

Systematic Approach to Agroforestry Policies and Practices in Asia

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Abstract: This paper introduces the Special Issue “Systematic Approach to Agroforestry Policies and Practices in Asia”. This Special Issue contains eleven papers on agroforestry at national, regional, and global levels. These papers discuss research trends; dominant services and functions of agroforestry; multiple case studies from Asian countries including Nepal, Lao PDR, Indonesia, Vietnam, Bangladesh, and Timor-Leste; and the benefits of agroforestry including income generation and carbon sequestration. They also interpret the goals, challenges, and social and cultural norms in agroforestry policies in national and local contexts. The research results can support policy design for the systematization and stabilization of agroforestry. This Special Issue provides us with scientific evidence and practical lessons on agroforestry policies and practices in Asia. It contributes to expanding the knowledge base for agroforestry and towards establishing and implementing agroforestry policies and practices in the region.

Keywords: agroforestry; policy; Asia; landscape restoration



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1. Introduction

Agroforestry, a traditional land-use practice found throughout the world, focuses on maximizing the benefits of biological interaction by intentionally linking trees, crops, and animals under agroecological systems [1]. According to a World Agroforestry Centre (ICRAF) working paper [2], agroforestry covers around one billion hectares or 43% of agricultural lands globally, and involves more than 900 million people. In Asia, agroforestry is also prevalent and has played a critical role in local livelihoods since ancient times [3]. If defined as being more than 10% tree cover on agricultural land [2], then agroforestry covers 77.8% of all agricultural land in Southeast Asia, 50.5% in East Asia, 27.0% in South Asia, and 23.6% in Northern and Central Asia.

Asian peoples have long reflected and implemented inventive wisdom and strategies in diverse agroforestry systems for their basic fuel, food, medicine, and cash income needs [4]. However, since the early 20th century, growing populations and food requirements have led to agroforestry land in Asia being converted into intensive agriculture and monoculture tree plantations, causing environmental and social challenges, such as a loss of food and homes for forest-dependent species and peoples [5]. Scientists have begun to acknowledge high levels of complexity and environmental heterogeneity in the interactions of trees, crops, and animals [6] and the various ecosystem services they provide. Sustainable agroforestry landscapes came into the spotlight in the late 20th century with growing global concern over environmental issues, natural resource depletion, and climate change [4]. Since agroforestry began to gain more attention in Asia, agroforestry research has been increasing steadily in the region (Figure 1) [7].

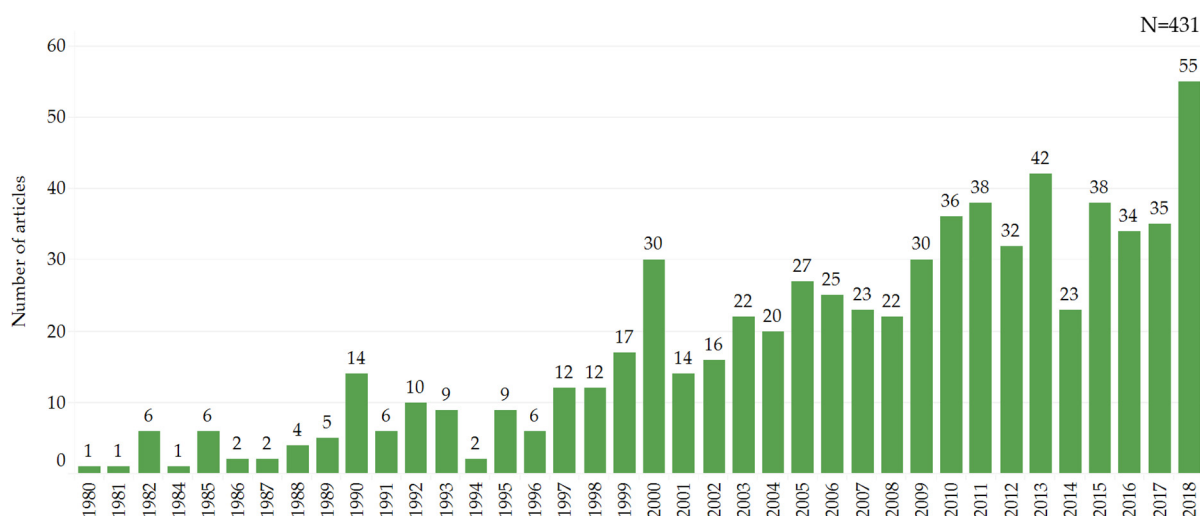


Figure 1. Numbers of academic publications on agroforestry and ecosystem services in Asia, based on data from Shin et al. (2020).

