

**ANALYSIS OF FACTORS CONTRIBUTING TO THE
CONTINUANCE OF FODDER TECHNOLOGIES BY THE
FARMERS**

PARTHA BANERJEE

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

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By

PARTHA BANERJEE

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

CERTIFICATE

This is to certify that the thesis entitled “ANALYSIS OF FACTORS CONTRIBUTING TO THE CONTINUANCE OF FODDER TECHNOLOGIES BY THE FARMERS” submitted by Mr. PARTHA BANERJEE for the degree of MASTER OF SCIENCE (AGRICULTURE) in AGRICULTURAL EXTENSION EDUCATION to the University of Agricultural Sciences, Dharwad is a record of research work carried out by him during the period of his study in this university, under my guidance and supervision, and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

**DHARWAD
JUNE, 2016**

**(NAGARATNA BIRADAR)
CHAIRMAN**

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	(NAGARATNA BIRADAR)
Members :	1. _____
	((J.G. ANGADI)
	2. _____
	(S.M. MUNDINAMANI)

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Gratitude takes three forms, “A feeling from the heart, an expression in words and a giving in return.....”

At last, the moment has come to look into the deeper layers of my heart which is filled with the feeling of togetherness and loveliness; consolation and satisfaction. Some are permanent and some are momentary but both involve a number of persons to whom I acknowledge my warm regards.

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..... omission of any name doesn't indicate lack of gratitude.

**DHARWAD
JUNE, 2016**

(Partha Banerjee)

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1. INTRODUCTION

Livestock is deemed as the oldest wealth resource for mankind and was once a symbol of economic status in the society. Although crop sector continues to dominate the overall agricultural economy of India, the importance of livestock has gained momentum during recent years. Its importance in India's economy can be gauged from the fact that 90 million farming families rear over 90 million milch animals (Kannan, 2012). Livestock provides a large share of draught power, with about half the cattle population and 25 per cent of the buffalo population being used to cultivate 60 million hectares of cropland. The contribution of draught animal is roughly estimated to be a tune of Rs. 10,000 crores per year. On an average, 800 million tones of manure is produced. Of this, some 300 million tones are burnt as fuel and the balanced used as manure. Even this could be improved upon by scientific planning like bio-gas production. The dung cakes are the sole source of energy of the poor, for cooking and for heating their dwellings during winter.

Animal husbandry and dairying activities, hitherto considered as supplementary to crop production, are being transformed into organized and industrialized production. The contribution of livestock to agriculture Gross Domestic Product (GDP) is 28 per cent and accounts for 5 per cent of total GDP, which was 4.70 per cent in 2004-05 (Planning Commission, GOI, 2012). In India where over 75 per cent farmers are small and marginal holders, livestock is the main source of livelihood for a majority of the rural population (Hegde, 2006). Livestock have been contributing about 15-20 per cent to the household income of farmers, which has been steadily increasing during recent years. Among different products, milk is the major output contributing to the GDP as well as to food security. In fact, the contribution of milk to GDP (5.86 %) is more than the contribution of rice (5.77 %) (Hegde, 2006). Currently around 46 per cent of the milk is consumed in the form of liquid milk, 47 per cent as traditional dairy products and 7 per cent as western dairy products (National Dairy Development Board, 2012). The value-added versions like ghee, butter, yogurt, paneer, cheese, along with a cornucopia of flavored milks, ice creams, Ultra High Temperature processed milk and shredded and liquid cheese is making the sector an attractive for growth. The demand for milk will further increase by 80 per cent by the year 2022. Demand for egg and meat is also likely to increase by several folds.

With the increase in per capita income and urbanization, the consumption of livestock products will continue to rise in the foreseeable future. Consequently, the demand for feed and fodder for feeding and fattening of livestock will also increase. The economic viability of livestock husbandry is dependent on the genetic potential for production, good health care, balanced feeding of animals and efficient marketing of the produce. While genetic improvement and health care are the prerequisites for sustainability, efficient feeding and marketing will help in increasing the profitability (Kannan, 2012). However, the profitability is directly dependent on the sources of feed and fodder, as about 65-70 per cent of the total cost of livestock farming is attributed to feeding (Hegde, 2006). Any saving in feed and fodder cost would directly contribute to increase in profitability. Balanced feeding of milch animals is more critical, as the results are reflected within a short span, almost immediately, in the form of milk production.

In case of growing stock of bullocks, sheep and goats, quality of feed will reflect on the growth rate, body weight and fertility, which are often unnoticed by the owners (Franzel *et al.*, 2003). Maximization of fodder in the diet of dairy animal makes their ration much cheaper as compared to concentrated based ration (Gaikwad and Gampower, 1995). Hence feeding of milch animals has greater significance for farmers, although feed management for other species is equally important.

There are already evidences of intensification of livestock production taking place across different regions of India. Among others, human population density, urbanization and small size farms have positive and significant effect on the intensification of livestock production (Birthal and Rao, 2004). Rise in intensification of livestock production may put pressure on the existing resource base. According to Dikshit and Birthal (2010), India's livestock sector requires 855 million tonnes of green fodder, 526 million tonnes of dry fodder and 56 million tonnes of concentrates by the year 2020. They predict that these requirements will be met from a basket comprising 27 million tonnes of cereals, 4 million tonnes of pulses, 21 million tonnes of oilseeds based items and 4 million tonnes of manufactured feed.

The total area under cultivated fodders is 8.3 million hectares on individual crop basis. The major fodder crops cultivated in India are sorghum, maize, bajra, oats, hybrid napier, guinea grass, paragrass, lucerne, berseem, cowpea, velvet bean and many others. Among these crops, sorghum, maize, oats, lucerne and berseem are more popular because of easy availability of seeds of improved varieties and well developed technology to increase the forage yield and quality. Sorghum amongst the kharif crops (2.6 million hectares) and berseem amongst the rabi crops (1.9 million hectares) occupy about 54 per cent of the total cultivated fodder cropped area. Improved perennial grasses have also played a major role to compensate with the high grazing intensity of 12.6 adult cattle units (ACU)/hectare. Permanent pastures constitute 3.6 per cent of total geographical area in the country. There are large chunks of common property and community lands which are under the public domain but becoming drastically reduced for livestock grazing. At present, the country faces a net deficit of 61.1 per cent green fodder, 21.9 per cent dry fodder residues and 64 per cent feeds. The requirement of crude protein and total digestible nutrients is 47.76 and 344.93 million tonnes, respectively. But the availability is 34.18 and 262.02 million tonnes of crude protein and total digestible nutrients, respectively, accounting to a net deficit of 28.44 per cent of crude protein and 24.04 per cent of total digestible nutrients (ICAR, 2013).

The schemes and programmes relating to feed, fodder and pasture development in the country are quite limited. There are several public departments and institutions directly or indirectly connected to the formulation and implementation of these schemes and programmes. The Department of Animal Husbandry and Dairying, Govt. of India, is the principal governmental agency in this regard. In addition, the state departments of Animal Husbandry, Agriculture, Forestry, Environment, Rural Development, State and Central Agricultural Universities, ICAR Institutions, National Seed Corporation and various local bodies such as panchayats, municipalities and corporations are engaged in the task. These programmes cover activities like introduction of fodder crops, establishment of fodder calendars, organization of farmers' field days, production of forage

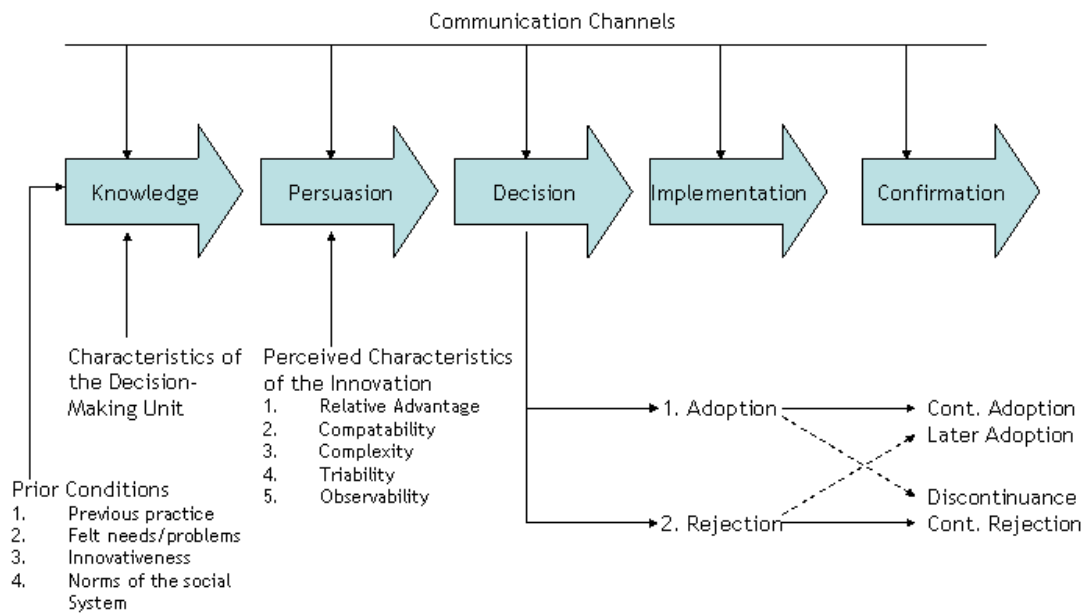


Figure 1: Innovation decision model as suggested by Rogers (2003)

Figure 1. Innovation decision as suggested by Rogers (2003)

crop foundation seeds through registered growers, conduct of training programmes and distribution of fodder seed minikits, grassland development, silvipasture development, etc. The effort of extension services to educate the farmers about improved fodder cultivation practices is very poor as it mainly emphasizes on food grain crops. The cultivation of fodder as sole crop has trade off between the allocation of land for food crops and fodder crops. Competition also emerges for the use of inputs like irrigation, labour and fertilizers. Forages are bulky and involve high transportation cost. There is a requirement of effective functioning of fodder markets and high profitability from livestock rearing to motivate the farmers to reallocate the resources for the cultivation of different perennial fodder crops (Mapiye *et al.*, 2006).

According to Rogers (2003), the innovation-decision process is the process (Fig. 1) through which an individual or other decision making unit, passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation and use of the new idea and to confirmation of this decision. This process consists of a series of actions and choices over time through which an individual or an organization evaluates a new idea and decides whether or not to incorporate the new idea into the ongoing system. The perceived newness of an innovation, and the uncertainty associated with this newness, is a distinctive aspect of innovation-decision making, compared to other types of decision making. Innovation-decision is a process that occurs over time and is conceptualized to have five stages-Knowledge occurs when an individual or other decision making unit is exposed to an innovation's existence and gains some understanding of how it functions. Knowledge function is mainly cognitive or knowing. Knowledge seeking is initiated by

an individual and is greatly influenced by one's predispositions. Exposure is selective and generally an individual tends to expose to those ideas which are consistent with one's existing attitudes and beliefs, and avoids those which are in conflict with them.

Persuasion occurs when an individual or some other decision making unit forms a favourable or unfavourable attitude toward the innovation. At this stage the individual becomes more psychologically involved with the innovation and actively seeks information about it. The individual perceives the attributes of innovation, which is conditioned by one's personality and social system norms and develops a general idea about the innovation.

Decision occurs when an individual or some other decision making unit engages in activities that lead to a choice to adopt or reject the innovation. The individual puts the innovation to a small scale trial in own situation. Considering the relative advantage, risks involved and many other related factors like availability of market, need for the family, etc. the individual takes a decision to adopt or reject the innovation.

Implementation occurs when an individual or other decision making units puts an innovation into use. At this stage the individual is generally concerned with where to get the innovation, how to use it and what operational problems will be faced and how these could be solved. Re-invention which is defined as the degree to which an innovation is changed or modified by a user in the process of its adoption and implementation, often occurs at this stage. As a result of re-invention, an innovation may be more appropriate in matching an adopter's pre-existing problems and more responsive to new problems that arise during the innovation-decision process.

Confirmation occurs when an individual or some other decision making unit seeks reinforcement of an innovation-decision already been made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation. The decision to adopt or reject an innovation is not a terminal act. Human mind is in a dynamic state and an individual constantly evaluates the situation. If the individual perceives that the innovation is consistently giving satisfactory or unsatisfactory results, the person may continue to adopt or reject the innovation as the case may be. At the confirmation stage extension agents have the additional responsibility of providing supporting messages to individuals who have previously adopted. Extension agents assume that once adoption is secured, it will continue. But there is no assurance against discontinuance, because negative messages about an innovation circulate via interpersonal networks in most client systems.

Many studies have been taken up on Roger's first four stages- knowledge, persuasion, decision and implementation, but very few studies on the fifth stage of confirmation, or what may be called as continuance (Parthasarthy, 1995). Black (1983) noted that the characteristics of the innovation that facilitates its adoption also influence its continued use. Thus innovations which are less complex and easy to try tend to be more readily adopted and also have a higher level of continuance. Discontinuance is defined as a decision to reject an innovation after having previously adopted it (Rogers, 2003).

Many studies have been conducted on innovation decisions of farmers on food crops. Studies to this effect on perennial fodder crops are meager. Many farmers in India do not come forward to cultivate perennial fodder crops owing to their small land holdings. But then, there are some farmers who cultivate these crops despite being perennial in nature occupying land for long. These crops do not enjoy the associated subsidies like for food crops. The benefit of growing these crops is indirect through the sale of animal products like milk. With these typical characteristics the trend for cultivation of perennial fodder crops though is growing in Karnataka. The factors that influence cultivation of these crops on continuing basis needs to be determined to better understand the innovation decision of the farmers. Therefore the present study was conceptualized and carried out with the following specific objectives-

1. To study the socio-economic profile of adopters of perennial fodder crops
2. To ascertain the different perennial fodder crops cultivated by them
3. To analyze the favorable factors for continuance of perennial fodder crops by adopters
4. To identify the constraints faced by them in cultivation of these crops

Significance of the study

Present study tries to identify the factors responsible for continuance of cultivation of perennial fodder crops. The analysis of personal and socio-economic factors may help to understand the target group. It helps the concerned authorities and field level workers to manipulate the appropriate factors so as to enhance the continuance level of fodder cultivation. An attempt has also been made to study the constraints faced by the fodder growers, thereby the efforts can be made to eliminate those constraints in order to increase the cultivation of perennial fodder crops.

Limitations of the study

The present study has limitations of time and other resources availability with the student researcher. As the study focused on the continuance of cultivation of perennial fodder crops, the sample size considered for the study is relatively small. Further, opinion expressed by the respondents with regard to the various issues of the study may not be totally free from personal bias and prejudice. Hence, the results of the study cannot be generalized beyond the limits of the study area.

2. REVIEW OF LITERATURE

A comprehensive review of literature is an integral part of any investigation. Fleishman *et al.* (1969) said better ways are needed to generate research findings from laboratory studies to operational settings, from one experimental study to another and from one operational setting to another. Studies for variables *viz.*, soil type, size of irrigated land, perceived attributes of innovation were limited. The entire reviews have been chronologically organized and presented under different heads as given below.

- 2.1 Continuance of fodder technologies
- 2.2 Socio-economic characters of respondents
- 2.3 Land, livestock holdings and other characteristics of respondents
- 2.4 Perennial fodder crops cultivated by respondents
- 2.5 Reasons for continuance of perennial fodder crops cultivation
- 2.6 Constraints in cultivation of fodder crops

2.1 Continuance of fodder technologies

Mason (1962) in his study on information source use in the adoption process in California found that the decision to adopt or reject a new idea is often not the terminal stage in the innovation-decision process, and that individuals continue to seek information about an innovation after they have adopted it.

Black (1983) in his study on discontinuance and diffusion: examination of the post adoption decision process noted that the characteristics of the innovation that facilitates its adoption also influence its continued use.

Ray (2001) reported that confirmation occurs when an individual or some other decision making unit seeks reinforcement of an innovation-decision already been made, or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation. The decision to adopt or reject an innovation is not a terminal act.

Kielmeyer (2003) conducted a study on discontinuance of innovations: social network characteristics, product attributes and adopter traits related to post adoption behaviour found that social networks are an important determinant of continuance and discontinuance of an innovation. In fact, he recommends that innovation disseminators should actively attempt to influence social networks by creating connections among current adopters.

Saljoughi (2003) in his study on adoption of e-commerce in Norway found that age had indirect effect towards local continuance or discontinuance adoption while education and income had direct effect.

Burton (2006) in his study on globalisation and cultural identity in Caribbean society: the Jamaican case reported that continuation of the dominant 20th century extension strategy of increasing the productivity of the major food crops or improving national food security will lead to declining farm incomes among small-scale farmers, increased hunger, forced rural urban migration, and further environmental degradation.

Miller and Mariola (2008) did a study on discontinuance of environmental technologies in the humid tropics of Costa Rica: in post-adoption stage or confirmation stage an individual seeks reinforcement of the innovation decision already made. It is at this point that the individual may choose to reverse their previous adoption decision and discontinue the use of innovation.

Wangpipatwong *et al.* (2008) did a study on understanding citizen's continuance intention to use e-government website: a composite view of technology acceptance model and computer self-efficacy and found that perceived usefulness and perceived ease of use of e-government websites and citizen's computer self-efficacy directly enhanced citizen's continuance intention to use e-government websites. In addition, perceived ease of use of e-government websites indirectly enhanced citizen's continuance intention through perceived usefulness.

Bhattacharjee (2011) reported that users' continuance intention is determined by their satisfaction and perceived usefulness of continued information system use. User satisfaction, in turn, is influenced by their confirmation of expectation from prior information system use and perceived usefulness. Post acceptance perceived usefulness is influenced by users' confirmation level.

Hossain and Quaddos (2011) made a study on the adoption and continued usage intention of RFID (Radio Frequency Identification) : an integrated framework and observed that along with technological, organizational and environmental factors RFID adoption and continued usage depends on the expectations and self-efficacy.

Jasmine *et al.* (2012) in their study on factors associated with the continuity of agricultural innovation adoption in Sabah, Malaysia reported that demographic and socio-economic factors which were found as one of the major factor associated with the agricultural innovation adoption included age, personal income, education attainment, numbers of dependents, length of residence, training attended and organizational membership, psychological (attitude) and cognitive (knowledge) factors have their influence towards the continuance and discontinuance of innovation adoption.

Peter *et al.* (2012) conducted a study on affective and social factors influencing the continuance intention of using social technology for the case-based learning and revealed that social factor of sharing knowledge and information with each other, perceived usefulness and satisfaction when using social technology to learn business cases have a positive

influence on a student's intention to continue using social technology to acquire information technology concepts and solve business case-related problems.

Ghasemi *et al.* (2013) conducted a study on investigation determinants of the continuance adoption of the canola crop and revealed that introduction of new variety such as canola in the area may be successful and continues if farmers have more contact with extension agent and participating in extension classes, which can facilitate change in the behavior of farmers and ultimately lead to a decision to risk technology adoption. Participation in extension classes will enable farmers to get more information and improve their understanding about the canola crop, which may intern leads to a change in their knowledge, attitude and behavior.

Most of the above reviews indicated that factors such as age, education, income, extension contact, innovative proneness, organization membership led to the continuance of innovation by farmers.

2.2 Socio-economic characters of respondents

2.2.1 Age

Gautam and Tripathi (2001) conducted a study on women in goat husbandry in Etawah district in Uttar Pradesh and found that most of the women involved in goat husbandry were young women.

Chi and Yamada (2002) in their research on factors affecting farmers' adoption of technologies in farming system: a case study in Omon district, Can Tho province, Mekong Delta found that age had positive significant relationship with adoption of technology.

Saljoughi (2003) in his study about adoption of e-commerce in Norway found that age had a relationship with the way people use of product, service and facilities that are available for them in their environment. Therefore, age had indirect effect towards local continuance or discontinuance of adoption.

Khin Mar Oo (2005) conducted a study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district and reported that 59.17 per cent of women dairy farmers belonged to middle age group, followed by young age group (22.50 %) and old age group (18.33 %).

Pushpa (2006) studied on livestock production systems of rural and periurban livestock owners in Belgaum district and found that 50.00 per cent of the respondents were middle aged, followed by old (36.25 %) and young (13.75 %) age groups.

Li *et al.* (2008) in their study on factors influencing the adoption of pasture crop rotation in the semiarid area of China's Loess plateau reported that age was positively and significantly correlated to adoption of pasture crop rotation technologies.

Rezvanfar and Arabi (2009) conducted a study on analyzing the farmer-specific and socio-personal factors influencing adoption of pasture conservation technologies amongst livestock farmers in the Tehran Province of Iran and reported that age had positive significant correlation with adoption of pasture conservation technologies.

Jera and Ajayi (2010) in their study on logistic modelling of small holder livestock farmers adoption of tree based fodder technology in Zimbabwe observed that 57.40 per cent of the adopters of fodder trees were of young- middle age followed by old age (42.60 %).

Mutambara *et al.* (2012) conducted a study on agroforestry technologies involving fodder production and implication on livelihood of smallholder livestock farmers in Zimbabwe: a case study of Goromonzi district and reported that age is negatively correlated with agroforestry technology adoption.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that most of the respondents (58.00 %) growing forage crops were of middle age, followed by old age (37.33 %) and the percentage of young respondents engaged in growing forages was comparatively less (4.67 %).

Adong *et al.* (2014) in their study on impact of households' membership of farmer groups on the adoption of agricultural technologies in Uganda found that age had positive and significant relationship with adoption of agriculture technologies.

Saikia *et al.* (2014) in their study on determinants of variables associated with adoption behaviour of farmers towards recommended production technologies of winter rice in Assam and found that age had positive and significant relationship with adoption.

Nunes *et al.* (2015) conducted a study on local knowledge about fodder plants in semi-arid region of north-eastern Brazil and found that 45.73 per cent of growers of fodder plants belong to age group of 35-55, followed by less than 35 years of age (28.34 %) and above 55 years of age (25.93 %).

Pushpa *et al.* (2015) studied on socio economic characteristics and livestock production systems of periurban and rural livestock owners of Belgaum district of Karnataka state, India and reported that majority of respondents of rural (57.50 %), peri-urban (42.50 %) and total category (50.00 %) belonged to middle age group followed by old age group and young age group, respectively.

Wairore *et al.* (2015) in their study on characterization of enclosure management regimes and factors influencing their choice among agropastoralists in north-western Kenya observed that age of the respondents had positive and significant relationship with management of pastures.

Most of the above reviews indicated that majority of the farmers belonged to middle age group.

2.2.2 Education

Chi and Yamada (2002) in their study on factors affecting farmers' adoption of technologies in farming system: a case study in Omon district, Can Tho Province, Mekong Delta reported that education had positive significant relationship with adoption of technology.

Saljoughi (2003) in his study about adoption of e-commerce in Norway found that education have a positive and significant relationship with the way people use of product, service and facilities that are available for them in their environment.

Wadear *et al.* (2003) in their study on economic analysis of human labour adoption in dairy farming in Karnataka revealed that 25.83 per cent of dairy farmers had primary education followed by 25.00 per cent illiterates, 13.33 per cent had matriculation, 12.50 per cent secondary, 10.83 per cent PUC and only 3.35 per cent of dairy farmers were educated upto graduation level.

Savitha (2004) did a study on role of rural women in animal husbandry in Dharwad district of Karnataka and observed that major portion of the respondents (75.50 %) were illiterates, followed by 10.00 per cent of them could only read and write. The respondents who attended primary school constituted 8.80 per cent and the rest of 5.60 per cent made upto middle school.

Rezvanfar (2007) in his study on communication and socio-personal factors influencing adoption of dairy farming technologies amongst livestock farmers of east Iran found that education contributed significantly to the adoption of dairy farming technologies.

Rezvanfar and Arabi (2009) in their study on analyzing the farmer-specific and socio-personal factors influencing adoption of pasture conservation technologies amongst livestock farmers in the Tehran province of Iran reported that education significantly affected the adoption of pasture conservation technologies.

Jera and Ajayi (2010) did a study on logistic modelling of smallholder livestock farmers' adoption of tree-based fodder technology in Zimbabwe and found that formal education of farmers is positively correlated with adoption of fodder technologies.

Satish (2010) did a study on farmers' perceptions, preferences and utilization of SRI and traditional paddy straw for livestock and indicated that equal per cent (29.17 %) of respondents studied upto middle and high school. One fifth (20.80 %) of the respondents studied upto primary school and is followed by pre-university (15.83 %) and graduate level (1.70 %). The illiterate respondents constituted 3.33 per cent.

Mutambara *et al.* (2012) in their study on agroforestry technologies involving fodder production and implication on livelihood of smallholder livestock farmers in Zimbabwe concluded that farmers with higher education are more likely to adopt agroforestry practices.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that 28.00 per cent of the respondents were

illiterate, followed by 28.67 per cent respondents had received education upto primary level and 27.33 per cent were educated upto high school. Only 13.33 per cent of respondents were educated to graduation level and only 2.67 per cent were received pre-university level.

Adong *et al.* (2014) in his study on impact of households' membership of farmer groups on the adoption of agricultural technologies in Uganda found that education had a positive and significant relationship with continued adoption of new technologies.

Saikia *et al.* (2014) in their study on determinants of variables associated with adoption behaviour of farmers towards recommended production technologies of winter rice in Assam and reported that education had positive and significant relationship with adoption.

Zerihun *et al.* (2014) conducted a study on determinants of agroforestry technology adoption in Eastern Cape Province, South Africa and found that education level of the respondents had significant effect on the adoption of agroforestry technologies.

