Policy Brief

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Photo by Jophel Botero Ybiosa

Mainstreaming Biodiversity in Southeast Asia's Agriculture

Agriculture, generally viewed as the primary driver of biodiversity loss, can have a synergistic relationship with biodiversity. The key to this synergy is the concept of agrobiodiversity.

Agrobiodiversity does not pertain only to plants and animals that are raised in farms or harvested from the wild for food and other uses. It also encompasses that which is known as "associated biodiversity" or the vast range of wild animals, plants, and microorganisms that live in and around agricultural production systems and sustain their structure, processes, and functions. Hence, agricultural systems that use agrobiodiversity sustainably support natural biodiversity conservation, which in turn enhances agricultural productivity and sustainability. In highlighting the interactions between the biodiversity of agricultural and natural ecosystems, the concept of agrobiodiversity therefore facilitates the recognition of natural biodiversity as an asset to be conserved.

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Agrobiodiversity Conservation is Necessary for Food Security

The concern for agrobiodiversity is reflected in the ASEAN Member States' (AMS) National Biodiversity Strategy and Action Plan (NBSAP) progress reports to the Convention on Biological Diversity (CBD), specifically with regard to the Aichi Biodiversity Targets. Almost all AMS have reported accomplishments in the *in situ* and *ex situ* conservation of plant genetic resources related to agrobiodiversity. Some have identified agrobiodiversity as the thematic focus of their NBSAPs, reporting activities related to biodiversity-friendly agricultural practices, documentation and conservation of traditional knowledge on agrobiodiversity, and the incorporation of agrobiodiversity conservation and sustainable use in land use planning.

In some cases, agrobiodiversity practices have already been scaled up as they have been found to facilitate improved productivity, resource conservation, resilience, and equity in social systems. Such efforts illustrate how mainstreaming biodiversity in agriculture is increasingly being recognised as necessary not only in safeguarding the species and genetic diversity that healthy ecosystems require but also in creating more productive, resilient, and sustainable agroecosystems that can effectively address food security concerns.

Agrobiodiversity is Highly Contextual

Mainstreaming agrobiodiversity conservation, however, is not a mere exercise in replication. As demonstrated in the case analysis of nine Southeast Asian agroecosystems—each illustrating how some components of agrobiodiversity can be conserved and sustainably used (Table 1)—agrobiodiversity, and therefore the practices through which it is conserved, is highly contextual. It varies based on the specific ecological, socio-economic, cultural, and historical contexts where it is found.

Table 1. Agroecosystems included in the case analysis

Cases	Key Features
Homegardens in the Upper Citarum River Basin, West Java, Indonesia	Species diversity of crops and animals bring about soil and nutrient conservation as well as address household needs for food and nutrition throughout the year.
Agroforestry system in Kiriwong, Nakhon Si Thammarat, Thailand	Multi-species agroforestry, with some wild species components, is promoted through the development of a wide range of biodiversity-based products tied to the local agrotourism industry.
Muyong-payoh system in the Philippines' Cordillera Administrative Region	The highly diverse and well-maintained muyong (upstream forest) serves as the water recharge area for irrigating the *payoh* (lowland paddy fields).
Mountain area of Sagaing Region, Naga Self-Administered Zone, Myanmar	Strong customary laws reinforced by supportive national policies on the land rights of indigenous people help maintain and protect current agrobiodiversity.
Homegardens in Bukit Gantang, Perak, Malaysia	Cultivation of various species is sustained by knowledge of their multiple traditional uses, especially underutilised species such as *Garcinia atroviridis*.
Mountain agriculture around Mount Ciremai National Park, Kuningan, West Java, Indonesia	The discovery of useful microbes, inspired by a local traditional farming practice, illustrates how the conservation forest has biological resource values that can support the cultivation activities of its surrounding communities.
Upland rice production in Cambodia's Northern Plains	The local farmers receive Agrobiodiversity-generated Payment for Biodiversity Conservation (APBC) through the premium price given to the wildlife-friendly rice they produce.
Coastal agroforestry in Wa Gone, Pyapon, Myaung Mya district, Ayeyarwady Region, Myanmar	The local community's collective action led to the conservation and rehabilitation of the mangrove forestland and to the use of mangrove-friendly crab production practices, thus maintaining the balance between livelihood and environmental conservation.
Agroforestry in the swampy land of South Kalimantan, Indonesia	The diverse and complex agroforestry system, which uses an elaborate system of bunds and canals, not only makes the land more productive but also increased green cover.

