



**SYNERGIES AND IMPACT OF AGROFORESTRY PRACTICES ON
DEPENDENT COMMUNITY IN KHOST PROVINCE, AFGHANISTAN**

By

AHMADZAI MUJIB RAHMAN

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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Chairman : Professor Gs. Ts. Mohd Hasmadi bin Ismail, PhD
Faculty : Forestry and Environment

This study examines the ecological and economic benefits of agroforestry systems and their impact on communities in Khost Province, Afghanistan. Through a mixed-mode cross-sectional research approach and stratified sampling method, data were gathered using a self-administered survey sent to key stakeholders, including local farmers, traders, livestock owners, and supporting staff, whose primary earnings rely on agroforestry from five selected districts. All the data were analysed using SPSS. For the qualitative study, visual documentation in the form of pictures and videos was compiled to offer supplementary context and evidence of agroforestry practices and societal dynamics and was transcribed into the narrative findings. Fruits ($F(2, 260) = 3.61, p < 0.05$) and Berries ($F(2, 260) = 3.56, p < 0.05$) were significantly related to basic and advanced satisfaction with the level of facilities and infrastructure. Herbs ($F(1, 274) = 3.27, p < 0.01$), mushrooms ($F(1, 274) = 3.15, p < 0.01$), wild animal ($F(1, 274) = 3.13, p < 0.01$), oils: ($F(1, 274) = 3.25, p < 0.01$); wood ($F(1, 274) = 5.05, p < 0.001$), honey ($F(1, 274)$

= 3.81, $p < 0.001$) were significantly related to knowledge about land use change and impacts. Mushrooms ($F(2, 260) = 4.60$, $p < 0.05$), berries ($F(2, 260) = 15.13$, $p < 0.001$), wild animal ($F(2, 260) = 4.22$, $p < 0.05$) were significantly related to natural and artificial factors of land use change. Pine nuts ($F(2, 260) = 6.24$, $p < 0.01$) berries ($F(2, 260) = 14.55$, $p < 0.001$), wild animal ($F(2, 260) = 3.84$, $p < 0.05$), berries ($F(2, 260) = 4.23$, $p < 0.05$) were significantly related to impact of land use change. Irrigated wheat ($F(2, 260) = 3.26$; $p < 0.05$), barley ($F(2, 260) = 4.45$, $p < 0.05$, corn ($F(2, 260) = 6.13$, $p < 0.01$), and millet ($F(2, 260) = 3.52$, $p < 0.015$) were significantly related to natural and artificial factors of land use change. Loquat was significantly related to positive and negative impacts of land use change ($F(2, 260) = 3.06$, $p < 0.05$). Licorice ($F(2, 260) = 4.86$, $p < 0.01$) and Asafetida ($F(2, 260) = 4.72$, $p < 0.01$) were significantly related to factors of land use change. Welfare organizations were significantly related to factors of land use change ($F(2, 260) = 4.31$, $p < 0.05$). The narrative analysis highlights impact across various dimensions, including income stability, community cohesion, environmental sustainability, resource utilization, and income source diversification. Factors affecting agroforestry acceptance include land ownership, credit accessibility, market connections, and institutional backing. Challenges for agroforestry-dependent societies include land degradation, limited access to technologies, and insufficient policy support. The study recommends strengthening agroforestry-centered livelihoods through improved extension services, knowledge dissemination, community skill-building, and supportive policies. This research can inform policymakers and local stakeholders to empower societies and maintain the region's ecological integrity.

Keywords: Sustainable agriculture, community cohesion, environmental sustainability, income stability, resource utilization, policy support

SDG: GOAL 1: No Poverty, GOAL 2: Zero Hunger, GOAL 13: Climate Action



Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**KESINAMBUNGAN DAN KESAN AMALAN PERHUTANAN TANI DALAM
KALANGAN MASYARAKAT YANG MEMERLUKAN DI WILAYAH KHOST,
AFGHANISTAN**

Oleh

AHMADZAI MUJIB RAHMAN

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Pengerusi : Profesor Gs. Ts. Mohd Hasmadi bin Ismail, PhD
Fakulti : Perhutanan dan Alam Sekitar

Kajian ini bertujuan untuk mengkaji faedah ekologi dan ekonomi sistem agroforestri dan kesannya terhadap komuniti di Wilayah Khost, Afghanistan. Melalui pendekatan penyelidikan keratan rentas mod campuran dan kaedah persampelan berstrata, data dikumpulkan menggunakan tinjauan yang ditadbir sendiri yang dihantar kepada pihak berkepentingan utama, termasuk petani tempatan, peniaga, pemilik ternakan dan kakitangan sokongan, yang pendapatan utamanya bergantung pada agroforestri daripada lima daerah terpilih. Semua data dianalisis menggunakan SPSS. Bagi kajian kualitatif, dokumentasi visual dalam bentuk gambar dan video telah disusun untuk menawarkan konteks tambahan dan bukti amalan perhutanan agro dan dinamik masyarakat dan ditranskripsikan ke dalam penemuan naratif. Buah-buahan ($F(2, 260) = 3.61, p < 0.05$) dan Beri ($F(2, 260) = 3.56, p < 0.05$) mempunyai hubungan yang signifikan dengan asas dan kepuasan lanjutan dengan tahap kemudahan dan infrastruktur. herba ($F(1, 274) = 3.27, p < 0.01$),