Pushpa *et al.* (2015) studied on socio economic characteristics and livestock production systems of periurban and rural livestock owners of Belgaum district of Karnataka state, India and reported that regarding education, in rural area more number of farmers (33.75 %) were educated up to primary school and 28.75 per cent were illiterates. While in periurban area 40.00 per cent of the respondents were educated upto high school and illiterates were only 21.25 per cent.

Wairore *et al.* (2015) in their study on characterization of enclosure management regimes and factors influencing their choice among agropastoralists in north-western Kenya reported that education plays a significant role in influencing household income, technology adoption and the socio-economic status of the family as a whole and is hypothesized to positively influence enclosure regimes.

Most of the above reviews indicated that education had significant effect on the adoption of technologies.

2.2.3 Family type

Gautum and Tripathi (2001) conducted a study on women in goat husbandry in Etawah district in Uttar Pradesh and indicated that majority (77.24 %) of women involved in goat rearing were from nuclear family.

Sophia (2001) in her study on knowledge and adoption of sustainable cultivation practices in sugarcane and cotton by farmers in Cuddalore district of Tamil Nadu indicated that 70.00 per cent of sugarcane farmers and 80.00 per cent of cotton farmers belonged to nuclear family and rest of sugarcane farmers (30.00 %) and cotton farmers (20.00 %) belonged to joint family.

Srivastava and Rankawat (2004) in their study on mass media effect on adoption of nutrition practices revealed that 59.00 per cent of the families of village were nuclear families and 41.00 per cent were joint families.

Pushpa (2006) studied on livestock production systems of rural and periurban livestock owners in Belgaum district and found that majority (72.50 %) of the respondents lived in joint family and remaining 27.50 per cent lived in nuclear family.

Satish (2010) did a study on farmers' perceptions, preferences and utilization of SRI and traditional paddy straw for livestock and indicated that more than half (56.67 %) of the respondents were from nuclear families and 43.33 per cent of the respondents lived in joint families.

Most of the above reviews indicated that majority of the farmers belonged to nuclear family.

2.2.4 Family size

Manay and Farzana (2000) in their study on socio-economic characteristics of rural family found that 25.00 per cent of the families had less than 5 members and 65.20 per cent of them had 3 to 7 members in their family, which shows the reducing trend in size of the family.

Rangi *et al.* (2002) conducted a case study on economic empowerment of rural women through self help groups at Fatehgarh Sahib district of Punjab revealed that 56.00 per cent of the respondents were having up to 5 family members whereas, 44.00 per cent had 6 to 10 family members.

Umarani (2002) in her study on technological needs of women in dairying conducted in three different mandals in Ranga Reddy district of Andhra Pradesh found that family size has not shown any significant relationship with technological needs of farmers.

Rezvanfar (2007) studied communication and socio-personal factors influencing adoption of dairy farming technologies amongst livestock farmers of east Iran and found that family size contributed significantly to the adoption of dairy farming technologies.

Shwetha *et al.* (2007) in their study on clinical health status prevailing complications among chronic renal failure patients in Hubli noticed that 65.00 per cent of the families had less than 4 members, 20.00 per cent had 4-8 members and 15.00 per cent had more than 8 members in their family which shows reducing trend in the size of the family.

Li *et al.* (2008) conducted a study on factors influencing the adoption of pasture crop rotation in the semiarid area of China's Loess plateau and observed that family size had positive significant relationship with pasture conservation technologies.

Desai (2009) conducted a study on contribution of livestock production system to farmers livelihood in western region of Maharashtra and found that majority of the respondents (77.00 %) belonged to large family size and the remaining (23.00 %) had small family size.

Rezvanfar and Arabi (2009) in their study on analyzing the farmer-specific and socio-personal factors influencing adoption of pasture conservation technologies amongst livestock farmers in the Tehran province of Iran concluded that family size is positively correlated to adoption of pasture conservation technologies.

Jera and Ajayi (2010) did a study on logistic modelling of smallholder livestock farmers' adoption of tree-based fodder technology in Zimbabwe and found that family size is positively correlated with adoption of agroforestry technologies.

Satish (2010) did a study on farmers' perceptions, preferences and utilization of SRI and traditional paddy straw for livestock and indicated that 53.33 per cent of respondents had big family size and remaining 46.67 per cent of respondents had small family size.

Mutambara *et al.* (2012) conducted a case study on agroforestry technologies involving fodder production and implication on livelihood of smallholder livestock farmers in Zimbabwe. They reported that family size is positively correlated with agroforestry technology adoption.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that majority of the respondents (82.67 %) belonged to big families and 17.33 per cent of respondents live in small families.

Pushpa *et al.*(2015) conducted a study on socio economic characteristics and livestock production systems of periurban and rural livestock owners of Belgaum district of Karnataka state, India and found that majority of the respondents in the rural (62.5 %), periurban (82.5 %) and in total category (72.5 %) belonged to big family size (>4 members).

Most of the above reviews concluded that majority of the respondents had family size of 4-6 members.

2.2.5 Annual income

Chi and Yamada (2002) in their research on factors affecting farmers' adoption of technologies in farming system: a case study in Omon district, Can Tho Province, Mekong Delta observed that annual income had positive significant relationship with adoption of technology.

Rao *et al.* (2002) in their study on dairy farming by landless women in southern states of India which was conducted in five villages, one each from four southern states of India and one from the union territory of Pondicherry revealed that, no single family was deriving less than 25.00 per cent of its income from dairying. Majority of the families were earning between 50.00 and 75.00 per cent of their income from dairying. This highlights the importance of dairy cattle in total landless families.

Savitha (2004) in her study on role of rural women in animal husbandry in Dharwad district of Karnataka and found that 45.50 per cent of the respondents belonged to low income group, followed by medium income group (28.80 %) and high income group (25.70 %).

Suresh (2004) conducted a study on entrepreneurial behaviour of milk producer in Chittoor district of Andhra Pradesh and reported that majority of milk producers were in medium income group (80.30 %), followed by high (15.00 %) and low (4.17 %) income groups.

Li *et al.* (2008) conducted a study on factors influencing the adoption of pasture crop rotation in the semiarid area of China's Loess plateau and observed that annual income had positive significant relationship with pasture conservation technologies.

Rezvanfar and Arabi (2009) in their study on analyzing the farmer-specific and socio-personal factors influencing adoption of pasture conservation technologies amongst livestock farmers in the Tehran Province of Iran observed that annual income is positively and significantly correlated to adoption of pasture conservation technologies.

Satish (2010) did a study on farmers' perceptions, preferences and utilization of SRI and traditional paddy straw for livestock and indicated that 36.66 per cent of respondents belonged to high income group followed by medium (31.66 %), semi medium (27.50 %) income groups and 4.16 per cent of them were in low income group.

Nataraju (2013) in his study on participation of women in dairy farming in Chikmagalore district of Karnataka found that 40.00 per cent of dairy farm women had high annual income (>Rs.1,00,000) followed by 33.33 per cent come under medium annual income (Rs.50,000 to Rs.1,00,000) category and 26.67 per cent under low income group category.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that 95.33 per cent of respondents belonged to high income group wherein their annual income exceeded Rs. 1.20 lakhs. Out of remaining respondents, 3.34 per cent belonged to medium income group (Rs.60,000 to Rs. 1.20 lakhs) and 1.33 per cent belonged to low income group of less than Rs.60,000.

Zerihun *et al.* (2014) studied on determinants of agroforestry technology adoption in Eastern Cape Province, South Africa and observed that annual income significantly contributed to the adoption of agroforestry technologies.

Pushpa *et al.* (2015) conducted a study on socio economic characteristics and livestock production systems of periurban and rural livestock owners of Belgaum district of Karnataka state, India and found that cent per cent of periurban respondents, 98.75 per cent of rural respondents and in total 99.37 per cent of respondents belonged to high income group.

Wairore *et al.* (2015) in their study on characterization of enclosure management regimes and factors influencing their choice among agropastoralists in north-western Kenya concluded that rich households are more likely inclined to practice diverse land use practices than the poor since agropastoralists in the former do not find sufficient feeds for their large herds in times of grazing scarcity.

From the above studies it could be concluded that annual income significantly contributed to the adoption of technologies.

2.3 Land, livestock holdings and other characteristics of respondents

2.3.1 Land holding

Umarani (2002) in her study on technological needs of women in dairying conducted in three different mandals in Ranga Reddy district of Andhra Pradesh found that landholding has not shown any significant relationship with technological needs of farmers.

Wadear *et al.* (2003) in their study on economic analysis of human labour adoption in dairy farming in Karnataka reported that small dairy farmers had average farm land of 1.74 ha, medium dairy farmers had 5.17 ha and large dairy farmers had 9.04 ha of land.

Gangil *et al.* (2005) in their study on effect of socio-economic variables on the level of knowledge and training needs of livestock observed that relationship between the land holding and level of knowledge of livestock farmers in animal husbandry practices was significant and positive. It signified large land holding farmers possess more knowledge as compared to small and marginal land holding farmers because large farmers have better resources and more exposure to mass media and they have more opportunities to acquire more knowledge.

Khin Mar Oo (2005) conducted a study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district and observed that 33.00 per cent of the respondents belonged to small and medium land holding group, 29.17 per cent come under medium land holding group and remaining 4.16 per cent of the respondents had large land holdings.

Chaudhari (2006) in his study on entrepreneurial behaviour of dairy farmers observed that 54.00 per cent of dairy farmers had semi medium land holding, followed by medium land holding (21.00 %), small land holding (19.00 %) and only very few (6.00 %) respondents had marginal land holdings.

Rezvanfar and Arabi (2009) in their study on analyzing the farmer-specific and socio-personal factors influencing adoption of pasture conservation technologies amongst livestock farmers in the Tehran Province of Iran observed that land holding had positive significant correlation with adoption of pasture conservation technologies.

Jera and Ajayi (2010) in their study on logistic modelling of small holder livestock farmers adoption of tree based fodder technology in Zimbabwe found that 62.00 per cent of the respondents had large farm size (>4ha) and the remaining (38.00 %) had farm size of less than 4 hectares.

Satish (2010) did a study on farmers' perceptions, preferences and utilization of SRI and traditional paddy straw for livestock and indicated that 50.84 per cent of the respondents were medium land holders, 28.33 per cent of them were big, 20.00 per cent of them were small land holders and very negligible per cent of them were marginal landholders.

Satyanarayan and Jagadeeswary (2010) conducted a study on knowledge and adoption behaviour of livestock farmers in Uttar Kannada and observed that 16.00 per cent of the livestock farmers had small land holdings, followed by 2.00 per cent of the livestock farmers had medium land holdings and 82.00 per cent of the livestock farmers were having large land holdings.

Mutambara *et al.* (2012) in their study on agroforestry technologies involving fodder production and implication on livelihood of smallholder livestock farmers in Zimbabwe revealed that land size had significant contribution to adoption of agroforestry technologies.

Nataraju (2013) conducted a study on participation of women in dairy farming in Chikmagalore district of Karnataka and found that most of the respondents were having 2.6 to 5.0 acres of land (46.67 %) followed by less than 2.5 acres (38.33 %), medium of 5.1 to 10.0 acres (10.00 %) and above 10 acres of land (5.00 %).

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that 41.00 per cent of respondents possessed medium land holdings (2-4 ha). Big land holdings (4-6 ha) were possessed by 22.67 per cent of respondents, small land holdings (upto 2 ha) were possessed by 16.00 per cent of respondents. Very big (6-8 ha) land holdings were possessed by 8.67 per cent of respondents and more than 8 ha, termed as affluent, were possessed by 12.00 per cent of respondents.

Zerihun *et al.* (2014) studied on determinants of agroforestry technology adoption in Eastern Cape Province, South Africa and observed that land size of respondents had positive significant relationship with agroforestry technology adoption.

Pushpa *et al.* (2015) conducted a study on socio economic characteristics and livestock production systems of periurban and rural livestock owners of Belgaum district of Karnataka state, India and reported that majority (61.25 %) of the respondents of the rural area possessed big landholdings. While in case of periurban respondents most of (43.75 %) them were marginal land holders.

Wairore *et al.* (2015) in their study on characterization of enclosure management regimes and factors influencing their choice among agropastoralists in north-western Kenya households with large landholdings are likely to practice livestock-based agropastoralism due to adequacy of pasture, particularly during the dry season. They are also likely to diversify income by engaging in other income-generating land use options such as contractual grazing.

From the above studies it could be concluded that majority of the respondents had small and medium land holdings.

2.3.2 Soil type

Biradar (2000) from his studies conducted on medium black soil at Dharwad reported that among various cover crops tried in the cotton, incorporation of intercropped cover crop viz., *Stylosanthes hamata* (816 kg/ha) and lucerne (806 kg/ha) increased the cotton seed yields.

Mahapatra *et al.* (2002) observed that the soils varied greatly in texture from loamy skeletal on steep slopes to silty clay loam and clay loam in piedmont plains in the various physiographic units in the sub humid eco-system of Kashmir region.

Kamble (2003) in a field trial at Dharwad on medium black soils observed that sunhemp and lucerne grown as 'in situ' green manures in cotton contained 2.57 and 2.63 per cent nitrogen, 0.30 and 0.27 per cent phosphorus and 0.98 and 0.88 per cent potassium respectively.

From the above studies it can be concluded that forage crops grow better in black soils.

2.3.3 Size of irrigated land

Prasad *et al.* (2001) conducted a study on analysis of milk production from buffaloes revealed that, out of the total milk producers, 61.00 per cent possessed land and 39.00 per cent possessed no land. The average wetland holding was 4.82 acres among milk producers who possessed wetland while the dry land average was 6.29 acres among the milk producers who possessed dryland.

Shashidhara (2003) in his study on socio-economic profile of drip irrigation farmers in Shimoga and Davangere districts of Karnataka observed that 58.00 per cent of the respondents falls under medium level of category of area under drip irrigation followed by 22.00 per cent of respondents under low level and 10.00 per cent of respondents under high level category of area under drip irrigation.

Sajjan (2006) in his study on comparative profile analysis of rural youth in rainfed and irrigated tracts of Bagalkot district of Karnataka reported that in irrigated tract more than one third of the respondent families (38.33 %) had land holding of 5 to 10 acres, more than one fourth of the respondent families (31.66 %) had land holding of 10 to 25 acres followed by 25.00 per cent of the respondent families had land holding of 2.5 to 5.0 acres and 6.66 per cent of the respondents families had land holding of 2.5 acres.

Ghasemi *et al.* (2013) conducted a study on investigation determinants of the continuance adoption of the canola crop in Kermanshah township of Iran and reported that size of irrigated land had positive and significant relationship with continuance of canola crop cultivation.

The above studies concluded that majority of respondents had medium land holdings.

2.3.4 Herd Size

Gautam and Tripathi (2001) studied on women in goat husbandry in Etawah district in Uttar Pradesh and revealed that majority of the respondents maintained small flock size which was significantly correlated with involvement and overall employment status.

Keshava and Mandape (2001) analyzed the potentials and problems of dairy farming in north Bihar and found that herd size was largest (3.82 cattle equivalents) on small farms and lowest (2.18 cattle equivalents) on medium-large farm.

Veeranna *et al.* (2004) studied attitude and adoption of improved dairy production practices by Lambani tribe in Bidar district and reported that herd size had positive and significant correlation with the extent of adoption of improved dairy production practices.

Gangil and Dabas (2005) in their study on effect of socio-economic variables on the level of knowledge and training needs of livestock revealed that farmers having large herd size have more knowledge in animal husbandry than the farmers having smaller herd.

Savitha *et al.* (2005) did a study on the role of rural women in dairy enterprise in Dharwad and observed that herd size was positively and significantly associated with the time spending pattern of the respondents. As the herd size increased, the amount of time spent on washing the animals, milking and various activities of dairy enterprise also increased.

Senthilkumar *et al.* (2005) conducted a study to know the profile of urban dairy farmers utilizing mobile artificial insemination service in Tamil Nadu and observed that 38.00 per cent of the respondents maintained medium herd size (4-7 animals), followed by one-third with small herd size (1-3 animals) and the remaining respondents maintained large herd size (8 and above animals).

Bharadwaj *et al.* (2006) in their study on economics of buffalo milk production in Hisar district of Haryana revealed that 67.00 per cent of the dairy farmers possessed small herd size (1- 2 animals), followed by medium herd size of 3 to 4 animals (24.50 %) and large herd size of 5 and above animals (8.50 %).

Rezvanfar (2007) studied communication and socio-personal factors influencing adoption of dairy farming technologies amongst livestock farmers of east Iran and found that herd size contributed significantly to the adoption of dairy farming technologies.

Mande and Thombre (2009) conducted a study on adoption of cattle rearing practices by owners in Latur district of Maharashtra and observed that 50.00 per cent of cattle owners possessed small herd size (upto 4 animals), followed by medium herd size (31.67 %) of 5 to 10 animals and big herd size (18.00 %) of above 10 animals.

Rezvanfar and Arabi (2009) in their study on analyzing the farmer-specific and socio-personal factors influencing adoption of pasture conservation technologies amongst livestock farmers in the Tehran Province of Iran observed that herd size is positively and significantly correlated to adoption of pasture conservation technologies.

Jera and Ajayi (2010) did a study on logistic modelling of smallholder livestock farmers' adoption of tree-based fodder technology in Zimbabwe and found that herd size is positively correlated with adoption of fodder technologies.

Satish (2010) did a study on farmers' perceptions, preferences and utilization of SRI and traditional paddy straw for livestock and indicated that medium size herds were owned by 73.33 per cent of respondents, small and big size herds were owned by 20.83 and 5.84 per cents of respondents, respectively.

Zerihun *et al.* (2014) studied on determinants of agroforestry technology adoption in Eastern Cape Province, South Africa and observed that herd size of respondents had positive significant relationship with agroforestry technology adoption.

Pushpa *et al.* (2015) conducted a study on socio economic characteristics and livestock production systems of periurban and rural livestock owners of Belgaum district of Karnataka and observed that 43.75 per cent of the respondents fall under medium category followed by 32.50 per cent in small category and 23.75 per cent in large category.

Kimba *et al.* (2015) conducted a study on adapting to the impacts of climate change in the sub-humid zone of Burkina Faso, West Africa: perceptions of agro-pastoralists and reported that cattle herd size positively affected the choice to adopt adaptation measures such as transhumance and off-farm activities.

Wairore *et al.* (2015) in their study on characterization of enclosure management regimes and factors influencing their choice among agropastoralists in north-western Kenya reported that the number of livestock in a household is likely to positively influence applied enclosure management regimes or systems. Households with large herds will practice livestock-based agropastoralism while those with smaller herds are likely to adopt enclosure regimes with complementary or subsistence land use practices.

From the above studies it could be concluded that herd size is positively and significantly correlated to adoption of technologies.

2.3.5 Livestock composition

Prasad *et al.* (2001) conducted a study on analysis of milk production from buffaloes and found that out of the total adult female buffaloes 75.80 per cent were in milk while 24.20 per cent were dry animals.

Arunachalam *et al.* (2002) in their study on goat farming structure and its income in certain parts of Tamil Nadu revealed that the largest number of households maintain combination of goat and buffalo followed by combination of goat, cow, buffalo and poultry.

Khin Mar Oo (2005) in his study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district revealed that 7.50 per cent of dairy women possessed 1 cross bred cow, followed by 2 crossbred cows (4.16 %) and 3 and above cross bred cows (0.83 %). Whereas 1 local cow (19.16 %) , 2 and above (9.16

%), up to 1 buffaloes (32.50 %), 2 buffaloes (34.16 %) and 3 and above (5.83 %) were also possessed by some respondents.

Singh (2005) conducted a study on socio-economic profile of farmers and animal feed resources in the mountains of Himachal Pradesh and reported that animal rearing in Chamba is dominated by cattle, sheep and goats. Buffaloes are almost absent and 98.00 per cent of the farmers had cattle and 4.00 per cent had ponies either in sole or in combination with cattle.

Pushpa (2006) studied on livestock production systems of rural and periurban livestock owners in Belgaum district and found that in peri-urban area most of the respondents (38.27 %) possessed local buffalo followed by upgraded buffalo (21.70 %) and bullocks (14.28 %). In total, most of the respondents possessed (39.94 %) local buffaloes. In rural areas most of the respondents (43.75 %) possessed local buffalo followed by bullocks (28.33 %) and crossbred cow (21.25 %). Sheep and goats were reared by negligible per cent of rural as well as peri urban respondents.

Biradar *et al.* (2007) conducted a study on traditional livestock feeding practices in northern Karnataka and reported that the large ruminants dominated the livestock profile; only a few farmers keep sheep and goats. The livestock is mainly composed of local breeds; local selections primarily khilari and a small, but increasing number of upgraded and crossbred cattle.

Chakeredza *et al.* (2007) did a study on managing fodder trees as a solution to human-livestock food conflicts and their contribution to income generation for smallholder farmers in southern Africa and reported that goats and sheep play some role in the small holder farmer household economy, cattle are the predominant livestock species supplying draught power, milk, manure and meat.

Gill and Saini (2008) conducted a study on awareness of recommended dairy practices among farmers and found that 80.65 per cent of the respondents had 1-2 crossbred cows and only 1.61 per cent possessed more than 10 cows. Whereas 9.68 per cent and 8.06 per cent possessed 3-5 and 6-10 crossbred cows, respectively. None of the respondents possessed desi cows and in case of buffaloes, 42.95 per cent of respondents had 3-5 and 34.90 per cent had 6-1- buffaloes, 11.41 per cent respondents had only 1-2 buffaloes and 10.74 per cent had more than 10 buffaloes.

Satish (2010) did a study on farmers' perceptions, preferences and utilization of SRI and traditional paddy straw for livestock and indicated that 46.66 per cent of the respondents possessed local cow, bullock were possessed by 60.83 per cent of respondents. Fifteen per cent and 23.33 per cent of the respondents possessed buffaloes and cross bred cow, respectively. Sheep and goats were reared by negligible per cent of respondents.

From the above studies it could be concluded that majority of the respondents had composition of cow and buffalo.

2.3.6 Extension contact and participation

Abdul *et al.* (2003) in their study on livestock farmers' preference of communication media and their use by extension workers in tribal area of Bihar reported that majority of extension workers preferred to use extension methods like group discussions (80.00 %), followed by kisan mela (66.67 %), farm visit (63.33 %), cattle show (56.67 %), training (46.67 %), newspaper (33.33 %), demonstration (30.00 %), film show (30.00 %), radio (26.66 %), television (16.66 %), exhibition (13.33 %), chart-poster-wall painting (13.33 %), slide shows (13.33 %) and folder-magazine-bulletin (10.00 %).

Khin Mar Oo (2005) conducted a study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district and reported that 97.50 per cent of respondents participated in training programmes followed by discussion meetings (91.66 %) and animal health camps (61.66 %). Exposure visits and field days were attended by 25.00 and 21.00 per cent of respondents, respectively. Only 12.50 and 16.66 per cent of the respondents participated in krishi mela and demonstrations, respectively.

Li *et al.* (2008) conducted a study on factors influencing the adoption of pasture crop rotation in the semiarid area of china's loess plateau and observed that extension contact had positive and significant relationship with adoption of pasture conservation technologies.

Omobolanle (2008) in his study on analysis of extension activities on farmers' productivity in southwest, Nigeria observed that 76.44 per cent had no contact with extension services for past three years while only 4.80 per cent were not visited within the year. Only 27.40 per cent visited or had contact with extension services for 1 - 4 times in a year in the past 3 years. The respondents with more than 12 times contact with the extension services in the past three years were 59.60 per cent while 31.73 per cent had more than 12 times visits during the year.

Bhatt (2011) conducted a study on extent of knowledge of dairy farmers regarding improved animal husbandry practices under VRCs (Village Research Centers) Program in Anand district of Gujarat and reported that majority of the respondents (65.62 %) had contact with Agricultural Assistant whenever there was a problem, while 62.50 per cent of the respondents had no contact with Assistant Agricultural officer. Only 13.12 per cent had contact with scientists whenever there was problem.

Prakashkumar (2012) studied on farmers perception towards livestock extension service: a case study in western Maharashtra and revealed that 40.83 per cent of the farmers belonged to medium extension contact category, followed by 30.00 per cent of high category and 29.16 per cent had low category of extension contact.

Ghasemi *et al.* (2013) conducted a study on investigation determinants of the continuance adoption of the canola crop in Kermanshah township of Iran and reported that extension contact and participation had positive and significant relationship with continuance adoption of canola crop cultivation.

Kashappa (2013) in comparative study on dairy and non-dairy farmers in Belgaum district indicated that more than half of the dairy farmers (65.28 %) had medium extension contacts followed by high (20.83 %) and low (13.89 %).

Oladele (2013) conducted a study on factors influencing demand for animal health services and knowledge of bio-security among livestock farmers along border villages of South Africa and Namibia and reported 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.

Soujanya (2014) did a study on management efficiency of dairy farm women in Belgaum district and observed that 18.33 and 4.16 per cent of the respondents had occasionally and regularly participated in krishimela, respectively. Only 12.50 per cent had participated in workshop and 26.66 per cent of respondents participated occasionally in exhibitions.

From the above studies it could be concluded that majority of the respondents participated in training programmes, krishi mela, discussion forums and extension contact had positive and significant relationship with adoption of technologies.

