



RESEARCH ARTICLE :

Socio-economic conditions of the farmers

■ HIMSHIKHA AND CHARAN SINGH

ARTICLE CHRONICLE :

Received :
28.10.2016;
Revised :
01.12.2016;
Accepted :
10.12.2016

SUMMARY : Agroforestry empowers farmers to take risk in long term investments like growing tree species and/ or rearing livestock, fluctuation in price and increase or decrease in demand and supply of agri produces. To access socio-economic conditions of both agroforestry and non agroforestry farmers, a survey was conducted in Haridwar, India. To analyze it, data pertaining to socio-economic indicators such as income level and employment, family size and community structure like land holding value, land distribution and ownership type, housing characteristics and labour resources were collected and then compared. To elaborate this comparison more, some other factors like farming and agroforestry experience, decision making, knowledge, awareness and favor to agroforestry etc. were also studied. Results revealed that approximately 97.8 per cent of sampled households were male headed. Approximately 18.90 per cent agroforestry and 34.43 per cent non-agroforestry respondents were having less than 1 ha of land. About 75.62 per cent agroforestry farmers and 67.21 per cent non agroforestry farmers considered farming as main occupation. The higher income status in categories was found more (12.60% and 27.40%) in agroforestry respondents than (6.56% and 14.75%) in non agroforestry respondents. It was concluded that higher income status enables agroforestry farmers to live their live style according to their own choice, hence, encouraging them to adopt, continue or promote agroforestry in their field.

KEY WORDS :

Adoption, Adopters,
Agroforestry,
Farmers, Practice,
Socio-economic

How to cite this article : Himshikha and Singh, Charan (2017). Socio-economic conditions of the farmers. *Agric. Update*, 12(1): 1-8; DOI : 10.15740/HAS/AU/12.1/1-8.

BACKGROUND AND OBJECTIVES

The level of participation of people in farming practices like agroforestry is a first step to determine its success or failure. The social orientation of agroforestry has been emphasized by many social scientists (Nair, 1993). When the growth of trees is combined with cultivation and sometimes with animals, it provides an essential part of an agricultural system which facilitates both productive and protective functions. Such practices have been developed primarily in response to the spatial

needs and conditions of developing countries (Spore, 2000). For agroforestry to, have any meaningful input on the people concerned therefore, it should be designed and implemented to involve the people, so that they do not perceive it being alien (Chup, 2004). To maintain the sustainable agricultural production and to alleviate forest deprivation, it is essential to systematically understand the intensive farming arrangement (Parihaar *et al.*, 2015).

Agroforestry is a substitute to both conventional crop cultivation and forestry

Author for correspondence :

HIMSHIKHA
Extension Division,
Forest Research
Institute, DEHRADUN
(UTTARAKHAND) INDIA
Email: bhhimshikha654
@gmail.com

See end of the article for
authors' affiliations

management. The large proportion of agroforestry farmers may not necessarily mean that agroforestry is prevalent in the region. The adoption or lack of adoption is influenced by a number of variables like socio-economic factors that associate with agroforestry. Socio-economic environment refers to a wide range of interrelated and diverse aspects and variables relating to or involving a combination of social and economic factors. These aspects and variables could, in general, be categorized into several categories including, economic, demographic, and social. A socio-economic assessment is a way to learn about the social, cultural, economic and political conditions of stakeholders including individuals, groups, communities and organizations. The socio-economic status of farmers is very important to access the actual ground status of farmers that reflect their livelihood (Bhanotra *et al.*, 2016). The level of participation of people in farming practices like agroforestry is a first step to determine its success or failure in any region. The social and economical orientation of agroforestry has been emphasized by many scientist and scholars. But hardly any work is done to access the socio-economic status of farmers in Haridwar district, India. This study is intended to assess the prevailing socio-economic conditions of farmers living in the study area. This includes provision of a baseline study and characterizing the existing state of the study site. In order to understand how farmers would respond to agroforestry, it is essential to know what conditions and variables influence the farmers most and why farmers accept or reject agroforestry. There are some factors which direct a farmer to adopt agroforestry, an adopter of agroforestry to promote it or to left practicing it. Besides all these, this study also shows a comparison between different socio-economic parameters among between two categories of farmers *i.e.* agroforestry and non agroforestry respondents.