cendawan ($F(1, 274) = 3.15, p < 0.01$), haiwan liar ($F(1, 274) = 3.13, p < 0.01$), minyak : ($F(1, 274) = 3.25, p < 0.01$); kayu ($F(1, 274) = 5.05, p < 0.001$), madu ($F(1, 274) = 3.81, p < 0.001$) berkait secara signifikan dengan pengetahuan tentang perubahan guna tanah dan impak. Cendawan ($F(2, 260) = 4.60, p < 0.05$), beri ($F(2, 260) = 15.13, p < 0.001$), haiwan liar ($F(2, 260) = 4.22, p < 0.05$) berkait secara signifikan dengan faktor semula jadi dan buatan perubahan guna tanah. Kacang pain ($F(2, 260) = 6.24, p < 0.01$) beri ($F(2, 260) = 14.55, p < 0.001$), haiwan liar ($F(2, 260) = 3.84, p < 0.05$), beri ($F(2, 260) = 4.23, p < 0.05$) mempunyai hubungan yang signifikan dengan kesan perubahan guna tanah. Gandum pengairan ($F(2, 260) = 3.26; p < 0.05$), barli ($F(2, 260) = 4.45, p < 0.05$), jagung ($F(2, 260) = 6.13, p < 0.01$), dan sekoi ($F(2, 260) = 3.52, p < 0.015$) berkait secara signifikan dengan faktor semula jadi dan buatan perubahan guna tanah secara signifikan dengan positif dan kesan negatif perubahan guna tanah $F(2, 260) = 4.86, p < 0.01$ dan Asafetida ($F(2, 260) = 4.72, p < 0.01$) berkait secara signifikan dengan faktor perubahan guna tanah Organisasi kebajikan berkait secara signifikan dengan faktor perubahan guna tanah ($F(2, 260) = 4.31, p < 0.05$). Analisis naratif menekankan impak daripada pelbagai dimensi, termasuk kestabilan pendapatan, kohesi komuniti, kelestarian alam sekitar, penggunaan sumber, dan diversifikasi sumber pendapatan. Faktor-faktor yang mempengaruhi penerimaan agroforestri termasuk pemilikan tanah, akses kepada kredit, sambungan pasaran, dan sokongan institusi. Cabaran bagi masyarakat yang bergantung kepada agroforestri termasuk degradasi tanah, akses terhadap teknologi, dan sokongan dasar yang tidak mencukupi. Kajian ini mengesyorkan pengukuhan pendapatan berasaskan agroforestri melalui

penambahbaikan perkhidmatan sambungan, penyebaran pengetahuan, pembangunan kemahiran komuniti, dan dasar sokongan. Penyelidikan ini dapat memberi maklumat kepada pembuat dasar dan pihak berkepentingan tempatan untuk memperkasakan masyarakat dan mengekalkan integriti ekologi rantau ini.

Kata Kunci: Pertanian lestari, kohesi komuniti, kelestarian alam sekitar, kestabilan pendapatan, penggunaan sumber, sokongan dasar

SDG: MATLAMAT 1: Tiada Kemiskinan, MATLAMAT 2: Kelaparan Sifar, MATLAMAT 13: Tindakan Iklim

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Mohd Hasmadi bin Ismail, PhD

Professor Gs. Ts.
Faculty of Forestry and Environment
Universiti Putra Malaysia
(Chairman)

Mohamad Maulana bin Magiman, PhD

Associate Professor
Faculty of Humanities, Management and Science
Universiti Putra Malaysia Campus Bintulu
(Member)

Paiman bin Bawon, PhD

Senior Lecturer
Faculty of Forestry and Environment
Universiti Putra Malaysia
(Member)

ZALILAH MOHD SHARIFF, PhD

Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 7 November 2024

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LIST OF ABBREVIATIONS

AF	Agroforestry
AFG	Afghani (Currency)
CA	Cronbach's Independent Variable Alpha
DV	Dependent Variable
FAO	Food and Agriculture Organization
Ha	Hectare
KG	Kilogram
KPK	Khyber Pakhtunkhwa
LDN	Land Degradation Neutrality
LUC	Land use/cover
M ²	Meter Square
M ³	Meter Cubic
M	Mean
MANOVA	Multivariate Analysis of Variance
MDG	Millennium Development Goal
NEPA	National Environmental Protection Agency
NGOs	Non-Government Organizations
NTFPs	Non-Timber Forest Products
SD	Standard Deviation
SDG	Sustainable Development Goal
SPSS	Statistical Package for Social Science
UN	United Nations
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Agroforestry is the collective name for land use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land management unit. The integration can be either in a spatial mixture or in a temporal sequence. Most of the time, there are both ecological and economic interactions between woody plants and other plants in agroforestry (Orwa et al., 2009; Zomer et al., 2009).