2.3.7 Social participation

Khin Mar Oo (2005) conducted a study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district and reported that 17.00 per cent of the respondents were the office bearers of milk cooperative societies and negligible 1.66 per cent each of them were the office bearers of farmers co-operative societies and mahila mandals. Only one respondent was working as office bearer of youth club. Further, it was reported that large number of members were regular participants in various activities of milk cooperative society (72.50 %) and mahila mandals (62.50 %). About 37.50 per cent of them were members of panchayat and 24.13 per cent of them cooperative society were regularly participating in the activities of their respective organizations and few of them were found to be occasional participants.

Chandra *et al.* (2008) in their study on constraints in mass media with special reference to listening of farm radio broadcast reported that majority of the respondents (92.00 %) had no participation in any of the social organization.

Ranawat *et al.* (2014) did a study on association between knowledge and adoption level of improved maize cultivation practices with selected variables of maize growers in Udaipur district of Rajasthan and indicated that social participation of farmers had significant relationship with knowledge and adoption level of improved maize cultivation practices.

Most of the above studies indicated that majority of the respondents were members of co-operative milk societies.

2.3.8 Mass media participation

Suresh (2004) studied on entrepreneurial behavior of milk producers in Chittoor district of Andhra Pradesh and observed that majority (64.17 %) of respondents were exposed to mass media to a moderate extent followed by 21.25 per cent to low extent and 14.58 per cent to high extent.

Khin Mar Oo (2005) conducted a study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district and concluded that radio sets were possessed by majority of the respondents (80.00 %). Almost one-fourth of the respondents (23.33 %) possessed television and 11.66 per cent of respondents were subscribers of newspapers whereas negligible number of respondents owned books and magazines. Majority of the respondents listen to radio sets regularly (71.67 %) and 9.17 per cent of them occasionally and 19.15 per cent of them did not listen. Majority of respondents were never in the habit of reading newspaper either regularly or occasionally (80.00 %). Only 11 per cent of them were regular readers of newspaper. Only 18.33 and 33.33 per cent of the respondents were in the habit of viewing television regularly and occasionally, respectively. Only five per cent go through dairy magazines.

Satish (2010) conducted a study on farmers perceptions, preferences and utilization of SRI and traditional paddy straw for livestock at Dharwad and reported that majority (80.00 %) and half (50.00 %) of the respondents were in low utilization group with respect to newspaper and radio. In case of television, 73.67 per cent of them were medium to high participation groups.

Prakashkumar (2012) in his study on farmers' perception towards livestock extension service: a case study in western Maharashtra revealed that almost half (48.00 %) of the respondents had medium level of mass media exposure while 12.00 per cent and 40.00 per cent of the respondents had low and high level of mass media, respectively.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that 42.00 per cent of the respondents owned television and 26.00 per cent of the farmers had never viewed programmes in television whereas, 24.00 per cent and 50.00 per cent of respondents view the programmes regularly and occasionally, respectively. Further, 28.00 per cent of the respondents subscribed for newspapers, of which, 42.00 per cent respondents read it regularly, 27.33 per cent of the respondents read it occasionally while 30.67 per cent of respondents did not had reading habit. Only 9.33 per cent respondents subscribed farm magazines of which, 39.33 per cent never read farm magazines while, 18.00 per cent of respondents read regularly and 42.67 per cent of respondents read occasionally.

Fatima (2014) studied on women dairy farmers in Madurai district and reported that 53.33 per cent of the respondents had medium level of mass media exposure, followed by 40.00 per cent and 6.67 per cent of the respondents had medium level and high level of mass media exposure, respectively.

Soujanya (2014) conducted a study on management efficiency of dairy farm women in Belgaum district and revealed that 59.16 per cent of the dairy farm women belonged to medium category, while 34.16 and 6.66 per cent of dairy farm women belonged to low and high categories of mass media utilization, respectively.

From the above studies it can be concluded that majority of the respondents fall under medium level of mass media category.

2.3.9 Innovative proneness

Suresh (2004) studied on entrepreneurial behavior of milk producers in Chittoor district of Andhra Pradesh and revealed that 55.00, 24.58 and 20.42 per cent of respondents fall under medium, high and low category of innovativeness, respectively.

Nagesh (2005) in his study on entrepreneurial behaviour of vegetable seed producing farmers in Haveri district of Karnataka reported that majority of the respondents (63.33 %) fall under medium innovative proneness category, followed by equal per cent (18.33 %) of them fall under high and low categories of innovative proneness, respectively.

Reddy (2005) in his study on knowledge, extent of participation and benefits derived by participation farmers of the watershed development programme in Raichur district of Karnataka state concluded that majority of the respondents (82.00 %) belonged to medium innovative proneness category, whereas 11.30 and 6.66 per cent of them belong to high and low level of innovative proneness categories, respectively.

Chaudhari (2006) conducted a study on entrepreneurial behaviour of dairy farmers at Dharwad and observed that half of trained (53.00 %) and untrained (48.00 %) dairy farmers had medium level of innovativeness whereas, 34.00 per cent of trained and only 11.00 per cent of untrained dairy farmers belonged to high innovativeness. Only, 13.00 per cent of trained and 41.00 per cent of untrained dairy farmers belonged to low innovativeness category.

Santoshkumar (2008) conducted a study on marketing behaviour, information source consultancy pattern and problems of vegetable growers in Bijapur district of Karnataka and reported that forty per cent of respondents belonged to medium level of innovative proneness category, followed by 33.75 and 26.25 per cent belonged to low and high innovative proneness categories, respectively.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that 45.00 per cent of respondents belonged to medium level of innovative proneness category, while 28.57 per cent and 30.71 per cent of respondents belonged to low and high level of innovative proneness categories, respectively.

From the above studies it can be concluded that majority of the respondents fall under medium level of innovative proneness category.

2.3.10 Scientific orientation

Tiwari and Singh (2000) conducted a study on attitude of livestock owners towards piggery enterprise and reported that scientific orientation of livestock owners was found to have positive and significant relationship with their attitude towards piggery enterprise.

Nagesh (2005) in his study on entrepreneurial behavior of pomegranate growers in Bagalkot district of Karnataka concluded that 58.33 per cent of the respondents had medium level of scientific orientation followed by 23.33 per cent and 18.33 per cent of respondents had high and low level of scientific orientation, respectively.

Chaudhari (2006) in his study on entrepreneurial behaviour of dairy farmers in Dharwad district of Karnataka concluded that near about two third of trained dairy farmers (62.00 %) had medium level of scientific orientation, followed by high (27.00 %) and low (11.00 %) level of scientific orientation. Whereas, nearly two third of untrained dairy farmers (61.00 %) had low level of scientific orientation, followed by medium level (34.00 %) of scientific orientation and only 5.00 per cent of untrained dairy farmers had high level of scientific orientation.

Santoshkumar (2008) conducted a study on marketing behaviour, information source consultancy pattern and problems of vegetable growers in Bijapur district of Karnataka and revealed that 42.50 per cent of respondents had medium level of scientific orientation followed by 32.50 and 25.00 per cent had low and high level of scientific orientation, respectively.

From the above studies it can be concluded that majority of the respondents fall under medium level of scientific orientation category.

2.3.11 Management orientation

Chaudhary and Intodia (2000) in their study on constraints perceived by cattle owners in adoption of modern cattle management practices revealed that 50.00 per cent of farmers belonged to high management orientation category.

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

From the above studies it can be concluded that majority of the respondents fall under high level of management orientation category.

2.3.12 Risk orientation

Dhamodaran and Vasanthakumar (2001) in their study on relationship between selected characteristics of registered sugarcane growers and their extent of adoption of improved sugarcane cultivation practices revealed that majority of the respondents (81.67 %)

had medium level of risk orientation, followed by 18.33 per cent of the respondents with high level of risk orientation.

Madhavareddy (2001) in his study on a comparative analysis on people's participation in watershed development programme implemented by government and non-government organization indicated that, more than two-third of NGO beneficiaries (66.70 %) had low risk orientation, 23.30 per cent of respondents had high and 10.00 per cent of respondents had medium levels of risk orientation, respectively.

Budihal (2002) in his study on utilization pattern of cotton production technology by farmers of Karnataka reported that majority of the farmers belonged to medium level of risk orientation category (68.38 %), followed by low (17.58 %) and high (14.04 %) levels of risk orientation category.

Suresh (2004) conducted a study on entrepreneurial behaviour of milk producers in Chittoor district of Andhra Pradesh and reported that majority of the respondents (62.02 %) had medium level of risk taking ability followed by low level (24.58 %) and high level (13.34 %) of risk bearing ability, respectively.

Khin Mar Oo (2005) conducted a study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district and reported that high level of risk orientation was noticed among 17.50 per cent the respondents, medium level of risk orientation was possessed by 62.50 per cent and 20 per cent of them had low level of risk orientation.

From the above studies it can be concluded that majority of the respondents fall under medium level of risk orientation category.

2.3.13 Perceived Attributes of Innovation

Mankar *et al.* (1998) did a study on attributes of cotton variety AKH-84635 influencing its adoption. The study revealed that majority of respondents perceived the relative advantages of cotton variety such as low expenditure of sowing (82.00 %) and low seed cost (79.00 %) as very important. Further majority of respondents perceived cotton variety AKH-84635 was compatible with previous varieties (89.00 %), try on small scale visible (80.00 %), opportunity to observe on others field (86.00 %) and no complicatedness (56.00 %) as very important.

Chandrashekar *et al.* (2005) conducted study on farmers perception towards innovation characters of GPU-28 ragi variety and neem seed kernel extract (NSKE) spray in cabbage. The study revealed that majority of farmers were under high perception that growing GPU-28 ragi variety was a relatively advantageous (58.84 %), less complexity (78.20 %), compatible (73.68 %), trailable (75.00 %) and observable (56.25 %) technology. Further majority of the farmers perceived that practicing NSKE spray in cabbage was relatively

advantageous (50.00 %), less complex (73.68 %), compatible (68.35 %), trailable (72.20 %) and observable (50.00 %) technology.

Vasantha and Buchareddy (2006) conducted study on perception on attributes of IPM technologies by cotton farmers in Guntur district. The results revealed that majority of farmers perceived the relative advantages of IPM technologies in terms of initial cost as expensive, net profit as meager, consistency of profits as irregular, time taking and derive multiple benefits. Regarding complexity, majority of farmers perceived that IPM practices are feasible, non acceptable, unnecessary, they have no social recognition and are dependent. Further, majority of farmers perceived that the IPM technologies had cognitive complexity, they are adoptable, resource complexity is scarce, technologies are reversible and consumes labour with respect to practicability of IPM technologies. Majority of farmers perceived that IPM technologies are demonstrable, communicable, reliable and visible.

Chavan *et al.* (2009) in their study on determinants of utility perception of farmers about attributes of Bt cotton indicated that independent variables like age, education, socio-economic status, area under Bt cotton, sources of information, extension contact, economic motivation, innovativeness were found to be positively and highly significant with relative advantage.

Asrani *et al.* (2011) conducted a study on perceived attributes of poultry farming among scheduled caste rural women in Hisar district of Haryana and revealed that regarding simplicity/complexity, most of the respondents (48.30 %) perceived the poultry farming enterprise as 'easy to understand' and 42.7 per cent considered it as a 'most profitable' business. Regarding perception about marketability of poultry products, majority of respondents (42.30 %) considered them 'easily marketable' followed by 18.70 per cent of respondents who found it as 'neither easy nor difficult' to market.

Karthik and Manjunath (2011) did a study on attributes of hybrid seed production technologies as perceived by farmers and revealed that the most perceived relative advantage aspects of hybrid paddy varieties (90.00 % respondents) gives high yield followed by no health hazards (75.00 %). Cent per cent of the farmers perceived that hybrid paddy seed production has good compatibility factor. Cent per cent of the hybrid paddy seed growers perceived that good growth of hybrid paddy crop in any season or in any month will give visual impact to others. Cent per cent of the respondents perceived that growing of hybrid paddy seed production can be tried in a limited area in any given situation.

Ramesh and Santha (2011) conducted a study on attributes of sugarcane technologies as perceived by farmers of quasi-government extension services and revealed that majority of the respondents had perceived low level of relative advantage, low level of compatibility, low level of complexity, low level of observability and low level of trialability of sugarcane cultivation technologies.

Savitha *et al.* (2011) conducted the study on perception of attributes of organic farming by the farmers of Andhra Pradesh indicated that majority of the organic farmers with respect to relative advantage perceived that the initial cost (75.00 %), net profitability (65.00 %) and consistency of profits (65.00 %) of organic farming as high but as a time taking process (65.00 %). Further compatibility of organic farming was found that, to be situationally (50.00 %), culturally (55.00 %) and relationally (100.00 %) compatible and is having cognitive (58.30 %), application (63.30 %) and resource complexity (51.60 %). Further, it was also observed that majority of the organic farmers felt it as practicable, sustainable (91.60 %), results are certain (91.60 %) but not observable (51.60 %) and is having low perceived risk (56.60 %).

Rathakrishnan and Padma (2012) conducted study on drip irrigation- a water wise approach revealed that with respect to relative advantage, 70.34 per cent of adopters and 16.63 per cent of non adopters perceived that efficient use of water is possible with drip irrigation technology and water saving was perceived by 90.00 per cent of adopters and 61.66 per cent of non adopters. Whereas in case of compatibility 80.00 per cent adopters and 13.33 per cent non adopters perceived as suitability of drip to all types of soil and 68.33 per cent of adopters and 11.66 per cent of non adopters perceived as suitable to all type of water. While, with respect to simplicity, 53.33 per cent and 18.33 per cent of adopters and non adopters perceived as spare parts are readily available, respectively. The drip technology was amenable for trial in small scale as opined by 40.00 per cent adopters and 13.33 per cent of non adopters. Further, increase in the quality of produce was observed by 31.60 per cent of adopters and 11.66 per cent non adopters and crop maturity advanced was perceived by 23.33 per cent adopters and 13.00 per cent non adopters.

From the above studies it can be concluded that perceived attributes of innovation had significant relationship with continuance of technologies.

2.3.14 Knowledge level of fodder crops

Saha (2002) conducted a study on knowledge of clean milk production practices among dairy farmers of West Bengal and observed that equal per cent of the dairy farmers had low (30.00 %) and lower medium (30.00 %) level of knowledge, followed by high (22.50 %) and upper medium (17.50 %) level of knowledge regarding clean milk production practices.

Gupta (2003) in their study on knowledge and adoption of improved dairy practices found that majority of the dairy farmers (97.50 %) had knowledge about cleaning animal udder; hands and vessels, followed by improved breeds (91.25 %), care of calf (91.25 %), animal insurance (91.25 %) and clean drinking water (86.25 %). Whereas, 47.50 per cent of dairy farmers had lack of knowledge about enrichment of dry fodder, followed by shed for milking animals (33.75 %).

Bardhan *et al.* (2005) in their study on assessment of farmer's awareness about improved dairy husbandry practices revealed that farmers were aware of some common livestock practices, like artificial insemination (91.67 %), importance of protection of animals against ectoparasites and vaccination (75.00 %), importance of feeding colostrums to the calves (73.61 %) and concentrates to pregnant animals (69.44 %), whereas the farmers were largely unaware of certain improved animal husbandry practices like superiority of fodder seeds (20.75 %), feeding of urea treated straw (100.00 %) and practice of weaning in their animals (34.72 %). It was also found that the farmers were not maintaining any kind of records (100.00 %) and not insured their animals (100.00 %).

Chaudhary and Panwar (2005) did a study on gender based knowledge analysis of milk producers about advanced dairy production technology and revealed that majority of milk producer members (61.25 %) had medium knowledge level, whereas 20.00 per cent members had low knowledge, followed by 18.75 per cent members had high knowledge about advanced dairy production technology. Further indicated that the dairy co-operative society members possessed highest knowledge about aspects viz. type of flooring for shed (88.75 %) followed by appropriate method of milking (84.17 %), methods of insemination (76.46 %), time taken by buffalo to expel placenta (76.25 %), feeding of animals after calving (76.25 %) and improved breed of buffalo for milk production.

Khin Mar Oo (2005) in his study on knowledge and adoption of improved dairy management practices by women dairy farmers in Dharwad district revealed that 65.00 per cent of women dairy farmers had medium knowledge, whereas 18.33 per cent women dairy farmers had high knowledge level, followed by low knowledge level (16.67 %) about improved dairy management practices.

Ghasemi *et al.* (2013) conducted a study on investigation determinants of the continuance adoption of the canola crop in Kermanshah township of Iran and reported that knowledge level of canola crop had positive and significant relationship with adoption of canola crop cultivation.

From the above studies it can be concluded that majority of the respondents fall under low and low-medium knowledge level category.

2.3.15 Information seeking behaviour

Abdul *et al.* (2003) in their study on livestock farmers' preference of communication media and their use by extension workers in tribal area of Bihar observed that livestock farmers (37.00 %) considered neighbours and relative as the most potent communication source in transfer of livestock production technologies, followed by village level worker (18.00 %), agriculture officer (14.50 %), university scientists (11.50 %), village *mukhiya* (8.50 %) and voluntary organization (6.00 %). As regards to mass media communication source, the livestock farmers preferred radio (46.50 %) as the most important and effective source of communication, followed by Kisan Mela/cattle show (25.50 %), television (11.50 %), film

show/ video show (7.00 %), non- projected visual aid (5.50 %) and extension literature (4.00 %).

Bhagyalaxmi *et al.* (2003) conducted a study on profile of the rural women micro-entrepreneurs and revealed that more than three fourth of the dairy farmers (76.67 %) had medium information seeking behaviour, whereas 13.33 per cent of dairy farmers had high information seeking behaviour, followed by low information seeking behaviour (10.00 %).

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

Rajanna *et al.* (2003) did a study on training needs and consultancy pattern of dairy farmers of Warangal district and found that 28.00 per cent of dairy farmers used the services of the local veterinarians for knowing the management practices of dairy farming, followed by milk-co-operative societies (20.00 %), personal experience (16.70 %), contacting other farmers (12.00 %), paper /magazines (10.00 %), television / radio (8.00 %), training programmes /meetings (3.30 %) and contact with scientists (2.00 %).

Chaudhari (2006) in his study on entrepreneurial behaviour of dairy farmers revealed that majority of trained (61.00 %) dairy farmers had high information seeking behaviour, followed by medium (29.00 %) and low (10.00 %) information seeking behaviour. However, nearly half of untrained (49.00 %) dairy farmers had medium information seeking behaviour, followed by low (28.00 %) and high (23.00 %) information seeking behaviour.

Patil (2008) conducted a study on constraints analysis of grape exporting farmers of Maharashtra state and reported that 43.00 per cent of the respondents used Assistant Director of Agriculture as occasional source of information and very few (9.00 %) used it as regular source of information. Forty four per cent of the respondents had occasionally contacted Agricultural Assistant and 11.00 per cent used it as a regular source of information, 28.00 per cent used scientists of the Agriculture University as occasional source of information, whereas only few respondents (7.00 %) used them as regular source of information.

Saikia *et al.* (2014) in their study on determinants of variables associated with adoption behaviour of farmers towards recommended production technologies of winter rice in Assam reported that information source utilization had positive and significant relationship with adoption.

From the above studies it can be concluded that majority of the livestock farmers considered friends, relatives and neighbours.

2.3.16 Training received

Rao and Sivaram (2001) in their study on rural programmes and peoples participation, watersheds comprehensive development at Nagaur district of Rajasthan stated that training to SHGs gained importance in implementing livestock hybridization programmes, organizing agro-processing systems, generation and maintenance of common assets, community bio gas plants, community solar illumination system, etc. and expressed that, training was very useful.

Li *et al.* (2008) in their study on factors influencing the adoption of pasture crop rotation in the semiarid area of China's Loess plateau reported that training was positively and significantly correlated to adoption of pasture crop rotation technologies.

From the above studies it can be concluded that the training received was helpful for the farmers.

2.3.17 Organization participation

Chaudhari (2006) in his study on entrepreneurial behaviour of dairy farmers at Dharwad district of Karnataka and reported that majority of both trained and untrained dairy farmers never participated in organizations like gram panchayat (96.00 % and 95.00 %), co-operative society (51.00 % and 56.00 %), dairy co-operative society (71.00 % and 87.00 %), self help group (78.00 % and 66.00 %) and yuvak mandal (72.00 % and 84.00 %). These findings might be due to their lack of interest, motivation and perceived as no economic gain from participation in organization.

Wambugu (2006) conducted a study on factors influencing the effectiveness of farmers as disseminators of fodder shrubs in the central Kenya highlands and found that on an average 8.5 visits per year was made by the farmers to NGO's.

Jera and Ajayi (2010) did a study on logistic modelling of smallholder livestock farmers' adoption of tree-based fodder technology in Zimbabwe and found that farmers participation in dairy associations is positively correlated with adoption of agroforestry technologies.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that majority of the respondents (62.66 %) were members of self help groups (SHGs) and some of the respondents (8.00 %) were office bearers of SHGs. 22.00 % and 2.66 % respondents were members and office bearers of dairy cooperatives, respectively. Youth club had the participation of 10.00 per cent respondents as members and 2.66 per cent respondents as office bearers. Village panchayat (4.00 %) and farmers forum had extremely less participation as members and office bearers of 2.00 per cent and 1.33 per cent, respectively.

Kimba *et al.* (2015) conducted a study on adapting to the impacts of climate change in the sub-humid zone of Burkina Faso, West Africa: perceptions of agro-pastoralists and found

that membership of herders' organization and farmers crop organization had positive and significant relationship with growing of pastures.

From the above studies it can be concluded that majority of the respondents were members of co-operative societies.

2.4 Perennial fodder crops cultivated by respondents

Rafique (2000) did a study on status of forage production and pastoral systems in the northern mountainous region of Pakistan and reported that the livestock in the area rely on forage from ranges, crop residues and cultivated forage crops on small scales. Less than 20 per cent farmers on less than 5 per cent of their cultivated area grow the conventional forage crops, which have low production.

Bashir *et al.* (2001) conducted a study on importance and development activities for sown forage crops in Afganistan and revealed that about 90 million tonnes/hectare of lucerne and 54.8 million tonnes/hectare of berseem leguminous forage crops being extensively cultivated in Afganistan.

Franzel *et al.* (2003) conducted a study on adoption and dissemination of fodder shrubs in central Kenya and indicated that the main feed source for dairy cows is napier grass, supplemented during the dry season with crop residues, such as maize and bean stover, banana leaves and pseudostems, and indigenous fodder shrubs.

Hegde (2006) in his study on forage resource development in India reported that the major fodder crops cultivated in India are sorghum, maize, bajra, oats, hybrid napier, guinea grass, paragrass, lucerne, berseem, cowpea, velvet bean and others. Among these crops, sorghum, maize, oats, lucerne and berseem are more popular because of easy availability of seeds of improved varieties and well developed technology to increase the forage yield and quality.

Mtengeti *et al.* (2008) in their study on forage availability and its quality in the dry season on smallholder dairy farms in Tanzania indicated that *Panicum maximum* and *P. purpureum* constituted the bulky forage in about 20 and 11 households, respectively.

Maposse *et al.* (2009) did a study on status of range and forage research in Mozambique and observed that Rhodes grass (*Chloris gayana*) and buffel grass (*Cenchrus ciliaris*) were among the top yielding species, both in the rainy and the dry season and is widely used in dairy farms as a fresh forage cultivar.

Byrne *et al.* (2010) in their study on factors influencing potential scale of adoption of a perennial pasture in a mixed crop-livestock farming system reported that lucerne can be typically grown as a monoculture for 2–7 years in rotation with crops.

Daniel *et al.* (2011) conducted a study on implications of local knowledge in the utilization of forage resources in mixed livestock systems of eastern Tanzania and observed

that forage grasses such as *Pennisetum purpureum*, *Panicum maximum* and *Rottboellia cochinchinensis* were widely grown for feeding the animals.

Kannan (2012) in his study on economics of production, processing and marketing of fodder crops in Karnataka revealed that napier grass and jowar are the two major fodder crops that the farmers have grown in the study area.

The above studies concluded that fodder crops like hybrid napier, lucerne, rhodes grass and jowar are the main feed resource for dairy animals.

2.5 Favorable reasons for continuance of perennial fodder crops cultivation

Franzel and Wambugu (2007) in their study on the uptake of fodder shrubs among smallholders in East Africa concluded that the number of shrubs per farmer is higher in Uganda where NGOs promote leguminous shrubs both for soil conservation and fodder.

Place *et al.* (2009) in their study on impact of fodder shrubs on milk production and income among smallholder dairy farmers in east Africa and the role of research undertaken by the world agroforestry centre, indicated that fodder shrubs are also used to reduce soil erosion, increase soil fertility and provide fuel wood, bee forage, fencing and staking materials. Fodder shrubs offer an alternative source of high-protein supplementary feed for dairy animals that is easily available, less expensive and more reliable than the commercial feeds.

Peters *et al.* (2011) conducted a study on role of forages in reducing poverty and degradation of natural resources in tropical production systems and found that forage crops play a major role in improving the productivity of smallholders farming systems and breaking the cycle of poverty and resource degradation.

Franzel *et al.* (2014) in their study on fodder trees for improving livestock productivity and smallholder livelihoods in Africa reported that the objective of introducing the fodder shrubs in east Africa was to provide a low-cost, easy-to-produce protein source that could also contribute to sustainable land management.