The need for food, medicine, fuelwood, construction materials, and extra income were found to be strong determinants of agrobiodiversity in the nine cases analysed. Traditional knowledge on how to sustainably satisfy these needs was also found to be of significant influence. For instance, in the home gardens found at the Upper Citarum River Basin in West Java, Indonesia, where ornamental, vegetable, and fruit species dominate, extensive traditional knowledge on these species' ecological and agronomic requirements determines their appropriate arrangement. The highly diverse agrobiodiversity of the *muyong-payoh* agroforestry system in the Philippines' Cordillera Region is largely shaped by the traditional laws and practices of the Ifugao indigenous people handed down from generation to generation. Likewise, the elaborate system of bunds and canals used to grow specific citrus species and varieties in the swampy lands of South Kalimantan, Indonesia all evolved from traditional knowledge produced for several generations.

Local knowledge on agrobiodiversity and its sustainable use is of course also shaped by catalytic historical events. The agroforestry system in Kiriwong, Thailand developed and were accordingly promoted due to the need for hillside protection after a devastating flood hit the area in 1988. Similarly, the resulting devastation when Cyclone Nargis hit Myanmar's Ayeyarwady Region in 2008 made the villagers of Wa Gone realise the importance of mangroves as natural barriers, which further strengthened their resolve to conserve and rehabilitate their mangrove forestland.

Unpacking Adaptive Practices for Agrobiodiversity

The policies created to scale agrobiodiversity conservation up and out must thus always take its contextual nature into account. As agrobiodiversity is linked to the needs of a particular community and interwoven into their local context and belief system, adapting good practices from one context involves unpacking key elements and principles and then using these to build upon or strengthen practices in others. Distilling these adaptive practices for agrobiodiversity (APAs) facilitates agrobiodiversity conservation mainstreaming through policy formulation and interagency collaboration in research and extension.

APAs are often interlinked activities, processes, systems, and structural arrangements mainly derived from traditional knowledge and are sometimes combined with formal knowledge from government extension activities. Three such mechanisms were identified by analysing the nine AMS cases, namely:

1. Improving the value of underutilised species and their wild relatives through technological and market enhancement,
2. Incentivising agrobiodiversity conservation through agrobiodiversity-generated payment for biodiversity conservation, and
3. Integrating agrobiodiversity in land use planning through the related issues of disaster risk reduction and tenurial security.

