University Extension Programs to Develop Intellectual Property in the Agricultural Sector of Marginalized Rural Communities in the ASEAN Region

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1 Introduction

Rural communities in developing economies are often marginalized due to their small holdings, small individual economic impact, inferior seed stock, and competition from large landholders. Sustainable production for subsistence farmers is vital, but they may be resistant to making any changes to their methods of production or crop type. Although many governments have recognized that national growth is dependent on innovation, they have often failed to promote or promulgate innovation into rural communities. However, there is a growing interest worldwide in

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protecting traditional knowledge, genetic resources, plant intellectual property protection, plant variety rights, and geographical indications in an effort to leverage current knowledge and build for future development. In this chapter, we focus on the ten countries which compose the Association of Southeast Asian Nations (ASEAN): Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.

Universities are also championing innovation as an important source of new ideas for advancing sustainable development, which is seen as a key to maintaining growing standards of living around the world without destroying the planet. This is especially notable for rural universities with faculties of agriculture, who have a critical role to play in this area, both within their local communities and on a broader level for the developing countries they neighbor. There are many areas where extension services could be deployed. On the one hand, universities can help rural communities navigate the maze of intellectual property rights surrounding plant innovation to obtain better genetic sources and exploit other means for sustainable development. On the other hand, they can help communities expand their own innovations for potential intellectual property rights and, where possible, license them for the benefit of the community.

Appellations of Origin (AOs) and Geographical Indications protect producers or manufacturers of goods, including agricultural products, and are discussed in detail in Gangjee (2016). The Geneva Act of the Lisbon System defines a Geographical Indication as an appellation containing the name of a geographical area that designates the origin of that good "which serves to designate a good as originating in that geographical area, where the quality or characteristics of the good are due exclusively or essentially to the geographical environment, including natural and human factors, and which has given the good its reputation" (art. 2[i]) as well as any appellation "which identifies a good as originating in that geographical area, where a given quality, reputation or other characteristic of the good is essentially attributable to its geographical origin" (art. 2[ii]).

The development of Geographical Indications (GIs) and protection of plant varieties in less developed countries are avenues for cooperation between rural communities and universities. The registration of GIs has proven economic benefits to some local communities. Six of the ten nations in the ASEAN have domestic products with Geographical Indications. The issue is not that they lack the products to protect; rather, they need assistance to develop the GIs. In agriculture, this means

defining the geographic region, product development, and specifying the product's unique characteristics.

The ASEAN is home to many indigenous communities that traditionally use herbs and medicinal plants to treat various kinds of illnesses and disorders. Communities require assistance in identifying and evaluating the medicinal properties of these herbs and medicinal plants, the protection of the traditional knowledge, in sustainable production, and in the protection of plant varieties. The goal of universities should be to work together with the local community for the common good and to include the community in the rewards from any commercial production.

Rural communities need to be assisted with the negotiation of rights and with the intellectual property (IP) minefield so that they have access to superior genetic resources at an affordable price. This will improve yields and with outreach services that improve farming practices, will greatly assist such communities in overcoming the poverty trap.

The importance of agriculture in developing economies must not be underestimated. Of the ASEAN countries, Singapore is considered to have a developed economy, Cambodia, Lao PDR, and Myanmar are the least developed economies, with the remainder termed as developing countries (United Nations Committee for Development Policy, 2021). Except for Brunei Darussalam and Singapore, the percentage of the workforce employed in the agriculture, fishery, and forestry sectors is highly significant. In the case of the three least developed members, the agricultural workforce is greater than 40% (ASEANStat, 2020). Therefore, the development of these sectors is a key pillar in their future development.

While significant extension activities are being undertaken in the agricultural sector worldwide, the role of universities, like most of the other providers, is focused on the broader issues of better farming practices (Swanson & Davis, 2014). This chapter focuses on how universities and other providers can assist primary producers to develop and protect their intellectual property rights and to increase the quality and profitability of their produce, with a particular focus on geographical indications.