RESOURCES AND METHODS

Sampling and surveys:

The main criteria to select study villages were their distribution under different tehsils of districts and presence of agroforestry in that area. Using random sampling (Safa, 2005), 426 respondents containing 365 agroforestry adopters and 61 non-agroforestry farmers were finally selected for the study. The choice of farmer to administer the questionnaire to was randomly done and not more

than one member of the family were allowed to fill/or answer the questions. However, they were included in focused group discussions at last of the interview.

Data tools and data collection:

The information was collected through a field survey using pre-tested semi structured questionnaire and interview schedules with adult members or head of the family. The questionnaires were administered to 432 random households in the selected villages were surveyed to determine land holding size, area under different land cover-land uses, crops, trees and shrubs used for various purposes and management practices. One or more visits were done when head of the family was not available for interview. Phonic conversations were also done for the purpose. Questionnaire based face to face interviews and focused group discussions (Chup, 2004) with family members, neighbors and villagers were used as a tool to obtain information for the study. This was done throughout the questionnaires based data collection from the study area. Socio-economic indicators as mentioned by Abdrabo and Hassaan (2003) were included in questionnaire. Further more information that why those farmers are adopting agroforestry or not, were also collected. Data collection was started with actual field surveys and visits to sample households. Instruments like Digital cameras, field notebooks were also used to capture photographs and to note additional information useful in the study. The administration of questionnaires lasted about four months (November 2013-March 2014) which were exercised by researcher herself.

Field observation:

Field observation was employed to confirm data on the socio-demographic characteristics of sampled households and farmers involved in agroforestry practices.

Data analysis:

Based upon farmers' response, qualitative data were cleaned sorted and coded as 0 and 1 to different sub categories. Data were analyzed and compared using simple statics like frequency counts and percentage calculation and cross tabulation of data.

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well

as discussions have been summarized under following heads:

Agroforestry and non-agroforestry famers:

From study, it is revealed that just over 86 per cent of respondent farmers practise agroforestry and rest 14.32 per cent have not adopted agroforestry practices in their fields. However, this percentage varies widely from under 77.54 per cent in Haridwar, through 88 per cent in Roorkee to just over 90 per cent in Laksar despite the fact proportion of sampled farmers in study area. Non agroforestry farmers in these tehsils were 11.81 per cent, 22.46 per cent and 9.03 per cent, respectively (Table 1).

Agro forestry is reported least in Haridwar tehsil probably due to nearest to the city; where many other activities/occupations apart from farming are carried out. Industrial development has let a downfall in agricultural land holding here, letting farmers less interested in agroforestry. Another reason may be that, population in areas close to the city, are employed in other sectors of the economy. Hence, people here, are less interested in farming.

Gender status of farmers:

The results indicated that there were more male than female farmers adopting (97.81%) and not adopting (100%) agroforestry. Similar findings were reported by

Basamba *et al.* (2016). From above table it is clear that at least 19 out of every 20 agroforestry farmers were male as this table clearly depicts gender disparity among farming communities in the region (Table 2).

Females are not given chance and rights to head their family and fields. This lends against to the earlier finding of Thangata *et al.* (2004) that adoption of agroforestry is gender neutral. This also supported somehow to Kiptot and Franzel (2011) that although women are as actively involved in agroforestry as their male counterparts, their level of participation is low as reflected in the number of shrubs/trees they plant relative to men. This may be because men have better access and power to approach and utilize resources and assets such as farm instruments, labor etc., than women. Furthermore, women in least developed or developing countries have greatest difficult in obtaining all essential requirements needed for farming activities particularly when it comes to agroforestry practices. Reported eight female as agro forestry farmers had also given the chance when no other male person was available to head in those situations.