Rajanikanth *et al.* (2015) in their study on identification of dissemination pathways followed by perennial fodder crop growing farmers of sugarcane belt of Karnataka revealed that 93.33 per cent of respondents mentioned that feeding the forage from the improved perennial fodder crops enhanced the milk production. Availability of green forage near to their doorstep was the reason mentioned by 88.00 per cent of the respondents. No need of many labours and less cost of forage was the reason mentioned by 78.66 per cent for continuing perennial fodder crop cultivation.

From the above studies it can be concluded that benefits from perennial fodder crops cultivation like good protein source, enhancement in milk production, reduce soil erosion, increase soil fertility, provision of fuel wood, fencing are the reasons for continuance of perennial fodder crops cultivation.

2.6 Constraints in cultivation of fodder crops

Chaudhary and Intodia (2000) in their study in Barmer district of Rajasthan to identify certain constraints in adoption of modern management practices of fodder crops. It was found that poor irrigation facilities for growing green fodder, high cost of concentrate, transportation of feed and fodder and non-availability of improved seeds were the most serious constraints of livestock owners.

Sabiti and Mugerva (2001) did a study on forage research and development for livestock production in Uganda. They revealed that the limited utilization of some of the research data has relevance to the farmers' problems. Other constraints are lack of emphasis by the government to support the application of such research data, limited manpower to develop co-ordinated research, lack of the necessary inputs and lack of continuity in the research programmes.

Vashist and Pathania (2001) conducted a study on requirement and availability of feed and forage resources for bovine population in Himachal Pradesh and reported that there was a shortage of as much as 50 per cent dry forage, 21 per cent of green forage, and 94 per cent concentrate. The existing resources were not sufficient to meet even the half of the requirements of bovine stock.

Mapiye *et al.* (2006) in their study on constraints to adoption of forage and browse legumes by smallholder dairy farmers in Zimbabwe observed that in terms of feeding the animals low produce of fodder due to drought was the major problem, in terms of type of forage used land allocation for different types of forages was a major problem.

Pushpa (2006) in her study on livestock production systems of rural and periurban livestock owners found that the constraints perceived by farmers in fodder management are lack of scientific knowledge in fodder cultivation (40.00 %), high transportation cost (41.25 %) and lack of space for proper storage of fodder (31.25 %). In peri-urban area the other constraints expressed by respondents were scarcity of green fodder (35.00 %) and scarcity of labour (33.75 %).

Mekoya *et al.* (2008) conducted a study on farmers' perceptions about exotic multipurpose fodder trees and constraints to their adoption and reported that major constraints to adoption of EMPFTs were agronomic problems, low multipurpose value and land shortage.

Orodho (2008) in his study on dissemination and utilisation of research technology on forages and agricultural by-products in Kenya found that the major constraints in adoption of napier grass cultivation were lack of adequate extension staff to reach more farmers, lack of farmers awareness of the importance of napier grass, reluctance on the part of farmers to accept and adopt research recommendations, unavailability of planting materials and lack of finance by farmers.

Rajanikanth (2013) did a study on spread of perennial forage crops' production technologies in north Karnataka and observed that majority of the respondents (71.33 %) felt that not getting right information at right time was the major constraint. Equal per cent (44.66 %) of the respondents mentioned non availability of veterinary officers in time and lack of seed materials as the constraints. 36.00 per cent of the respondents mentioned that lack of information about source of seed was the constraint experienced by them.

Franzel *et al.* (2014) conducted a study on fodder trees for improving livestock productivity and smallholder livelihoods in Africa and found that the key challenges for enhancing fodder trees' benefits include species diversification, lack of functioning of seed supply system and weak extension support.

From the above studies it can be concluded that major constraints in cultivation of fodder crops are non-availability of improved planting materials, lack of scientific knowledge, transportation cost, no proper storage, labour scarcity, weak extension support, no government support to strengthen research on fodder crops.

3. MATERIAL AND METHODS

The research study was conducted during the year 2014-15 in Dharwad and Belagavi districts of Karnataka state. In this chapter the research methods and procedures employed in the study are outlined under the following major headings.

- 3.1 Research design used in the study
- 3.2 Locale of the study
 - 3.2.1 Selection of villages
 - 3.2.2 Selection of respondents
 - 3.2.3 Brief description of the study area
- 3.3 Devices of data collection
- 3.4 Operationalization of term 'fodder technologies'
- 3.5 Variables and their measurement
- 3.6 Procedure followed in data collection
- 3.7 Statistical tools used in the study

3.1 Research design used in the study

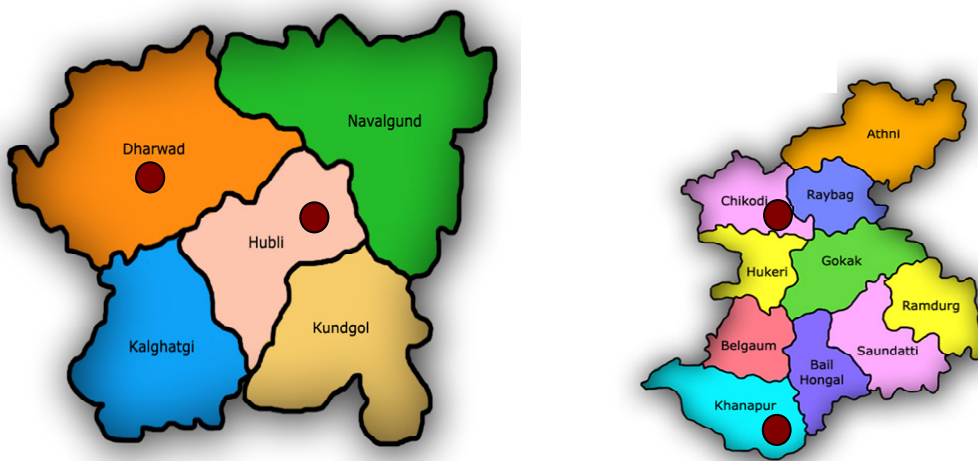
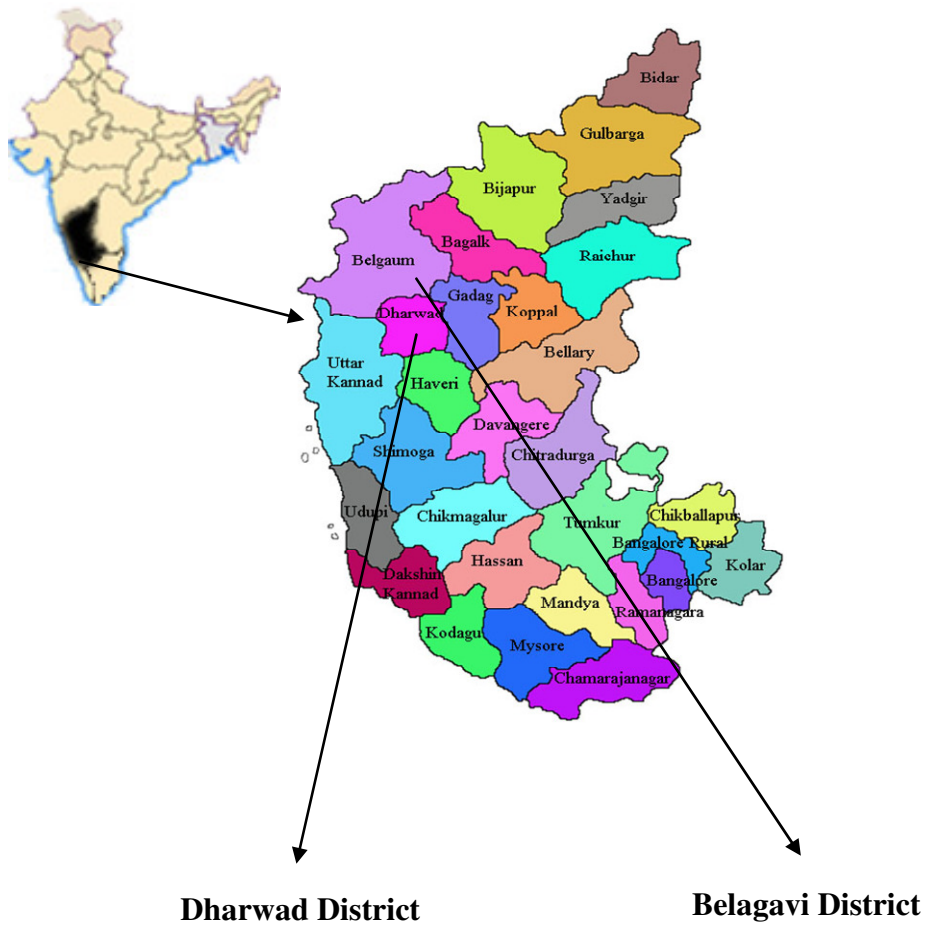
In the study, *Ex-post facto* research design was used. This design was considered as appropriate because the phenomenon of adoption of perennial fodder crops had occurred already. *Ex-post facto* research is the most systematic empirical enquiry in which the researcher does not have control over independent variables as their manifestation has already occurred or as they are inherent and cannot be manipulated. Thus, inferences about relation among variables could be made without direct intervention from concomitant variation of independent and dependent variables (Kerlinger, 1973).

3.2 Locale of the study

The study was conducted in Dharwad and Belagavi districts of Karnataka state. These districts were purposively selected with the consultations of scientists working on fodder crops. Besides, Belagavi district ranks first in livestock population in the state and Dharwad district stands at eight position.

3.2.1 Selection of villages

Villages were selected based on the criteria of maximum number of fodder growers as enlisted with Indian Grassland and Fodder Research Institute (IGFRI), Dharwad. Kodachwad and Avarolli village in Khanapur taluk, Kallol village in Chikodi taluk (Belagavi district), Mansur, Managondi and Tegur villages in Dharwad taluk, Kamplikoppa village in Hubli taluk (Dharwad district) were selected as study areas.



● Selected taluks

Fig. 2. Map showing study districts and taluks

3.2.2 Selection of respondents

List of farmers cultivating perennial fodder crops in the study area was collected from Southern Regional Research Station, Dharwad of Indian Grassland and Fodder Research Institute (IGFRI). These farmers were contacted initially to collect the data and through them, by using snowball technique other perennial fodder crops growing farmers of the village were contacted to collect the data. Overall, 55 farmers from Belagavi district and 40 farmers from Dharwad district were contacted, thus forming the sample size of 95 farmers.

3.2.3 Brief description of the study area

Belagavi district lies in the north-western part of Karnataka. It lies between 15°23' to 16°58' north latitude and 74°5' to 75°28' east longitude. It is bordered by Maharashtra to the North, Bagalkot district in the east, Dharwad & Uttar Kannada districts in the south, Goa in the west. The area of the district is 13,415 km² with an average elevation of 751 metres (2463 feet) above mean sea level. The population of the district is 4,88,157 according to 2011 census. As per the provisional 2011 census, Belagavi has an average literacy rate of 78 per cent, of which 54 per cent are male and 46 per cent are female. The languages spoken here are Kannada, Marathi and English. The topography of the district can be divided into four key zones:

1. On the western side, the district is covered with thick forests along the Western ghat ranges
2. The northern belt of the district between the Ghataprabha and Krishna rivers makes a second zone
3. The central zone of the district is defined by hills to the west and a succession of bare sand stone ranges to the east
4. The lands are more open in the southern zone of the district where arable crops occupy the majority of the land

The major commercial crops are maize, rice, wheat, sugarcane, tobacco and cotton. There has been a 45 per cent increase in sugarcane cultivation since 1993 and currently sugarcane, tobacco and cotton account for 22 per cent of the gross cropped area of the district. Medium and large scale farmers own nearly 70.00 per cent of the cultivable land in the district. Agriculture is the main source of livelihood for 71.00 per cent of the district population. Belagavi is popularly known as the "Sugar District" of Karnataka. Belagavi is also known for buffalo milk production, and out of Karnataka's annual production of 13.58 lakh tonnes of milk, Belagavi contributes 3.83 lakh tonnes which accounts for 28.00 per cent of total milk production in the state. The current livestock population comprises of 8,29,370 buffaloes, 5,92,833 cattle, 7,88,929 sheep and 4,91,545 goats (Anonymous, 2012).

Dharwad is situated in the western sector of the northern half of Karnataka state. The district encompasses an area of 4,263 km² lying between the latitude parallels of 15°02' and 15°51' north and longitudes of 73°43' and 75°35' east. It lies at an altitude of 750 meters above mean sea level and enjoys a salubrious climate. Summers are mildly hot with occasional thunderstorms, lasting from late February to early June, followed by the monsoon season with moderate temperatures and a large

amount of precipitation. Temperature is fairly moderate from late October to early February, with virtually no rainfall. Dharwad sits at the cusp of two distinct geographical divisions- Malenadu (hilly forest land with red soil) and Belavalanaadu (Deccan plains with black soil). The district is bounded on the north by the district of Belagavi, on the east by Gadag, on the south by Haveri and on the west by Uttar Kannada district. The total population of the district is 16,03,794. On the agriculture front, the presence of black soil helps in raising crops like cotton, wheat, ragi, jowar, bengal gram, green gram, moong and oilseeds and that of red soil is more suitable for paddy. Dharwad alphonso mangoes and Navalur guavas are famous. According to 2011 census, total population of Dharwad district is 18,67,023, out of which 9,32,206 are males and 9,09,817 are females. Average literacy rate of Dharwad is 80.00 per cent. Male literacy rate is 86.37 per cent and female literacy rate is 73.46 per cent. Milk production of Dharwad is 2.57 lakh tonnes. The livestock population comprises of 79,513 buffaloes, 1,93,781 cattle, 62,140 goats and 73,982 sheep (2012 livestock census).

3.3 Devices of data collection

In the context of objectives set for study and by reviewing literature, interview schedule was prepared. This interview schedule was pre-tested with the perennial fodder crop growers of Hirekerur taluk in Haveri district, which is a non- sample area, to test the practicability and relevancy of the interview schedule. Pre-tested and standardized interview schedule (Appendix I) was used for collecting data from the fodder growers.

3.4 Operationalization of term 'fodder technologies'

In the present study, fodder technologies refer to cultivation of improved perennial fodder crops and feeding to livestock either by grazing and/or cut and carry system. Technologies like annual fodder crops (e.g. fodder maize, fodder cowpea etc), hay making, silage, chaffing, pelleting, etc. does not form the part of the terminology 'fodder technologies' in the present study.

3.5 Variables and their measurement

3.5.1 Dependent variable

3.5.1.1 Continuance of perennial fodder crops cultivation

Continuance is a post-adoption stage, the confirmation stage, in which an individual seeks reinforcement of the innovation decision already made. Black (1983) noted that the characteristics of the innovation that facilitates its adoption also influence its continued use. Innovations which are less complex and easy to try are more rapidly adopted and also have a higher level of continuance.

Information was elicited from farmers on number and type of perennial fodder crops cultivated by them, year of planting and area covered initially and at the time of study. The respondents were then grouped into five categories based on the number of years they are continuing with the cultivation of fodder crops.

Categories	Number of years of continuing fodder cultivation
I	3-8
II	9-14
III	15-20
IV	21-26
V	>26

Based on the responses obtained, frequency and percentage of respondents belonging to each of these categories were computed and presented in tabular form.

3.5.2 Independent variables

3.5.2.1 Age

It refers to the chronological age of the respondents in completed years at the time of investigation. The procedure followed by Hinge (2009) was used to categorize the respondents.

Category	Age
Young age	18-30 years
Middle age	31-50 years
Old age	Above 50 years

3.5.2.2 Education

Number of years of formal schooling completed by the respondents at the time of data collection was collected and used for the study. Each year of schooling was given one score. The similar procedure of grouping and scoring was followed by Pushpa (2006). The respondents were grouped as given below.

Categories	Education level
Illiterate	Cannot read & write
Primary school	1-4 th std.
Middle school	5-7 th std.
High school	8-10 th std.
Pre-university	11 th & 12 th std.
Graduate and above	above 12 th std.

3.5.2.3 Family size

It refers to the total number of members of the family consisting of men, women and children living together. Classification of family size was done as followed by Chaudhari (2006).

Family	No. of members
Small	Upto 4 members
Medium	5-8 members
High	Above 8 members

3.5.2.4 Family type

Family type refers to the classification of the family as nuclear and joint. The basic grouping of mates and their children is called nuclear family. The collection of more than one nuclear family on the basis of close blood ties and common residence is called joint family. Method followed by Pushpa (2006) was used for the present study.

Category	Score
Nuclear	0
Joint	1

3.5.2.5 Land holding

It refers to the number of acres of land possessed by the farmer. The criteria prescribed by the Karnataka Land Reforms Act 38 to 1996 (Part-B) 99 and 195-96 under sections 2 (a) 32 was used where in one acre of irrigated or garden land is equated to 2.5 acres of dry land. This conversion was used for calculating the total land holding of the producers, based on which respondents were grouped as below. The procedure followed by Shilpashree (2011) was used.

Category	Acres
Marginal	Upto 2.5
Small	2.51-5.0
Small medium	5.01-10.0
Medium	10.01-25
Big	>25

3.5.2.6 Soil type

It refers to the types of soil such as black soil, red sandy, mixed soil and alluvial soil on which the respondents grow the crops. Based on given responses, frequency and percentages were calculated and presented in tabular form.

3.5.2.7 Size of irrigated land

It refers to the number of acres of wet land possessed by the farmer. Respondents were grouped into 4 categories based on the size of irrigated land possessed.

Categories	Size of irrigated land (acres)
I	Upto 2.50
II	2.51 to 5.0
III	5.01 to 9.0
IV	≥9.0

Frequency and percentage of respondents belonging to each of these categories were computed and presented in tabular form.

3.5.2.8 Annual income

It refers to the total amount of income earned annually from various sources by the respondent's family. Respondents were categorized according to the classification suggested by Ministry of Rural Development, Government of India notification of June, 2011. Similar procedure was followed by Taskeen (2012).

Categories	Annual income (Rs.)
Low income group	Upto 60,000.
Medium income group	60,001-1,20,000.
High income group	Above 1,20,000.

Frequency and percentage of respondents belonging to each of these categories were computed and presented in tabular form.

3.5.2.9 Herd size

It refers to a group of cattle or other domestic animals kept together for a specific purpose by the respondent's household. Data regarding type and age of livestock owned by the respondents was collected. The data was converted into adult cattle units using the conversion factors as suggested by Ramachandra *et al.* (2007).

Species	Age	Conversion factor
Buffalo	>2.5 years	1.14
	1.0- 2.5 years	0.50
	<1.0 years	0.17
Cow/Bullocks	>2.5 years	1.00
	1.0- 2.5 years	0.34
	<1.0 years	0.11

Respondents were then categorized as those having small, medium and large herd sizes based on the mean and standard deviation of Adult Cattle Units.

3.5.2.10 Livestock composition

It refers to the constituent types and numbers of animals within an overall holding of livestock. Data was collected from the respondents about the livestock possessed. Respondents were then grouped into 6 categories based on the various combinations of livestock possessed by them. Similar procedure was followed by Pushpa (2006).

Categories	Livestock composition
I	Cow
II	Buffalo
III	Cow + Buffalo
IV	Cow + Bullocks
V	Buffalo + Bullocks
VI	Cow + Buffalo + Bullocks

For these categories, frequency and percentages were computed and presented in tabular form.

3.5.2.11 Extension contact and participation

Extension contact refers to the frequency of contact of respondents with extension personnel and extension agencies for seeking information about fodder cultivation. Data was collected from the respondents about their frequency of contacts with the extension workers. Responses were tabulated as frequency and percentage for each of the responses and presented in tabular form.

Extension participation refers to the participation of the respondents in various extension activities. Responses were tabulated as frequency and percentage for each of the responses and presented in tabular form. Similar procedure was followed by Rajasekhar (2009).

3.5.2.12 Social participation

It refers to the degree of participation or involvement of the respondents in formal and informal social organizations either as member or as an office bearer. Procedure followed by Belli (2008) was used. Variable was quantified as by assigning one score if the respondent is a member and two score if the respondent is an office bearer of the organization. Frequency of contact was quantified by assigning scores as given below

<u>Frequency of use</u>	<u>Scores</u>
Regular	2
Occasional	1
Never	0

Responses were also tabulated as frequency and percentage for each of the responses and presented in tabular form.

3.5.2.13 Mass media participation

It refers to the frequency of using mass media such as radio, T.V., newspaper, farm magazines by the respondents. Data was presented in frequency and percentage. Variable was quantified on the basis of procedure followed by Shilpashree (2011).

<u>Frequency of use</u>	<u>Scores</u>
Regular	2
Occasional	1
Never	0

Responses were tabulated as frequency and percentage for each of the responses and presented in tabular form.

3.5.2.14 Innovative proneness

Innovative proneness was operationalised as 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. It was measured by procedure followed by Hagemanty (2011). The scale consisted of 5 statements. These statements were rated on a three point continuum viz., agree, undecided and disagree with scores 2, 1 and 0, respectively. The possible maximum and minimum scores were 10 and 0 respectively. Using mean and standard deviation, respondents were divided into three categories as shown below. Similar procedure was followed by Hagemanty (2011).

Category	Score range
Low	Mean – (0.425×SD)
Medium	Mean ± (0.425×SD)
High	Mean + (0.425×SD)

3.5.2.15 Scientific orientation

Variable was quantified by using scientific orientation scale of Supe and Singh (1969) with slight modifications. Four statements were included for the present study with two response categories as 'Agree' and 'Disagree' with scores of '1' and '0' and vice-versa respectively for negative statements (statement 2). Summation of the scores obtained by the respondents for all four statements indicated his scientific orientation score. The possible maximum and minimum scores were 4 and 0, respectively. Based on the score obtained the respondents were grouped into three categories by using mean and S.D. as a measure of check. Procedure followed by Rajasekhar (2009) was used.

Category	Score range
Low	Mean – (0.425×SD)
Medium	Mean ± (0.425×SD)
High	Mean + (0.425×SD)

3.5.2.16 Management orientation

It refers to the degree to which a farmer is oriented towards scientific farm management, comprising of planning, production and marketing functions of the farm. Procedure followed by Gamannavar (2011). There were 4 statements with two responses for each statement as 'agree' and 'disagree'. The positive statements were given a score of one for 'agree' and zero for 'disagree'. The scoring was reversed for negative statements. The possible maximum score was 4 and minimum score was 0.

Category	Score range
Low	Mean – (0.425×SD)
Medium	Mean ± (0.425×SD)
High	Mean + (0.425×SD)

3.5.2.17 Risk orientation

It refers to the degree to which a farmer is oriented towards risk and uncertainty and has courage to face the problems in farming. This risk orientation scale developed by Supe and Singh (1969) and as followed by Fami (2000) was used to measure the risk orientation of the respondents. There were 4 statements rated on a five point continuum ranging with weightages of 5, 4, 3, 2 and 1 for positive statements and 1, 2, 3, 4 and 5 for negative statements, respectively. The maximum and minimum score an individual could obtain by addition of the scores were 20 and 0, respectively. Based on the scores obtained, farmers were grouped into three categories by using the mean and standard deviation score as measures of check.

Category	Score range
Low	Mean – (0.425×SD)
Medium	Mean ± (0.425×SD)
High	Mean + (0.425×SD)

3.5.2.18 Perceived Attributes of Innovation

It refers to the quality or character of the innovation as people see to them. Procedure followed by Kudari (2014). The perceived attributes of innovations which are basic to extension are as follows-

Relative advantage: It is the degree to which an innovation is perceived as being better than the idea it supersedes.

Compatibility: It is the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters.

Complexity: It is the degree to which an innovation is perceived as relatively difficult to understand and use.

Trialability: It is the degree to which an innovation may be experimented with on a limited basis.

Observability: It is the degree to which the results of an innovation are visible to others.

Responses for the statements were collected on a five point continuum viz., strongly agree, agree, undecided, disagree and strongly disagree with scores from 5 to 1. Total scores of each respondent were used for correlation and regression analysis.

The statements were framed by referring literature and discussing with the experts in fodder crops. Initially, relative advantage had 15 statements, compatibility had 8 statements, complexity had 11 statements, trialability had 7 statements and observability had 9 statements covering range of aspects of perennial fodder crops. So, totally 50 statements were framed. This set of statements were given to 10 experts in fodder crops to judge them on five point continuum as most relevant, relevant, somewhat relevant, less relevant and not relevant with the scores 5,4,3,2 and 1 for positive statements and vice-versa for negative statements, respectively. Selection of final statements were done by applying z-test to arrive at the upper & lower limits, using the formula given below-

$$\text{Upper/Lower limit} = \text{Mean} \pm (\text{Standard Error} \times 1.65)$$

The statements falling between the upper and lower limits were included in the final schedule.

Four statements for relative advantage, four statements for compatibility, six statements for complexity, five statements for trialability and five statements for observability, together consisting of 24 statements were selected for final interview schedule.

3.5.2.19 Knowledge level of fodder crops

Knowledge level of fodder crops was measured for 8 crops viz., fodder maize, fodder jowar, fodder cowpea, bajra napier hybrid, guinea, perennial fodder sorghum, paragrass/signal grass and lucerne. Responses for these crops were collected against eight parameters which are annual/perennial, grass/legume/cereals, irrigated/rainfed, propagation by seed/rootslips/both, high/medium/low yield of green fodder, can be used as dry fodder (yes/no), tolerant to grazing grasses (yes/no) and good soil binder (yes/no). For correct response for each parameter, score of one was given and for incorrect response, score of zero was given. Based on the scores obtained, farmers were grouped into three categories by using the mean and standard deviation score as measures of check.