2 The Issue

The intellectual property protection regime in agriculture is complex as it attempts to balance the rights of farmers against those of plant breeders. "[T]he unauthorized use of patented material may involve the user in patent liability. In the agricultural sector, the potential defendants are;

farmers growing seed with patented DNA; traders in proprietary seed; and research institutes utilizing patented DNA or distributing seed with that DNA" (Blakeney, 2020b, s. 2.5). The sections that follow describe the implications of this issue, providing further details about intellectual property in the agricultural sector, as well as the role of universities in the resolution of the issue.

3 Intellectual Property in the Agricultural Sector

As we will describe in detail, the agricultural sector is subject to a veritable maze of IP treaties and legislation. Discussed below are some of the treaties that are intended to protect farmer's rights and others which seek to protect the rights of developers rather than farmers, such as dedicated plant breeders. The discussion is restricted to the agricultural sector concerned with plants (i.e., members of the Kingdom Plantae).

Agreement on Trade-Related Aspects of International Property Rights (TRIPS)

Members of the World Trade Organization, which includes all ten members of ASEAN, are obligated to implement laws to protect intellectual property rights under article 1(1) of the Agreement on Trade-Related Aspects of Intellectual Property Rights, 2017 (TRIPS). They are free to determine the appropriate method of implementing the agreement within their legal system and practices (art 1[1]). Members must accord the same treatment as set out in TRIPS to the nationals (both natural and legal persons) of the other members (art 1[3]). The TRIPS protections relevant to agriculture are outlined below.

Geographical Indications

A geographical indication (GI) identifies a good as "originating in a member's territory, or a region or locality in that territory, where a given quality, reputation, or other characteristic of the good is essentially attributable to its geographical origin" (art 22[1]). Legal means must be provided for interested parties to prevent the designation or presentation of a good that misleads the public as to its geographical origin (art 22[2][a]) or which constitutes an act of unfair competition (art 22[2][b]). There are additional protections for Geographical Indications for wines and spirits (art 23).

Plant Patents

Patents must be available for any invention in fields of technology regardless of whether it be a product or process (art 27[1]). They must be new, involve an inventive step, and be capable of industrial application (art 27[1]). Patent rights must be available regardless of the place of invention, the field of technology, and country of production (art 27[2]). Members may

> exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusion is not made merely because the exploitation is prohibited by their law. (art 27[2])

Members may also exclude from patentability

> plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective *sui generis system* or by any combination thereof. (art 27[3])

Unfortunately, TRIPS does not define the requirements of a sui generis system (Repetto & Cavalcanti, 2000). At the time of the drafting of the TRIPS, the International Union for the Protection of New Varieties of Plants (UPOV) Convention was the only extant *sui generis* system, although the TRIPS does not prescribe its adoption. Subsequently, all ASEAN members have enacted their own legislation rather than relying on UPOV (Smith et al., 2023). This issue is discussed in detail in the Food and Agricultural Organization (FAO) Manual on TRIPS (Repetto & Cavalcanti, 2000). The UPOV Treaty provisions are discussed below.

International Union for the Protection of New Varieties of Plants (UPOV) Convention

The granting and protection of breeders' rights for new varieties of plants are a fundamental obligation of the contracting parties to the International Convention for the Protection of New Varieties of Plants, 1991 (UPOV Convention) (art 2). For a breeder to be granted rights, the variety must

be new, distinct, uniform, and stable (art 5). These criteria are described in detail in the Convention (art 6-art 9). Authorization is required from the breeder for production or reproduction, conditioning for propagation, offering for sale, selling or other marketing, and exporting, importing, and stocking for any of the purposes mentioned earlier (art 14[1]). Breeders' rights do not extend to non-commercial acts for private purposes and acts done for the purpose of breeding of other varieties (art 15[1]). The duration of the breeders' rights must be no less than 20 years from the date of the grant except for trees and vines, where the duration must be at least 25 years (art 19). Further discussion about the UPOV can be found in (Sanderson, 2017).