Family size:

Average family member numbers was 3 members/family for agro forestry while it was reported 7 members for non-agro forestry farmers.

Table 3 reveals information on family size of the respondent farmers. In non agro forestry farmers, smaller

Table 1 : Frequency and percentage of agroforestry and non-agroforestry famers

Council/ Tehsil	Farmers in agroforestry		Farmers not in agroforestry	
	Frequency	%	Frequency	%
Roorkee	127	88.19	17	11.81
Haridwar	107	77.54	31	22.46
Laksar	131	90.97	13	9.03
Total	365	85.68	61	14.32

Table 2 : Gender status of farmers

Gender	Adopters		Non-adopters	
	Counts	Percentage	Counts	Percentage
Male	357	97.81	61	100.00
Female	8	2.19	0	0.00

Table 3 : Family size of sampled households

Family size	Adopters		Non-adopters	
	Frequency	Percentage	Frequency	Percentage
Small	66	18.08	14	22.95
Medium	203	55.62	36	59.02
Large	96	26.30	11	18.03

and medium families were reported most. For adopters, these farmers had relatively medium sized families (5 - 8). For adopters, almost 18 per cent of the respondents had 5 or fewer than 5 members in households, while just over one forth had 5-10 member households, just less than one-fifth had 11 and more member in their families (Table 3). The entire agro forestry farmers had a mean household size of 7. The large family sizes may be a burden on family resources like income, whereas this may be beneficial for land resources, farm work participation and labour requirement and supply. Smaller families, however, seem less interested in agro forestry. This may be due to the fact that these families are nuclear family types and most of the time only a single family member handles most of the economic responsibilities and other burdens, making him unavailable or less interested in agro forestry. The result supports to Kumar (2006) that the small and marginal farmers have long been practicing agro forestry to meet their food, fodder and fuel requirements. However, it contradicts the findings of Glover *et al.* (2013) that small land holding farmers worldwide and particularly in developing countries have increased their interests in adoption and promotion of agro forestry in recent years. It also goes against the revealing of Sood (2006) that agro forestry adoption increased when farmers had a smaller family and contradicting Glover *et al.* (2013) that small land holding farmers worldwide and particularly in developing countries have increased their interests in adoption and promotion of agro forestry in recent years. This result also implies that farmers with large family tend to adopt agro forestry than that of non agro forestry farmers.

Land holding size:

Land status of the respondents is surveyed to indicate

their socio-economic condition (Islam *et al.*, 2012). In study area, approximately 19 per cent agro forestry and 34 per cent non agro forestry respondents were having less than 1 ha of land (Table 4). Through in study area, the percentage of small and marginal farmers in agro forestry farmers is lesser than non agro forestry farmers. But adoption of agro forestry by these small and marginal farmers goes with favor of earlier statement given by Kumar (2006) that despite the prevailing dogma that the subsistence farmers depend more on annual crops, the small and marginal farmers have long been practicing agroforestry to meet their food, fodder and fuel requirements.

On the other hand, the percentage of small and marginal farmers (non-adopters) in study area exceeds than the percentage of small and marginal farmers (adopters). This low level of land holding acts as hindrance to farm households in adoption of agroforestry especially if they are large families' especially when they depend upon farming for income generation because they require immediate benefits from farming like grain production, sale of left produces etc. Its goes with the idea of Chup (2004) that farmers requiring immediate benefits become difficult to convince to invest in, and devote their land to forestry production. This result also favor to findings of Mombo *et al.* (2016) that large landholding owners are more likely to adopt agroforestry and any increases in farm size, would increase probability of agroforestry adoption.