Agroforestry, the integration of trees with food crops or pasture, offers a holistic land management system, supplementing traditional methods where separate systems fulfil individual needs. Conventional practices have long served communities by harvesting building materials and fuelwood from forests and producing food from herbaceous crops, orchards, and grazing pastures (Jambut et al., 2007). However, agroforestry presents a more balanced approach to land management, fostering sustainable socioeconomic development and ecosystem preservation (Ashton & Kelty, 2018; Smith et al., 1996). Socioeconomic status consists of many variables, categorized into; social dimensions and economic, etc. In the agroforestry context, besides this, some other aspects are directly or indirectly related to a farmer's socioeconomic status and have effects and vice versa (Himshikha, 2016).

The relationship between humanity and the environment is critical, with dependency and involvement sustaining this connection over time. Humans have historically relied on nature's resources for survival and protection from external threats. As social animals, humans are deeply connected to their surroundings and society, finding collective progress and prosperity in unity. The utilization of resources to enrich life has been productive, but concerns arise regarding environmental overexploitation, disrupting natural cycles and causing chaos (Balasubramanian, 2008).

With the rise of urbanization and diminishing greenery, agroforestry's significance becomes apparent, especially in developing countries where many depend on agro-based livelihoods with limited income potential. Activities like fodder collection, fuel sourcing, and non-wood tree product harvesting from forests, as well as livestock management and fruit and vegetable cultivation, sustain rural communities (Kumar, 2007). In such a situation, natural resources, which are otherwise meant for generating livelihoods on a sustainable basis, are often used for destructive or consumptive purposes (Lehmann et al., 2020). This leads to ecological imbalances and environmental pollution. It has been reported that about Forty-Three percent of the total energy where a high number of individuals in the developing world. This is equivalent to 22 million barrels of oil per day.

Agroforestry, also known as agriculture with trees, proves promising in uplifting socioeconomic conditions while enhancing environmental resilience (Taylor, 2007), It has gained traction as a component of Land Degradation Neutrality

(LDN) initiatives, with considerable investments aimed at bolstering its implementation (Place et al., 2013; Hughes et al., 2020). However, challenges remain in fully replacing conventional land management systems with agroforestry practices (Brown et al., 2018).

As humanity witnesses the rapid vanishing of greenery and potential life-altering consequences, it becomes crucial for policymakers and communities to take responsibility and prevent overexploitation (Lauren, 2013). The impact on ecosystems, naturally occurring assemblages of life and the environment, is profound. Ecosystems, consisting of biotic components (animals, plants, etc.) and the biotope (physical region of life), provide vital services for humanity's well-being (Balasubramanian, 2008; Bopp, 1989; Lauren, 2013; Walker et al., 2006). Agroforestry stands as a sustainable solution to balance socioeconomic development and environmental preservation. By integrating trees with agricultural practices, agroforestry offers a promising path forward. However, fostering its full potential requires collective efforts to embrace sustainable practices to protect the world's ecosystems for future generations (Gurholt, 2014).

1.1.1 Agroforestry and Socioeconomic Development: Definition of General Conception

Agroforestry, a woody perennial-based mixed-species production system, holds great potential in combating land degradation and soil erosion while promoting agricultural and forestry practices as well as greenery. It offers the opportunity to improve rural livelihoods and manage natural resources more

effectively (Kumar, 2007). Although the term "agroforestry" may be relatively new as a scientific discipline, the practice itself has ancient roots, with farmers historically caring for trees on their farms and pastures (Atangana et al., 2014). At its core, agroforestry involves integrating two or more species of plants or animals, with at least one intended for wood production, and one serving both biological and economic purposes over multiple seasons (Negash, 2002).

The World Agroforestry Centre (ICRAF) defines agroforestry as a collective land use system where woody perennials are intentionally integrated with crops and/or animals on the same management unit (Nzui, 2014). In essence, agroforestry represents a harmonious coexistence of agriculture and forestry, where trees are intentionally planted or retained alongside crops and animals. This integration leads to multiple benefits, including enhanced production and yields, making it a sustainable and environmentally friendly land management approach.

1.1.2 Masses Involvement and Community Uplifting

Modern planning requires innovative methodologies and community empowerment for successful economic development. In the past, economic improvement relied solely on government or higher authorities, leading to failures due to a lack of community interest and input. The absence of supportive policies and institutional frameworks is identified as one of the main hindrances to the widespread adoption of agroforestry, for instance, there is a lack of evaluation of the current status of the agricultural and agroforestry activities or policies, understanding the role of the stakeholders and

investigating the ways and strategies to incorporate agroforestry activities (Bettles et al., 2021). However, involving more stakeholders and encouraging community ownership proved vital for swift success. This approach, known as socioeconomic development, aims to improve the commoners' lifestyle and social factors, including education, health, and overall well-being. Education plays a crucial role in enhancing lives by providing essential skills and income opportunities. The power of socioeconomic principles lies in the community's active involvement as stakeholders, reflecting several key aspects of development, which are productivity, sustainability, adaptability, income and health.

