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Structured agroforestry questionnaire: facilitating stakeholders in survey and data collection

Abstract

Agroforestry is a land use system that deliberately combines trees, crops and/or livestock on the same piece of land to enhance productivity, profitability and sustainable management of land. Data collection and surveying of any agroforestry system is crucial for promoting its wider application and ensuring successful implementation. Although numerous agroforestry surveys have been conducted worldwide, however, designing a formal, comprehensive and adaptable questionnaire remains a major challenge for stakeholders. This paper aims to accomplish this gap by developing a structured and flexible questionnaire designed for agroforestry survey. It is intended as a practical tool for students, researchers, extension workers and policymakers conducting agroforestry surveys across diverse ecological and socioeconomic frameworks. The present questionnaire includes key agroforestry dimensions and organized into eight major sections *viz.* demographic information, land details, crop production practices, agroforestry practices and techniques, livestock rearing and management, market engagement and economic aspects, environment and ecology and policy and institutional support. Overall this questionnaire supports stakeholders for their objectives and enables the smooth and effective implementation of agroforestry surveys.

Keywords: agroforestry, questionnaire, stakeholders, respondents, survey

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Introduction

Agroforestry is a sustainable land-use system that enhances farm productivity, supports livelihood, provides ecosystem services and reduces pressure on natural forests. Unlike conventional agricultural systems, agroforestry systems are multifunctional, integrating biological diversity with economic viability. Agroforestry is defined as a land-use system that integrates trees with crops and/or livestock to enhance ecological and economic outcomes.[1] Agroforestry provide a wide array of benefits including improved soil fertility, enhanced water-use efficiency, carbon sequestration and conservation of biodiversity. In addition, agroforestry contributes significantly to livelihood support by generating multiple products such as fuelwood, fodder, fruits, fibre, timber etc. The scope of agroforestry is diverse and extensive which supports climate smart agriculture and rural development strategies. Despite the importance of agroforestry, it is continuously facing challenges related to systematic data collection. Comprehensive and accurate data are essential for assessing the performance, benefits, constraints and adoption patterns of different agroforestry systems.[2] However, there is paucity of well-structured questionnaires specifically designed for agroforestry research and field level data collection. While various questionnaires exist for general agricultural surveys, they often fail to capture the unique structural, functional, ecological and socioeconomic aspects that characterize agroforestry systems. Though there are agroforestry questionnaires in place dealing with specific area but they have limitation in covering entire broad and diverse agroforestry practices. As a result, researchers, academicians and stakeholders face difficulties in gathering information in a single, coherent and user friendly format. This is not only limiting the quality of research and policy formulation but also hampers the ability of stakeholders to make informed decisions regarding planning, implementation, and management of agroforestry interventions. The questionnaire should assess the understanding of respondents about the importance of multifunctional agroforestry landscapes and collect their socio-demographic information, along with their responses to various aspects of the system.[3] Also as per the requirement the importance of method, tools, sampling in survey of agroforestry, Scherr et al.,[4] narrated about the methodological difficulties of surveying highly variable on-farm plots, and difficulties in identifying key variables for measurement. They describes a set of methods and tools used in evaluating plots of alley-cropping and tree borders around crop fields established by farmers for Agroforestry Extension Project in western Kenya and also discussed condensed version of agroforestry questionnaire. Considering these limitations, a comprehensive and well organized agroforestry questionnaire has developed for simplifying and standardizes data collection processes. This questionnaire has been designed to include all key dimensions of agroforestry systems, ensuring that users can capture detailed and relevant information in an easy format. The questionnaire is divided into several sections, including demographic information, landholding and land-use details, crop production practices, agroforestry practices and techniques, livestock rearing and management, market participation and economic aspects, marketing and post-harvest operations related to wood-based products, marketing channels and considerations for horticulture-based agroforestry systems, environmental and ecological aspects, as well as policy and institutional support mechanisms. Each section has been thoughtfully developed to address the specific information required for agroforestry for ease of response for participants. The questionnaire helps to overcome the problems faced by and stakeholders. It aims to make agroforestry surveys more accessible, comprehensive and effective, thereby strengthening the evidence base needed to advance agroforestry adoption across diverse landscapes of India and globe.