Farming as occupation and favor to agroforestry:

In the study area farming is main occupation to about 75.62 per cent agroforestry farmers while among non agroforestry farmers, 67.21 per cent farmers considered farming as main occupation for income generation (Table

Table 4 : Land holding size of sampled farmers

Land holding size	Adopters		Non-adopters	
	Frequency	Percentage	Frequency	Percentage
Marginal	69	18.90	21	34.43
Small	107	29.32	20	32.79
Medium	170	46.58	9	14.75
Large	19	5.21	1	1.64

Table 5 : Farming as occupation and favor to agroforestry by the farmers in the study area

Variables name	Adopters		Non-adopters	
	Frequency	Percentage	Frequency	Percentage
Farming main occupation	276	75.62	41	67.21
Favor to agroforestry	356	96.16	19	31.15

5). Agroforestry farmers are more dependent upon farming for income generation and that's why they have adopted agroforestry in their fields for additional income support whereas for non-agroforestry farmers, they are less dependent upon farming for income generation.

In agroforestry adopters, almost all favored to agroforestry adoption as they had mentioned farming as major income generating activity. So to achieve it, they support agroforestry adoption. While in case of non agroforestry adopters, only one-third favored agroforestry. It clearly shows the difference in the opinion of agroforestry and non-agroforestry farmers regarding agroforestry.

Income status:

The income and wealth status of a family is important in agroforestry especially for market utilities and resource approach (Keil *et al.*, 2005). The income distribution of the respondent has been divided into six income groups in two farmers' categories (Table 6). Average income in agroforestry adopters was Rs. 37013.95, while it was Rs. 24786.89 for non-agroforestry adopters. A higher income status was also reported in agroforestry farmers than non-agroforestry farmers, favoring Minz and Quli (2000), who revealed a positive role of agroforestry in improving the socio- economic status.

This Table 6 compares the difference between income status of agroforestry and non-agroforestry respondents. The higher income status in categories (Rs. 40000-49999 and 50000- more than 50000) was found more in agroforestry respondents than in non-agroforestry respondents. This finding confirms Sharma and Kumar (2000) reporting of significantly higher socio-economic status for the farmer adopting agroforestry than those of non-adopters and Rasul and Thapa (2006) that economic returns from agroforestry are greater than other

farm practices. This result also supports Irshad *et al.* (2011) that higher monthly income of the farmers was found positively associated to the presence of trees on their farms. In study area, the information provided on level of income by the respondents that the income of agroforestry farmers is fairly evenly distributed; although majority of the farmers earned more than Rs. 50000 constituting nearly 27 per cent of the entire agroforestry farmers. However, this distribution difference depends upon a number of other variable such as land holding, land under agroforestry, fertilizer application, land fertility etc. Furthermore, the farmers having low income irrespective to land holding would not be able to invest in any long term activity, due to poverty. This no doubt is a hindrance to large scale adoption of agroforestry by the farmers in the region. Lowest or very poor income was reported maximum in non-agroforestry adopters. It also favors findings of Kabwe (2010) that farmers classified as poor and very poor had lower rates of adoption. The study also shows that rich farmers preferred agroforestry practices more than other land uses.

Housing patterns:

Housing pattern of the target households was taken into consideration to analyze the effects of agroforestry in the study area as earlier studied by Islam *et al.* (2012).

Table 7 compares housing pattern between agroforestry and non-agroforestry respondents. This table shows that as compared to non-agroforestry respondent, the agroforestry respondents have good pucca house structure and patterns. Farmers having mixed type house were also more in agroforestry adopters. We also see that percentage of respondent having more kuccha, thatched, tin or semi pucca house types were more in non agroforestry farmers. It clearly shows that the socio-economic status in terms of housing

Table 6 : Income status of farmers

Income range	Agroforestry adopters		Non-agroforestry adopters	
	Frequency	Percentage	Frequency	Percentage
<10000	32	8.77	17	27.87
10000-19999	74	20.27	10	16.39
20000-29999	69	18.90	11	18.03
30000-39999	46	12.60	10	16.39
40000-49999	42	11.51	04	06.56
50000->50000	100	27.40	09	14.75
Unknown	2	0.55	0	0.00
Total	365	100.00	61	100.00

pattern is at higher level in agroforestry respondents. It means adoption of agroforestry practices somehow improves farmers' living standard.

