. G. D., and Lanjewar. A. D., 2000, Characteristics of farmers influencing their knowledge about use of biofrtilizers. *Maharashtra J. Ext. Edu,* **19** : 130-131.

Chandra Charan, 2003, A profile of Sujala watershed project beneficiary farmers in Dharwad district. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Chandran, B., 1997, A study on knowledge and adoption of farmers cultivating tapioca in Ernakulum district of Kerala state. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Chandrashekhara, P., 1999, Knowledge and adoption gaps in coffee cultivation practices among coffee growers. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

Chandregowda, K. N., 1997, A study on extent of adoption of improved cultivation practices of Chrysanthemum. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Chaudhari, M. R., Tidke, G. R. and Jyoti Sahare, 1999, Training needs of peasant women. *Maharashtra J. Ext. Edu.,* **18** : 114-117.

Chikhale, N. J., Deshpande, P. V. and Thakre, P. V. 1996. Factors influencing adoption of orange production technology by growers. *Maharashtra J. Ext. Edu.,* **15** : 176-180.

Chothe. G. D, and Borkar, M. M., 2000, constraints faced by farmers in adoption of bio fertilizers . *Maharashtra J. Ext. Edu.,* **19**; 298-299

Dhamodaran, T. and Vasanthakumar, J., 2001, Relationship between selected characteristics of registered sugarcane growers and their extent of adoption of improved sugarcane cultivation practices. *J. Ext. Edu.,* **12**(2) : 3138 – 3143.

Gaikwad, B. H. and Gunjal, S. S., 2000, Constraints faced and suggestions made to improve activities of the Krishi Vigyan Kendra in Maharashtra. *Ind. Farm.,* **49** (2) : 34-35.

Gangappa, G. N., 1975, A study of adoption behaviour, consultancy pattern and information source credibility of small farmers in Mysore district of Karnataka state. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Geetha Kutty, P. S., 1982, An analysis of adoption of recommended rice cultivation practices in relation to the understanding of the principles and knowledge of procedures by farmers and extension workers. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Godhandapani, G., 1985, Knowledge and adoption of nutrient recommendation for irrigated groundnut. *M. Sc. (Agri.) Thesis* (unpublished.), TNAU, Coimbatore.

Gotyal, S. H., 2007, Backward and forward linkages of grape production in Karnataka. *Ph. D. Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Govindagowda, V. and Narayanagowda, K., 2006, Profile of Thompson Seedless and Bangalore Blue grape growers. *Mysore J. Agric. Sci.,* **40**(3) : 424-429.

Hegde, N. G., 2001, WTO Challenges for Indian dairy farmers. *Yojana,* **45** : 34-35.

Hinge, R. B., 2009, A study on diffusion and adoption of wine grape production technology in Maharashtra. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

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

Jagannatha Rao, R., 1995, A study on the knowledge and adoption level of paddy farmers in Hospet taluk of Tungabhadra Command Area in Karnataka. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Kabi, M. C and Poi, S. C., 1998, "Improvement of pulse cultivation in West Bengal through effective use of Rhizobium. "*Bio fertilizers potentialities and problems* Ed. Sen, S. P and P. Palit, plant physiology forum, Culcutta, pp. 35-34.

Kadian, K. S., 1992, Physiological correlates of knowledge of dairy innovation of farm women. *Indian Psy. Rev.*, **39** : 6-9.

Kantaraj, J., 1980, A study on knowledge, extent of adoption and appropriateness of sunflower technology among growers. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Kantharaju, 1989, Study on adoption of improved practices of coffee and cardamom by small farmers in Hassan district of Karnataka state. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Karpagam, C., 2000, A study on knowledge and adoption behaviour of turmeric growers in Erode district of Tamil Nadu state. *M. Sc(Agri) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Kharatmol, 2006, Impact of trainings conducted on vermicompost by Krishi Vigyan Kendra, Bijapur. *M. Sc. (Agri.) Thesis,* Uni. Agric. Sci., Dharwad (India).