Following an increase in awareness of the benefits it provides, agroforestry has become an important topic in global and national agendas for sustainable development during international policy meetings. It is now recognized as a climate-smart agricultural system by the Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Convention on Climate Change (UNFCCC); as a Nationally Appropriate Mitigation Action (NAMA) and National Adaptation Programme of Action (NAPA) for the agriculture sector; as an important strategy to combat desertification by the United Nations Convention to Combat Desertification (UNCCD); as being beneficial to biodiversity by the Convention on Biological Diversity (CBD); and as being able to enhance ecosystem services by the United Nations Forest Forum (UNFF) [8].

The World Agroforestry Centre (ICRAF) has been introducing agroforestry agendas and leading international discussions on agroforestry development since 2003. The ICRAF-led World Congress on Agroforestry (WCA) shares agroforestry ideas and knowledge and provides opportunities to strengthen cooperation between various stakeholders (Garrity, 2012). The first World Congress on Agroforestry (WCA 1), held in 2004 in Orlando, FL, USA, involved nearly 600 stakeholders from 82 countries. These stakeholders announced the Orlando Declaration, which focuses on increasing household earnings from agroforestry; promoting gender equality and women’s participation; improving health and welfare; and promoting environmental sustainability. The second World Congress on Agroforestry (WCA 2) was held in 2009 in Nairobi, Kenya; the third in Delhi, India, in February 2014, and the fourth in Montpellier, France in May 2019. This world congress series has led to notable outcomes for strengthening links between science, environment, society, and policy in diverse aspects of agroforestry and subjects such as climate change, biodiversity, soil protection, food security, livelihoods, and Sustainable Development Goals (SDGs) [5].

In Asia, agroforestry has gained attention in the fields of forestry and agriculture. In most countries, agroforestry is now included in agriculture or forestry policies [9]. In recent years, some Asian countries have introduced specialized national agroforestry policies. In 2014, for example, India became the first country in the world to adopt a national agroforestry policy [10], followed by Nepal in 2019 [11]. At the regional level, Asian countries have cooperated in facilitating agroforestry. At the 37th ASEAN Ministers of Agriculture and Forestry Meeting in 2015, ministers endorsed the Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry 2016–2025. This strategic plan identified seven ‘strategic thrusts’ and related action programs. Strategic Thrust 4 focuses on increasing resilience to climate change, natural disasters, and other shocks, and includes action programs for expanding resilient agroforestry systems where ecologically and economically appropriate [12]. Recognizing the contributions of agroforestry

to achieving food security, sustainable forest management and SDGs, participants in the 20th ASEAN Senior Officials of Forestry meeting agreed to develop agroforestry guidelines through the ASEAN Guidelines for Agroforestry Development (ASEAN GAD), which were adopted at the 39th ASEAN Ministers of Agriculture and Forestry Meeting in 2017. The ASEAN GAD includes 75 guidelines under 14 principles for the institutional, economic, environmental, socio-cultural, technical design and communication, and scaling-up areas of agroforestry [13].

As mentioned above, national and regional agroforestry strategies have been established in Asia. In this context, systematic approaches and methodologies can help to better understand Asian agroforestry systems, policies and practices. This Special Issue, entitled “Systematic Approach to Agroforestry Policies and Practices in Asia”, explores environmental, economic, and social dimensions of agroforestry in Asia through multiple research methods. It can contribute to maximizing benefits from agroforestry, to designing agroforestry policies, and ultimately to achieving SDGs.

2. Overviews of Papers in the Special Issue

Papers included in the Special Issue cover an extensive variety of topics: farmers’ willingness to adopt agroforestry systems; ecosystem services; social and cultural norms; agroforestry management policies; and bamboo and wild-simulated ginseng; as well as different research methodologies (systematic reviews, surveys, topic modeling, policy analysis and case studies) (Table 1). These papers provide an overall picture of agroforestry as well as case studies of specific agroforestry systems in Asia.