International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)

The ITPGRFA was developed for the "conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security" (ITPGRFA, 2001 art 1.1). As we explore below, it is closely linked to the Convention on Biological Diversity (art 1.2). The treaty requires the contracting parties to ensure the conformity of their laws and regulations (art 4). The scope of the obligations includes the "conservation, exploration, collection, characterization, evaluation and documentation of plant genetic resources for food and agriculture" (art 5); and, to develop and maintain legislation and agree on procedures "that promote the sustainable use of plant genetic resources for food and agriculture" (art 6).

Parties are to protect and promote Farmers' Rights, including the "protection of traditional knowledge relevant to plant genetic resources for food and agriculture" (art 9.2[a]); ensuring the equitable "sharing benefits arising from the utilization of plant genetic resources for food and agriculture" (art 9.2(b)); and, ensuring participation in decision making, "at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture" (art 9.2[c]). Examples of success stories and best practices are described in Andersen and Winge (2013).

Convention on Biological Diversity

The objectives of the Convention are

> the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding. (Convention on Biological Diversity, 1993 art 1)

Santilli (2012) discusses the interface between agrobiodiversity and the law, while Chiarolla (2011) argues that current global institutional reforms that govern crop diversity are insufficient.

Traditional Knowledge

Over time, farmers have adapted their techniques to local environmental conditions (Kuruk, 2020, p. 51). Similarly, others discovered the medicinal properties of plants and applied that knowledge to promote health and well-being in their community. Kuruk (2020) argues that products and practices based on traditional knowledge are similar to those that can be protected under intellectual property laws (p. 51). The issue is that they must meet the accepted notions of intellectual property such as "ownership, originality, duration, inventiveness and uniqueness" (p. 54).

As of October 2021, the World Intellectual Property Organization has been unable to agree on the contents of an international legal instrument relating to the intellectual property protections that should be provided to genetic resources, traditional knowledge, and traditional culture (WIPO, 2021a). One of the issues is the difficulty of agreeing on a definition of "traditional knowledge," although this may be neither possible nor necessary (WIPO, 2001, p. 25). WIPO has a detailed working definition: The relevant components for the agricultural sector are tradition-based inventions, scientific discoveries, and all other tradition-based innovations and creations resulting from intellectual activity in the industrial or scientific fields (p. 25). The lack of a treaty has been no impediment to developing countries implementing their own domestic legislation. Most of the ASEAN economies have introduced such legislation (see Smith et al., 2023). For instance, in 1999, Thailand legislated its Protection and Promotion of Traditional Thai Medicinal Intelligence Act, B.E. 2542

(1999) and Plant Varieties Protection Act B.E. 2542 (1999). The issues associated with the intellectual property protection of traditional knowledge are discussed in depth by Santilli (2012, Chap. 11), Kuruk (2020, Chap. 3), and Blakeney and Siddique (2020). For instance, a case study by Charoenniyomphrai et al. (2006) investigates indigenous knowledge, customary use of natural resources, and sustainable biodiversity management amongst the Hmong and Karen communities in the mountainous areas of Thailand.

Potential Extension Roles for Universities

Improvement of Agricultural Practices

Chemical deterioration is the major type of land degradation in Thailand, Cambodia, the south of Vietnam, and the northern part of Borneo Island, while physical deterioration is the major mode in the Philippines (Takeshima & Joshi, 2019, p. 4) and deforestation is a major threat in Indonesia. Forested land makes up around 50% of the land area of Southeast Asia, but the rate of forest loss since the 1990s has been between 0.3% to approximately 0.65% per annum (p. 5). The annual reduction of carbon stock in living biomass in Indonesia has been 1.79% per annum since 2000, mostly due to oil palm production.

For the decades of the 1990s and the 2000s, the average annual growth of agriculture value-added fluctuated to around 3% across all Southeast Asian countries (Takeshima & Joshi, 2019, p. 6). In the 2010s, growth slowed down, particularly in Brunei Darussalam, Myanmar, the Philippines, Thailand, and Timor-Leste. Indonesia and Malaysia, however, showed growth during the 2010s of around 4% per annum. All Southeast Asian nations have adopted modern, mostly non-hybrid, varieties of rice; from around 30% in the 1970s to 70% in 2000 (Takeshima & Joshi, 2019, p. 6). Thailand was slower to adopt these varieties due to its focus on aromatic rice. The adoption of hybrid rice has remained low in all Southeast Asian countries (p. 7). Cereal crops, such as maize, have shown a fast adoption of hybrid varieties, as have root crops such as cassava and potatoes (p. 8). Mechanization has expanded across the region over the last few decades with the emphasis on small, low horsepower tractors that are often two-wheeled (p. 9). The use of agrochemicals has increased significantly since the 1960s to the point where there is concern about potential overuse (p. 10).