Khin Mar Oo, 2005, Knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district. *M. Sc. (Agri.) Thesis,* Uni. Agric. Sci., Dharwad (India).

Kubi, S. B. and Ptel, B. J., 1993, G. S. F. C. Contribution to national bio- fertilizer programme, National conference on bio-fertilizers and organic farming.

Kumar, H. S., 1998, A study on knowledge, adoption and economic performance of banana growers. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

Kumbar, S. V., 1983, A study on adoption behaviour and consultancy pattern of grape growers of Bijapur district of Karnataka state. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Kute, S. B. and Patel, B. J., 1993, G.S.F.C. contribution to national biofertilizer programme. *Nation. Conf. on Biofert. and Organic Farming*.

Manay, S. and Farzana, C., 2000, Socio economic characteristics of rural families. *Maharashtra J. Ext. Edu.,* **19** : 325 – 328.

Marwaha, B. C., Bio-fertilizer a supplementary source of plant nutrients. *Fertilizer News,* **40** (7) : 39-50.

Menon, R. K. and Doraiswamy, K. N., 1975, Small farmers and utilization of concessions and loans. *Madras J. Ext. Edu.,* **62** : (10&12) : 791.

Motsara, M. R., 1993, "National project on bio fertilizer status position, VIII plan proposal". *National Conf. on Biofertilizer and Organic Farming,* pp. 15-19

Moulasab, I., 2004, A study on knowledge and adoption of improved cultivation practices by mango growers of North Karnataka, *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Moulik, T. K., 1965, A study of predictive values of time factor of adoption of nitrogenous fertilizers and the influence of source of information on adoption behaviour. *Ph. D. Thesis,* FARI, New Delhi.

Nagaraj, K. H., 1996, A study on 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, Karnataka (India).

Nagaraj, M. V., 2002, A study on knowledge of improved cultivation practices of sugarcane and their extent of adoption by farmers in Bhadra command area in Davanagere district, Karnataka (India). *Ph. D. Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Nagoormeeran, N. and Jayaseelan, M. J., 1999, Socio-personal, socio-economic and socio-psychological profile of shrimp farmers. *J. Ext. Edu.,* **10** (2) : 2445 – 2448.

Nagpurkar, S. V., 1998, Adoption of the technology recommended for cotton. *Thesis Abst.,* **24**(1) : 17-18.

Narasima Murthy, H. and Madhava Rao, A. R., 1994, "Bio fertilizers in Karnataka state". National conference on bio-fertilizers and organic farming : 3-32.

Nataraj, M. S. and Channegowda, M. B., 1986, Knowledge level of dairy farmers and their personal characteristics. *Indian J. Ext. Edu.,* **22**(1&2) : 47-55.

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

Nidagundi, F. R., 1981, A study on knowledge and adoption behaviour of trained farmers in Ghataprabha command area, Karnataka state. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Ninga Reddy, 2005, A study on knowledge, extent of participation and benefits derived by participant farmers of the watershed development programme in Raichur district of Karnataka state (Unpublishedlished). *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Ningappa, K., 1988, Analysis and impact of the dairy development programmers of KMF on farm women in Bidar district of Karnataka state. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Nithyshree, D. A., 1992, Study on yield gap and adoption of improved practices of coffee in Chikkamagalur district. *M Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

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

Parasu Ram Singh, Singh, M., Jaiswal, R. S. and Raikwar, R., 2004, Feeding of existing concentrate mixtures to dairy animals in the Kumaon hills of Uttaranchal. *Ind. J. Anim. Res.,* **38** (2) : 147-149.

Patil, A. B., 2008, A study on constraints of grape exporting farmers of Maharashtra state. *Ph. D. Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Patil, V. G., 1990, A critical analysis of technological gap and constraints in the adoption of improved rice cultivation practices in Konkan region. Maharashtra state. *Ph. D. Thesis,* Univ. Agric. Sci., Dharwad.