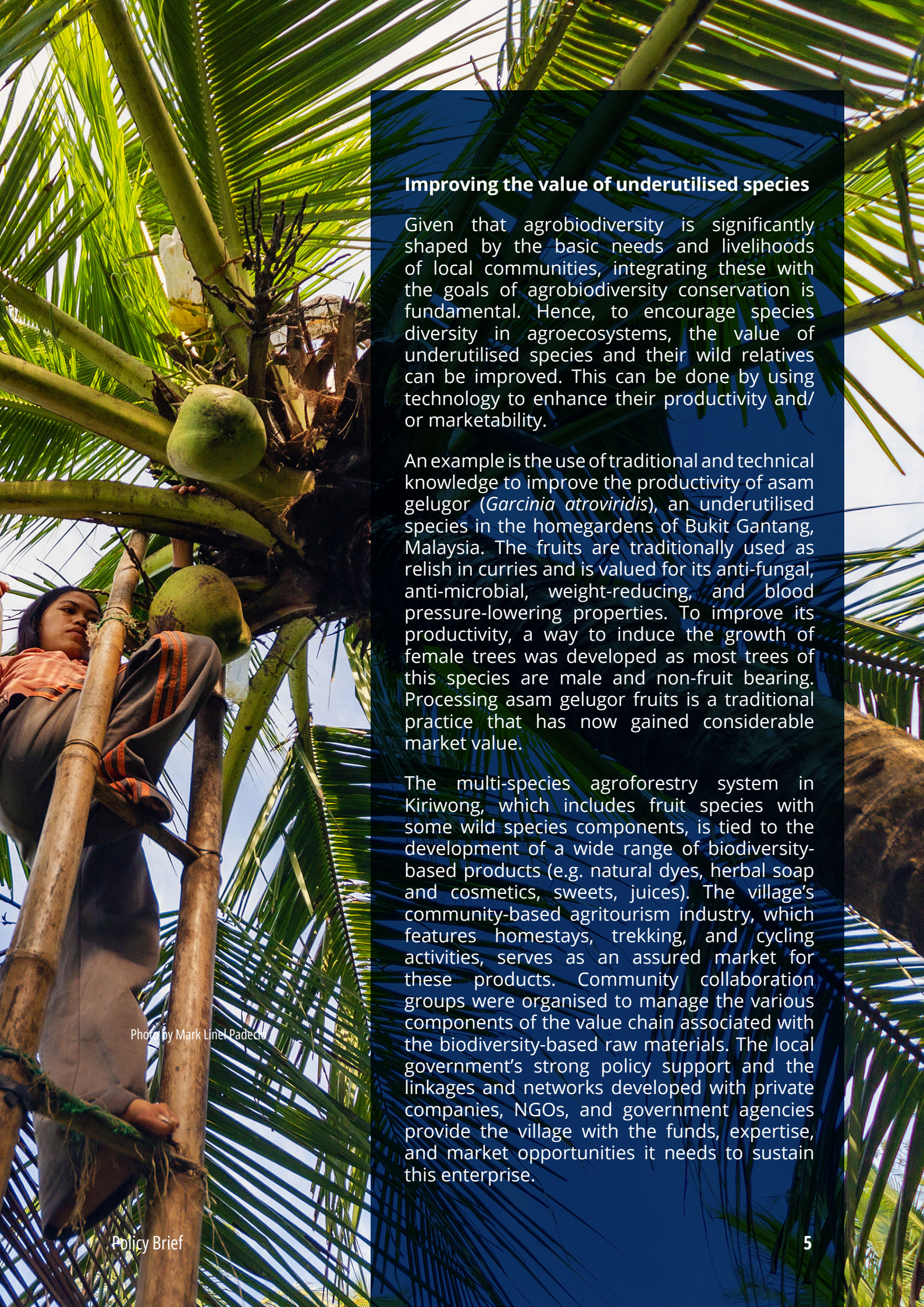

Photo by Mark Linel Padecio

Improving the value of underutilised species

Given that agrobiodiversity is significantly shaped by the basic needs and livelihoods of local communities, integrating these with the goals of agrobiodiversity conservation is fundamental. Hence, to encourage species diversity in agroecosystems, the value of underutilised species and their wild relatives can be improved. This can be done by using technology to enhance their productivity and/or marketability.

An example is the use of traditional and technical knowledge to improve the productivity of asam gelugor (*Garcinia atroviridis*), an underutilised species in the homegardens of Bukit Gantang, Malaysia. The fruits are traditionally used as relish in curries and is valued for its anti-fungal, anti-microbial, weight-reducing, and blood pressure-lowering properties. To improve its productivity, a way to induce the growth of female trees was developed as most trees of this species are male and non-fruit bearing. Processing asam gelugor fruits is a traditional practice that has now gained considerable market value.

The multi-species agroforestry system in Kiriwong, which includes fruit species with some wild species components, is tied to the development of a wide range of biodiversity-based products (e.g. natural dyes, herbal soap and cosmetics, sweets, juices). The village's community-based agritourism industry, which features homestays, trekking, and cycling activities, serves as an assured market for these products. Community collaboration groups were organised to manage the various components of the value chain associated with the biodiversity-based raw materials. The local government's strong policy support and the linkages and networks developed with private companies, NGOs, and government agencies provide the village with the funds, expertise, and market opportunities it needs to sustain this enterprise.

Incentivising agrobiodiversity conservation

Agricultural practices that respect natural biodiversity can also be rewarded by developing agrobiodiversity-generated payment for biodiversity conservation (APBC) schemes. For example, in Cambodia's Northern Plains, local farmers who participate in the IBIS Rice programme receive APBC through the premium price given to the wildlife-friendly rice they produce. The programme, which was launched in 2009, helps to conserve the vulnerable habitats of more than 50 species of global conservation concern including the giant ibis (*Thaumatibis gigantea*) and the white-shouldered ibis (*Pseudibis davisoni*). This is done while also improving the livelihood of the local communities living within and on the borders of the Northern Plains' wildlife sanctuaries. Through organic agriculture, science-based knowledge is combined with traditional practices to develop a cultivation approach that improves agroecosystem resilience against the climate change-induced droughts experienced in the area. The local communities' participation in the programme has resulted in reduced poverty and increased populations of critically endangered species within and around the IBIS Rice fields and villages.