The agroforestry has been widely studied; however, the important research gaps persist in the methodological approaches used to generate field-level evidence, particularly with respect to survey-based research. Existing agroforestry questionnaires are often designed around generalized indicators that overlook local cultural contexts, ecological variability and socioeconomic conditions, limiting their ability to capture place specific realities. In addition, many surveys are implemented in isolation from complementary qualitative methods, such as focus group discussions, which constrains deeper interpretation of farmers' perspectives and decision making processes. Therefore,

survey questionnaires should be carefully pre-tested across different locations prior to full-scale implementation to ensure their contextual validity.[5] Gender dimensions are also important to be addressed, despite the central role of women in agricultural production in many regions.[6,7] Furthermore, farmer surveys tend to prioritize production and environmental outcomes, while giving limited attention to market related factors, including access to markets for tree products, online or e-platforms,[8] price expectations and risks along the value chain. Collectively, these gaps are important and taken care for integrative survey frameworks in agroforestry research.

Key considerations for designing a questionnaire

Designing an effective agroforestry questionnaire requires thoughtful planning and a clear understanding of the context in which the survey will be conducted. An essential first step in this process is to carry out an informal survey to gather baseline information and develop a foundational understanding of the study area. Informal surveys are particularly valuable because they allow researchers to collect preliminary insights that are often overlooked during more structured, formal surveys.[9] Through open-ended discussions, field observations, and participatory tools, informal surveys help identify local land-use patterns, existing agroforestry practices, farmers' perceptions, and potential constraints or opportunities that may influence adoption.[10]

This early-stage information plays a crucial role in shaping the structure, language, and content of the final questionnaire. It enables researchers to ensure that the survey instrument is relevant, culturally appropriate and developed to local conditions. Moreover, it helps in identifying key variables, selecting suitable response formats and refining questions to avoid ambiguity or bias. By grounding the questionnaire in real-world observations and community insights, researchers can design a tool that captures the multidimensional aspects of agroforestry and yields accurate, meaningful and actionable data. Thus, beginning with an informal survey forms the backbone of an effective questionnaire design process and enhances the overall quality and reliability of agroforestry research. Questionnaire helps us to collect detailed information on adoption patterns, species diversity and other information from farmers.[11] A structured questionnaire informs the development of region-specific recommendations to improve agroforestry adoption and effectiveness.[12] Researchers used precisely designed and pre-tested questionnaire to collect data on farmers' adoption trends, socio-economic and psychological profiles and the extent of their agroforestry practices.[13] The researcher should equip themselves with various tools to measure vegetation and field parameters, such as measuring tape, calliper, height measuring instruments for trees, khurpi, wooden hoe, and more and other required instruments. Therefore, by addressing key questions in the questionnaire and conducting field measurements, the stakeholders can better understand the agroforestry conditions in the area, which aids in the diagnosis and design for agroforestry research and development.

The questionnaire was pre-tested through interviews with small, representative groups and was also applied by research scholars across different sites to assess its clarity, relevance and functionality. During this process, technical anomalies and inconsistencies were identified and subsequently resolved. The refined questionnaire has been used by researchers and projects for the systematic collection of agroforestry data. Experts' opinion have also sought and incorporated to further improve its content and structure. Due care was taken at every stage of development to ensure that the questionnaire captures accurate, factual and real time agroforestry information from farmers and other stakeholders. Also, the diverse composition of village populations, covering all social and economic strata, have duly considered during the design and pre-testing of the questionnaire.

Sections of questionnaire

For obtaining the proper and reliable information, it is important to categorise the agroforestry questionnaires in eight different sections (Tables A to H) while developing the question, the broad sections to be covered are demographic information, land details, crop production practices, livestock rearing and management, agroforestry practices and techniques, market engagement and economic aspects, environmental and ecological factors, and policy and institutional support. The description of different sections given below in the detailed agroforestry questionnaire narrated hereunder.

Detailed Structured agroforestry questionnaire

Name of State: District: Block/village (Location):

Basic information of interviewer (person who is taking interview) and location

Basic information						
Team number (If any)						
Interviewer: First and Last Name						
Interviewer affiliation with contact number						
Purpose of Interview						
Details of event		**Period of Interview**			**Time**	
		Day	**Month**	**Year**	**Hour**	**Minute**
Date and time of start of interview						
Date and time of end of interview						
GPS location of place	Latitude					
	Longitude					
Elevation (amsl)						
Aspect						

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Table A1 Demographic information of respondent (Household)