Productivity is the main component of any agroforestry projection. Increased production of tree products, greater yields of linked crops, reduced cropping system inputs, and increased labour are always that agroforestry can boost productivity (Bevege, 1986; Lehmann et al., 2020). Although production is a significant concern in agroforestry, it is the attribute of sustainability that distinguishes it from other land-use alternatives. Today's buzzword in land-use jargon is "sustainability," which is also the cornerstone of agroforestry (Arosa et al., 2017; Awazi & Avana-Tientcheu, 2020).

In term of adaptability, the implication here is that better or new agroforestry technology that is used in new places must also follow local farming traditions (Dalemans et al., 2019; Djanibekov et al., 2016). Income is the first factor that reflects an area's socioeconomic status or any community is income. The success of any project will be determined based on how the income of

associated stakeholders increases, resulting in the overall economic and social uplift of the understudy group (Darin-Mattsson et al., 2017). Finally, health is another indicator by which socioeconomic development can be measured is a community's health. The notion of development or economic progress was judged based on numbers, and no accounting was made to affect the health of the targeted community (Pechholdová, 2015).

Several other factors are also associated with socioeconomic models ranging from political awareness to participation, the decline in inequalities, and many others (Cingano, 2014). These characteristics are so distinctive of agroforestry systems that they serve as the foundation for comparing and contrasting different agroforestry systems (Nair, 1993). Agroforestry can help people achieve self-sufficiency while also maintaining ecological balance. Characteristics such as multipurpose, companion growing, and ecological improvement are considered while choosing tree species and cropping systems.

Multipurpose indicates those tree species and cropping systems that produce many goods, such as edible fruits, flowers, and leaves, full-wood, wax, timber, fodder, medicinal extracts, and many others, have a high economic worth. The multi-story cropping method is the most efficient use which represents companion growing. The species chosen should help maintain the overall system's balance of plants. There should be a wide variety of tree species as well as cropping systems that lead to ecological improvement including improve soil and soil balance, provide habitat and food for a wide range of

animal species, diversify ecosystems to keep food chains healthy, reduce temperature and boost moisture, and improve water supply and recycling (Petmak, 1991; Rao & MacDicken, 1991).

Agroforestry systems encompass three crucial aspects: trees or woody perennials, herbs (including pasture plants), and animals, along with other elements like seafood and honey. Each system typically consists of two of these major components, with some projects focused solely on plantations. Classification criteria for agroforestry include spatial and temporal organization, production goals, socioeconomic characteristics, and ecological spread. The main aim of categorization is to achieve the desired structure, function, socioeconomic character, and ecological impact (Gholz, 1987). Thus, agroforestry systems can be classified as follows (Table 1.1).

Table 1.1 : Major Approaches to Classification of Agroforestry Systems and Practices

Nature of components	Categorization of systems based on their structure and function	Grouping of systems (according to their spread and management)
Agrisilviculture (crops and trees including shrubs/trees)	Structure and Arrangement of components (nature and arrangement of components, especially woody ones) In space Mixed dense (e.g. home garden)	Agro-ecological environmental adaptability Socioeconomic and management level
Silvopastoral (pasture/animals and trees)	Mixed space (e.g. most systems of trees in pastures)	System in/for Lowland humid tropics Based on the level of technology input Low input
Agrosilvopastoral (crops, pasture/animal and trees)	Strip (width of strip to be more than one tree)	Highland humid tropics Medium input High input
Others (multipurpose tree lots, apiculture with trees, aquaculture with trees, etc.)	Boundary (trees on edges of plots/fields) In time (temporal) <ul style="list-style-type: none"> • Coincident • Concomitant • Overlapping • Sequential (separate) • Interpolated 	Based on cost/benefit relations Commercial Intermediate Subsistence
	Productive function Food, Fodder Fuelwood Other woods Other products Protective function Windbreak Shelterbelt Soil conservation Soil improvement Shade (for crop, animal and man)	

The structural basis includes the spatial arrangement of the woody component, vertical stratification of all components, and the temporal arrangement of distinct components (Figure 1.1). According to Figure 1.1, agrisilviculture includes crops which including shrubs or vines and trees. The Silvopastoral indicates the pasture or animals and trees, while, agrosilvopastoral indicates the crops, pasture or animals and trees. The functional basis includes the woody components which usually provide the system's principal function or duty (service or protective nature, e.g., windbreak, shelterbelt, soil conservation). The socioeconomic basis is one of the catchy words where agroforestry is preferred over the conventional systems.