If the intellectual property rights issue can be worked out such that the benefits from bioprospecting in Indonesia's Mount Ciremai National Park accrue to the local community, then these benefits can also be considered as a type of APBC. Mount Ciremai National Park and its rich biodiversity is jointly managed by the Taman Nasional Gunung Ciremai (TNGC), Perum Perhutani, which is a state-owned enterprise that manages the state forests in Java and Madua, and its surrounding communities. Bioprospecting research in the area has resulted in the development of three microbial isolates that can increase agricultural productivity without using chemical fertilizers or pesticides. These microbes were discovered as inspired by the local farmers' past practice wherein they took topsoil and litter from the mountain forest to use as fertiliser in their farms. The results of the bioprospecting activities in Mount Ciremai are thus important in demonstrating how conservation areas contribute to solving problems related to mountain agriculture and climate change and to supporting their surrounding communities' cultivation activities. This is particularly relevant to the farmers of Ciremai's buffer villages with whom TNGC has been working with since 2018 to develop healthy agriculture.

Valuation studies can be conducted to provide the basis for implementing APBC schemes. Such studies will put actual economic values to the services that natural ecosystems contribute to agroecosystem productivity and resilience.

Integrating agrobiodiversity in land use planning

As demonstrated in the experiences of Kiriwong and Wa Gone, disaster risk reduction and agrobiodiversity goals overlap. Both highlight the importance of considering landscape-level interactions, which include the linkages between agricultural and natural ecosystems, as input into land use planning.

Related to this is the issue of tenurial security. Providing tenurial security to encourage and support social arrangements that promote the sustainable use of agrobiodiversity is necessary. For instance, in granting the villagers of Wa Gone with forestland tenure and management rights, the community was able to develop a local institution that not only improved agrobiodiversity benefit generation but also allowed for the more equitable distribution of these derived benefits through their community development fund.

Similarly, providing land tenure to cultures whose practices and traditional laws promote agrobiodiversity conservation and sustainable use is important in the efforts to mainstream biodiversity in agriculture. The Philippines' Indigenous People's Rights Act of 1997, which protects the rights of indigenous peoples to their ancestral lands, supports the continued practice of the *muyong-payoh* agroforestry system. Likewise, Myanmar's 2016 National Land Use Policy recognises aspects of customary tenure systems and has allowed the ethnic tribes of the Naga Self-Administered Zone to uphold their customary land use systems. The Naga customary system secures all land within village boundaries from generation to generation, which enables the integrated management of forests, agroforests, and agriculture.

The Role of Policy in Preserving Agrobiodiversity Knowledge

Aside from contextual factors, government policies and markets also shape agrobiodiversity. In Indonesia's Upper Citarum River Basin where highly diverse home gardens are often found around house clusters surrounded by rice fields, the shift in government policy towards the promotion of commercial enterprises has led to a corresponding shift to dairy and vegetable production. While this substantially improved local income, some ecological costs were incurred in the form of protected forest encroachment, hydrological impairment of the watershed, decline in faunal species, and soil deterioration.

The preference for agricultural systems that generate more income is also projected to lead to the decline of homegarden cultivation in Bukit Gantang. Farm income derived from growing oil palm and rubber trees in the area is much higher than those derived from home gardens, and there is a greater tendency for farmers to favour this type of farming.

Market homogenisation, or the tendency towards standardisation and uniformity in global markets, can reduce agrobiodiversity by prioritising the use of high-value species. In the *muyong-payoh* system, certain trees species are being favoured for *muyong* cultivation because of the demand from the local wood carving industry. The income from planting fast-growing and exotic species may end up replacing the local and more diverse species.

Large-scale state-imposed policies and interventions are obviously effective ways through which agrobiodiversity conservation can be supported and scaled up. However, they often fail to reach the intended conservation goals when they fail to consider the diversity of local contexts. Key issues such as the importance of traditional local knowledge systems are often overlooked. This is of major concern as the intergenerational transfer of this knowledge system is under threat; the existing educational system often does not include traditional knowledge materials (e.g. traditional knowledge on crop mixing, medicinal plants, locally-adapted crops), thus creating a discontinuity that inadvertently accepts the narrowing agrobiodiversity. Policy support is hence necessary to prioritise the preservation of traditional agrobiodiversity knowledge through research. Such knowledge is crucial in making policies and mechanisms that incentivise agrobiodiversity conservation and encourage crop diversification more context-sensitive and effective.

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