Sl. No.	Category	Score
1.	Low	Mean – (0.425×SD)
2.	Medium	Mean ± (0.425×SD)
3.	High	Mean + (0.425×SD)

3.5.2.20 Information seeking behavior

It refers to the tendency of a farmer to gather required information about his cropping practices from the available resources. Variable was quantified on the basis of procedure followed by Shilpashree (2011).

<u>Extent of consultancy</u>	<u>Scores</u>
Frequently	2
Occasional	1
Never	0

Responses were expressed as frequency and percentage for each of the responses and presented in tabular form.

3.5.2.21 Training received

It refers to the training received by the farmers on various aspects related to animal husbandry and fodder crops in recent years. Responses were tabulated as frequency and percentages for each of the responses and presented in tabular form.

3.5.2.22 Organization participation

It refers to the degree of participation or involvement of the respondents in formal and informal organizations either as member or as an office bearer. Procedure followed by Belli (2008) was used. Variable was quantified by assigning one score if the respondent is a member and two score if the respondent is an office bearer of the organization. Frequency of contact was quantified by assigning scores as given below

<u>Frequency of use</u>	<u>Scores</u>
Regular	2
Occasional	1
Never	0

Responses were also tabulated as frequency and percentage for each of the responses and presented in tabular form.

3.5.2.23 Perennial fodder crop/s cultivated

It refers to the various perennial fodder crops grown by farmers. Data was collected from the respondents about the various perennial fodder crops cultivated. Respondents were then grouped into 11 categories according to the various combinations of perennial fodder crop/s cultivated by them.

Category	Fodder crops
I	Napier
II	Guinea
III	Napier + Guinea
IV	Napier + Rhodes
V	Napier + Paragrass
VI	Guinea + Rhodes
VII	Napier + Guinea + Lucerne
VIII	Napier + Guinea + Paragrass
IX	Napier + Guinea + Rhodes
X	Napier + Guinea + Rhodes + Lucerne
XI	Napier + Guinea + Rhodes + Paragrass

For these categories, frequency and percentages were computed and presented in tabular form.

3.5.2.24 Source of obtaining seed/planting material

It refers to the source from where the planting materials of perennial fodder crops were obtained by the farmers. Data was collected from the respondents about the various source/s for getting the planting materials of perennial fodder crops. Respondents were then grouped into 5 categories according to the various sources contacted to obtain planting materials.

Category	Sources for planting materials
I	IGFRI, DWD
II	KMF
III	Other growers
IV	Other growers + IGFRI, DWD
V	Other growers + KMF

For these categories, frequency and percentages were computed and presented in tabular form.

3.5.2.25 Utilization of land

It refers to the sites used for cultivation of perennial fodder crops by the farmers. Data was collected from the respondents about the places in their fields, where they cultivate perennial fodder crops. Respondents were then grouped into 10 categories according to the various combinations of sites used for perennial fodder crop cultivation.

Category	Various sites
I	Field Boundaries
II	Bunds
III	Main field
IV	Waterways
V	Field Boundaries + Waterways
VI	Bunds + Mainfield
VII	Bunds + Field Boundaries
VIII	Bunds + Waterways
IX	Mainfield + Waterways
X	Bunds + Mainfield + Waterways

For these categories, frequency and percentages were computed and presented in tabular form.

3.5.2.26 Area under perennial fodder crops

It refers to the total area put to use for cultivation of perennial fodder crop by the respondents. Farmers were grouped under 4 categories based on the area used for growing perennial fodder crops as given below.

Category	Area (acre/s)
I	Upto 0.50
II	0.51-1.00
III	1.01-1.50
IV	>1.50

For these categories, frequency and percentages were computed and presented in tabular form.

3.5.2.27 Yield from perennial fodder crops

It refers to the green fodder yield obtained from perennial fodder crops by the respondents in one year. Data was collected from the farmers about the yield obtained by them from these crops. Respondents were then grouped as per categories shown below. Frequency and percentages were calculated for each category and presented in tabular form.

Category	Yield (quintals)
I	Upto 6.00
II	6.01-8.00
III	8.01-10.00
IV	>10.00

For these categories, frequency and percentage was computed and presented in tabular form.

3.5.2.28 Constraints faced in cultivation of fodder crops

In the structured interview schedule, respondents were asked to mention the constraints perceived by them while cultivating fodder crops and rank them accordingly. Garret ranking technique was followed to rank the constraints. It is calculated as percentage score and the scale value is obtained by employing Scale Conversion Table given by Henry Garrett. The percentage score is calculated as-

$$\text{Percentage score} = 100 (R_{ij}-0.5) / N_j$$

where, R_{ij} is Rank given for i^{th} item j^{th} individual, N_j is number of items ranked by j^{th} individual. The percentage score for each rank from 1 to 10 are calculated. The percentage score thus obtained for all the ten ranks are converted into scale values using Scale Conversion Table given by Henry Garrett. The scale values for first rank to tenth rank are 81, 70, 63, 57, 52, 47, 42, 36, 29 and 18, respectively. The score value (fx) is calculated for each factor by multiplying the number of respondents (f) with respective scale values (x). The total scores are found by adding the score values (fx) of each rank for every factor. The mean score is then calculated to know the order of preference given by the respondents for the factors. Based on the mean score, the overall ranks are assigned for each.

3.6 Procedure followed in data collection

A structured schedule was prepared inclusive of all the variables identified for the study. This schedule was pre-tested in a non-sample area to locate ambiguity in the questions included. Based on the nature of the responses, necessary corrections were made at different stages so as to standardize the interview schedule (Appendix I). This pre-tested and standardize schedule was used to collect the data in the study area. Data was collected by personal interview technique.

3.7 Statistical tools used in the study

The data collected from the respondents were scored, tabulated and analyzed using suitable statistical methods. The statistical methods used in the present study are as follows-

Frequency, percentage, means, standard deviation, Pearson correlation coefficient, step-wise regression model, path analysis technique and garret ranking technique.

Frequency and percentage

These measures were used to know the distribution pattern of respondents according to the variables used for the study and accordingly categorize them.

Mean and standard deviation

Mean and standard deviation were used to classify the respondents into three categories as low, medium and high.

Pearson's correlation coefficient

It was computed in order to know the nature of relationship between the dependent and independent variables. The values of the correlation coefficients were then tested for statistical significance.

$$r = \frac{n \sum xy - \sum x \sum y}{\sqrt{[n \sum x^2 - (\sum x)^2][n \sum y^2 - (\sum y)^2]}}$$

Where,

r = Simple correlation coefficient

x = Independent Variables

y = Dependent Variables

$\sum x$ = Sum of x values

$\sum y$ = Sum of y values

$\sum x^2$ = Sum of square of x values

$\sum y^2$ = Sum of squares of y values

$\sum xy$ = Sum of Squares of xy values

n= Numbers of pairs of observations

Step-wise regression model

It was used mainly to find out the significant contributions made by the independent variables on the dependent variable.

Path analysis

In finding a quantitative interpretation of direct and indirect effect of factors (independent variables) on dependent variable, path analysis was employed. According to Miller (1977) the technique of path analysis is not a method for discovering causal laws but a procedure for giving quantitative interpretation of an assumed causal system as it operates within a given population. Path co-efficient reflect the amount of direct contribution to a given variable on other variables when effects of other related variables are taken into account. The direct path co-efficient follows the order of magnitude of partial regression co-efficient of the variables. The direct co-efficient are comparable.

Garret ranking

To find out the most significant factor which influences the respondent, Garrett's ranking technique was used. As per this method, respondents have been asked to assign the rank for all factors and the outcomes of such ranking have been converted into score value with the help of the following formula:

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

where, R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = Number of variable ranked by j^{th} respondents

With the help of Garrett's table, the per cent position estimated is converted into scores. Then for each factor, the scores of each individual are added and then total value of scores and mean values of scores is calculated. The factors having highest mean value is considered to be the most important factor.

4. EXPERIMENTAL RESULTS

In accordance with the objectives of the study the necessary data collected were analyzed and presented under following headings-

- 4.1 Continuance of fodder technologies
- 4.2 Socio-economic profile of perennial fodder growers
- 4.3 Land and livestock holdings of perennial fodder growers
- 4.4 Perennial fodder crops cultivated by respondents
- 4.5 Favorable factors for continuance of perennial fodder crops cultivation
- 4.6 Constraints in cultivation of fodder crops

4.1 Continuance of fodder technologies

More than one-third of respondents (34.73 %) continued cultivation of perennial fodder crops for 9-14 years and nearly one third (30.53 %) cultivated for 3-8 years. Among the remaining, 18.95 per cent cultivated for 15-20 years, 9.47 per cent for 21-26 years and 6.32 per cent of respondents continued cultivation of perennial fodder crops for more than 26 years (Table 1). The average number of years of continued cultivation was 14 years.

4.2 Socio-economic profile of perennial fodder growers

4.2.1 Age

More than half of the farmers (60.00 %) belonged to middle age group followed by 28.42 per cent belonged to old age group and only 11.58 per cent belonged to young age group. The mean age of farmers was 45.29 ± 1.10 years (Table 2).

4.2.2 Education

More than half of the farmers (60.00 %) were educated upto pre-university level. Equal per cent of farmers (17.90 %) were educated upto high school and graduate and above education level. Remaining percentage of farmers were educated upto middle school (2.10 %). An equal percentage (1.05 %) of farmers were illiterate and educated upto primary school level. The mean year of schooling was 11.69 ± 0.26 years (Table 2).

4.2.3 Family size

Two third respondents (66.32 %) belonged to small category of family size. Almost one-third of respondents (32.63 %) belonged to medium category of family size. Only 1.05 per cent of respondents had large family size. The mean size of family was 4.61 ± 0.13 members (Table 2).

4.2.4 Family type

Majority of the respondents (83.16 %) belonged to nuclear type of family and 16.84 per cent of respondents belonged to joint type of family (Table 2).

4.2.5 Annual income

Majority of the respondents (64.21 %) belonged to high income group (above Rs. 1,20,000). One fifth (21.05 %) respondents belonged to medium income group (Rs. 60,000-Rs. 1,20,000) and 14.74 percentage of respondents belonged to low income group (upto Rs.

Table 1. Distribution of respondents according to their continuance of perennial fodder crop cultivation

(n=95)

Number of years of continuing fodder cultivation	Frequency	Percentage
3-8	29	30.53
9-14	33	34.73
15-20	18	18.95
21-26	9	9.47
>26	6	6.32
Mean	14 years	

Table 2. Socio-economic profile of perennial fodder growers

Particulars	Categories	Respondents (n=95)	
		f	%
Age (years)			
Young	18-30	11	11.58
Middle	31-50	57	60.00
Old	>50	27	28.42
Mean	45.29		
SE	1.10		
Education (standard)			
Illiterate	cannot read & write	1	1.05
Primary school	1-4 th std.	1	1.05
Middle school	5-7 th std.	2	2.10
High school	8-10 th std.	17	17.90
Pre-university	11 th & 12 th std.	57	60.00
Graduate & above	above 12 th std.	17	17.90
Mean	11.69		
SE	0.26		
Family size (no.)			
Small	Upto 4 members	63	66.32
Medium	5-8 members	31	32.63
Large	>8 members	1	1.05
Mean	4.61		
SE	0.13		
Family type			
	Nuclear	79	83.16
	Joint	16	16.84
Annual income (Rs.)			
Low	Upto 60,000	14	14.74
Medium	60,000-1,20,000	20	21.05
High	Above 1,20,000	61	64.21
Mean	286147.37		
SE	26474.63		

Table 3. Land and livestock holdings of perennial fodder growers

Particulars	Categories	Respondents (n=95)	
		f	%
Land holding (ac)			
Marginal	Upto 2.5	15	15.78
Small	2.51-5.0	44	46.33
Small medium	5.01-10	20	21.05
Medium	10.01-25	13	13.68
Big	>25	3	3.16
Mean	7.18		
SE	0.80		
Irrigated land (ac)			
	Upto 2.50	29	30.52
	2.51 to 5.0	40	42.11
	5.01 to 9.0	15	15.79
	≥9.0	11	11.58
Mean	5.08		
SE	0.49		
Soil type			
	Black	32	33.68
	Red Sandy	29	30.53
	Mixed	30	31.58
	Alluvial	4	4.21
Herd size (Adult cattle units)			
Small	Mean- (0.425×SD)	31	32.63
Medium	Mean±(0.425×SD)	43	45.26
Large	Mean+(0.425×SD)	21	22.11
Mean	5.81		
SD	3.47		
Livestock composition			
	Cow	6	6.31
	Buffalo	3	3.15
	Cow + Buffalo	45	47.37
	Cow + Bullocks	2	2.11
	Buffalo + Bullocks	2	2.11
	Cow + Buffalo + Bullocks	37	38.95

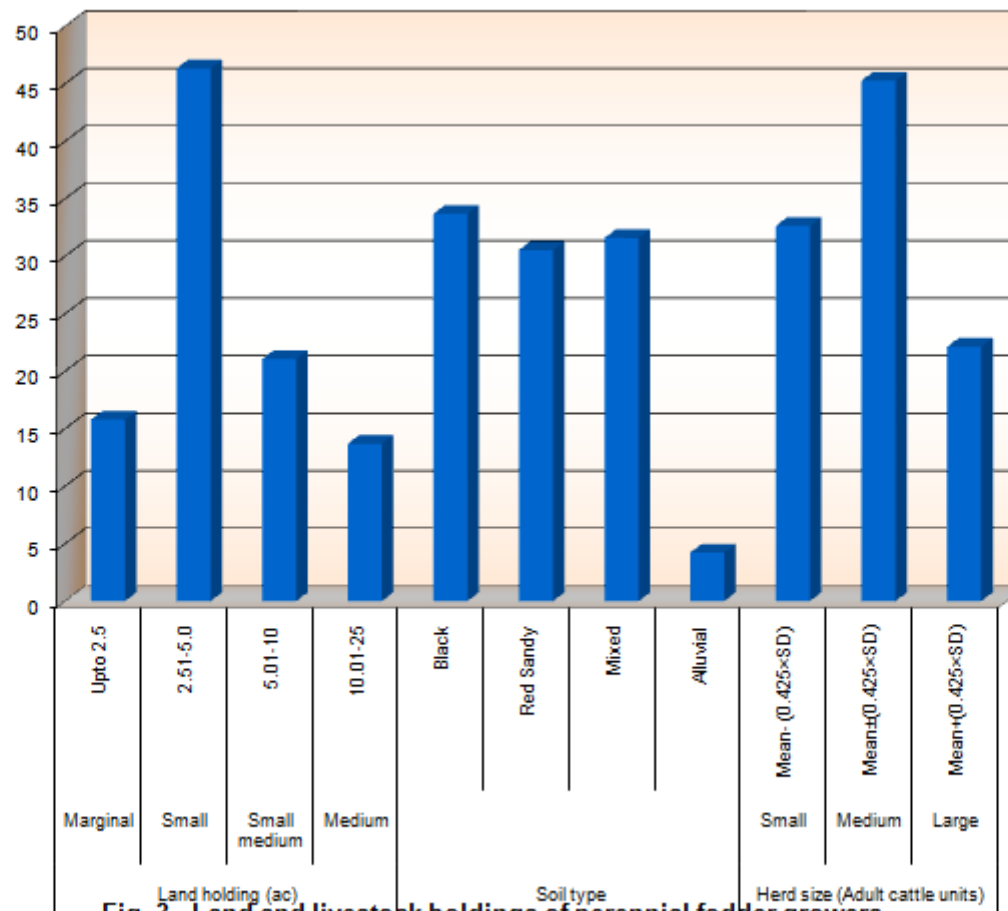


Fig. 3. Land and livestock holdings of perennial fodder growers

Fig 3.Land and livestock holdings of perennial fodder growers

60,000). The average annual income of the respondents was Rs. 2,86,147.30 \pm 26,474.63 (Table 2).

4.3 Land and livestock holdings of perennial fodder growers

4.3.1 Land holding

Almost half of the respondents (46.33 %) belonged to small category of land holdings. One fifth (21.05 %) of the respondents belonged to small-medium category of land holdings. Among remaining, 15.78 per cent of the respondents belonged to marginal category of land holdings, 13.68 per cent and 3.16 per cent of the respondents belonged to medium and big categories of land holdings, respectively. The mean land holding was 7.18 \pm 0.80 acres (Table 3 and Fig. 3).

4.3.2 Irrigated land

Less than half (42.11 %) of farmers had irrigated land of 2.51 to 5.0 acres. Almost one-third of farmers (30.52 %) had irrigated land up to 2.50 acres, 15.79 per cent and 11.58 per cent of farmers had irrigated land of 5.01 to 9.0 acres and more than 9.0 acres, respectively. The mean irrigated land was 5.08 \pm 0.49 acres (Table 3).

4.3.3 Soil type

Around one-third of farmers (33.68 %) had black soils. Less than one third (30.53 %) had red sandy soil. Among the remaining, 31.58 per cent and 4.21 per cent of farmers had mixed and alluvial type of soils, respectively (Table 3 and Fig. 3).

4.3.4 Herd size

Less than half of the respondents (45.26 %) possessed medium herd size, One third (32.63 %) possessed small herd size and 22.11 per cent of farmers possessed large herd size. The mean herd size was 5.81 \pm 3.47 adult cattle units (Table 3 and Fig. 3).

4.3.5 Livestock composition

Almost half of the respondents (47.37 %) had cow and buffaloes. More than one third (38.95 %) respondents had cow, buffaloes and bullocks. Meager per cent (6.31 %) of respondents had only cows, 3.15 per cent of respondents had only buffaloes and equal per cent of respondents (2.11 %) possessed cow and bullocks; and buffaloes and bullocks (Table 3).

4.3.6 Extension participation

Majority of the respondents (88.42 %) participated in krishi mela, 36.84 per cent of the respondents participated in agriculture exhibitions, one-fourth (25.26 %) of respondents participated in training programmes, 15.79 per cent of respondents participated in demonstrations, equal per cent of respondents (7.37 %) participated in field visits and extension group meetings. Only 5.26 and 4.21 per cent of respondents participated in study tour and field days, respectively (Table 4).

4.3.7 Extension contact

Agricultural assistant was contacted by 64.21 per cent of farmers once in 15 days, 27.37 per cent of farmers never contacted and 8.42 per cent of farmers contacted once in 6 months. Assistant agricultural officer was contacted by 64.21 per cent of farmers in 15 days, one-third of farmers (32.63 %) never contacted and 3.16 per cent of farmers contacted in 6 months. Raitha Sampark Kendra was contacted by 31.58 per cent of farmers with the frequency of 15 days and 6 months, respectively and

Table 4. Extension participation of respondents

Particulars	Respondents (n=95)	
	f	%
Krishi mela	84	88.42
Agriculture Exhibitions	35	36.84
Training programmes	24	25.26
Demonstration	15	15.79
Field visits	7	7.37
Extension group meetings/interactions	7	7.37
Study tour	5	5.26
Field days	4	4.21

Table 5. Extension contact of respondents

Sl. No.	Extension Workers	Frequency of contact (n=95)							
		15 days		Once in a week		6 months		Never	
		f	%	f	%	f	%	f	%
1.	Agricultural Assistant	61	64.21	0	0	8	8.42	26	27.37
2.	Assistant Agricultural Officer	61	64.21	0	0	3	3.16	31	32.63
3.	Raitha Sampark Kendra	30	31.58	7	7.37	30	31.58	28	29.47
4.	Officers of Indian Grassland and Fodder Research Institute (IGFRI),Dharwad	33	34.74	1	1.05	18	18.95	43	45.26
5.	Krishi Vigyan Kendra (KVK) Staff	58	61.05	1	1.05	11	11.58	25	26.32
6.	Karnataka Milk Federation (KMF) Staff	89	93.68	4	4.22	1	1.05	1	1.05

they were never contacted by 29.47 per cent of farmers. Officers of Indian Grassland and Fodder Research Institute, Dharwad was never contacted by 45.26 per cent of farmers, followed by 34.74 per cent of farmers contacted them once in 15 days and 18.95 per cent of farmers contacted them once in 6 months. Staff of Krishi Vigyan Kendra (KVK) was contacted by 61.05 per cent of farmers once in 15 days, 26.32 per cent of farmers never contacted and 11.58 per cent of farmers contacted them in 6 months. Staff of Karnataka Milk Federation was contacted once in 15 days by 93.68 per cent of farmers, followed by 4.22 per cent contacted once in a week (Table 5).

4.3.8 Mass media participation

Newspaper was subscribed by 68.42 per cent of the respondents. It was read regularly for agriculture programmes by 5.26 per cent of respondents and occasionally by 58.95 per cent of respondents. It was read regularly for news by 67.37 per cent of respondents and occasionally by 1.05 per cent of respondents. It was read regularly for entertainment by 60.00 per cent of respondents and occasionally by 8.42 of respondents.

Farm magazines was subscribed by 10.53 per cent of respondents. It was read regularly for agriculture programmes by 10.53 per cent of respondents. Only 3.15 per cent of respondents read it regularly for news and 7.38 per cent read it occasionally for news. It was read regularly for entertainment by 1.05 per cent of respondents and occasionally by 2.11 per cent of respondents.

Television was owned by cent per cent (100.00 %) of respondents. It was viewed occasionally by 66.32 per cent of respondents. Cent per cent (100.00 %) of respondents viewed for news. Almost cent per cent (98.95 %) of respondents viewed regularly for entertainment and occasionally viewed by 1.05 per cent of respondents.

Radio was subscribed by 9.47 per cent of respondents. It was listened equally (4.21 %) as regular and occasional for agriculture programmes. Only 8.42 per cent of respondents listened it regularly for news. It was listened regularly and occasionally for entertainment by 2.11 per cent and 3.12 per cent of respondents, respectively (Table 6).

4.3.9 Social and organizational participation

Majority of the farmers (82.10 %) were members of Karnataka Milk Federation and a small per cent (2.11 %) were office bearers. More than half of the respondents (54.73 %) were regular participants and 29.47 per cent of the respondents participated occasionally. One third (29.47 %) of the respondents were members of the youth club, 2.11 per cent of farmers participated regularly and 27.36 per cent of farmers occasionally participated in youth club. More than one-fourth of respondents (28.42 %) were members of mahila mandal, 4.21 per cent of respondents were regular participants and 22.11 per cent of respondents were occasional participants. Only 17.89 per cent of respondents were members of raitha sangha, of which 14.73 and 2.11 per cent of respondents participated regularly and occasionally, respectively. Only 8.42 per cent of farmers were members of agriculture co-operative society amongst them equal per cent of farmers (4.21 %) participated regularly and occasionally. Only 4.21 per cent of farmers were members of zilla parishad, 3.16 per cent and 1.06

Table 6. Mass media participation of respondents

Sources	Subscribed/ Owned		Programmes	Frequency of use (n=95)			
	f	%		Regularly		Occasionally	
				f	%	f	%
Newspaper	65	68.42	Agri.Programmes	5	5.26	56	58.95
			News	64	67.37	1	1.05
			Entertainment	57	60.00	8	8.42
Farm magazines	10	10.53	Agri.Programmes	10	10.53	0	0
			News	3	3.15	7	7.38
			Entertainment	1	1.05	2	2.11
Television	95	100.00	Agri.Programmes	0	0	63	66.32
			News	95	100.00	0	0
			Entertainment	94	98.95	1	1.05
Radio	9	9.47	Agri.Programmes	4	4.21	4	4.21
			News	8	8.42	0	0
			Entertainment	2	2.11	3	3.12

Table 7. Social and organizational participation of respondents

(n=95)

Sl. No.	Organization	Nature of participation				Extent of participation			
		Member		Office bearer		Regular		Occasional	
		f	%	f	%	f	%	f	%
1.	Karnataka Milk Federation (KMF)	78	82.10	2	2.11	52	54.73	28	29.47
2.	Youth club	28	29.47	0	0	2	2.11	26	27.36
3.	Mahila Mandal	27	28.42	0	0	4	4.21	21	22.11
4.	Raitha Sangha	17	17.89	0	0	14	14.73	2	2.11
5.	Agri.Co-operative Society	8	8.42	0	0	4	4.21	4	4.21
6.	Zilla Parishad	4	4.21	0	0	3	3.16	1	1.05
7.	Mandal Panchayat	4	4.21	0	0	3	3.16	1	1.05
8.	Sugar factories	16	16.84	0	0	14	14.73	2	2.11

per cent of respondents participated regularly and occasionally, respectively. Only 4.21 per cent of farmers were members of mandal panchayat, 3.16 and 1.05 per cent of farmers were regular and occasional participants, respectively. Only 16.84 per cent of farmers were members of sugar factories of which, 14.73 and 2.11 per cent of farmers were regular and occasional participants, respectively (Table 7).

4.3.10 Information seeking behaviour

Almost two-third of respondents (74.74 %) consulted family members frequently for seeking information and almost one-fourth of respondents (24.21 %) consulted occasionally. Majority of respondents (86.32 %) frequently consulted their friends and relatives while 13.68 per cent respondents consulted occasionally. Majority of respondents (91.58 %) frequently consulted their neighbours for taking information while 8.42 per cent of respondents occasionally consulted their neighbours. Majority of respondents (84.21 %) frequently consulted other fodder growers while 15.79 per cent of respondents consulted other fodder growers occasionally. More than half (58.95 %) of the respondents frequently consulted veterinary department while 41.05 per cent of respondents occasionally consulted. Only 8.42 per cent of respondents frequently consulted agriculture department while 62.11 per cent of respondents consulted it occasionally. Very few per cent of respondents (3.16 %) frequently consulted others for seeking information while only 1.05 per cent of respondents consulted them occasionally for seeking information (Table 8).