Name		
Age		
Gender (Male/Female/Other)		
No. of members in family	Adults (above 18) Male:	Female:
	Children (Below 18) Boys:	Girls:
Literacy (Specify no.): Literate/Educated Not literate/ Uneducated Literate up to 14 years of age Literate between 15 to 25 years of age Literate above 25 years	Male	Female
School/college left in early age group (reason)	Male: Female:	
Have you completed high school (10th)?		
If NO: please specify		
Have you completed intermediate (12th)?		
If NO: Please specify		
Have you completed graduation /post-graduation?		
Monthly income of respondent (Rs.)		
Monthly income of family (Rs.)		
Category/Caste religion		

Section A Demographic Information

Table B1 The land details include land holdings, land use patterns and the type of agroforestry systems practiced

Total land holding (Acre/ Hectare), can use local/regional unit	
Cultivated land (Acre/ Hectare)), can use local/regional unit	
Ownership (owned, leased and sharecropped, other)	
Land-use patterns (Cropland, agroforestry, pasture, fallow land, plantation etc.)	
Type of farmers on the basis of land holding (ha), please specify	
Types of land available (ha) (✓)	☐ Cultivable (irrigated) land ☐ Uncultivable (irrigated) land ☐ Cultivable (rainfed) land ☐ Uncultivable (rainfed) ☐ Home garden Other types of land
Do you practice agroforestry on your farm?, If Yes, Area under agroforestry (ha)	
Major tree-crop combination in agroforestry	Tree species: Crop species:
Type of agroforestry system existing (✓)	☐ Agri-silviculture ☐ Silvo-pastoral ☐ Agri-horticulture ☐ Agri-horti-silviculture Other:
Are you aware of the soil status of your farm? If Yes, Which type of soil is present on the farm?	☐Yes/ ☐No

Section B Land and farm details

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Table C1 Crop production/agronomic practices prevalent in the area

Is agriculture your main occupation?			☐Yes/ ☐No		
Apart from agriculture do you perform some other work for earning?			☐Yes/ ☐No If yes, which type of work:		
Number of family members engaged in agriculture?					
During which time or season maximum manpower is required?					
Do you hire laborers for farming activities? If Yes, In a year, how many laborers do you hire for farming-related work?					
On an average how much you pay on daily basis? (Rs.)					
How long do you hire the laborers? (days/months)					
What is the main source of income for your household? Please specify					
Do you have any secondary sources of income in your household? Please specify					
Tell us the method of ploughing (Manual or mechniseds)?					
Do you have your own ploughing Oxens/equipment, or hire on a payment basis?					
If you hire, what is the cost per hectare? (Rs.)					
Number of crops growing in a year					
Please specify the major crops grown in different seasons					
Do you practice crop rotation? If Yes,					
Name the crop sequences do you follow?					
Do you use intercropping? If Yes,					
Which crop combinations do you typically use?					
Yield from crops grown in various seasons					
Kharif (name of crops)	Yield (q/ha)	Rabi (name of crops)	Yield (q/ha)	Zaid (name of crops)	Yield (q/ha)

Section C Crop production/agronomic practices

Table D1 Type of agroforestry practiced present and Trees available on farmlands:

Agroforestry practices	**Examples of trees**
Agri-silviculture	
Agri-horticulture	
Silvo-pastoral	
Home gardens	
Agri-horti-silviculture	
Energy plantation	
Farm forestry	
Others	
Reason of practicing agroforestry	
Name the trees (Forest and Horticultural trees) present on agroforestry farmland	

Section D Agroforestry practices and techniques

Table D2 Preferred tree species (forest and horticulture) in agroforestry

Preferred forest tree species for short-rotation agroforestry or farm forestry		
Name of forest Tree species	Rotation period (Years)	Reason for adoption
Preferred horticulture tree species grown by farmers in agroforestry systems		
Name of Horticulture Tree species	Primary Products	Specific reason for preference
Utilization of tree species grown in agroforestry systems (Fruit, fodder, fuel, timber etc.)		
Name of tree species	Examples Uses/functions	
Details of Tree Planting material (Forest/Horticulture)		
What type of planting material is being used for tree planting? (Seed, Seedling, Rootstock, etc)		
What is the source of planting material? (Self-grown seedlings, From local or other farmers, Private nursery, Government-provided, Industry-provided, etc)		

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Table D2 Continued...