Land distribution and ownership types:

Land ownership is also likely to influence adoption (Parwada *et al.*, 2012). The targeted households were interviewed regarding their land ownership type (Table 8).

As this Table 8 shows the percentage of own land holding is higher in agroforestry farmers as compared to non agroforestry land owners. While percentage of own and rented/leased land holders was high in non agroforestry farmers as compared to agroforestry farmers. It may be because the farmers having rented/leased lands cannot take much risk in investing money in long term projects like agroforestry, hence, show less interest in agroforestry. On the other hand own land holdings act as own land resource and having this, it gives back support to farmers when they try to adopt agroforestry or other new practice or technology in their fields.

Labour resource type:

According to Abadi Ghadim and Pannell (1999),

labour tends to increase the adoption of new technologies. In agroforestry households, compared to both temporary and permanent labour hired by adopters, temporary labour is hired more frequently in seasonal times. About one tenth of the respondent don't use any kind of hired labour and take family human resource as working force in the fields (Table 9).

It is reported that these families are also have higher economical status as they are well capable of paying high payments to these permanently employed labour. As Table 9 shows that for agroforestry adopters, maximum labour for farm work is available temporarily on seasonal demands fulfilled by local people. About 77.05 per cent farmers admired family support in fulfilling labor requirement in farms. 10 per cent farmers were those who do not hire any kind of labour and the whole family members act as work force. These were also the farmers who did not get labour at time or who were having large family which is enough to support at farm level activities. It supports indirectly to Ajayi *et al.* (2003) who considered labour as a limiting factor, to a farmer's decision to practice agroforestry. In non-agroforestry households, maximum was dependent upon family person and locally available labour. 86.69 per cent labor was

Table 7 : Housing types and pattern of surveyed households

Types	Agroforestry farmers		Non-agroforestry farmers	
	Frequency	Percentage	Frequency	Percentage
Kuccha	8	2.19	2	3.28
Thatched	13	3.56	6	9.84
Tin shed/semi pucca	11	3.01	3	4.92
Pucca house	215	58.9	34	55.74
Mixed	118	32.33	16	26.23

Table 8 : Land ownership type and distribution

Farmers	Agroforestry farmers		Non-agroforestry farmers	
	Frequency	Percentage	Frequency	Percentage
Own	363	99.45	58	95.08
Own and rented/leased	2	0.55	03	4.92

Table 9 : Labour types in survey area

Labour type	Adopters (Agroforestry farmers)		Non-adopters (non-agroforestry farmers)	
	Counts	Percentage	Counts	Percentage
Local	318	87.12	47	77.05
Outside	70	19.18	8	13.11
Voluntarily hired	138	37.81	19	31.15
Family members	287	78.63	47	77.05
Temporary	314	86.03	53	86.89
Permanent	126	34.52	8	13.11

temporary hired in fields.

Awareness of agroforestry, approach to forests, markets, their utility and effectiveness:

Farmers were asked if they had heard about agroforestry. Only 25 per cent of the farmers adopting agroforestry as compared to 20 per cent farmers, who were non-agroforestry farmers, were aware of new programmes- technologies related to agroforestry.

Table 10 shows that approach to forest, market utility and its effectiveness to agroforestry adopters is quite lesser than non-agroforestry adopters. Hence, it may be a limiting factor in adoption of agroforestry in the region. It goes with Sharma and Kumar (2000) who also reported significantly higher awareness for the farmer adopting poplar based agroforestry.

Although the majority of the respondents were male headed households, some female headed households were also reported in the the survey. Regarding large family size, almost one-fourth of total agroforestry households and one-fifth of total non-agroforestry farmers were from large families. This large family sizes may be a burden on family resources like income, whereas this may be beneficial for land resources, farm work participation and labour requirement and supply. Small family size was reported more in non agroforestry households indicating another reason rejection of agroforestry in those households. It is quite evident from the results that smaller families, however, seem less interested in agroforestry. This may be due to the fact that these families are nuclear family types and most of the time only a single family member handles most of the economic responsibilities and other burdens, making him unavailable or less interested in agroforestry. However, small size of land holding with large family size encouraged the farmer to manage their agroforestry practices at plot level, at the same time they have been benefited from this increasing family size for labor availability hence reducing labor cost to almost nil. Nearly half of the agroforestry adopters were having medium land holding ranging between 2- 5