Providing a comprehensive overview of agroforestry systems in Asia, the article by Shin et al. [7] explores research trends on agroforestry practices and ecosystem services in the Asia-Pacific region. It presents a systematic review of 431 articles published between 1970 and 2018 included in the specialized international academic database, SCOPUS. Research results show: (1) countries where silvoarable practices and regulating and supporting ecosystem services are most prominent (China, Indonesia, and Australia); (2) research trends by decade; and (3) the intersection of agroforestry practices and ecosystem services in academic research targeting the Asia-Pacific region.

Dhyani et al. [14] review published papers to investigate evidence of the climate change adaptation and mitigation potential of agroforestry systems in South Asia. The paper looks at agroforestry systems being developed in South Asian countries as enabling conditions for commitments to international agreements, and a consensus on establishing agroforestry policies to tackle climate change through the South Asian Association for Regional Cooperation’s Resolution on Agroforestry. It also discusses constraints impeding agroforestry system climate goals, including data uniformity, stakeholder rights, financial support, governance, and water scarcity. The paper provides strong recommendations on incentives and sustainable local livelihoods, as well as carbon neutrality scenarios.

As the first of two papers documenting research in Nepal, Dhakal and Rai [15] investigate factors that influence farmers’ decisions to adopt agroforestry practices in the country. The Multinomial Logistic Regression (MNL) model was used to analyze 288 households’ agroforestry and conventional agriculture choices. Results show head of household gender, off-farm income, home-to-forest distance, farmer group membership, livestock herd size, extension services, and awareness of the environmental benefits of agroforestry being factors that affect the likelihood of farmers adopting agroforestry. It also shows farmland area, household size, and irrigation being major constraints to agroforestry adoption.

Lee et al. [16] discuss the potential of the bamboo industry to be a key component in agroforestry development by comparing an existing model of supplying semi-processed bamboo splits with a new model involving locally produced bamboo handcrafts. A value chain assessment of the two models uses statistical data and interview responses collected in eastern Lao PDR. Results show the new model of selling handcrafts being able to generate 234–244 times more revenue for farmers than the old bamboo split model. The new

handcraft production model could be a credible income generator and ensure sustainable use of bamboo, though it would necessitate specific skills training.

In a study on specific agroforestry species, Shin et al. [17] explore trends in global research on wild-simulated ginseng (WSG), which has been widely used in agroforestry systems across the world for food and medicine. Results show key subjects in global WSG research being growth conditions, effects of WSG, and its components; key countries being the Republic of Korea, China, and the USA; key words being ginsenosides, antioxidant activity, and metabolites; and key topics being medicinal effects, metabolite analysis, genetic diversity, cultivation conditions, and bioactive compounds. They also show research topics changing towards precise identification and characterization of the bioactive metabolites of WSG. This trend suggests increasing academic interest in the value-added utilization of WSG and the potential of non-timber forest products for human well-being.

Nurrochmat et al. [18] examine changes in agroforestry management policies in Indonesia by evaluating local development goals, barriers, and risks to agroforestry implementation. They show the key elements of local development goals being increased stability, public order, and legal and political awareness; increased environmental quality; and increased social and community protection. Results also show challenges to agroforestry implementation and management being lack of financial resources; inappropriate communication with stakeholders; low levels of human capital; and weak coordination. The research stresses the importance of understanding policies and stakeholder interaction and awareness for ensuring successful agroforestry implementation and management.

In a case study in Vietnam, Nguyen et al. [19] apply a knowledge-based approach to investigate how the social and cultural norms of different ethnic groups influence agroforestry adoption in Vietnam. It shows farmers having different ideas about the benefits of agroforestry, and ethnic groups' different social and cultural values affecting farmers' willingness to adopt agroforestry practices. The results indicate the importance of understanding social and cultural preferences before developing agricultural policies and interventions.

Siarudin et al. [20] examine the carbon stock potential of six different agroforestry systems on degraded land in Indonesia using survey, interview, and Rapid Carbon Stock Appraisal (RaCSA) approaches. The study shows all six agroforestry systems having significant capacity for carbon capture, but mixed tree lots having the highest carbon stock. Farmer interview and survey outcomes indicate agroforestry helping soil erosion control and landscape restoration on degraded lands.