4.3.11 Risk bearing prophesy

More than half of the respondents (54.74 %) belong to medium category of risk orientation, followed by almost one-fourth of respondents (24.21 %) belonged to low category and 21.05 per cent of respondents belonged to high category of risk orientation.

Majority of the respondents (70.53 %) belonged to medium category of scientific orientation, 22.11 per cent of respondents belonged to high category of and 7.36 per cent of respondents belonged to low category of scientific orientation.

Less than half (44.21 %) of the respondents had medium innovative proneness, 31.58 per cent had low and nearly one-fourth of respondents (24.21 %) had high innovative proneness.

Nearly half of the respondents (48.42 %) had high management orientation, followed by 36.84 per cent of respondents had medium and 14.74 per cent of respondents had low management orientation (Table 9 and Fig. 4).

4.3.12 Knowledge level

Less than half (43.16 %) respondents had medium level of knowledge on annual fodder crops followed by 32.63 per cent had high and 24.21 per cent had low knowledge level of these crops.

Forty per cent of respondents had high knowledge level, 30.53 per cent had medium and 29.47 per cent had low knowledge level of perennial fodder crops.

Table 8. Information seeking behaviour of respondents

(n=95)

Sources	Extent of consultancy			
	Frequently		Occasionally	
	Frequency	Percentage	Frequency	Percentage
Family members	71	74.74	23	24.21
Friends/Relatives	82	86.32	13	13.68
Neighbours	87	91.58	8	8.42
Other fodder growers	80	84.21	15	15.79
Veterinary department	56	58.95	39	41.05
Agriculture department	8	8.42	59	62.11
Others	3	3.16	1	1.05

Table 9. Risk bearing prophesy of respondents

Particulars	Respondents (n=95)	
	f	%
Risk orientation		
Low (<14.59)	23	24.21
Medium (14.59-16.13)	52	54.74
High (>16.13)	20	21.05
<i>Mean</i>	15.36	
<i>SD</i>	1.82	
Scientific orientation		
Low (<2.90)	7	7.36
Medium (2.90-3.37)	67	70.53
High (>3.37)	21	22.11
<i>Mean</i>	3.14	
<i>SD</i>	0.56	
Innovative proneness		
Low (<5.56)	30	31.58
Medium (5.56-7.17)	42	44.21
High (>7.17)	23	24.21
<i>Mean</i>	6.37	
<i>SD</i>	1.90	
Management orientation		
Low (<2.94)	14	14.74
Medium (2.94-3.64)	35	36.84
High (>3.64)	46	48.42
<i>Mean</i>	3.29	
<i>SD</i>	0.82	

Table 10. Knowledge level of respondents on cultivation of fodder crops

Fodder crops	Categories	Respondents (n=95)	
		f	%
Annual	Low (<22.34)	23	24.21
	Medium (22.30-23.30)	41	43.16
	High (>23.30)	31	32.63
Mean	22.84		
SD	1.18		
Perennial	Low (<40.74)	28	29.47
	Medium (40.74-42.92)	29	30.53
	High (>42.92)	38	40.00
Mean	41.84		
SD	2.57		
Overall (Annual + Perennial)	Low (<63.44)	36	37.89
	Medium(63.44-65.90)	18	18.95
	High (>65.90)	41	43.16
Mean	64.67		
SD	2.90		

Table 11. Distribution of respondents based on the training received

(n=95)

Training	Authority	f	%
Dairy/Veterinary training programmes	NDRI, Bangalore	5	5.26
Milk enhancement programmes	Karnataka Milk Federation (KMF)	18	18.95
Dairy training programmes	NGO	12	12.63

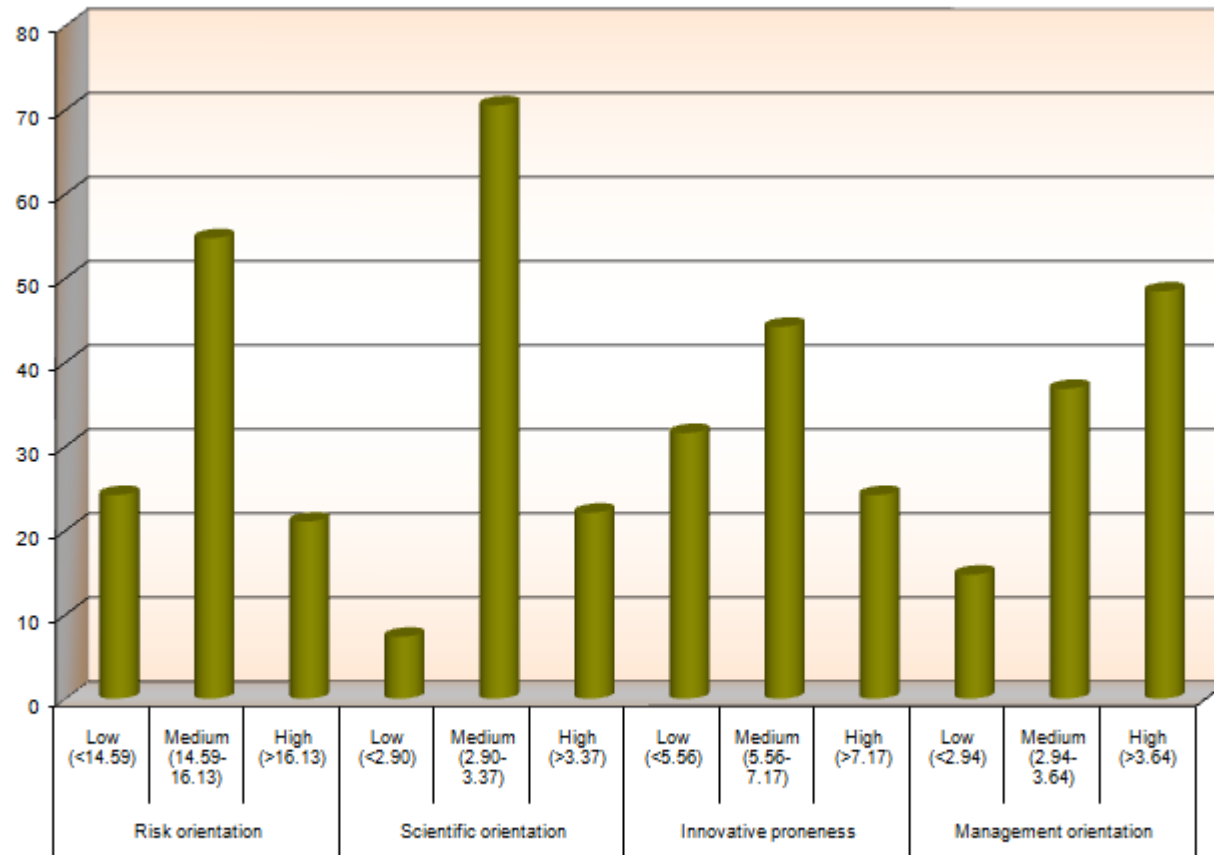


Fig. 4. Risk bearing prophesy of respondents

Fig 4. Risk bearing prophesy of respondents

Less than half (43.16 %) of respondents had high knowledge level, 37.89 per cent had low and 18.95 per cent had low knowledge levels on perennial fodder crops (Table 10).

4.3.13 Training received

Less than one fifth (18.95 %) of respondents received training on milk enhancement programmes by Karnataka Milk Federation (KMF), followed by 12.63 per cent of respondents received training on dairy programmes by non-governmental organizations and 5.26 per cent of respondents received training on dairy and veterinary programmes by National Dairy Research Institute, Bangalore (Table 11).

4.4 Perennial fodder crops cultivated by respondents

4.4.1 Perennial fodder crop combinations

More than one third (37.89 %) of respondents had grown bajra napier hybrid and rhodes grass. Only 13.68 per cent of respondents had grown bajra napier hybrid only. Equal per cent of respondents (9.48 %) had grown fodder combination of bajra napier hybrid and guinea grass; bajra napier hybrid and paragrass. Three grasses (bajra napier hybrid, guinea grass, rhodes grass) and one legume (lucerne) were cultivated by 7.37 per cent of respondents. Equal per cent of respondents (5.26 %) had cultivated only guinea grass and fodder combination of bajra napier hybrid, guinea grass and rhodes grass. Equal per cent of respondents (4.21 %) had cultivated fodder combination of guinea grass + rhodes grass; and bajra napier hybrid + guinea grass + lucerne. Negligible per cent of respondents (1.05 %) cultivated bajra napier hybrid + guinea grass + paragrass and bajra napier hybrid + guinea grass + rhodes grass + paragrass (Table 12).

4.4.2 Source of obtaining seed/planting material of perennial fodder crop

Majority of respondents (89.47 %) obtained seed materials from other growers. Few (4.21 %) respondents obtained seed materials both from other growers and Indian Grassland and Fodder Research Institute, Dharwad. Very few (3.16 %) respondents obtained seed materials both from other growers and Karnataka Milk Federation (KMF), 2.11 per cent of respondents obtained seed materials both from Karnataka Milk Federation (KMF) only and 1.05 per cent of respondents obtained seed materials from Indian Grassland and Fodder Research Institute, Dharwad only (Table 13).

4.4.3 Utilization of land for cultivation of perennial fodder crop

Less than half (42.10 %) of respondents used only bunds for cultivation of perennial fodder crop, 17.89 per cent of respondents used both bunds and waterways, 14.74 per cent of respondents used bunds and mainfield for cultivation of perennial fodder crop and 7.37 per cent of respondents used waterways for cultivation. Equal per cent of respondents (4.21 %) used field boundary and mainfield for cultivation of perennial fodder crops. Equal per cent of respondents (3.61 %) used bunds and field boundary, mainfield and waterways for cultivation of perennial fodder crops, followed by 2.11 per cent of respondents used bunds, mainfield and waterways (Table 14).

Table 12. Perennial fodder crop combinations cultivated by the respondents

(n=95)

Sl. No.	Fodder crops	Respondents	
		f	%
1.	Bajra Napier Hybrid	13	13.68
2.	Guinea grass	6	6.32
3.	Bajra Napier Hybrid + Guinea grass	9	9.48
4.	Bajra Napier Hybrid + Rhodes	36	37.89
5.	Bajra Napier Hybrid + Paragrass	9	9.48
6.	Guinea grass + Rhodes	4	4.21
7.	Bajra Napier Hybrid + Guinea grass + Lucerne	4	4.21
8.	Bajra Napier Hybrid + Guinea grass + Paragrass	1	1.05
9.	Bajra Napier Hybrid + Guinea grass + Rhodes	5	5.26
10.	Bajra Napier Hybrid + Guinea grass + Rhodes + Lucerne	7	7.37
11.	Bajra Napier Hybrid + Guinea grass + Rhodes + Paragrass	1	1.05

Bajra Hybrid Napier - *Pennisetum glaucum* × *Pennisetum purpureum*

Guinea grass - *Panicum maximum*

Rhodes grass - *Chloris gayana*

Paragrass - *Brachiaria mutica*

Lucerne - *Medicago sativa*

Table 13. Source of obtaining seed/planting material of perennial fodder crop by respondents

(n=95)

Sl. No.	Sources for planting materials	Respondents	
		f	%
1.	Other growers	85	89.47
2.	Other growers + Indian Grassland and Fodder Research Institute, Dharwad	4	4.21
3.	Other growers + Karnataka Milk Federation (KMF)	3	3.16
4.	Karnataka Milk Federation (KMF)	2	2.11
5.	Indian Grassland and Fodder Research Institute, Dharwad	1	1.05

Table 14. Utilization of land for cultivation of perennial fodder crop

(n=95)

Sl. No.	Various sites	Respondents	
		f	%
1.	Field boundary	4	4.21
2.	Bunds	40	42.10
3.	Mainfield	4	4.21
4.	Waterways	7	7.37
5.	Field boundary + Waterways	1	1.05
6.	Bunds + Mainfield	14	14.74
7.	Bunds + Field boundary	3	3.16
8.	Bunds + Waterways	17	17.89
9.	Mainfield + Waterways	3	3.16
10.	Bunds + Mainfield + Waterways	2	2.11

4.4.4 Area under perennial fodder crop

Bajra napier hybrid was cultivated by 64.21 per cent of respondents in an area upto 0.50 acre. This was followed by 18.95 per cent of respondents allocating land of 0.51-1.00 acre and 5.26 per cent of respondents allocating land of 1.01-1.50 acres for cultivation.

For guinea grass, One-third of respondents (33.68 %) cultivated guinea grass in an area upto 0.50 acre, 10.53 per cent of respondents allocated land between 0.51-1.00 acre, 3.16 per cent of respondents allocated land between 1.01-1.50 acres and 2.11 per cent of respondents allocated land higher than 1.50 acres for cultivation.

For rhodes grass, one-fourth of respondents (25.26 %) had allocated land upto 0.50 acre, followed by 7.37 per cent of respondents allocated land of 0.51- 1.00 acre, 2.11 per cent of respondents allocated land of 1.01-1.50 acres for cultivation.

For paragrass, 5.26 per cent of respondents allocated land of 0.51-1.00 acre, followed by 2.11 per cent of respondents allocated land upto 0.50 acre and 1.05 per cent of respondents allocated land higher than 1.50 acres for cultivation.

For lucerne, 3.16 per cent of respondents allocated a land upto 0.50 acre for cultivation (Table 15 and Fig. 5).

4.4.5 Yield obtained from perennial fodder crop

For bajra napier hybrid, more than half of the respondents (58.95 %) obtained green fodder yield of 6.01-8.00 quintals. Less than one fifth (17.89 %) obtained yield upto 6 quintals, 10.53 per cent of respondents obtained yield of 8.01-10.00 quintals and 1.05 per cent of respondents obtained yield higher than 10 quintals.

More than one-fourth of respondents (26.32 %) obtained green fodder yield upto 6 quintals from guinea grass. One fifth (20.00 %) per cent of respondents obtained yield of 6.01-8.00 quintals, followed by 2.11 per cent of respondents obtained yield of 8.01-10.00 quintals and 1.05 per cent of respondents obtained yield higher than 10 quintals.

Around one-fourth of respondents (23.16 %) obtained yield upto 6 quintals from rhodes grass. Only 6.32 per cent of respondents obtained yield of 6.01-8.00 quintals and 5.26 per cent of respondents obtained a yield of 8.01-10.00 quintals.

Only 5.26 per cent of respondents obtained yield upto 6 quintals, followed by 2.11 per cent of respondents obtained a yield of 6.01-8.00 quintals and 1.05 per cent of respondents obtained a yield of 8.01-10.00 quintals from paragrass.

From lucerne, 3.16 per cent of respondents obtained yield of 6.01-8.00 quintals (Table 16 and Fig. 6).

Table 15. Distribution of respondents based on area under perennial fodder crop

(n=95)

Sl.No.	Perennial fodder crop	Area(acre/s)	f	%
a.	Bajra Napier Hybrid			
		Upto 0.50	61	64.21
		0.51-1.00	18	18.95
		1.01-1.50	5	5.26
		>1.50	0	0.00
b.	Guinea grass			
		Upto 0.50	32	33.68
		0.51-1.00	10	10.53
		1.01-1.50	3	3.16
		>1.50	2	2.11
c.	Rhodes			
		Upto 0.50	24	25.26
		0.51-1.00	7	7.37
		1.01-1.50	2	2.11
		>1.50	0	0.00
d.	Paragrass			
		Upto 0.50	2	2.11
		0.51-1.00	5	5.26
		1.01-1.50	0	0.00
		>1.50	1	1.05
e.	Lucerne			
		Upto 0.50	3	3.16
		0.51-1.00	0	0.00
		1.01-1.50	0	0.00
		>1.50	0	0.00

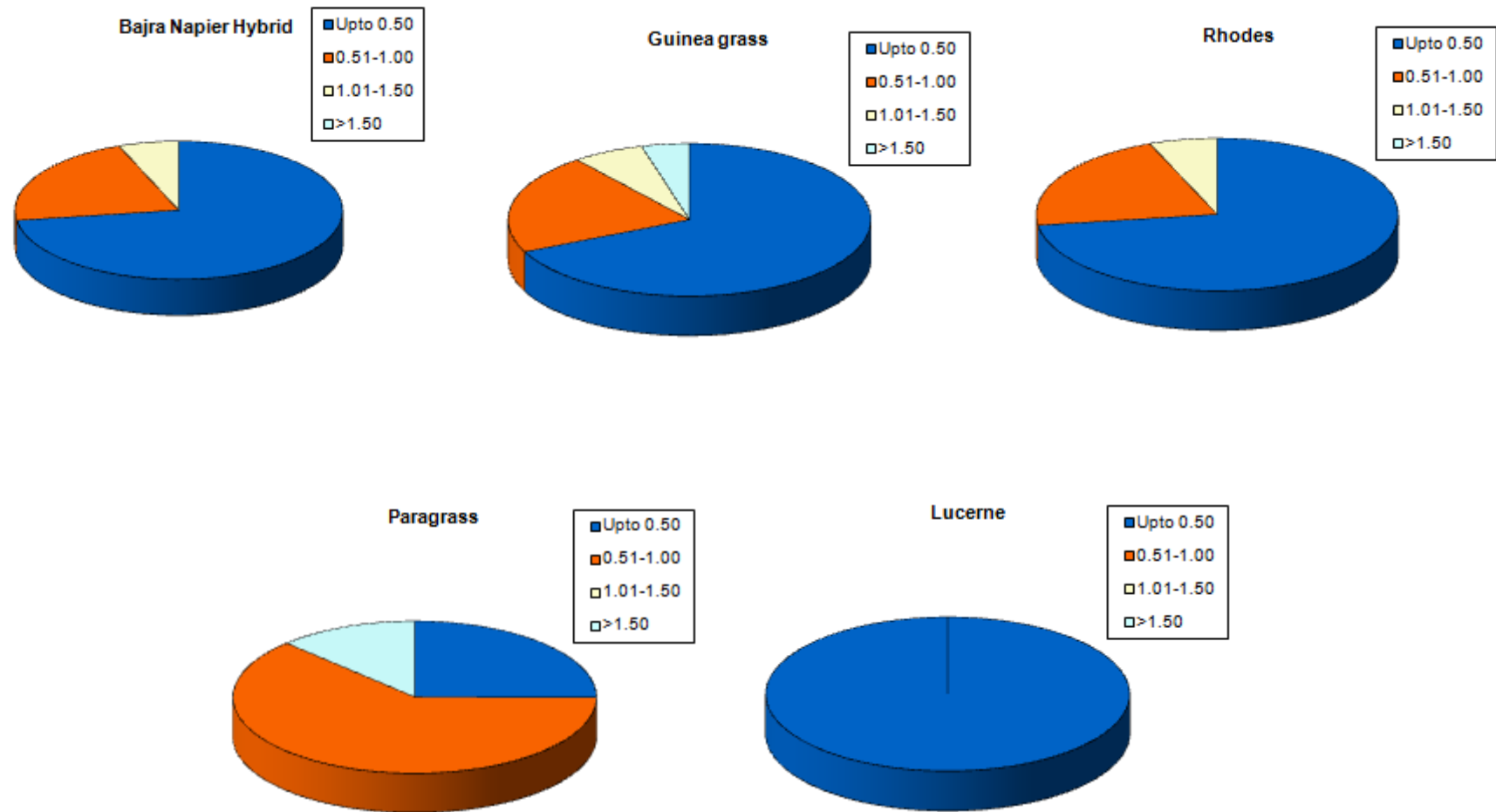


Fig 5. Distribution of respondents based on area under perennial fodder crop

Table 16. Distribution of respondents based on yield obtained from perennial fodder crop

(n=95)

Sl. No.	Perennial fodder crop	Yield(quintals)	f	%
a.	Bajra Napier Hybrid			
		Upto 6.00	17	17.89
		6.01-8.00	56	58.95
		8.01-10.00	10	10.53
		>10.00	1	1.05
b.	Guinea grass			
		Upto 6.00	25	26.32
		6.01-8.00	19	20.00
		8.01-10.00	2	2.11
		>10.00	1	1.05
c.	Rhodes			
		Upto 6.00	22	23.16
		6.01-8.00	6	6.32
		8.01-10.00	5	5.26
		>10.00	0	0.00
d.	Paragrass			
		Upto 6.00	5	5.26
		6.01-8.00	2	2.11
		8.01-10.00	1	1.05
		>10.00	0	0.00
e.	Lucerne			
		Upto 6.00	0	0.00
		6.01-8.00	3	3.16
		8.01-10.00	0	0.00
		>10.00	0	0.00

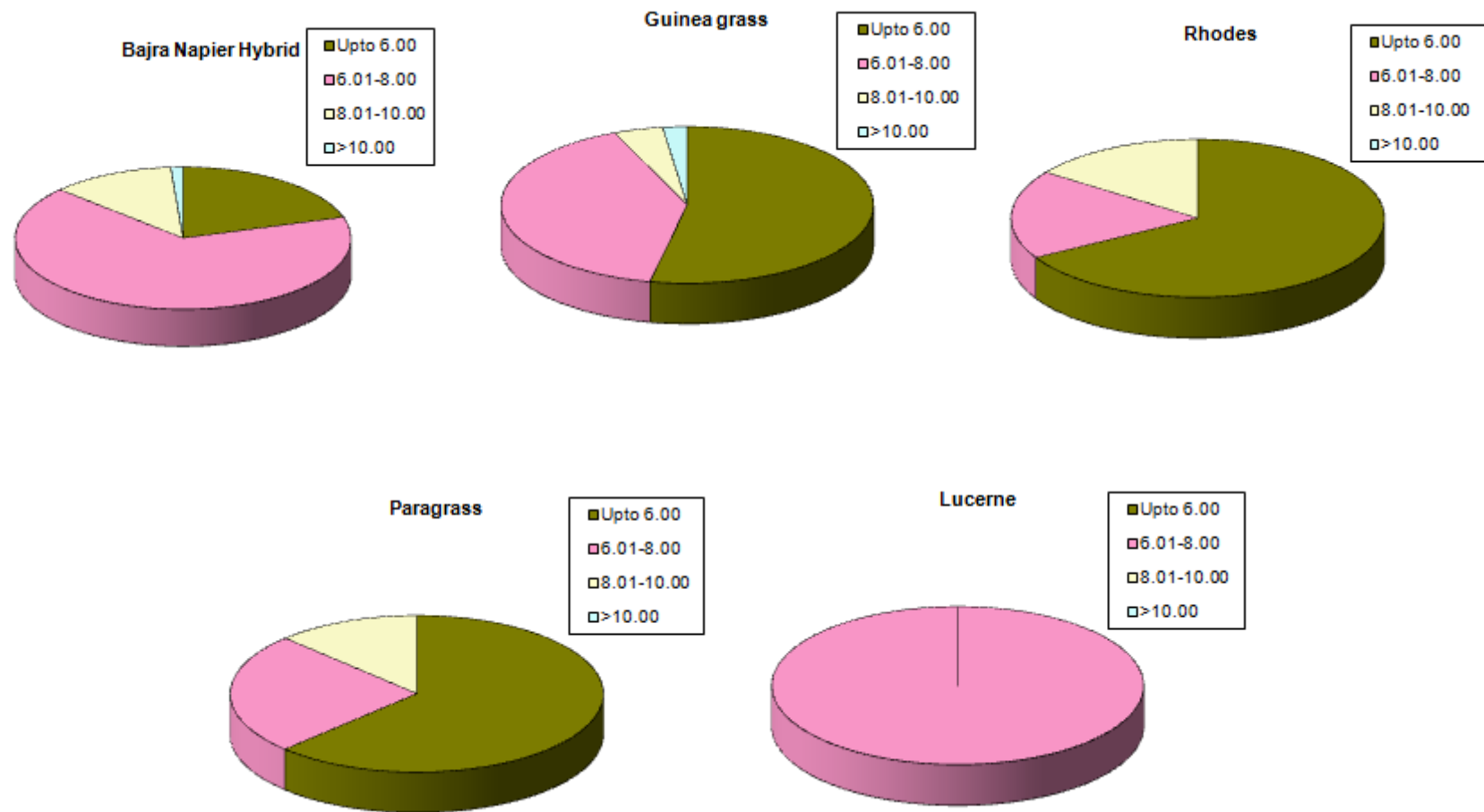


Fig 6. Distribution of respondents based on yield obtained from perennial fodder crop

4.5 Favorable factors for continuance of perennial fodder crops cultivation

4.5.1 Correlation between continuance of perennial fodder crops cultivation and other independent variables

Out of 19 variables subjected for correlation analysis, 15 variables exhibited positive and significant relationship with continuance of perennial fodder crops by adopters. Landholding, size of irrigated land, annual income, herd size, extension participation, organization participation, mass media participation, innovative proneness, management orientation, risk orientation, perceived attributes and training received expressed positive and significant relationship with continued adoption at 1 per cent level of probability. Family size, extension contact and information seeking behavior were positively and significantly correlated with continued adoption at 5 per cent level of probability (Table 17).