What type of planting material (certified or not, if certified name the agency)
Cost of planting material (Rs.)
Supplier of planting material (Private, Government etc)

Table D3 Management practices adopted for agroforestry trees by the farmers

Name the method(s) of planting adopted by you
What type of plantation do you practice? (Mono-cropping, Mixed cropping, Agroforestry, etc)
What type of plantation pattern do you follow? (Line planting, Square planting, Triangular planting, Quincunx planting, etc)
How many plants present per hectare? (Spacing, Number of plants, Number of plants per hectare)
In which season(s) do you usually carry out plantation activities? (Summer, Monsoon/ Rainy, Winter, Spring)
Name the methods and practices of irrigation on your farm
What type of fertilizer and its amount do you use in the field?
What type of fencing do you use for the plantation?
How do you manage diseases and pests in your farm? (Biological control, Chemical control, Mechanical measures, etc)
Which of the following factors affects the crop? (Wild animals, Wild fires, Erratic rainfall, Weed, etc)
How frequently do you perform tending and cultural operations (months/years)? (Weeding, Cleaning, Thinning, Pruning, Pollarding, Lopping, etc)
Which crops are commonly used as intercropping?

Table D4 Details of forest near the village

Is there any forest near the village? If yes, name the dominant tree species in the forest
What are the associated or secondary species found in the forest?
What are the main benefits you obtain from the forest?
How often do you visit the forest to collect forest resources? (Daily, Weekly, Monthly, Occasionally, not visit)
Have you noticed any changes in the forest from past few years? If yes, Please specify the changes you observed
Do you face any challenges to access the forest resources? If yes, please specify
Express your view on significance of forest in your livelihood/ daily life

Table D5 Utilization of agroforestry and forest trees

Fuelwood details		
Preferred fuelwood species from agroforestry systems (Top 5)	From agroforestry	In summer: In winter: In rainy:
	From forests	In summer: In winter: In rainy:
Fuelwood consumption (kg/family/day)	From agroforestry	In summer: In winter: In rainy:
	From forests	In summer: In winter: In rainy:
Which fuelwood species is most consumed by local people		
Are you using LPG for cooking, specify the quantity		
Are you using alternative source of energy (biogas /gobar gas/Solar etc), if your, provide detail		
Fodder utilization		
Preferred fodder species from agroforestry (Top 5)		In summer: In winter: In rainy:
Preferred fodder species from forest (Top 5)		In summer: In winter: In rainy:
How much fodder is consumed? (kg/Family/day)	From agroforestry	In summer: In winter: In rainy:
	From forests	In summer: In winter: In rainy:
Which tree fodder is most consumed by livestock?	From agroforestry	

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Table D5 Continued...

How often do you collect tree fodder? (days/week or month)	From forests	
	From agroforestry	In summer:
		In winter:
		In rainy:
	From forests	In summer:
		In winter:
		In rainy:
How often do you collect grass fodder? (days/week or month)	From agroforestry	In summer:
		In winter:
		In rainy:
	From forests	In summer:
		In winter:
		In rainy:
Other than above, how much fodder is consumed as agriculture residue or preserved fodder? (kg/family/day)		In summer:
		In winter:
		In rainy:
What are the options for fodder consumption available during lean period (trees/grasses/preserved forage/other)		

Table E1 Livestock rearing and management practices within agroforestry systems

Do you have livestock? If yes, give details of livestock population viz. Cow, Cow calf, Bull, Bull calf, Buffalo, Buffalo calf, Buffalo bull, Buffalo bull calf, Goat, Buck, Sheep, Hen, Cock, Chick, Mules, Horse, etc) with number
What is the average monthly production for each produce/product? (Milk, meat, wool, Eggs etc)
Where do you sell livestock produce/products?
How are the prices for your livestock products determined?
What is your average annual/monthly income from livestock? (Rs.)
Have you used any storage/post-harvest techniques for livestock produce? If Yes, please specify
Do you face challenges in post-harvest management? If yes, specify the challenges
How do you transport livestock products to the market?
What challenges are being faced during transportation?
How far is the nearest market for livestock produce/products? (Km)
Do you face barriers in accessing the market? If yes, specify the barriers
Do you engage in value addition for livestock produce/products? If yes, what products do you make, and how do you market them?
How do trees and crops in agroforestry systems benefit livestock?
How does livestock contribute to the agroforestry system?
How do you see the future of livestock-based agroforestry in your area?
What improvements are needed to enhance the marketing of livestock-based agroforestry products?