Irrigation accounted for 22% to 28% of irrigated land from 1993 to 2013, while it remained virtually unchanged at 13% in the maritime states (Takeshima & Joshi, 2019, p. 10). Surface water is the predominant source of irrigation water at over 95%. Salinization in irrigation areas is non-negligible in most of Southeast Asia, estimated in 2018 to be 8% of the irrigated land in Thailand and Vietnam, and 9% in Indonesia (p. 4).

The potential roles for universities in the improvement of agricultural practices are almost limitless. Subsistence farmers need assistance improving horticultural practices to make them more sustainable. The task may be as simple as working with groups of farmers to improve their existing techniques, while at the same time learning practices from them that may be applied elsewhere. One pressing need, particularly in parts of Southeast Asia, is to develop practices to remove the need for burning crop stubble to avoid the very high levels of pollution that impacts many parts of the ASEAN's countries. Innovation is needed to improve crop yields, while at the same time increasing immunity to crop diseases. Salinization needs to be reversed where possible and actions developed to stop its spread, including development of saline-resistant crops. There is a pressing need for the development of herbicides and pesticides that do not imperil the health of rural workers, nor leaving residual compounds that are a threat to users.

Geographical Indications

ASEAN member Cambodia recorded Kampot Pepper as the first GI registered via the Geneva Act, 2015 of the Lisbon System (Lisbon Agreement, 1979) of the World Intellectual Property Organization (WIPO, 2021b). Kampot Pepper is grown exclusively in the provinces of Kampot and Kep and was registered domestically in 2010. According to figures released by the Department of Intellectual Property of the Ministry of Commerce of Cambodia, the impact of registration has been significant (WIPO, 2021b). The average farm-gate price rose from an average of USD 7.50 in the year before domestic registration to USD 22.70 ten years after registration (WIPO, 2021b). At the same time, the value of production rose from USD 70,000 to over USD 1 million. A study highlighting the role of contract farming and the role of the Kampot Pepper Agricultural Cooperative and the Kampot Pepper Promotion Association is described in detail by Thorng and Chao (2016).

As noted in Table 1, six of the ASEAN members have recognized the potential for promoting the geographical indication of products to their

Table 1 Geographical indications registered in the ASEAN Members States as of November 27, 2021

Member	*Total*	*Foreign*	*Domestic*		*Main GI agricultural products*
			Non-agricultural products	*Agricultural products*	
Brunei Darussalam	–	–	–	–	–
Cambodia	5	1	–	4	Palm sugar, Pepper, Pomello, Wild honey
Indonesia	92	9	12	71	Coffee, Fruit, Spices
Lao PDR (Phonevilay 2021)	6	–	2	4	Coffee, Rice, Tea
Malaysia	80	8	33	39	Fruit, Rice, Spices
Myanmar	–	–	–	–	–
Philippines	1	1	–	–	–
Singapore	144	144	–	–	–
Thailand	114	11	31	72	Coffee, Fruit, Rice, Spice
Vietnam	95	1	16	78	Fruit, Rice, Spice

local producers. Indonesia, Thailand, and Vietnam have been the drivers with agricultural products, followed by Malaysia. Interestingly, two of the three least developed members, Cambodia and Lao PDR, have embraced the concept for key local products, thus improving the quality of life of those local communities, whether as producers or providers of labor.