4.5.2 Stepwise regression analysis of continuance of perennial fodder crops cultivation versus other independent variables

Table 18 presents the stepwise regression analysis of continuance of perennial fodder crops cultivation with 19 other independent variables. It has been found that four predictors viz., herd size, extension participation, innovative proneness, perceived attributes of innovation have been retained at the last step of screening. The R^2 being 0.564, is to infer that all the above 4 predominating predictors have explained 56.4 per cent variance embedded with the predicted variable continuance of perennial fodder crops cultivation.

4.5.3 Stepwise regression analysis of continuance of perennial fodder crops cultivation versus various perceived attributes of innovation

Table 19 presents the stepwise regression analysis of continuance of perennial fodder crops cultivation with 5 perceived attributes of innovation. It has been found that one predictor, complexity have been retained at the last step of screening. The R^2 being 0.205, is to infer that the predominating predictor have explained 20.5 per cent variance embedded with the predicted variable continuance of perennial fodder crops cultivation.

4.5.4 Path analysis on continuance of perennial fodder crops cultivation versus other independent variables

Table 20 depicts that out of 19 variables, 11 variables had positive direct effect and 8 variables had negative direct effect on continuance of perennial fodder crops cultivation. Ranking of variables based on their direct effect on continuance of perennial fodder crops cultivation revealed that, innovative proneness (x12), perceived attributes of innovation (x16) and herd size (x7), occupied first three ranks. Regarding total indirect effect channeled through other factors for each of the independent variable was also substantial, ranking of these effects indicated that risk orientation (x15)

Table 17. Correlation coefficient between continuance of perennial fodder crops cultivation and other independent variables

Variables	Correlation coefficient (r)
Age	-0.006
Education	0.061
Family size	0.217*
Land holding	0.416**
Size of irrigated land	0.409**
Annual income	0.469**
Herd size	0.513**
Extension contact	0.262*
Extension participation	0.508**
Organization participation	0.381**
Mass media participation	0.295**
Innovative proneness	0.418**
Scientific orientation	0.025
Management orientation	0.389**
Risk orientation	0.336**
Perceived Attributes of Innovation	0.450**
Knowledge level of fodder crops	0.067
Information seeking behaviour	0.230*
Training received	0.474**

**Significant at 1% level, *Significant at 5% level

Table 18. Stepwise regression analysis of continuance of perennial fodder crops cultivation versus other independent variables

Predictors	B	Std. Error	Beta	t	R	R ²	Adjusted R ²	Std. Error estimated
Age	-0.032	0.149	-0.022	0.212	0.751	0.564	0.447	11.425
Education	-0.529	0.703	-0.088	0.752				
Family size	0.829	1.201	0.070	0.691				
Land holding	0.292	0.380	0.149	0.767				
Size of irrigated land	-0.163	0.753	-0.050	0.217				
Annual income	-4.099	0.000	-0.010	0.037				
Herd size	0.669	0.309	0.270	2.165*				
Extension contact	-0.383	0.400	-0.101	0.958				
Extension participation	1.371	0.649	0.218	2.112*				
Organization participation	-0.103	0.370	-0.044	0.279				
Mass media participation	-0.017	0.183	-0.010	0.092				
Innovative proneness	2.438	1.007	0.301	2.420*				
Scientific orientation	-5.583	3.129	-0.203	1.784				
Management orientation	3.001	1.792	0.161	1.674				
Risk orientation	-1.728	1.145	-0.204	1.510				
Perceived Attributes of Innovation	1.171	0.460	0.277	2.601**				
Knowledge level of fodder crops	-0.437	0.354	-0.117	1.236				
Information seeking behaviour	-0.692	1.278	-0.054	-0.541				
Training received	1.675	3.859	0.053	0.434				

** Significant at 1% level, *Significant at 5% level

Table 19. Stepwise regression analysis of continuance of perennial fodder crops cultivation versus perceived attributes of innovation

Predictors	B	Std. Error	Beta	t	R	R ²	Adjusted R ²	Std. Error estimated
Relative Advantage	2.133	1.374	0.155	1.553	0.452	0.205	0.160	14.080
Compatibilty	1.331	1.468	0.094	0.907				
Complexity	1.920	0.868	0.229	2.212*				
Trialability	2.260	1.533	0.147	1.474				
Observability	1.793	2.124	0.092	0.844				

*Significant at 5% level

Table 20. Path analysis on continuance of perennial fodder crops cultivation versus other independent variables

Variables	Total Effect	Total Direct Effect	Total Indirect Effect	Substantial indirect effect		
				I	II	III
Age (x1)	-0.006	-0.022	0.016	0.046(x2)	0.020(x6)	0.012(x13)
Education (x2)	0.038	-0.088	0.126	0.056(x17)	0.041(x14)	0.029(x13)
Family size (x3)	0.217	0.070	0.147	0.056(x4)	0.041(x18)	0.032(x10)
Land holding (x4)	0.392	0.149	0.243	0.081(x10)	0.077(x8)	0.057(x6)
Size of irrigated land (x5)	0.410	-0.050	0.460	0.127(x8)	0.123(x4)	0.109(x13)
Annual income (x6)	0.466	-0.010	0.476	0.169(x8)	0.119(x4)	0.109(x13)
Herd size (x7)	0.514	0.270	0.244	0.111(x13)	0.103(x10)	0.091(x17)
Extension contact (x8)	0.262	-0.101	0.363	0.109(x13)	0.103(x17)	0.063(x10)
Extension participation (x9)	0.508	0.218	0.290	0.127(x8)	0.122(x13)	0.079(x17)
Organization participation (x10)	0.379	-0.044	0.423	0.166(x13)	0.133(x17)	0.101(x10)
Mass media participation (x11)	0.294	-0.010	0.304	0.146(x13)	0.117(x17)	0.099(x8)
Innovative proneness (x12)	0.418	0.301	0.117	0.140(x17)	0.099(x8)	0.088(x10)
Scientific orientation (x13)	0.024	-0.203	0.227	0.158(x13)	0.053(x17)	0.042(x15)
Management orientation (x14)	0.389	0.161	0.228	0.116(x17)	0.104(x13)	0.089(x8)
Risk orientation (x15)	0.336	-0.204	0.540	0.174(x13)	0.154(x17)	0.094(x10)
Perceived Attributes of Innovation (x16)	0.450	0.277	0.173	0.152(x13)	0.088(x8)	0.067(x15)
Knowledge level of fodder crops (x17)	-0.067	-0.117	0.050	0.059(x13)	0.045(x17)	0.030(x8)
Information seeking behaviour (x18)	0.230	-0.054	0.284	0.095(x8)	0.081(x17)	0.061(x13)
Training received (x19)	0.474	0.053	0.421	0.160(x13)	0.127(x8)	0.124(x10)

followed by annual income (x6) and size of irrigated land (x5) were the first three important variables which had total indirect effect on continuance of perennial fodder crops cultivation. Total indirect effect by risk orientation (x15) was channelized through scientific orientation (x13), knowledge level of fodder crops (x17) and organization participation (x10). Total indirect effect by annual income (x6) was channelized through extension contact (x8), land holding (x4) and scientific orientation (x13). Total indirect effect by size of irrigated land (x5) was channelized through extension contact (x8), land holding (x4) and scientific orientation (x13). Variables like herd size (x7), extension participation (x9) and training received (x19) were the first three factors to exert total effect on the dependent variable, continuance of perennial fodder crops cultivation.

4.6 Constraints perceived by respondents

Totally 10 constraints have been identified for adoption of perennial fodder crops (Table-21). Difficulty to get seeds/ planting materials (Garret score 54.62, rank-1) was perceived as the major constraint, followed by poor germination of seeds (Garret scores 46.74, rank-2), less contact with extension personnel (Garret scores 23.52, rank-3), difficulty to get proper information (Garret score 22.84, rank-4), requirement of special trainings to get higher yields (Garret score 20.17, rank-5), other problems (Garret score 18.21, rank-6), irrigation problem (Garret score 13.91, rank-7), difficult to store the produce (Garret score 9.01, rank- 8), requirement of high crop management practices (Garret score 7.43, rank-9), difficult to maintain the harvest schedule (Garret score 2.93, rank-10).

Table 21. Ranking of constraints in cultivation of perennial fodder crops as perceived by respondents

Constraints	Garret Scores	Rank
Difficult to get seeds/planting materials	54.62	I
Poor germination of seeds	46.74	II
Less visit of extension personnel	23.52	III
Difficult to get proper information	22.84	IV
Requirement of special trainings to get higher yields	20.17	V
Irrigation problem	13.91	VII
Difficult to store the produce	9.01	VIII
Requirement of high crop management practices	7.43	IX
Difficult to maintain the harvest schedule	2.93	X
Others*	18.21	VI

*Includes labour problem, less market demand, low palatability

5. DISCUSSION

The results of the present study are elaborately discussed in this chapter and plausible reasons and explanations have been given to interpret them. The discussions of the results of the study are made under the following headings –

- 5.1 Continuance of fodder technologies
- 5.2 Socio-economic profile of perennial fodder growers
- 5.3 Land and livestock holdings of perennial fodder growers
- 5.4 Perennial fodder crops cultivated by respondents
- 5.5 Favorable factors for continuance of perennial fodder crops cultivation
- 5.6 Constraints in cultivation of fodder crops

5.1 Continuance of fodder technologies

More than one-third of respondents (34.73 %) continued cultivation of perennial fodder crops for 9-14 years. One-third (30.53 %) of respondents continued cultivation of perennial fodder crops for 3-8 years, followed by 18.95 per cent of respondents continued cultivation of perennial fodder crops for 15-20 years, 9.47 per cent of respondents continued cultivation of perennial fodder crops for 21-26 years and 6.32 per cent of respondents continued cultivation of perennial fodder crops for more than 26 years (Table 1).

Perennial fodder crops once sown or planted provide fodder continuously for many years. The ease of cutting once in every 15 days, the availability of quality fodder and their positive effect on health and milk yield of livestock might have motivated farmers to continue to grow these crops for many years. So as these farmers possess dairy animals, they had continued cultivating fodder crops to feed them.

5.2 Socio-economic profile of perennial fodder growers

5.2.1 Age

Table 2 indicated that more than half of the farmers (60.00 %) belonged to middle age group followed by 28.42 per cent belonged to old age group and only 11.58 per cent belonged to young age group. The mean age of farmers was 45.29 ± 1.10 years.

The probable reason for this could be that the middle aged respondents with some experience in farming might have realized about the less availability of proper feeding resources for livestock to obtain higher milk yield. This could have encouraged them to take fodder cultivation. Similar results were reported by Rajanikanth (2013).

5.2.2 Education

More than half of the farmers (60.00 %) were educated upto pre-university level. Equal per cent of farmers (17.90 %) were educated upto high school and graduate and above education level. Remaining percentage of farmers were educated upto middle school level (2.10 %) followed by an equal percentage (1.05 %) of farmers were illiterate and educated upto primary school level of education. The mean year of schooling was 11.69 ± 0.26 years (Table 2)

The probable reason for this could be attributed to better awareness about the importance of education and also existence of primary and high school facilities in the rural areas. Similar results were reported by Chaudhari (2006) and Pushpa (2006).

5.2.3 Family size

Results presented in table 2 indicated that majority of respondents (66.32 %) belonged to small category of family size. One-third of respondents (32.63 %) had medium family size and only 1.05 per cent of respondents had large family size. The mean size of family was 4.61 ± 0.13 members.

The reason for this might be that majority of the respondents had nuclear families. Similar results were reported by Manjunatha (2002) and Satish (2010).

5.2.4 Family type

Majority of the respondents (83.16 %) belonged to nuclear type of family and 16.84 per cent of respondents belonged to joint family (Table 2).

The reason might be respondents preference to have better quality of life as nuclear family has less sharing of facilities or resources. Similar results were reported by Satish (2010).

5.2.5 Annual income

Majority of the respondents (64.21 %) belonged to high income group (above Rs. 1,20,000). More than one-fifth (21.05 %) of respondents belonged to medium income group (Rs. 60,000- Rs. 1,20,000) and 14.74 percentage of respondents belonged to low income group (upto Rs. 60,000). The average annual income of the respondents was Rs. $2,86,147.30 \pm 26,474.63$ (Table 2).

The reason for this would be assured irrigation facility with majority of the respondents which would enable the farmers to cultivate more than one crop in a year. In Belagavi district, majority of the respondents cultivated sugarcane which fetches very good price and is also protected by Minimum Support Price (MSP). Large area is also used for cultivation of vegetables.

So, growing cash crops could be the reason for majority belonging to high and medium income groups. Similar findings were reported by Satish (2010), Akshata (2014) and Soujanya (2014).

5.3 Land and livestock holdings of perennial fodder growers

5.3.1 Land holding

Almost half of the respondents (46.33 %) belonged to small category of land holdings. One fifth (21.05 %) of the respondents belonged to small-medium category of land holdings. Among remaining, 15.78 per cent of the respondents belonged to marginal category of land holdings, 13.68 per cent and 3.16 per cent of the respondents belonged to medium and big categories of land holdings, respectively. The mean land holding was 7.18 ± 0.80 acres (Table 3 and Fig. 3).

The probable reason for possession of small and medium land size might be due to division of land because of separation of families. Meeting livelihood needs of a family from small land holdings is difficult and to supplement the income, livestock rearing that matches with their traditional skills might have been taken up by many respondents. Big land holdings may be because of joint families. Some of the respondents are marginal farmers because of poor socio-economic status. Similar findings were reported by Rajni (2015), Kashappa (2013) and Khin Mar Oo (2005).

5.3.2 Irrigated land

Less than half (42.11 %) of farmers had irrigated land of 2.51 to 5.0 acres. Almost one-third of farmers (30.52 %) had irrigated land up to 2.50 acres, 15.79 per cent and 11.58 per cent of farmers had irrigated land of 5.01 to 9.0 acres and more than 9.0 acres, respectively. The mean irrigated land was 5.08 ± 0.49 acres (Table 3).

Total of 27.37 per cent of respondents had irrigated land area of 5.0 to more than 9.0 acres. It is because the respondents of Chikkodi taluk and its nearby areas of Belagavi district have good source of irrigation. Rivers like Ghataprabha, Malaprabha and Krishna and their tributaries flow through Belagavi district. There are good number of dugwells, tubewells and canals in Belagavi district. Rest of the respondents (72.63 %) belonging to Dharwad district and Khanapur taluk of Belagavi district mainly depend on monsoon rains. Similar findings were reported by Motebennur (2013).

5.3.3 Soil type

Around one-third of farmers (33.68 %) had black soils, 30.53 per cent of farmers had red sandy soils followed by 31.58 per cent and 4.21 per cent of farmers had mixed and alluvial type of soils, respectively (Table 3 and Fig. 3).

It might be because soils vary in depth and texture, depending on the parent rock type, physiographic settings and climatic conditions. By and large, black soils predominate the deccan trap terrain and the red soils are found in the southwestern and southeastern part of the study area in gneissic terrain. Similar findings were reported by Angadi (2014).

5.3.4 Herd size

Less than half of the respondents (45.26 %) possessed medium herd size, 32.63 per cent of farmers possessed small herd size and 22.11 per cent of farmers possessed large herd size. The mean herd size was 5.81 ± 3.47 adult cattle units (Table 3 and Fig. 3).

The reason for medium and small herd size together, being possessed by almost 78 per cent of the respondents, could be attributed to various reasons like requirement of more manpower to take care of more animals, high cost to purchase animals, restricting herd size in accordance with the estimated production of fodder and selling of animals to meet the expenditure of the family, The results were in line with the results of Satish (2010), Akshata (2014) and Rajni (2015).

5.3.5 Livestock composition

Almost half of the respondents (47.37 %) had cow and buffaloes, 38.95 per cent of the respondents had cow, buffaloes and bullocks; 6.31 per cent of respondents had only cows; 3.15 per cent of respondents had only buffaloes and equal per cent of respondents (2.11 %) possessed cow and bullocks; and buffalo and bullocks (Table 3).

Milk of higher fat from buffaloes could be the reason for more number of respondents owing them. High cost, sophisticated feeding and proper health management systems for cows could be the reason for less number of respondents owing them. The dependence on bullocks for tillage could be reason for having them. Similar findings were reported by Biradar *et al.* (2007) and Satish (2010)

5.3.6 Extension participation

Table 4 depicts that majority of respondents participated in krishi mela and exhibitions, which might be due to the fact that fodder growers get exposure to various types of improved fodder varieties, cattle breeds, availability of latest fertilizers and implements, etc. in krishi mela and exhibitions. Participation of one-fourth of respondents in training programmes might be due to the fact that the respondents found it very useful and interesting to learn by themselves in training. As demonstrations, field visits and extension group meetings are rarely conducted in the study area, so there is very less participation by the respondents. Similar findings were reported by Rajasekhar (2009) and Archana (2013).

5.3.7 Extent contact

Table 5 depicts that majority of the respondents (64.21 %) contacted Agricultural assistant and Assistant agricultural officer in 15 days because they work in Raitha Sampark Kendra (RSK) and meet farmers on their farm once in a fortnight as it is obligatory to them. Almost one-third of respondents (31.58 %) contacted Raitha Samparka Kendras (RSKs) directly because RSKs are located in proximity to farm communities and are aimed at addressing wide range of local issues related to agriculture. They also act as a common platform and creating a terminal linkage to the farmers to access and interact about agriculture based technology and information at the grass root level. These kendras are intended to provide technical information on crop selection, crop production,

and crop protection related know-how, market and weather information etc., to the farmers. Indian Grassland and Fodder Research Institute is less contacted by farmers because of its mainly a research institute with less involvement in outreach activities. The reason behind Krishi Vigyan Kendra (KVK) being contacted by majority of respondents (61.05 %) in 15 days might be to get vocational trainings, see on-farm trials on crops like cotton and vegetables to get acquainted with integrated pest and disease management on crops. High majority of respondents (93.68 %) contacted staff of Karnataka Milk Federation (KMF) in 15 days because most of the farmers were its members and they sell the milk obtained from dairy animals to KMFs. Similar findings were reported by Avinash (2013) and Kashappa (2013).

5.3.8 Mass media participation

Table 6 depicts that newspaper was subscribed by 68.42 per cent of respondents and regularly read for news by majority of respondents (67.37 %). It was because newspapers give latest information on varied topics like politics, science, agriculture, sports and entertainment. Farm magazines were subscribed by very few respondents (10.53 %) might be because of lack of awareness about farm magazines and/or availability of agriculture related information in newspaper itself. Cent per cent of respondents had television at their homes might be because of reduced cost of televisions and as best source of information and entertainment to the family. Similar findings were reported by Khin Mar Oo (2005) and Rajasekhar (2009).

5.3.9 Social and organizational participation

Table 7 indicates that majority of the respondents (82.10 %) were members of Karnataka Milk Federation (KMF) co-operatives and 54.73 per cent of respondents participate regularly because the dairy farmers sell the milk obtained to KMFs which gives them high incentives. About one-third of the respondents (29.47 %) were members of youth club for recreational activities. Higher than one-fourth of respondents (28.42 %) were members of mahila mandal, out of which 22.11 per cent of respondents participated occasionally might be because of their preoccupation in farm related activities and less time to spare for. Less than one-fifth of respondents (17.89 %) were members of raitha sangh, out of which 14.73 per cent of respondents participated regularly might be due to relevance of its activities to farming. Only 8.42 per cent of farmers were members of agriculture co-operative societies and equal per cent of farmers (4.21 %) participated regularly and occasionally, this might be because agriculture cooperative societies provide mostly the input which does not require regular participation. Few respondents (4.21 %) were members of zilla parishad, out of which 3.16 per cent and 1.06 per cent of respondents participated regularly and occasionally, respectively.

Similarly, fewer respondents (4.21 %) were members of mandal panchayat and out of which 8.42 and 2.10 per cent of farmers were regular and occasional participants, respectively. Less representation in such bodies might be due to limited membership availability. Nearly seventeen per cent of farmers were members of sugar factories, out of which 14.73 and 2.11 per cent of farmers were regular and occasional participants, respectively. Respondents of Chikodi taluk of Belagavi district were sugarcane growers, so the sugarcane produced were sold to the sugar factories and thus

they tend to become members of the sugar factories. Similar findings were reported by Khin Mar Oo (2005) and Avinash (2013).

5.3.10 Information seeking behaviour

Table 8 indicates that in majority informal sources of information were sought by respondents, viz., family members were consulted frequently by 74.74 per cent of respondents, 86.32 per cent of respondents frequently consulted their friends and relatives, 91.58 per cent of respondents frequently consulted their neighbours, 84.21 per cent of respondents frequently consulted other fodder growers for seeking information. Whereas just more than half of respondents (58.95 %) frequently contacted formal sources for information like veterinary department, very few respondents (8.42 %) consulted agriculture department frequently and other sources of information were consulted frequently by fewer respondents (3.16 %). The probable reason behind farmers giving priority to informal sources for seeking information might be due to the fact that farmers growing perennial fodder crops in the study area get their planting materials from their family members, neighbours, friends and relatives. So to get information the farmers had high credibility on them. Apart from this, the extension officers of agriculture and veterinary department rarely visit fodder growing farmers and so the farmers are less aware about the organized government sources for seeking information on fodder crops. Similar findings were reported by Lwoga *et al.* (2010)

5.3.11 Risk bearing prophesy

Table 9 and Fig. 4 depicts that more than half of the respondents (54.74 %) fall under medium category of risk orientation and 21.05 per cent of respondents fall under high category of risk orientation, together making to 75.79 per cent. The reason could be that many respondents belonged to irrigated belt with very good income. High income level might have motivated them to take risk. Similar findings were reported by Rajasekhar (2009).

Majority of the respondents (70.53 %) fall under medium category of scientific orientation, followed by 22.11 per cent of respondents fall under high category of scientific orientation accounting to 92.64 per cent of the total respondents. The probable reason could be that the traditional livestock rearing demands more labour to graze animals and demands feeding expensive concentrate feeds. Respondents of the study followed scientific production of fodder by cultivating perennial fodder crops indicating that they have medium to high level of scientific orientation. Similar findings were reported by Maraddi (2006) and Rajasekhar (2009).

Forty four per cent of the respondents fall under medium category of innovative proneness and nearly one-fourth of respondents (24.21 %) fall under high category of innovative proneness, together making it to 68.42 per cent. The possible reason behind it could be that majority of the respondents are resource rich in terms of land holdings, irrigation facility and annual income. Farmers endowed with resources tend to be innovative to try new technologies. Similar findings were reported by Rajanikanth (2013) and Chaudhari (2006).

Nearly half of respondents (48.42 %) belonged to high category of management orientation, followed by 36.84 per cent of respondents belonged to medium category together accounting to 85.26 per cent. The probable reasons could be that perennial fodder crops need proper cutting management practices to obtain higher green fodder yield of good quality. This will enable them to get more milk and better income from livestock. Similar findings were reported by Moulasab (2004).

5.3.12 Knowledge level

Table 10 depicts that 43.16 per cent of respondents had high knowledge level and 18.95 per cent of respondents had medium knowledge level of total fodder crops together accounting to 62.11 per cent of total respondents. Reasons for this finding could be that majority of respondents are cultivating these crops since many years (some even more than 25 years). This rich experience of cultivating these crops might have contributed for good knowledge of these crops by them. Additionally their contact with milk cooperatives of Karnataka Milk Federation might have also enabled them to get more recent information about scientific management of these crops. Majority respondents read news paper regularly and have good participation in mass media. This could have also contributed substantially to the present finding.

5.3.13 Training received

Nineteen per cent of respondents received training on milk enhancement programmes by Karnataka Milk Federation (KMF), followed by 12.63 per cent of respondents received training on dairy programmes by non-governmental organizations and 5.26 per cent of respondents received training on dairy and veterinary programmes by National Dairy Research Institute, Bangalore (Table 11). The probable reason for receiving trainings could be to enhance their knowledge and skills on dairy management. Similar results were obtained by Rajkumar *et al.* (2013).

5.4 Perennial fodder crops cultivated by respondents

5.4.1 Perennial fodder crop combinations

More than one third (37.89 %) of respondents had grown bajra napier hybrid and rhodes grass. Only 13.68 per cent of respondents had grown bajra napier hybrid only. Equal per cent of respondents (9.48 %) had grown fodder combination of bajra napier hybrid and guinea grass; bajra napier hybrid and paragrass. Three grasses (bajra napier hybrid, guinea grass, rhodes grass) and one legume (lucerne) were cultivated by 7.37 per cent of respondents. Equal per cent of respondents (5.26 %) had cultivated only guinea grass and fodder combination of bajra napier hybrid, guinea grass, rhodes grass. Equal per cent of respondents (4.21 %) had cultivated fodder combination of guinea grass+ rhodes grass; and bajra napier hybrid+guinea grass+ lucerne. Negligible per cent of respondents (1.05 %) cultivated bajra napier hybrid+guinea grass+ paragrass and bajra napier hybrid+guinea grass+rhodes grass+paragrass (Table 12).

Bajra napier hybrid is a very fast growing crop with high fodder yield. It grows very tall (as tall as 8 to 10 feet) providing adequate quantity of fodder to livestock. This could be the reason why almost all the respondents cultivated this crop. Rhodes grass though produces less tonnage/ yield, is

more nutritious and improves health of the animals. It does not need chaffing before feeding and can be fed directly as it has thin and succulent stem. It also grows very fast enabling farmers to cut once in a month. Guinea grass brings tangible effects as by feeding it milk yield of animal increases. This is the reason guinea being preferred by many farmers and being cultivated for long. Paragrass grows well in marshy land. Some part of the study area is irrigated by canal and over the years it lead to creation of marshy patches in the area. So paragrass is prevalent in study area. All the fodder crops cultivated by these farmers are suited to study area and have been promoted since many decades. Similar findings were reported by Rajanikanth (2013).