Prasad, C., 1983, Youth development education aims and scope. *A paper Presented in the National Rural Youth Staff Training Workshop* held at Ludhianap, p. 4-5.

Raghavendra, 1997, Relative effectiveness of lecture, folder and lecture plus folder in communicating dairy management practices to farmers – A field experiment. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, 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).

Rajashekhar., 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).

Ramanna, K. N., Chandrakandan, K. and Karthikeyan, C., 2000, Motivation factors and constraints of hybrid sunflower seed growers. *J. Ext. Edu.,* **11**(3) : 2840 – 2844.

Ranganatha, A. D., 1997, A study on knowledge and adoption of organic farming practices among rice farmers. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Ratnakar, R. and Reddy, M. S., 1993, Knowledge of tribal farmers about recommended farm practices. *Indian J. Ext. Edu.,* **27**(3&4) : 91-94.

Raut, P. N., 2006, Production constraints of orange cultivation in Nagpur district of Maharashtra. *Asian J. Ext. Edu.*, **25** (1&2) : 1-4.

Ravishankar, R. L., 1995, A study on knowledge, adoption and constraint analysis of potato farmers in Chikkamagalur district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Rogers, E. M. and Shoemaker, F. F., 1971, *Communication of innovation : A cross cultural approach*. The Free Press, Collier MacMillan Publishers, London.

Sagwal, R. C., 1998, Problems, prospects and management of cotton wheat cropping system. *Thesis Abst.,* **24** (2) : 108-110.

Saikrishana, M, 1998, A study on knowledge of paddy ion practices and adoption behaviour of Andhra migrant farmers in Raichur district. *M. Sc. (Agri.) Thesis* (unpublished), Univ. Agric. Sci., Dharwad, Karnataka (India).

Sakharkar, V. S., 1995, A study on knowledge, fertilizer use pattern and constraints in the cultivation of soybean by farmers of Nagpur district, Maharashtra. *Ph. D. Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Salam, A., 1975, Economic analysis of fertilizer application in Punjab-Pakistan. *M. Sc. (Agri.) Thesis* (unpublished.), University of Hawali, Hawali.

Samanta, R. K., 1977, A study of some agro-economic, socio-psychological and communication variables associated with repayment behaviour of agricultural credit users of Nationalised Bank. *Ph.D. Thesis*, Bidhan Chandra Krishi Vishvavidyalaya, West Bengal.

Saravanakumar, R., 1996, A study of management of mango gardens by farmers in Krishinigiri taluk of Dharmapuri district, Tamil Nadu. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Savant, P, A, Nirbhan, A, L., 1992, Acceptance of gall-midge resistant varieties of rice. *Maharashtra J. Ext. Edu.,* **11** : 98-101

Sawant, P. A., 1999, An experimental study on the effectiveness of different modes of presentation of information on mushroom cultivation through television. *Ph. D. Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Saxena, A. K., Tiwari, K. B. and Thakur, P., 1999, Adoption of improved garlic production technology. *Agric. Ext. Rev.,* 11(1) : 17-18.

Shanmukappa, S., 1978, A Study on the adoption behavior and value orientation of arecanut growers of Shimoga district in Karnataka state. *M. Sc. (Agri.), Thesis,* (unpublished.), T. N. A. U. Coimbatore (India).

Shashidhara, D. N., 2004, A study on influencing factors and constraints in drip irrigation by horticultural farmers of Bijapur district of Karnataka. *M. Sc (Agri.) Thesis,* Univ. Agric. Sci., Dharwad, Karnataka (India).

Shashidhara, K. K., 2003, A study on socio-economic profile of drip irrigation farmers in Shimoga and Davanagere districts of Karanataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Shiva Murthy, G. R., 1991, A study on knowledge and adoption behavior of arecanut and cardamom growers in Shimoga district of Karnataka state. *M. Sc. (Agri.) Thesis* (unpublished.), Univ. Agri. Sci., Dharwad, Karnataka (India)

Shivalige Goda, N. S., Balachandra, C. K., Khan, M. M and Umamahesh, A. B., 1990, Studies on the level of adoption of selected practices in raising cardamom nursery. *Mysore. J. Agric. Sci.,* **24** : 121-127.