Thailand has the greatest number of domestic GIs in the ASEAN. The ASEAN database has complete details, in English, of each product. Thailand launched its geographical indication registration system in 2004. Subsequently, it launched its One Province One Geographical Indication scheme to develop one GI product for each of its 77 provinces (Department of Intellectual Property, 2013). As can be seen in Table 1, not all are agricultural products. In 2013, the Department issued the second edition of One Province One Geographical Indication (Department of Intellectual Property, 2013), which details ten GI products described in Thai and English. A full list of these is available via (provide source), the products showcased were varied, and include examples such as:

(a) Doi Tung Coffee, Chiang Rai Province northern Thailand—a coffee growing in an area of around 480 hectares in the mountains of northern Thailand at the height of between 800 and 1200 meters. Local hill tribes participate in all stages of the production process;
(b) Phurua Plateau Wine from Loei in northeastern Thailand is grown on a high plateau at 650–800 meters above sea level. The topsoil is a one-meter-deep layer of sandy loam soil. The minerals in the soil and abundant rainfall allow vines to blossom in November and produce fruit during the cool season.
(c) Trang Roast Pork from the southern province of Trang is characterized by its method of roasting and the marination ingredients and
(d) Surat Thani Oyster from southern Thailand is cultivated in Ban Don Bay of Surat Thani Province and has specific physical characteristics.

As well as registering GIs in Thailand, the Department of Intellectual Property registers Thai GIs in foreign countries to provide intellectual property protection in international jurisdictions. By May 3, 2021, six products had been registered internationally by the Department: Thung Kula Rong Hai hom mali rice, Doi Chaang coffee, Doi Tung coffee, and Sangyod Muang Phatthalung rice in the EU; Isan indigenous Thai silk yarn in Vietnam; and Lamphun brocade Thai silk in India and Indonesia (Arunmas, 2021). At the same time, applications have been lodged for Thung Kula Rong Hai hom mali rice, Pakpanang Tub Tim Siam pomelo, and Phetchabun sweet tamarind in China; Doi Chaang and Doi Tung coffee and Huay Mon pineapple in Japan; Phetchabun sweet tamarind and Lamphun golden dried longan in Vietnam; and Thung Kula Rong Hai hom mali rice, Sangyod Muang Phatthalung rice, Pakpanang Tub Tim Siam pomelo in Malaysia (Arunmas, 2021).

Cambodia and Lao PDR have followed a different path. They are party to the Geneva Act of the Lisbon Treaty (Geneva, 2015), where the state parties are able to access a one-stop-shop to register appellations of origin and geographical indications through a single procedure within the World Intellectual Property Organization under the Lisbon Agreement for the Protection of Appellations of Origin and their International Registration, 1979.

The potential roles for universities in the development of GI products will involve specialist with a variety of skills. The key is to determine the characteristics that make a particular product “unique” and distinguish it

from other similar products. In the non-agricultural area, this can be fairly straightforward, where weavers from a particular area use a special weaving technique or have developed a characteristic design. In the agricultural sphere, it is more complex, as it requires the product to be grown in a defined area with a particular geography and soil characteristics. The product must be able to be differentiated from similar products from other areas on the basis of shape, color, taste, or smell. The product must be uniform across its production area.

Traditional Knowledge

Traditional knowledge possessed by indigenous peoples and farmers is important "in identifying biological resources worthy of commercial exploitation" (Blakeney, 2020a, s. 3.5). For instance, in 2018, around two-thirds of the population of India relied on indigenous knowledge of biological resources, with more than 7500 species being utilized for this purpose (Sharma et al., 2018). Agricultural applications include knowledge of local biological resources, animal breeds, and local plant, crop, and tree species (Hansen & Van Fleet, 2007). This knowledge would also identify which plants are indicators of soil salinity. Blakeney (2020a) notes that a significant contribution "has been made by the knowledge of indigenous peoples and farmers in the development of new crop types and biodiversity conservation" (s. 3.5).

The World Health Organization (2019) recognizes the role of *herbal medicines,* which include "herbs, herbal materials, herbal preparations as well as finished herbal products that contain, as active ingredients, parts of plants, other plant materials or combinations thereof" (p. 8). It defines *indigenous traditional medicine* as the sum total of knowledge and practices, whether explicable or not, used in diagnosing, preventing, or eliminating physical, mental, and social diseases. This knowledge or practice may rely exclusively on past experience and observation handed down orally or in writing from generation to generation. These practices are native to the country in which they are practiced. The majority of indigenous traditional medicine has been practiced at the primary healthcare level (p. 8).