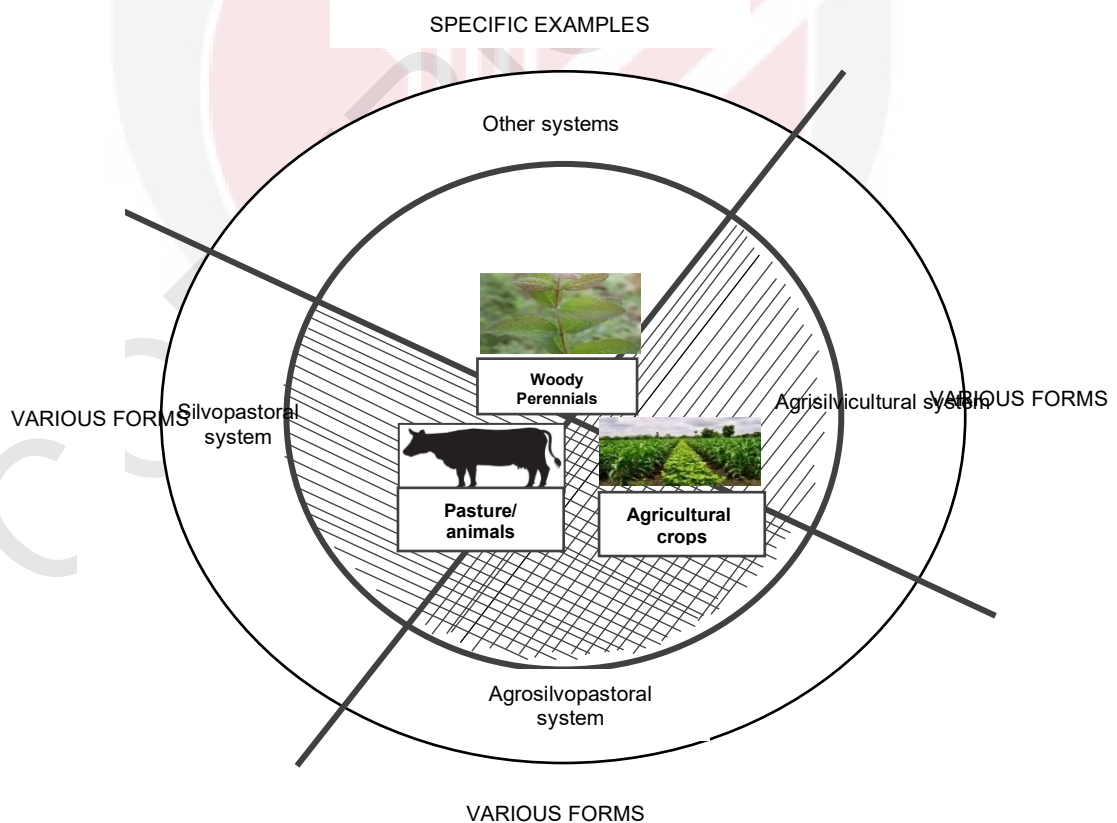


Figure 1.1 : Classification of Agroforestry Systems Based on the Type of Components

Finally, the ecological basis explains that agroforestry systems are chosen based on environmental suitability, tailored to specific ecological conditions such as arid regions, tropical highlands, and humid lowlands (Nair, 1985). The environmental benefits include reduced pressure on forests, improved nutrient recycling, protection of ecological systems, minimized run-off, leaching, and erosion, and enhanced microclimate (Chundawat & Gautam, 1993). Agroforestry offers significant economic and social advantages, providing higher outputs of food, fuelwood, fodder, and lumber while reducing crop failures. It enhances food quality, variety, nutrition, health, rural living standards, job opportunities, and income (Chundawat & Gautam, 1993).

Table 1.2 lists the most common agroforestry practices that make up different types of agroforestry systems around the world and their main features (Nair, 1991).

Table 1.2 : Major Agroforestry Practices and Their Main Characteristics

Agroforestry practice	Brief description of (arrangement of components)	Major groups of components	Agro-ecological adaptability
Agrisilviculture systems (crops – including shrubs/vine/trees crops – and trees)			
1- Improved fallow	Woody species planted and left to grow during the “fallow phase”	w: fast-growing preferably leguminous h: common agricultural crops	In shifting cultivation areas
2- Alley cropping (hedgerow intercropping)	Woody species in hedges: agricultural species in alleys in between hedges: micro-zonal or strip arrangement	w: fast-growing, leguminous, that coppice vigorously h: common agriculture crops	Subhumid to humid areas with high human population pressure and fragile (productive but easily degradable) soils
3- Multilayer tree gardens	Multispecies, multilayer dense plant associations with no organized planting arrangements	w: different woody components of varying form and growth habits h: usually absent: shade tolerant ones sometimes present	Area with fertile soils, good availability of labour, and high human population pressure
4- Multipurpose trees on croplands	Trees scattered haphazardly or according to some systematic patterns on bunds, terraces or plot/field boundaries	w: multipurpose trees and other fruit trees h: common agricultural crops	In all ecological regions esp. subsistence farming: also commonly integrated with animals
5- Plantation crop combinations	<ul style="list-style-type: none"> i. Integrated multistory (mixed, dense) ii. A mixture of plantation crops in alternate other regular arrangements iii. Shade trees for plantation crops: shade trees scattered iv. Intercropping with agricultural 	w: plantation crops like coffee, cacao, coconut, etc. and fruit trees, sep. in (i): fuelwood/fodder spp., esp in (iii) h: usually present in (iv): and to some extent in (i): shade-tolerant species	In humid lowlands or tropical humid/Subhumid highlands (depending on the plantation crops concerned): usually in smallholder subsistence system