Sidram, 2008, A study on analysis of organic farming practices in pigeon pea in Gulbarga district of Karnataka state. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Singh, P. M. and Mankar, D. M., 2007, Personal and professional policies of village extension workers of T&V system. *Maharashtra J. Ext. Edu.,* **11** : 85-89.

Sreedevi, R. and Mruthyunjayam, N., 1997, A study on farm women's knowledge and adoption of recommended practices of sorghum crop. *Madras J. Ext. Edu.,* **4**(2) P 675-678.

Sreenivasreddy, M. V., 1995, A study on knowledge and adoption of recommended mango cultivation practices among farmers of Kolar district. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

Sunderaj, A. R., 1978, A study on knowledge and adoption behaviour of small and big farmers growing tomato in Bangalore district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Sunilkumar, 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 (India).

Supe, S. V., 1969, Factors related to different degrees of rationality in decision making among farmers in Buldana district. *Ph. D. Thesis*, Ind. Agric. Res. Ins., New Delhi.

Suresh, M., 1991, Nutrient management : An export facto study among paddy farmers. *M. Sc. (Agri.) Thesis,* TNAU, Coimbatore.

Suresh, M., 1991, Nutrient management : An expost facto study among paddy farmers. *M. Sc. (Agri.), Thesis*. (unpublished.), T. N. A. U. Coimbatore.

Sureshkumar, 2009, A study on technological gap in recommended soybean cultivation practices. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.

Sutha, T., 1989, Differential knowledge level and adoption behaviour of rubber growers. *M. Sc. (Agri.) Thesis,* TNAU, Coimbatore.

Thimmappa, H., 1981, A study on adoption behavior and motivation pattern of coconut cultivation in Tumkur district of Karnataka state. *M. Sc. (Agri.), Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

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).

Thiranjangowda, B., 2005, A study on cultivation and marketing pattern of selected cut flowers in belgaum district. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Trivedi, G., 1963, Measurement and analysis of socio-economic status of rural families. *Ph. D. Thesis*, Indian Agric. Res. Inst., New Delhi (India).

Vasantha Kumar, P., 1999, A study on knowledge, adoption and economic performance among coffee growers of Virajpet taluk of Coorg district. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Vedamurthy, H. J., 2002, A study on the management of areca gardens and marketing pattern preferred by the arecanut farmers of Shimoga district in Karnataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad.

Verrma, L. N. and Bhattacharya, P., 1990, "A Role of Biotechnology in supplying plant nutrients in the ninties". *Fertilizer News,* **87** : 96.

Vijayakumar, C., 1997, A study on knowledge and adoption of improved cultivation practices among rose growers. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Vijayaraghavan, P., 1977, Study on the factors affecting the knowledge and adoption of high yielding varieties of paddy of small and marginal farmers. *M. Sc. (Agri.) Thesis,* Univ. Agric. Sci., Bangalore, Karnataka (India).

Vijaykumar, P. K., 2000, A study on knowledge and adoption behaviour of sugarcane growers in Belgaum district of Karnataka. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Dharwad, Karnataka (India).

Visweswaran, C., 1979, A comparative study of socio-psychological factors, knowledge and adoption of farm practices among migrant farmers from Tamil Nadu and non-migrant farmers in Kollegal taluk. *M. Sc. (Agri.) Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

Wase, R. B., 2001, Knowledge and adoption of farmers about Jayanti chilli cultivation. *M. Sc. (Agri.) Thesis,* Dr. Punjabrao Deshmukh Krishi Vidyalaya, Akola. (India).