Section E Livestock rearing and management

Table F1 Marketing and Economic in Agroforestry

What is the income generated annually from different agroforestry components? (Rs.)
Do you observe seasonal variation in income from agroforestry?, if yes, please specify
What was the cost of establishing your agroforestry system (land preparation, planting, etc.)?
What are the average annual maintenance costs for your agroforestry system? (Rs.)
Tell us about main challenges in maintaining your agroforestry system?
How far is the nearest market for agroforestry produce/products (Km)?
Do you face difficulties in accessing markets for agroforestry products?, how
Does agroforestry play a significant role in diversifying your income?, if yes, please specify
Marketing and post-harvest operations of wood
What are the fast rotation trees species available on your farm (name the main tree species)
Are you aware about felling and harvesting rule of Government?
What are methods used for tree harvesting?
Who is involved in the tree harvesting process?
Are the tree stumps and roots uprooted after harvesting?, please specify
Are the uprooted stumps and roots used for some purpose/ or selling out to market?
What is the harvesting cost of tree? (Rs.)- per tree or trees/ha
What is the preferred season and time for tree harvesting?

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Table F1 Continued...

What is the general age of tree harvest (purpose and species-wise)?
Who are the primary buyers of wood from agroforestry system?
How are the wood prices decided?
How is the harvested wood transported?
What challenges do you face during wood transportation for marketing?
What are the major marketing channels for selling wood?
What products are generally made from the agroforestry wood you sell?
What are the key challenges in marketing agroforestry wood?
What is your opinion for the future of wood based agroforestry?
Marketing of horticulture-based agroforestry
What are the horticultural produces/ products cultivated on your agroforestry farm land?
Tell us the annual production of each produce/products (t/ha)
Where do you sell your horticulture produce?
How do the prices for horticulture produce decided?
What is your average annual income from horticulture-based agroforestry products? (Rs.)
What are the storage/post-harvest processes are commonly performed?
Do you face challenges in post-harvest management? If yes, please specify
How do you transport horticulture produce/products grown on agroforestry farm to the market?
What are the main challenges faced during transportation?
Do you face challenges to accessing the market of horticulture produce? If yes, specify
Do you engage in value addition? If yes, what products do you make, and how do you market them?
How do you see the future of horticulture-based agroforestry in your area?
What improvements are needed to enhance the facilitation and marketing of these products?

Section F Market engagement and Economic aspects

Table G1 Environmental and ecological aspects of agroforestry systems

What is your opinion for Soil conservation and soil fertility in agroforestry systems?	
What is your view for role of agroforestry in biodiversity (particularly agro-biodiversity)?	
Tell us your observation for the role of pollinators/insects gets benefited from agroforestry systems?	
Do you believe that trees in agroforestry systems help in environment amelioration?	
Are you aware of the potential of agroforestry to sequester carbon in soil and tree biomass? If yes, please specify	
Have you noticed that agroforestry practices influenced temperature regulation on your farm land? how	
Do the trees act as windbreaks or reduce wind intensity? If yes, how	
Have you observed any changes in humidity or other microclimatic factors due to agroforestry? If yes, please specify	
Does agroforestry improve water retention and reduce runoff? If yes, please specify	
Does agroforestry influence the overall productivity on your farm land? If yes, please specify	
Does agroforestry align with local traditions or provide cultural or spiritual value? If Yes, Please give details	

Section G Environmental and ecological aspects

Table H1 Policy and institutional support to farmers especially for agroforestry

Are you aware of any government policies or schemes that promote agroforestry? If yes, please specify
Have you availed any subsidies or incentives for adopting agroforestry practices? If yes, please specify
Please tell us the agroforestry schemes/ programmes you have heard or read?
Have you benefitted from any such agroforestry schemes/ programmes? If yes, please specify
Have you attended any training programs or workshops on agroforestry? If yes, please specify with the benefit you got
Are you a member of any farmer group, cooperative or community organization that promotes agroforestry? If yes, please specify

Section H Policy and institutional support

Conclusion

The development of a structured and comprehensive agroforestry questionnaire represents an important step toward improving the quality, consistency and usefulness of agroforestry research and field-level data collection. By integrating diverse dimensions ranging from demographic characteristics and land-use patterns to agroforestry practices, market linkages, environmental aspects and policy support, the agroforestry questionnaire offers a practical and adaptable tool for a wide range of stakeholders. Ultimately, this standardized survey questionnaire will strengthen research outcomes, support informed decision making and facilitate the wider adoption and effective implementation of agroforestry systems across varied ecological and socioeconomic environments.

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Conflict of interest

The authors declare that there is no conflict of interest.

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