Table 1.2 : Continued

Agroforestry practice	Brief description of (arrangement of components) crops	Major groups of components	Agro-ecological adaptability
6- Home-gardens	Intimate, multistory combination of various trees and crops around homesteads	w: fruit trees predominate: as other woody species, vines, etc. h: common agricultural species	In all ecological regions, esp. in areas of high population density
7- Trees in soil conservation and reclamation	Trees on bunds, terraces, raisers, etc. with or without grass strips: trees for soil reclamation	w: multipurpose and/or fruit trees h: common agricultural species	In sloping areas, esp. in highlands, reclamation of degraded, acid, alkali soils, and sand-dune stabilization
8- Shelterbelts and windbreaks, live hedges	Trees around farmland/plots	w: a combination of tall-growing spreading types h: agriculture crops of the locality	In wind-prone areas
9- Fuelwood production	Inter-planting firewood species on or around agricultural lands	w: firewood species h: agricultural crops of the locality	In all ecological regions
Silvopastoral systems (trees + pasture and/or animals)			
10- Trees on rangeland or pasture	Trees scattered irregularly or arranged according to some systematic pattern	w: multipurpose: of fodder value f: present a: preset	Extensive grazing areas
11- Protein banks	Production of protein-rich tree fodder on farm/rangelands for cut-and-carry fodder production	w: leguminous fodder trees h: present f: present	Usually in areas with a high person-land ratio
12- Plantation crops with pastures	Example: cattle under coconuts in Southeast Asia and the South	w: plantation crops f: present	In areas with less pressure on plantation croplands

Table 1.2 : Continued

Agroforestry practice and animals	Brief description of (arrangement of components)	Major groups of components	Agro-ecological adaptability
Agrosilvopastoral systems (trees + crops + pasture/animals)			
13- Home-gardens involving animals	Intimate, multistory combination of various trees and crops, and animals, around homesteads	w: fruit trees predominate: also other woody species a: present	In all ecological regions with a high density of human population
14- Multipurpose woody hedgerows	Woody hedges for browse, mulch, green manure, soil conservation, etc.	w: fast-growing and coppicing fodder shrubs and trees h: (similar to alley cropping and soil conservation)	Humid to subhumid areas with hilly and sloping terrain
15- Apiculture with trees	Trees for honey production	w: honey production (other components may be present)	Depending on the feasibility of apiculture
16- Aqua-forestry	Trees lining fish ponds, tree leaves being used as "forage" for fish	w: trees and shrubs preferred by fish (other components may be present)	Lowlands
17- Multipurpose woodlots	For various purposes (wood, fodder, soil protection, soil reclamation, etc.)	w: multipurpose species: special location-specific species (other components may be present)	Various

Note: w = woody; h = herbaceous; f = fodder for grazing; and a = animals

1.1.3 Agroforestry: A New Normal Way Forward

The pursuit of sustainable development has led to the integration of various fields, optimizing available resources. Unlike past practices where segregated fields were believed to result in declining outputs, advancements in agriculture and forestry have shown that combining them can promote natural progress and maximize output. Agroforestry, a land-use system integrating agriculture, trees, people, and livestock, improves soil quality, increases yields, and enhances livelihoods (Hillbrand et al., 2017).

These systems offer significant potential for increasing crop yield, reducing soil erosion, providing economic benefits, and mitigating climate change through carbon sequestration. Agroforestry's low-cost, integrated forestry approach enhances production while safeguarding forests and greenery. Understanding the socioeconomic context is essential, as farmers' economic status influences their management techniques, including agroforestry practices (Abdrabo & Hassaan, 2003; Irshad et al., 2011). Agroforestry has the potential to provide extensive employment opportunities and contribute to sustainable development.

In addition, the farmers are not persuaded of the potential benefits of agroforestry for their livelihood, for instance decreased accessibility of information spread among the farmers hence they are not able to determine the quality of the seeds or seedlings required for this practice, the high cost of transportations that is linked with the supply of those seeds and also low economies facilities. For example, a study in the northern states of India,

demonstrated that smallholder wheat and rice farmers have widely adopted the agroforestry activities and system due to the higher economic returns from high-quality poplar germplasm developed in partnership with the Indian universities and an agriculture supply company (Puri & Nair, 2004). Moreover, other factors such as land tenure concerns or market integration act as potential obstacles for the application of agroforestry activities' implementation to larger landscape.