Yogananda, H. G., 1992, Study on knowledge level, adoption behavior and training need of coconut growers. *M. Sc. (Agri.), Thesis*, Univ. Agric. Sci., Bangalore, Karnataka (India).

UNIVERSITY OF AGRICULTURAL SCIENCES, DHARWAD
DEPARTMENT OF AGRICULTURAL EXTENSION EDUCATION

Research Title : Knowledge and adoption pattern of bio fertilizers by the farmers of Tungabhadra Command Area

Appendix I: Interview schedule

PART –I

District …….. Taluka . …… Village ..…….

General information

1. Name of the farmer :

2. Age :

3. Educational status

Illiterate : ……...

Read and write : ……

Primary school : ……...

Middle school : ……

High school : ……...

Puc /diploma : ……

Degree and above : ……

4. Occupation :

5. Land Holding :

Land Holding	Dry (In acres)		Irrigated (In acres)	
	Owned	Leased	Owned	Leased
Landless				
Small farmer				
Marginal farmers				
Large farmers				

6. Income of the family per Annum ……..

7. Cosmopoliteness:

Please indicate the frequency of visits to the nearby town/city for each of the following purpose

Purpose of Visit	Frequency of visit					
	Twice in a week	Once in a week	Once in 15 days	Once in a month	Seldom	Never
All visits relating to agriculture						
Some visits relating to agriculture						
Personal / Domestic						
Entertainment						
Other						
No response						

8. Social participation:

Are you a member in any of the following social organizations? Yes/No If yes, give details.

Sl. No	Organization	Nature of Membership		Extent of Participation		
		Member	Office Bearer	Regularly	Occasionally	Never
1.	Co-operative Society					
2.	Youth Club					
3.	Taluk Panchayat					
4.	Organic farmers club					
5.	Self Help Groups					
6.	Others (specify)					

9. Extension contact

Indicate the frequency of your contact with the Extension workers/Officials

Sl. No	Extension Workers	Frequency of contact				
		Once in a week	Once in a fortnight	Once in a month	Occasionally	Never
1	Agriculture Assistant					
2	Assistant Agriculture Office					
3	Assistant Horticulture Officer					
4	Assistant Director of Agriculture					
5	Agricultural Scientists					
6	Input Dealers					
7	Extension Personnel of Private Companies					
8	Others (if any), specify					

10. Economic motivation

Please state your agreement or disagreement with the following statements

Sl. No	Statements	SA	A	UD	DA	SDA
1	Farmers should work towards larger yield and economic profile					
2	The most successful farmer is one who makes the most profit					
3	A farmer should try and few farming idea which may earn him more money					
4	A farmer should grow cash crops to increase monetary profits in comparison to growing of food crops for home consumption					
5	It is difficult for the Farmers children to make good start unless he provides them with economic terms					

11. Scientific orientation

Please state your agreement or disagreement with the following statements

Sl. No	Statements	SA	A	UD	DA	SDA
1	New methods of farming give better results to a farmer than the old methods					
2	The way a farmer forefather farmed is still the best way of farming					
3	Even a farmer with lot of experience should use new methods of farming					
4	A good farmer experiments with new ideas in farming					
5	Traditional Method of Farming have to be changed in order to raise the level of living					
6	Though it takes time for a farmer to learn new methods in farming it is worth the efforts					

12. Risk orientation

Please state your agreement or disagreement with the following statements

Sl. No	Statements	SA	A	UD	DA	SDA
1	A farmer should grow large number of crops to avoid greater risk involved in growing one or two crops					
2	A farmer should rather take more of chance in making a good profit than to be content with smaller, but less risky profits					
3	A farmer who is willing to take greater risks then the average farmer usually does better financially					
4	It is good for a farmer to take risks when he knows his chance of success is fairly high					
5	It is better for a farmer not to try new farming methods unless most other farmer has used them with success					
6	Trying entirely new methods in farming by farmers involves risk but it is worth taking					

13. Management orientation

What is your opinion about the following statements?