Traditional medicine is "the sum total of the knowledge, skill and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness" (p. 8). The importance of traditional medical

knowledge should not be underestimated, as many of our modern medicines and vaccines are derived from natural resources and the associated traditional medicine (WIPO, 2015, p. 1).

In 2010, the ASEAN published its first compilation of herbal and medicinal plants (Ali et al., 2010). Each of the 142 plants is described by its attributes, including scientific and vernacular names, chemical constituents, reported medicinal usage and whether this is supported by experimental/clinical data, contraindications, and references. A second edition, including 159 species commonly used and consumed for health benefits and preventative properties, was published in 2017 (Sukmajaya, et al., 2017). While reliable data is unavailable, the Secretary-General of the ASEAN, in the foreword to the 2nd edition, opined that "about 1,500 plant species have been widely used for traditional medicines" (p. iii). He considered that

> with this high potential it is expected that ASEAN Member States and people in the region could get benefit from utilizing herbal and medicinal plants for improving livelihood and support healthcare (or the region's population. With reliable policy support, standards, safety. quality and sustainable resources, herbal and medicinal plants can be further explored to support the development of the traditional medicine industry. (p. iii)

To assist the development of the traditional medicine industry within the ASEAN economies, the ASEAN Traditional Medicines Scientific Committee (ATSC) developed Guidelines on Safety Substantiation and Guidelines on Claims and Claim Substantiations (Pramono, 2019). These guidelines developed in 2014 (ASEAN Traditional Medicines and Health Supplements Scientific Committee Meeting, 2014) were incorporated as Annex VII into the draft ASEAN Agreement on Regulatory Framework for Traditional Medicines, which was opened for signature on May 16, 2017.

Roles for universities in the area of traditional knowledge require yet another different skill set. In this context, personnel with people skills that can work with local communities and gain their confidence and trust are required to identify how biological resources are being used in the community and for what purpose. This knowledge will be held with high regard in the community, so it should not be dismissed, but its efficacy must still be tested. It is important to remember that many of the medicines used in the west are based on compounds found in indigenous communities. Once a suitable product has and been sourced, it must be tested

both pharmacologically and for efficacy in its proposed role. Universities can also play a role in product development, production, product registration, marketing, and ongoing support.

4 University Extension Programs in Action

Promoting Development of Herbal Products for Community Health

In southern Thailand, staff from Walailak University worked with a subdistrict hospital to develop guidelines for the development of herbal products to promote community health (Walailak University in Collaboration, 2020). The main activities carried out as part of the project included field visits to survey local medicinal plants and obtain traditional knowledge on the use of herbs locally, as well as the sources of local herbal raw materials. Most importantly, the University project leader conducted a forum with the local community to brainstorm ideas about developing herbal massage oil products. The discussion covered cultivation and collection of the herbs, developing, and processing the raw materials to develop a certified quality product. They also desired to market the product through both online and offline marketing channels.

In September 2021, a workshop was organized to launch "Plai Oil, Liniment, Pain Relief" with members of the community enterprise group established to develop herbal products and the staff of the hospital. The herbs were to be marketed under the brand "Happy Herb: Health and Happiness with Local Herbs." The project team brought the prototype product to the market to be used in the care and rehabilitation of the elderly (Walailak University, 2021). Plai Oil is an extract from a member of the ginger family—*Zingiber cassumnar Roxb.* Its medicinal properties have been reported in the literature (see Leelarungrayub et al., 2017).

Subject to determining the unique properties of the Plai Oil from the local area, it would be possible for the community to apply for GI registration. This will present a new challenge for both the university and the community. The key question is, how does the growing environment differ from that of other potential producers? Otherwise, a trademark should be registered.