However, a study in Bangladesh reported that agroforestry farmers were able to attain an improved financial stability and make purchases of their own vehicles using the income they are receiving from the agriculture and forest products from agroforestry practices and a study in India indicated that the reliance of borrowed money significantly decreased after the farmers were involved and improved their financial stability which enhances their access to food items that are produced outside their home gardens. Besides, the improved financial resources enable the farmers to access to better medical facilities, for instance, through the integration of forestry practices which increases their accessibility to medicinal plants and herbs. A study in Bangladesh revealed that over 80% of the household members rely on agroforestry medicinal plants to meet up to their health status.

1.1.3.1 History of Agroforestry

Agroforestry, though a modern idea, has roots dating back centuries. The term was first introduced academically in 1929 by Russel Smith, promising high production at a lower economic input (Smith, 1929). The concept of "Tree-

Based" Agriculture emerged as a solution to counter declining forestry and greenery, gaining significance during the green revolution of 1970. Agroforestry gained scientific support, with Canada leading the way in recognizing its importance in enhancing agricultural and forestry presence in tropical lands (Lelle & Gold, 1994).

This research examines Agroforestry's history and key characteristics, emphasizing its relevance in addressing issues of declining greenery and increasing production for small-scale farmers. The method's ability to spread cultural and management requirements throughout the year helps create a more stable economy, lowering peak demands (Raj et al., 2019). Agroforestry's potential to enhance productivity and sustainably manage natural resources makes it a vital approach in contemporary times.

1.1.3.2 The Characteristics of Agroforestry

The main two characteristics of agriculture are productivity and provide employment: Agroforestry's productivity is not restricted to specific soil conditions; it can be applied over a wide area, ensuring increased food security for humans and animals while safeguarding the environment (Lehmann et al., 2020). Scientifically implemented, it provides habitat for wildlife, enhances the ecosystem, and boosts economic activities, benefiting society and environmental protection. Years of extensive research have shown that agroforestry has a positive impact on soil. It enhances soil fertility, improves hydro balance, and significantly increases per-unit yield, directly contributing to higher productivity. Agroforestry's positive effects on soil yield are closely

related to its economic impact on socioeconomic practices (Bevege, 1986).

Provide Employment: Agroforestry provides employment opportunities, especially in developing countries where agriculture has been a primary source of livelihood for thousands of years (Usman et al., 2021). However, declining agricultural land and a growing population have reduced employment opportunities in traditional agriculture. Agroforestry offers hope, as it has the potential to increase agricultural yield. As production rises, agroforestry is expected to create more jobs, providing a sustainable solution for those on the brink of leaving the agricultural sector.

1.2 Problem Statement

Agroforestry, a sustainable land use practice with considerable benefits, remains underutilized in Afghanistan, primarily in Khost province. The limited adoption of agroforestry stems from a lack of knowledge and awareness among farmers and a dearth of supportive policies and institutional frameworks. To tackle this issue effectively, this research endeavours to explore the factors influencing agroforestry adoption among farmers in Khost province, Afghanistan. The ultimate goal is to devise actionable recommendations that promote the widespread implementation of agroforestry as a sustainable land use practice in the region. Despite the potential benefits of agroforestry as a sustainable land use practice, its adoption in Afghanistan has been limited. For instance, misconceptions or preconceived ideas may impaired the adoption of agroforestry practices. The perception of some farmers categorise agroforestry as a traditional or

antiquated practice rather than as a profitable compared to conventional agricultural techniques (Musa et al., 2019). Hence, it is imperative to dispel those myths and encourage a mindset shift that acknowledges the ecological significance and long-term benefits of agroforestry.

The lack of knowledge and awareness among farmers, policymakers, and different groups of organisations or communities members may indicate that they are not aware of the fundamentals, specific practices and the importance of agroforestry (Jha et al., 2021). Moreover, the limited dissemination of information related to those practices are insufficient and ineffective, for instance in order for the farmers to determine whether agroforestry systems are suitable and feasible for their lands, they must have the accessibility to the information and tools required (Jha et al., 2021) which they are lacking behind. This implies that the agroforestry-related scientific research and knowledge is not being reached effectively to the farmers and the policymakers for their implementations, hence there might be a gap between the academic research centers and the local level where agroforestry is practiced.

The availability of external services with essential resources are not prioritizing and providing enough of funding sources to support and further motivate agroforestry practices (Miller et al., 2020), despite the fact that these services and resources are crucial for equipping the farmers with knowledge and the required technical guidance related to the precise and current information for the advantages, optimal methods and prosperous case studies of agroforestry. Hence, the implementation of extensive and comprehensive

campaigns are crucial to target distinctive stakeholders to bring their awareness to the benefits of agroforestry. Those campaigns should focus on the augmented crop yields, soil health and quality required, increased biodiversity, a reduction in the effects of climate changes and other external sources of resources such as income (Amare & Darr, 2020).