Sl. No.	Statements	Agree	Disagree
A	**Technical Orientation**		
1	Each year one should think a fresh about the crops to be cultivated in each type of land		
2	It is not necessary to make prior decision about the variety of crops to be cultivated in each type of land		
3	It is possible to increase the yield through farm production plan		
4	One need not to consult an agricultural experts for crop planting		
5	It's not necessary to think ahead of the cost involved in raising a crop		
6	The amount of seed, fertilizer needed for raising a crop should be assessed before cultivation		
B	**Production Orientation**		
1	Timely planting of a crop ensures good yield		
2	One should use as much fertilizer as one likes		
3	Determining fertilizers does by soil testing saves money		
4	Seed rate should be given as recommended by the specialists		
5	For timely weed control one should even use suitable herbicides		
6	With low moisture rate one should use as much irrigation water as available		
C	**Marketing Orientation**		
1	Market news is not so useful to farmers		
2	A farmer can get good price by grading his produce		
3	Warehouses can help the farmers to get better price for his produce		
4	One should sell his produce to the nearest market irrespective of price		
5	One should purchase his inputs from the shop, where his other relatives purchase		
6	One should grow those crops which have more of market demand		

14. Mass media utilization

Please indicate the extent of utilization of Mass Media

Items	Reading / Listening / viewing	Extent of Utilization		
		Regularly	Occasionally	Never
a. Reading newspaper				
b. Reading farm literature				
c. Listening to farm radio				
d. Watching T V				

15. Innovation proneness

Please state your agreement or disagreement with the following statements

Sl. No.	Statements	Agree	Disagree
1	I try to keep myself up to date with information on new farm practices, but that does not mean that I try out all the new methods on my farm		
2	I feel restless till I try out new farm practices that I have heard about it		
3	They talk of many farm practices these days, but who knows if they are better than the old ones		
4	From time to time, I have heard several new farm practices and I have tried out most of them in the last few years		
5	I usually wait to see that what results my neighbors obtain before, I try out the new farm practices		
6	Somehow I believe that traditional ways of farming are the best		
7	I am cautious about trying a new practice		
8	After all our forefathers were wise in their farming practices and I do not see any reason for changing the old methods		
9	Often new practices are not successful. However if they are promising, I would surely like to adopt them		

PART-II

Knowledge and Adoption of Bio Fertilizes

Knowledge of farmers about specific aspects of biofertilizer usage

Sl. No.	Specific knowledge about biofertilizer usage		Knowledge level	
			Yes	No
1	Type of the biofertilizer used	Rhizobium *Azospirillum* PSB Azolla Others		
2	Source of availability	Agricultural University RSK Fertilizer shop Others		
3	Method of application	Seed treatment Seedling dipping Broadcasting Split application		
4	Quantity required for one hectare	1 kg 10 kg 500 gm		
5	Time of application	Before sowing After sowing		
6	Time gap with in which the treated seeds to be sown			
7	Using biofertilizer without mixing with chemical fertilizer			
8	Using biofertilizer before expiry date			
9	Nutrient supplied by the biofertilizers	Nitrogen Phosphorus Both		
10	Quantity available in packets	250 gm 500 gm 1 kg		
11	Cost of biofertilizers	Rs. 50/kg Rs. 70/kg Rs. 50/kg		
12	Advantage of biofertilizers usage			

Adoption of specific biofertilizer practices by the farmers

Sl. No.	Adoption of specific practices of biofertilizers usage		Adoption level	
			Yes	No
1	Type of biofertilizer used	Rhizobium *Azospirillum* PSB Azolla Others		
2	Quantity of biofertilizers used for one hectare	200-400 gm 1 kg 25 kg		
3	Time of application	Before sowing After sowing		
4	Using biofertilizer without mixing with chemical fertilizers			
5	Using biofertilizers before expiry date			
6	Method of application	Seed treatment Seedling dipping Broadcasting split application		
7	Percent of yield increased by using biofertilizer	2% 5%		