ha. The fragmentation in land size between agroforestry and non-agroforestry farmers is may be because of increasing population and increase in nuclear family. Also due to rapid industrialization and difficulties such as decreasing soil fertility, animal conflicts-infiltration and long term returns, farmers in the study area are more likely to sell their lands to industrial units, saying that “we don’t get enough returns from farming also the management costs inputs are going to be high day by day, rendering sale of land as the only solution before us to fulfill our economic needs”. Higher income status enables agroforestry farmers to live their live style according to their own choice, hence, encouraging them to adopt, continue or promote agroforestry in their field. On the other hand, it also empowers them to take risk in long term investments in agroforestry like growing tree species and/ or rearing livestock, fluctuation in price of agroforestry produce and increase or decrease in demand and supply of these agro forestry produces.

Conclusion :

Agro forestry has shown potential of socio-economic development of farming households. The study concludes that socio-economic conditions of agroforestry farmers in terms of above studied factors and parameters are better than non-agroforestry farmers in terms of their income status, awareness, living standard. Land and labour resource utilization is also done more efficiently by agro forestry adopters. In land resource contexts, the study also comes to the point that farmers having rented leased land holdings hesitate to take risks in long term investments like agroforestry. Overall, the farmers’ interests and responses confirmed that agroforestry this area is gaining popularity day by day due to its contribution in socio-economic development of the farmers and their livelihoods. This study recommends necessary steps at local and government level to improve market channels and awareness programmes, training schedule as improvement in market utilities, approach effectiveness and increasing awareness among the farmers can attract

Table 10 : Awareness of agroforestry, approach to forests, markets, their utility and effectiveness

Determinants	% of agroforestry farmers	% of non-agroforestry farmers
Awareness	25.0	20.0
Approach to forest	14.52	32.79
Approach to market	99.73	98.36
Market utility	91.78	86.89
Effectiveness	78.63	77.86

more farmers towards agroforestry adoption that can improve status of agroforestry to its upper level.

Authors' affiliations :

CHARAN SINGH, Forest Extension Division, Forest Research Institute, DEHRADUN (UTTARAKHAND) INDIA