In addition, socioeconomic factors such as restricted market accessibility or availability, low market prices for agroforestry products, and competing land-use options may act as serious hindrances (Muhie, 2022). For example, if there is no obvious economical benefit to agroforestry practices and other land practices yield more immediate financial returns, the farmers might be reluctant to commit their land and other resources to this practice (Datta et al., 2024)

However, there is a significant gap in understanding its comprehensive socioeconomic impact on the communities that depend on these practices. This lack of knowledge hinders effective policy-making and intervention strategies aimed at maximizing the benefits of agroforestry (Meijer et al., 2015). While existing literature highlights the environmental and ecological benefits of agroforestry, such as soil conservation, biodiversity enhancement, and climate mitigation, there is a paucity of research focused on its socioeconomic outcomes (Himshikha, 2016; Sollen-Norrlin et al., 2020; Van Noordwijk, 2021). Furthermore, current studies often lack detailed analysis on how agroforestry affects economic indicators, community livelihoods, and social well-being comprehensively (Amare & Darr, 2020; Musa et al., 2019).

Indicators such as household income levels, employment rates, access to markets, and financial stability will be assessed to provide a detailed picture of the economic conditions within these communities (Raj et al., 2019; Zada et al., 2022). Understanding these indicators is crucial for evaluating the direct economic benefits of agroforestry and identifying areas where additional support may be needed. This analysis will help in tailoring development programs that directly address the financial needs of these communities. Analyzing data on agricultural productivity, should be expended including the export revenues from agroforestry products, and changes in community income and living standards due to agroforestry practices (Castle et al., 2022). By linking agroforestry practices to national economic performance and local community well-being, this evaluation will provide insights into how agroforestry contributes to economic growth and poverty reduction. It will also highlight the potential of agroforestry as a sustainable economic practice that can be scaled up for national benefits (Gosling et al., 2021). On the other hand, to understand the combined social and economic impacts of agroforestry on communities (Hussain et al., 2022), its involved holistic assessment that includes social indicators such as education, health, social cohesion, and gender equity, alongside economic metrics. An integrated analysis of social and economic impacts Hariram et al. (2023) will provide a comprehensive understanding of how agroforestry affects overall community welfare (Brown et al., 2018). This knowledge is essential for designing policies that not only enhance economic outcomes but also improve social conditions, ensuring sustainable development (Fallah Shayan et al., 2022).

Therefore, a mixed-mode study was conducted aims to address these problems by investigating the factors that influence the adoption of agroforestry among farmers in Khost province, Afghanistan, and providing recommendations for promoting its adoption as a sustainable land use practice.

1.3 Research Objective

The main objective is to examine the ecological and economic benefits of agroforestry systems and their impact on communities in Khost Province, Afghanistan.

1. To examine the economic indicators of the socioeconomic condition of agroforestry-dependent communities.
2. To evaluate the impact of agroforestry practices and its setting on the country's income and the socioeconomic of the community.
3. To examine the integrated social and economic impacts of agroforestry on dependent communities.

1.4 Research Questions

1. What are the economic indicators of the socioeconomic condition of agroforestry in dependent communities?
2. What is the impact of agroforestry practices and its setting on the country's income and the socioeconomic of the community?
3. What are the integrated social and economic impacts of agroforestry on dependent communities?

1.5 Scope of the Study

The research scope of the study focused on the impact of agroforestry practices on the socioeconomic development of dependent communities in Khost province, Afghanistan. The study aims to identify the factors that influence the adoption of agroforestry practices among farmers in the region and to assess the socio-economic benefits of these practices. The study is limited to five districts of Khost province, namely Gurbuz, Khost "Matun", Mandozayi, Musakhel, and Qalandar, which have a forest and shrub cover of 365.82 km², representing 23.62% of the total province's geographical area. The study uses a cross-sectional research design, and data is collected through a self-administered questionnaire and observational notes in the form of pictures and videos. The study does not include an assessment of the environmental impacts of agroforestry practices or an assessment of the economic viability of these practices.

1.6 Organization of Thesis

There are five chapters in this thesis:

Chapter 1: Introduction: Provides an overview of the introduction to the chapter, the definition of agroforestry, background of the study, problem statement, research, objectives, questions, scope of the study, significance, limitations and organization of the thesis.

Chapter 2: Literature Review: Reviews the relevant literature on agroforestry, its benefits, and challenges, and the factors that influence its adoption among farmers.

Chapter 3: Methodology: Describes the research design, sampling strategy, data collection methods, and data analysis techniques used in the study.

Chapter 4: Results and Discussion: Presents the findings of the study and discusses their implications for promoting the adoption of agroforestry practices in Afghanistan.

Chapter 5: Conclusion and Recommendations: Summarizes the main findings of the study, draws conclusions, and provides evidence-based recommendations for promoting the adoption of agroforestry practices in Afghanistan.

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