5.4.2 Source of obtaining seed/planting material of perennial fodder crop

Table 13 depicts that majority of respondents (89.47 %) obtained seed materials from other growers and 4.21 per cent of respondents obtained seed materials from other growers and Indian Grassland and Fodder Research Institute, Dharwad which accounted for 93.68 per cent.

All the fodder crops cultivated by farmers can be propagated by rooted slips and/or stem cuttings. Guinea and rhodes grass though can be propagated by seeds, but their germination percentage is very less. Unlike seeds of food grain crops, fodder seeds are not available everywhere. There are almost no seed traders selling fodder seeds. In such situation it becomes very convenient to the farmers to collect some quantity of planting material from neighbouring farmers and plant them in their fields. Once they grow in small patches, in two months using the stem cuttings of the same crop farmers can increase the area under the fodder crops. It becomes expensive for the farmers to collect planting material from far away places and transport to their villages. That could be the reason why extremely few farmers sourced planting material from formal institutions like IGFRI and KMF. Few might have did it for the want of new varieties in these crops.

5.4.3 Utilization of land for cultivation of perennial fodder crop

Nearly half of the respondents (42.10 %) cultivated fodder crops on bunds (Table 14). The reason behind cultivation of perennial fodder crops in bunds could be that in black soil large field bunds are laid to check soil erosion which provides a good opportunity for the farmers to grow fodder crops in bunds. Many have planted fodder crops on bunds and waterways (17.89 %), mainfield and waterways (3.16 %). The probable reason for using waterways for growing perennial fodder crops could be that fodder crops check soil erosion and also utilize the available moisture. Few farmers (4.21 %) have grown fodder along field boundary especially crops like hybrid napier bajra for the purpose of saving the main crop from cattle and produce fodder for the livestock. Only 4.21 per cent farmers have cultivated fodder crops in the main field. This indicates that due to small holdings farmers prefer to use less utilized land for fodder cultivation. So bunds, field boundary and waterways are more preferred places to cultivate fodder crops than the main field.

5.4.4 Area under perennial fodder crop

Most of the farmers, as presented in Table 15 and Figure 5, have cultivated these fodder crops in an area (may be bunds/waterways/field boundary/main field) measuring upto half an acre.

Bajra napier hybrid (64.21 %), guinea grass (33.68 %), rhodes (25.26 %), paragrass (2.11 %) and lucerne (3.16 %) were cultivated by respondents in an area measuring upto 0.5 acres. Livestock in study area is reared mainly to get cow dung for the farm yard manure (FYM) production. Milk production is the main objective. Sugar cane farmers need adequate quantity of FYM to apply to their fields to ensure good fertility of the soil for better productivity. So small to medium herd size is maintained by them. As a result the green fodder requirement is less, besides perennial fodder crops provide continuous green fodder to the animals. Livestock in the study area is also fed with other crops residues including sugar cane tops, so green fodder is not the sole feed for these animals.

Some farmers have cultivated fodder crops in more than half an acre, probably they might have big herd size or they might have got less availability of other crops residues to feed to their livestock.

5.4.5 Yield obtained from perennial fodder crop

More than half of the respondents realized green fodder yield between 6 to 8 quintals from bajra napier hybrid (Table 16 and Fig. 6). This is higher as compared to other crops like guinea, rhodes and paragrass. Among all the cereal fodder crops, bajra napier hybrid is the highest tonnage yielding crop. Quantity wise it stands first. Guinea grass and rhodes are valued more for the quality than for the quantity. About one fourth of the respondents have obtained yield less than 6 quintals from guinea and rhodes grass. Para grass is a low yielder as compared to other grasses. Lucerne is the leguminous perennial fodder crop which grows very fast and can be harvested once in 20 to 25 days. In a year it can be harvested 13 times but grasses can be harvested 6-7 times only as in winter their growth reduces. Because of frequent harvest the yield of lucerne is more, so respondents mentioned that they had obtained yield of green fodder between 6 to 8 quintals.

5.5 Favorable factors for continuance of perennial fodder crops cultivation

5.5.1 Correlation between continuance of perennial fodder crops cultivation and other independent variables

Table 17 depicts that out of 19 variables subjected for correlation analysis, 15 variables exhibited positive and significant relationship with continuance of perennial fodder crops by adopters. Landholding, size of irrigated land, annual income, herd size, extension participation, organization participation, mass media participation, innovative proneness, management orientation, risk orientation, perceived attributes and training received expressed positive and significant relationship with continued adoption at 1 per cent level of probability. Family size, extension contact and information seeking behavior were positively and significantly correlated with continued adoption at 5 per cent level of probability.

Bigger the land holding farmers can spare some part of their land for continuous cultivation of perennial fodder crops. Green fodder production from perennial fodder crops throughout the year

demands irrigation and hence size of irrigated land showed positive correlation. Income from fodder crops is indirect unlike for grain crops. It is through milk or meat production. Higher annual income farmers can forego their direct income by grain crops by cultivating fodder crops. Requirement for fodder increases as herd size increases. Participation in extension activities, different organizations and mass media creates more awareness about the new crops and their importance to cultivate. This enables the farmers to have more access to knowledge and seed/planting material. Farmers who are in regular contact with extension personnel easily get the planting materials and their participation in krishi mela, demonstrations and exhibitions give them a good exposure and learning situation where the farmers can learn by themselves about the benefits of growing perennial fodder crops, which will in turn boost the farmers to cultivate them. Being members of organizations and co-operatives like Karnataka Milk Federation (KMF), farmers can directly sell their milk produce to KMFs, thus reducing the burden of middlemen. Mass media like newspaper, farm journals, radio and television is utilized by farmers to get information on latest high yielding fodder hybrids, technologies pertaining to grow fodder crops and different schemes launched by government to enhance fodder cultivation. Farmers get benefitted from the information they get from friends, relatives and other fodder growing farmers pertaining to technologies related to cultivation of perennial fodder crops. Highly innovative farmers are more likely to adopt new farming technologies and get high fodder yields. Farmers who can manage their farms and take calculated risk will earn higher income by cultivating perennial fodder crops and will be motivated to continue growing them. Perennial fodder crops which are perceived as advantageous in comparison to other fodder crops, which are compatible to existing situations and culture of farmers, can be tried on a small scale, whose yield obtained is observable and which are less complex in nature are continuously grown by farmers. Farmers with big family size can diversify crops due to the availability of family labours. Training imparts knowledge and technical skill which enables the farmers learn to use the available resources efficiently to get good results. Similar findings were reported by Rezvanfar (2009) and Jera and Ajayi (2010).

5.5.2 Stepwise regression analysis of continuance of perennial fodder crops cultivation versus other independent variables

Table 18 presents the stepwise regression analysis of continuance of perennial fodder crops cultivation with 19 other independent variables. It has been found that four predictors viz., herd size, extension participation, innovative proneness and perceived attributes of innovation have been retained at the last step of screening. These four variables exert critical influence on continuance of perennial fodder crops cultivation. Among these four variables, perceived attributes of innovation gives a strong message that it should not be neglected in order to enhance continued cultivation of perennial fodder crops. The R^2 being 0.564, is to infer that all the above 19 variables had explained 56.4 per cent variance embedded with the predicted variable, continuance of perennial fodder crops cultivation. Farmers with large herd size should be the target group for extension functionaries to increase the area under perennial fodder crops. 'Fodder extension' is not very popular in India. State agricultural departments concentrate on principal grain and cash crops of the region for popularization. State animal husbandry departments mainly focus on clinical aspects of livestock. If

farmer has better extension participation by visiting various places then he tends to obtain knowledge on perennial fodder crops. Innovative proneness forms an important component as fodder crops are not traditionally grown and innovative farmers might have tried and continued to adopt them.

5.5.3 Stepwise regression analysis of continuance of perennial fodder crops cultivation versus various perceived attributes of innovation

Table 19 depicts that among the various perceived attributes of innovation, the predictor complexity had been retained at the last step of screening. The R^2 being 0.205 indicates that the five predictors, viz., relative advantage, compatibility, complexity, trialability and observability exhibited 20.5 per cent variance embedded with the dependent variable, continuance of perennial fodder crops cultivation. Technologies related to fodder cultivation which are perceived as complex require more attention. Seeds of many fodder crops are very small with less germination percentage. They are not available everywhere and are expensive. The crop if to be raised first time needs knowledge on sowing method and also in some cases nursery raising technique. Maintaining persistency in plant population of these perennial fodder crops require better crop cultivation methods like regular intercultural operations and fertilization. Thus 'complexity' of these technologies need to be addressed for continuance of these crops.

5.5.4 Path analysis on continuance of perennial fodder crops cultivation versus other independent variables

Table 20 depicts that out of 19 variables, 11 variables had positive direct effect on continuance of perennial fodder crops cultivation, while remaining 8 variables had negative direct effect on continuance of perennial fodder crops cultivation. Ranking of variables based on their direct effect on continuance of perennial fodder crops cultivation revealed that, innovative proneness (x12), perceived attributes of innovation (x16) and herd size (x7), occupied first three ranks. These three variables are very important as perennial fodder crops are new crops when compared to their traditional crops with different attributes. Bigger herd size raises the demand for more fodder so it might have expressed direct effect on continued cultivation of these crops. Regarding total indirect effect channeled through other factors for each of the independent variable was also substantial, ranking of these effects indicated that risk orientation (x15) followed by annual income (x6) and size of irrigated land (x5) were the first three important variables which had total indirect effect on continuance of perennial fodder crops cultivation. Any new idea tried for the first time always involves risk of varied nature and quantity. It demands initial investment in terms of labour and planting material. Perenniality of the crop also depends on availability of irrigation so as to grow and produce green fodder throughout the year. Total indirect effect by risk orientation (x15) was channelized through scientific orientation (x13), knowledge level of fodder crops (x17) and organization participation (x10). Better the knowledge level, person will be better prepared to take risk. Scientific orientation of farmers and their participation in organizations might have helped them to gather more knowledge about these crops. Total indirect effect by annual income (x6) was channelized through extension contact (x8), land holding (x4) and scientific orientation (x13). Total indirect effect by size of

irrigated land (x5) was channelized through extension contact (x8), land holding (x4) and scientific orientation (x13). Variables like herd size (x7), extension participation (x9) and training received (x19) were the first three factors to exert total direct effect on the dependent variable, continuance of perennial fodder crops cultivation.

5.6 Constraints perceived by respondents

Totally 10 constraints have been identified for adoption of perennial fodder crops (Table-21). Difficulty to get seeds/ planting materials (Garret score 54.62) was perceived as the major constraint as it ranked first for continuance of perennial fodder crops followed by poor germination of seeds (Garret scores 46.74, rank-2) and less contact with extension personnel (Garret scores 23.52, rank-3).

Planting material of perennial fodder crops are not available everywhere. None of the private agency is involved in multiplication of these materials. However to plant one acre of land, requirement of planting material is about 10000 rooted slips or stem cuttings. Farmers find it difficult to get so many planting materials from the farmers. They need to get in small quantity, multiply at their level and then increase the area as desired by them. This is time consuming process. Also availability of planting material of their desired species is difficult. In view of this they might have expressed this as the major constraint. As mentioned earlier seeds of fodder crops have poor germination and maximum germination percentage of fodder crops is between 40 to 45 percentage. Similarly extension personnel working and disseminating information on fodder crops is almost absent. Even in milk federations only of late they are employing graduates to work on fodder extension. So it becomes difficult for the farmers to obtain information on fodder crops. Perennial fodder crops as are harvested continuously they need proper cultivation and management practices to sustain their higher yields if not the yield will be reduced. Farmers tend to give less importance to these crops and hence timely cultivation practices are not taken up affecting the yield levels. Some of the fodder crops especially bajra napier hybrid loses its fodder value if it is dried. So the crop cannot be stored and stacked for future use. This could be the reason of expressing difficult to store the produces as the constraint. Best quality fodder can be harvested when crop is at flowering stage but many farmers due to continuous requirement do not allow the crop to flower and harvest either before or after the flowering stage. In both the situations fodder quality affects. So maintaining harvest schedule is expressed as one of the constraint by the respondents. Similar findings were reported by Mapiye *et al.* (2006).

6. SUMMARY AND CONCLUSIONS

There is a high demand for meat, milk and other animal products in India. With the increase in per capita income and urbanization, the consumption of livestock products will continue to rise in the foreseeable future. Consequently, the demand for feed and fodder for feeding and fattening of livestock will also increase. The economic viability of livestock husbandry is dependent on the genetic potential for production, good health care, balanced feeding of animals and efficient marketing of the produce. While genetic improvement and health care are the prerequisites for sustainability, efficient feeding and marketing will help in increasing the profitability (Kannan, 2012). However, the profitability is directly dependent on the sources of feed and fodder, as about 65-70 per cent of the total cost of livestock farming is attributed to feeding (Hegde, 2013). Any saving in feed and fodder cost would directly contribute to increase in profitability. Balanced feeding of milch animals is more critical, as the results are reflected within a short span, almost immediately, in the form of milk production.

Many improved perennial fodder crops have been developed by different research stations for different farming situations in Karnataka. Farmers engaged in dairy production have started cultivating perennial fodder crops to feed the animals. Many studies have been taken up on Rogers's first four stages, but much less on the fifth stage of confirmation, or what may be called as continuance (Parthasarthy, 1995). Discontinuance is defined as a decision to reject an innovation after having previously adopted it (Rogers, 2003). Black (1983) noted that the characteristics of the innovation that facilitates its adoption also influence its continued use. Thus innovations which are less complex and easy to try tend to be more readily adopted and also have a higher level of continuance.

Perennial fodder crops owing to their typical characteristics (occupying land for long, indirect benefits, no associated subsidies like for food crops, poor extension network, etc.) form a very interesting subject to study the factors that influence the continuance or otherwise by the farmers. Therefore, the purpose of the study is to determine the influential factors on continuance of cultivation of perennial fodder crops by farmers. Keeping the above facts in mind, the present study was designed with the following specific objectives-

- I. To study the socio-economic profile of adopters of perennial fodder crops.
- II. To ascertain the different perennial fodder crops cultivated by them.
- III. To analyze the favorable factors for continuance of perennial fodder crops by adopters.
- IV. To identify the constraints faced by them in cultivation of these crops.

List of farmers cultivating perennial fodder crops in the study area was collected from Southern Regional Research Station, Dharwad of Indian Grassland and Fodder Research Institute (IGFRI). These farmers were contacted initially to collect the data and through them, by using snowball technique other perennial fodder crops growing farmers of the village were contacted to collect the data. Overall, 55 farmers from Belagavi district and 40 farmers from Dharwad district were contacted, thus forming the sample size of 95 farmers.

Pre-tested and standardized interview schedule was used for data collection from 95 perennial fodder growing farmers of Dharwad and Belagavi districts through personal interview technique. The appropriate statistical procedures such as frequency, percentage, means, standard deviation, correlation coefficient, step-wise regression model, path analysis technique and garret ranking technique were employed to analyze the data. Statistical packages like Microsoft excel and SPSS were used for analysis.

Major findings of the study were as follows

1. More than one-third of respondents (34.74 %) continued cultivation of perennial fodder crops for 9-14 years and nearly one third (30.53 %) cultivated for 3-8 years. The average number of years of continued cultivation was 14 years.
2. More than half of the farmers (60.00 %) were educated upto pre-university level. Equal per cent of farmers (17.90 %) were educated upto high school and graduate and above education level. The mean year of schooling was 11.69 ± 0.26 years.
3. Two third respondents (66.32 %) belonged to small category of family size. Almost one-third of respondents (32.63 %) belonged to medium category of family size. The mean size of family was 4.61 ± 0.13 members.
4. Majority of the respondents (83.16 %) belonged to nuclear type of family and 16.84 per cent of respondents belonged to joint type of family.
5. Majority of the respondents (64.21 %) belonged to high income group (above Rs. 1,20,000). One fifth (21.05 %) respondents belonged to medium income group (Rs. 60,000- Rs. 1,20,000). The average annual income of the respondents was Rs. 2,86,147.30 \pm 26,474.63.
6. Almost half of the respondents (46.33 %) belonged to small category of land holdings. One fifth (21.05 %) of the respondents belonged to small-medium category of land holdings. Among remaining, 15.79 per cent of the respondents belonged to marginal category of land holdings , 13.68 per cent and 3.16 per cent of the respondents belonged to medium and big categories of land holdings, respectively. The mean land holding was 7.18 ± 0.80 acres.
7. Less than half (42.11 %) of farmers had irrigated land of 2.51 to 5.0 acres. Almost one-third of farmers (30.53 %) had irrigated land up to 2.50 acres, 15.79 per cent and 11.58 per cent of farmers had irrigated land of 5.01 to 9.0 acres and more than 9.0 acres, respectively. The mean irrigated land was 5.08 ± 0.49 acres.
8. Around one-third of farmers (33.68 %) had black soils. Less than one third (30.53 %) had red sandy soil. Among the remaining, 31.58 per cent and 4.21 per cent of farmers had mixed and alluvial type of soils, respectively.
9. Less than half of the respondents (45.26 %) possessed medium herd size. One third (32.63 %) possessed small herd size and 22.11 per cent of farmers possessed large herd size. The mean herd size was 5.81 ± 3.47 adult cattle units.

10. Almost half of the respondents (47.37 %) had cow and buffaloes. More than one third (38.95 %) respondents had cow, buffaloes and bullocks.
11. Majority of the respondents (88.42 %) participated in krishi mela, 36.84 per cent of the respondents participated in agriculture exhibitions, one-fourth (25.26 %) of respondents participated in training programmes, 15.79 per cent of respondents participated in demonstrations.
12. Agricultural assistant was contacted by 64.21 per cent of farmers once in 15 days Assistant agricultural officer was contacted by 64.21 per cent of farmers in 15 days. Staff of Karnataka Milk Federation was contacted once in 15 days by 93.68 per cent of farmers.
13. Newspaper was subscribed by 68.42 per cent of the respondents and read occasionally for agricultural programmes by 58.95 per cent of respondents, read regularly for news (67.37 %), for entertainment by 60.00 per cent of respondents. Television was owned by cent per cent (100.00 %) of respondents, viewed occasionally (66.32 %) for agriculture programmes and cent per cent viewed for news and regularly for entertainment (98.95 %). Radio was subscribed by 9.47 per cent of respondents, was listened equally (4.21 %) as regular and occasional for agriculture programmes.
14. Majority of the farmers (82.10 %) were members of KMFs, more than half were regular participants (52.63 %).
15. Almost two-third of respondents (74.74 %) consulted family members frequently for seeking information, consulted occasionally (24.21 %). Respondents (86.32 %) frequently consulted their friends and relatives, respondents (91.58 %) frequently consulted their neighbours for taking information , respondents (84.21 %) frequently consulted other fodder growers, respondents (58.95 %) frequently consulted veterinary department and 41.05 per cent of respondents occasionally consulted agriculture department
16. More than half of the respondents (54.74 %) belong to medium category of risk orientation, majority of the respondents (70.53 %) belonged to medium category of scientific orientation, less than half (44.21 %) of the respondents had medium innovative proneness and nearly half of the respondents (48.42 %) had high management orientation.
17. Less than half respondents (43.16 %) had medium knowledge level of annual fodder crops and forty per cent of respondents had high knowledge level of perennial fodder crops.
18. Less than one fifth (18.95 %) of respondents received training on milk enhancement programmes by KMF and 12.63 per cent of respondents received training on dairy programmes by Non-governmental Organizations.
19. Bajra napier hybrid and rhodes grass were cultivated by 37.89 per cent of respondents. Bajra napier hybrid was grown as a sole crop by 13.68 per cent of respondents. Equal per cent of respondents (9.47 %) had grown fodder combination of bajra napier hybrid and guinea grass; bajra napier hybrid and paragrass.

20. Majority of respondents (89.47 %) obtained seed materials from other growers.
21. Less than half (42.11 %) of respondents used only bunds for cultivation of perennial fodder crop, 17.89 per cent of respondents used both bunds and waterways and 14.74 per cent of respondents used bunds and mainfield for cultivation of perennial fodder crop.
22. Bajra napier hybrid was cultivated by 64.21 per cent of respondents in an area upto 0.50 acre. Respondents (33.68 %) cultivated guinea grass in an area upto 0.50 acre and rhodes grass was cultivated by one-fourth of respondents (25.26 %) in land upto 0.50 acre.
23. For bajra napier hybrid, 58.95 % of respondents obtained green fodder yield of 6.01-8.00 quintals and less than one fifth (17.89 %) obtained yield upto 6 quintals. More than one-fourth of respondents (26.32 %) obtained green fodder yield upto 6 quintals from guinea grass. Around one-fourth of respondents (23.16 %) obtained yield upto 6 quintals from rhodes grass. Only 5.26 per cent of respondents obtained yield upto 6 quintals from lucerne. From lucerne, 3.16 per cent of respondents obtained yield of 6.01-8.00 quintals.
24. Landholding, size of irrigated land, annual income, herd size, extension participation, organization participation, mass media participation, innovative proneness, management orientation, risk orientation, perceived attributes and training received expressed positive and significant relationship with continued adoption at 1 per cent level of probability. Family size, extension contact and information seeking behavior were positively and significantly correlated with continued adoption at 5 per cent level of probability.
25. It has been found that four predictors viz., herd size, extension participation, innovative proneness, perceived attributes of innovation have been retained at the last step of screening. The R^2 being 0.564, is to infer that all the above 4 predominating predictors have explained 56.4 per cent variance embedded with the predicted variable continuance of perennial fodder crops cultivation.
26. Factors like innovative proneness, perceived attributes of innovation and herd size exerted highest direct effect on continuance of perennial fodder crops cultivation. Factors like risk orientation followed by annual income and size of irrigated land had highest total indirect effect on continuance of perennial fodder crops cultivation. Variables like herd size, extension participation and training received were the first three factors to exert total effect on the dependent variable, continuance of perennial fodder crops cultivation.
27. Difficulty to get seeds/ planting materials (garret score 54.62, rank-1) was perceived as the major constraint, followed by poor germination of seeds (garret scores 46.74, rank-2) and less contact with extension personnel (garret scores 23.52, rank-3).

Conclusions of the study

1. Generally the perennial fodder growers contacted informal sources like family members, friends/relatives and neighbours for required information rather than the trained professionals. So the government extension service should be strengthened in such a way that it holds a good

rapport among the fodder growers and disseminates information on latest fodder varieties from lab to land efficiently.

2. As there are very few organizations involved in supplying planting materials to fodder farmers, innovative farmers with high annual income and big land holdings should be targeted to involve in participatory approach for the production of fodder planting materials.
3. The training received by farmers were on milk production techniques, specifically no farmer had training on fodder technologies. So the concerned institutions should conduct training programmes and result demonstrations on improved fodder technologies.
4. Farmers who actively participate in extension activities, have large herd size and are innovative in nature should be targeted by extension personnel to adopt latest fodder technologies, which are relatively advantageous than the existing ones, are compatible with the existing culture and are less complex in nature.
5. In comparison to cash crops, there are very few programmes concerned with fodder crops. Thus, steps should be taken by the apex bodies at state and national level to implement programmes and schemes, so that all categories of farmers are benefitted and are encouraged to cultivate fodder for economic livestock rearing.

Future line of work

- ✓ The study was conducted only in two districts. However, to get a broader picture, similar study could be taken up for Karnataka state as a whole,
- ✓ Study on impact of fodder development schemes can be taken up.
- ✓ A comparative study on the attitude and perception of farmers towards cultivation of perennial fodder growers and cash crops can be taken up.

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ANALYSIS OF FACTORS CONTRIBUTING TO THE CONTINUANCE OF FODDER TECHNOLOGIES BY THE FARMERS

PARTHA BANERJEE

2016

**Dr. NAGARATNA BIRADAR
MAJOR ADVISOR**

ABSTRACT

The demand of fodder for feeding and fattening of livestock has increased. A study was conducted in 7 villages of Belagavi and Dharwad districts. The objectives were to study the socio-economic profile of respondents, ascertain the different perennial fodder crops cultivated, analyze the favorable factors for continuance of these crops and to identify the constraints faced in cultivation of these crops. Data was collected from 95 respondents with the help of pre-tested interview schedule through personal interview technique.

More than one-third of respondents (34.74 %) continued cultivation of perennial fodder crops for 9-14 years. Majority of the respondents (64.21 %) belonged to high income group (above Rs. 1,20,000). Less than half of the respondents (45.26 %) possessed medium herd size. Majority of the respondents (88.42 %) participated in krishi mela and 82.10 per cent of respondents were members of KMFs.

Bajra napier hybrid and rhodes grass were cultivated by 37.89 per cent of respondents. Majority of respondents (89.47 %) obtained seed materials from other growers. Four predictors viz., herd size, extension participation, innovative proneness and perceived attributes of innovation have been retained at the last step of screening contributing 56.4 per cent of variance embedded with continuance of perennial fodder crop cultivation. Herd size, extension participation and training received were the first three factors to exert total effect on the dependent variable.

Difficulty to get seeds/ planting materials (Garret score 54.62, rank-1) was perceived as the major constraint, followed by poor germination of seeds (Garret score 46.74, rank-2). Innovative farmers with high annual income and big land holdings should be targeted to involve in participatory approach for the production of fodder planting materials.