REFERENCES

- Abadi Ghadim, A.K.** and Pannell, D.J. (1999). A conceptual framework of adoption of an agricultural innovation. *Agric. & Res. Econ.*, **21** (2) : 145-154.
- Abdrabo, M.A.** and Hassaan, M.A. (2003). From river catchment to the sea: comparative and integrated approach to the ecology of Mediterranean coastal zones for sustainable management (MEDCORE). *A manual for socio-economic study*. Centre for environment and development for the Arab region and Europe, EC (Cadare). 1-76.
- Ajayi, O.C.**, Franzel, S., Kuntashula, E. and Kwesiga, F. (2003). Adoption of improved fallow technology for soil fertility management in Zambia: Empirical studies and emerging issues. *Agrofore. Syst.*, **59**(3): 317-326.
- Basamba, T.A.**, Mayanja C., Kijja, B., Nakileza, B., Matsiko, F., Nyende, P., Kukunda, E.B., Tumushabe, A. and Ssekabira, K. (2016). Enhancing adoption of agroforestry in the Eastern agro-ecological zone of Uganda. *Internat. J. Ecol. Sci. & Environ. Engg.*, **3** (1): 20-31.
- Bhanotra, A.**, Gupta, J. and Singh, M. (2016). Socio-economic status and communication behaviour pattern of the dairy farmers in Kathua district of Jammu and Kashmir. *Internat. J. Farm Sci.*, **6** (1): 37-42.
- Chup, C.D.** (2004). Analysis of agroforestry practices in Guinea Savannah ecological zone: A case study of federal territory of Nigeria (Ph.D. Thesis) University of Joes.
- Glover, E.K.**, Hassan, B.A. and Glover, M.K. (2013). Analysis of socio-economic conditions influencing adoption of agroforestry practices. *Internat. J. Agric. & Agroforestry*, **3** (4): 178-184.
- Irshad, M.**, Ashraf, M. and Sher, H. (2011). Identifying factors affecting agroforestry systems in Swat, Pakistan. *African J. Agric. Res.*, **6** (11) : 2586-2593.
- Islam, M.W.**, Islam, M.M. and Sadath, M.N. (2012). Contribution of agroforestry practice towards reducing poverty at Kashabpur Upazila of Jessore District- A case study. *J. Environ. Sci. & Nat. Res.*, **5** (2): 267-274.
- Kabwe, G.** (2010). Uptake of agroforestry technologies among smallholder farmers in Zambia. Ph.D. Thesis, Lincoln University, Christchurch, New Zealand.
- Keil, A.**, Zeller, M. and Franzel, S. (2005). Improved tree fallows in smallholder maize production in Zambia: do initial testers adopt the technology? *Agrofore. Systems*, **64** (3) : 225-236.
- Kiptot, E.** and Franzel, S. (2011). Gender and agroforestry in Africa: are women participating? ICRAF Occasional Paper No. **13**. Nairobi: World Agroforestry Centre.
- Kumar, B.M.** (2006). Agroforestry: the new old paradigm for Asian food security. *J. Trop. Agric.*, **44** (1-2): 1-14.
- Minz, A.V.** and Quli, S.M.S. (2000). Impact of agroforestry on socio-economic status of farmers. *Indian Forester*, **124**(6): 788-791.
- Mombo, L.F.**, Senkondo, M., and Makonda, F. (2016). Attitude, adoption and economic potential of agroforestry in Kilosa district, Tanzania. *Internat. J. Agric. Innovat. & Res.*, **4** (5): 883-893.
- Nair, P.K.R.** (1993). *An introduction to agroforestry*. Kluwer Academic Publishers, Dordrecht, the Netherlands. pp. 1-489.
- Parihaar, R.S.**, Bargali, K. and Bargali, S.S. (2015). Status of an indigenous agroforestry system: A case study in Kumaun Himalaya, India. *Indian J. Agric. Sci.*, **85** (3):442-447.
- Parwada, C.**, Gadzirayi, C.T., Karavina, C. and Munyati, V. (2012). A review of agroforestry technologies adoption among smallholder farms in Zimbabwe. *J. Sustain. Develop. Stud.*, **1** (1): 68-92.
- Rasul, G.** and Thapa, G.B. (2006). Financial and economic suitability of agroforestry as an alternative to shifting cultivation: The case of the Chittagong Hill Tracts, Bangladesh. *Agric. Syst.*, **91** (1-2) : 29-50.
- Safa, M.S.** (2005). Socio-economic factors affecting the income of small scale agroforestry farms in Hill Country areas in Yemen: A comparison of OLS and WLS determinant. *Small Scale Forest Econ., Manage. & Policy*, **4** (1): 117-134.
- Sharma, V.P.** and Kumar, A. (2000). Factors influencing adoption of agroforestry programme: A case study from North- West India. *Indian J. Agric. Econ.*, **55** (3): 500-510.
- Sood, K.K.** (2006). The influence of household economics and farming aspects on adoption to traditional agroforestry in Western Himalaya. *Mountain Res. & Deve.*, **26** (2):124-130.
- Spore** (2000). Urban and peri-urban livestock production, where the ask comes to town. Information for agricultural development in ACP countries 89.
- Thangata, P.H.**, Alavalapati, J.R.R. and Hildebrand, P.E. (2004). Meta modeling agroforestry adoption. In: *Valuing agroforestry systems*, J. R. R. Alavalapati and D. E. Mercer (Eds.) Kluwer Academic Publishers. Printed in the Netherlands. pp. 219-236.

12th
Year
★★★★★ of Excellence ★★★★★