PART-III

Factors influencing the use of bio fertilizers

Sl. No.	Factors	Yes	No
1	Regular supply		
2	Low price		
3	Easy to procure		
4	High yield		
5	Enhances Soil fertility		
6	Eco friendly		
7	If others (specify		

PART-IV

Constraints faced by the farmers in adoption of bio –fertilizers

Sl. No.	Particulars	Yes	No
1	Lack of knowledge about the practice?		
2	Non availability of bio-fertilizers in time?		
3	Lack of conviction about the merits of the practice?		
4	Inability to remember the quantity to be applied?		
5	Difficulty in understanding the technology?		
6	Not willing to take risk?		
7	Lack of finance?		
8	Non availability of Bio fertilizer locally at times when needed?		
9	Non-available ability of specific strain of Bio-fertilizers?		
10	Non-availability of extension literature on Bio-fertilizers usage?		
11	Low shell life of Bio-fertilizers?		
12	Improper soil condition?		
13	Lack of re-enforcement efforts from the agriculture department?		
14	Scarcity of water?		
15	Others (specify)		

Suggestions by the farmers for adoption of bio fertilizers

Sl. No.	Suggestions	Agree	Disagree
1	Bio fertilizer Technology is difficult to understand		
2	By using of Bio fertilizers the incidence of pest and diseases can be minimized		
3	Subsidy on Bio fertilizers improves soil health condition		
4	Farmers can get better yield by the use of Bio fertilizers		
5	Non availability of Bio fertilizers locally is the cause for non adoption of Bio fertilizers		
6	Bio fertilizers usage can be increased if they are provided free of cost		
7	Bio fertilizers usage among farmers can be increased, by the effective, use of mass media		
8	Chemical fertilizers can be totally replaced by bio fertilizers and other organic manures in a phased manner		
9	The usage of Bio fertilizers is cost effective when compared to the use of chemical fertilizers		
10	Technical aspects on biofertilizer should be provided by extension agencies		
11	Awareness campaign on popularization of biofertilizers		
12	Other (if any), specify		

KNOWLEDGE AND ADOPTION PATTERN OF BIOFERTILIZERS BY THE FARMERS OF TUNGABHADRA COMMAND AREA

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ABSTRACT

The present study was conducted in Raichur, Bellary and Koppal districts of Karnataka state during 2010-11 to measure the knowledge level and adoption pattern of bio-fertilizers by the farmers, ascertain the factors influencing the use of bio-fertilizers and identify the constraints by the farmers in adoption of bio-fertilizers. One hundred and twenty farmers were selected as the sample for study. The data was collected by personal interview with the help of structured schedule which was developed keeping in view the objectives and variables of the study.

Nearly 45.00 per cent of the respondents had medium level of knowledge, while 63.00 per cent and 12.00 per cent of the respondents had low and high level of knowledge, respectively. More than half (52.50%) of the respondents belonged to low adoption category followed by medium (37.50%) and high (10.00%). High yield (81.66%) and regular supply (78.33%) were the major factors which influences use of biofertilizers by the farmers. Lack of reinforcement efforts from the Department (85.00%) and inability to understand the details of biofertilizers (77.50%) were the major constraints encountered by the farmers in adoption of bio-fertilizers.

About 45.00 per cent of the respondents belonged to semi-medium land holding followed by almost equal percentage of marginal (11.66%), small (19.16%), medium (14.16%) and big farmers (10.00%). In case of cosmopoliteness, 39.00 per cent of farmers belonged to high cosmopoliteness followed by low (35.00%) and medium (25.83%). Among total number of respondents 42.00 per cent fall under medium social participation followed by low and high. More than 40.00 per cent of farmers belonged to medium extension contact followed by low (33.33%) and high (25.00%). Majority (74.16%) of farmers belonged to medium economic motivation followed by high (13.33%) and low (12.50%). In mass media utilization, (51.00%) of farmers fell under medium category followed by low and high.