Rahman et al. [21] assess tree cover and the direct and mediated effects of tree diversity on carbon storage through stand structure in homegardens in southwestern Bangladesh. Results indicate tree diversity increasing stand basal area and improving total carbon storage in homegardens, and privately managed homegardens represent a potential nature-based solution for biodiversity conservation and climate change mitigation in Bangladesh.

Khadka et al. [22] studied how the adoption of agroforestry would influence the farmers' livelihood through interviews with a structured questionnaire in Nepal. Agroforestry systems are limited with a lack of technical and functional knowledge about agroforestry uses compared to community forestry although farmers in the region adopted agri-silviculture, agri-silvi-pastoral, and horti-agri-silvicultural practices. The authors suggest proper extension services and market development to fill the gaps which hinder agroforestry adoption.

Paudel et al. [23] examined that agroforestry presents opportunities and challenges as a viable way to balance ecological and socio-economic functions in Timor-Leste, where farmers have traditionally implemented agroforestry systems. However, challenges for agroforestry in Timor-Leste still remain, such as lack of knowledge, institutional capacity, and funding. This research suggests sustainable forest management and promotes capacity building and other initiatives.

Table 1. Highlights of research papers presented in the Special Issue.

| Category | Key Topic | Target Area | Methodology | Contributing Manuscript |
|--|---|---------------------|--|-------------------------|
| Article | Research trends on agroforestry and ecosystem services. | Asia-Pacific region | Systematic review | [7] |
| | Factors that influence farmers' decisions to adopt agroforestry. | Nepal | Interviews with a structured questionnaire | [15] |
| | Bamboo-based income generation. | Lao PDR | Value chain analysis (survey questionnaire, field observations and stakeholder interviews) | [16] |
| | Global trends in research on wild-simulated ginseng. | Global region | Systematic review | [17] |
| | Transformation of agro-forest management policy. | Indonesia | Keyword analysis Topic modeling | [18] |
| | Social and cultural norms in agroforestry. | Vietnam | Interpretive Structural Modeling (ISM) | [19] |
| | The carbon sequestration potential of agroforestry systems in degraded landscapes. | Indonesia | Survey questionnaire Interviews Group discussion | [20] |
| | Assessing tree cover and the direct and mediated effects of tree diversity on carbon storage through stand structure in homegardens in southwestern Bangladesh. | Bangladesh | Interview Rapid Carbon Stock Appraisal (RaCSA) | [21] |
| Contribution of agroforestry to farmers' livelihood. | Nepal | Carbon calculation | [22] | |
| Review | The climate change adaptation and mitigation potential of agroforestry systems | South Asia | Interviews with a structured questionnaire | [23] |
| Opinion | Agroforestry opportunities and challenges | Timor-Leste | Review | [14] |
| | | | Review essay | [23] |

3. Expanding the Knowledge Base for Agroforestry in Asia

There are several collections of agroforestry research at the regional level. A Special Issue of the journal *Agroforestry Systems* published in 2012, entitled “Agroforestry Landscapes”, presented nine articles focusing on fruit trees in West African parklands in the African dimension [24]. A Special Issue of the same journal published in 2018, entitled “Advances in European agroforestry”, contained 23 papers based on AGFORWARD project results in the European dimension [25]. This Special Issue focuses specifically on Asian research on agroforestry. It provides diverse approaches and new knowledge on agroforestry policies and practices in Asia. By reviewing previous studies, it explains agroforestry research trends focusing primarily on dominant services and functions of agroforestry and specific crops. Above all, this Special Issue offers multiple case studies from Asian countries including Nepal, Lao PDR, Indonesia, Vietnam, Bangladesh, and Timor-Leste. It examines notable research areas in the social, economic, and environmental benefits of agroforestry, including income generation and carbon sequestration. In this Special Issue, goals, challenges, and social and cultural norms in agroforestry practices and policies are interpreted in national and local contexts. The research can support policy design for the systematization and stabilization of agroforestry.

In conclusion, this Special Issue provides us with scientific evidence and practical lessons on agroforestry policies and practices in Asia. In doing so, it contributes to expanding the knowledge base for agroforestry in the region. The expectation is that the results of this issue can be applied to establishing and implementing agroforestry policies and practices in Asia.

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