Preparing for Registration of Geographical Indication for Mangosteens
Ban Khiriwong is a village in southern Thailand where mangosteen is planted in an area 250–900 m above sea level (Walailak University, 2020). The mangosteens are planted in a garden-style with other plants or other forest plants such as the betel nut (*Areca catechu*) and sataw (*Parkia speciosa*). In early 2020, staff from Walailak University assisted the local community in their preparation of the documentation to register "Khao Khiriwong Mangosteens". The growing area includes planting areas in a number of adjacent local villages. The resultant fruit has characteristics different from those of other areas. Producers believe that this is the result of the fruit being grown in an area with high humidity and shade from trees with full sun and low rainfall.

Outreach Activities to Local Communities
In early 2021 Walailak University conducted outreach activities to primary producers within the Nakhorn Si Thammarat Province (Raise the Ability, 2021). During a two-month period, staff from the university undertook the following activities to assist farmers to produce and manage products efficiently, ensuring safety and quality:

(a) Groups of farmers who grow vegetables, peppers, and guava were encouraged to expand biochemical pesticides to eliminate diseases and pests in a highly efficient, low-cost manner when used correctly.
(b) Fish farmers were provided information on coastal aquaculture development and good post-harvest care practices to meet agricultural best practice. They were also provided with information on coastal marine biology and
(c) Pig farmers were provided with information on good agricultural practice (GAP) to improve product quality, promote pig health, and meet certification standards.

The initial activities were to be followed by incorporating the information into a group management and financial system. In addition, the communities would be assisted with developing their marks both within and outside the local community. The modes would be both online and offline.

5 Conclusion

Universities are by far the best placed institutions to undertake community outreach in this sector. They can provide an integrated "one-stop-shop" for the services that are required. A comprehensive team to support the agriculture sector could include:

(a) Agronomists
(b) Soil scientists
(c) Botanists
(d) Biologists
(e) Water engineers
(f) Chemists
(g) Community development specialists
(h) Pharmacists
(i) Traditional medical researchers
(j) Food technologists
(k) Intellectual property lawyers
(l) Marketing professionals and
(m) Business development specialists

In addition, depending on the community, there may be a need for services such as basic community health, financial management, and work skills. No other organization would be able to draw on all of these resources in-house.

Most importantly, where opportunities exist, the challenge is to be proactive and seek them out. Universities can start out by providing a community service. Later, they may open commercial opportunities where the university can partner with the local community to benefit from the project's success. They should not wait for a sponsor to act.

Sharma (2018), while specifically discussing the relationship between scholars from the Nepali diaspora and local Nepali academics, provides insightful advice on this issue

> Those who are working on the ground may not need or want outside help. In my experience of working … there is no lack of talent, knowledge, or skill among them. Colleagues back home are brilliant, or at least far more knowledgeable about the local context, including its challenges and opportunities. What we should strive to create instead is a positive and healthy environ-

> ment of exchange and collaboration, and that should be done through collaboration and slow, humbling process of learning. (para. 15)

Valuable resources for the undertaking of agricultural outreach services have been prepared by the International Food Policy Research Institute (IFPRI) and the Centre for Research on Innovation and Science Policy (CRISP) who funded the development and publication of Good Practice Notes for Extension and Advisory Services. These were prepared by the Global Forum for Rural Advisory Services (GFRAS) (2016; Davis & Sulaiman, 2016). They are freely available online.[1] The most recently published note was GGP Note #29, in 2017. The philosophy behind the system is the agricultural knowledge and information approach, which emphasizes the two-way links between farmer, research extension, and education (Davis & Sulaiman, 2016, p. 2). The Practice Notes are quite comprehensive and expansive in their topics, covering topics as diverse as the use of mass media such as leaflets, pamphlets, posters and radio, websites and mobile/cell phones; demonstrations, training and visiting systems (T & V); farmers field schools (FFS); Theatre; Videos; and Innovation Platforms. The idea behind the Practice Notes was to consolidate the available information in one place and present it in "easy-to-understand formats" (Posthumus & Wongtschowski, 2014, p. 1). To further assist those wishing to develop effective agricultural extension services, GFRAS has also developed a learning kit to assist in the capacity development of extension workers in the agricultural sector, which is also available online.[2]

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[1] These resources can be found at www.betterextensions.org

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