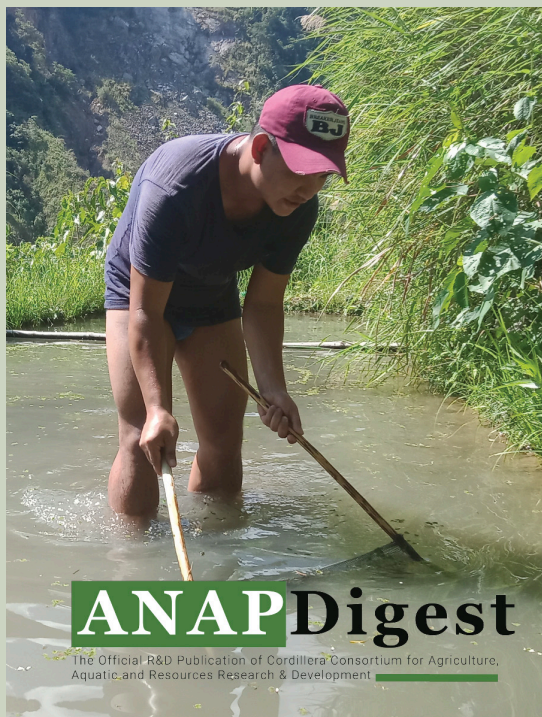




ANAP Digest

The Official R&D Publication of Cordillera Consortium for Agriculture, Aquatic and Resources Research & Development

about the cover



Traditional knowledge and indigenous practices play a significant role in understanding the community and its important role in the context of AANR.

The communities surrounding the Amburayan River in Kapangan Benguet continuously practice the traditional fishing technique called "sarep". Sarep is done by partly draining a part of the river system and leaving it for hours or overnight.

in this issue

- 4 Dapil or Chapil: Discover the Swimming Colors of Amburayan River
- 7 Yookah: Kalinga's Purified Native Pig
- 14 A treasure Trove of Health Remedies : Science and IK in the healing plants of Palina and Kadaclan
- 19 Shade Trees for Coffee-based Agroforestry Systems in La Trinidad, Tublay, Atok, Benguet
- 22 Traditional Weather Forecasting: The Uma Tribe Way

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The ANAP Digest is an annual publication of the Cordillera Consortium for Agriculture, Aquatic and Resources Research & Development (CorCAARRD) intended to showcase promising R&D product and results produced by its member institutions in the region. This is an evolution and popular version of the Anap Journal which has published winning papers from its annual Regional R&D Symposium from 2004-2015.

ANAP notes

The recognition of the rich culture, indigenous practices, and systems of the Cordillera region has continuously shown its imperative contribution to the body of knowledge and its impact on society. These IKs being maintained and developed by the local communities have become a subject in the conduct of research-exploring new species and documenting practices in the context of agriculture, aquatic, and natural resources (AANR) which created interest among audiences.

For this issue, content rests on discoveries and documentation of the practices which lie in the rivers and mountains of the region. It highlights the inclusion of the IKs as a primary source of data in research and its contribution to the different sectors.

The new discovery of the new fish species which is believed to thrive only in Japan appears in the rivers of Benguet specifically in the Amburayan River. With this discovery, it is good to note that a new indigenous fish was recorded in the country.

Moreover, while various biomedical system undertakings are being introduced, the peaceful village of Palina and Kadaclan rests on their traditional healing practice with respect to their healers. The existence of these practices was converted into pages as a way of restoring and conserving the Kankana-eyes and Ikachackran practices.

The traditional weather practices of the Uma tribe in weather forecasting leave an interesting impression on its impact on their agricultural community. These practices and knowledge may be ancient but these bits of gems are proven effective that continuously passed from one generation to another.

Whether a science-based or traditional approach, these IKs will co-exist and are still pertinent in the lives of the Cordillerans. These research results are a testament to the deep understanding and invaluable knowledge gained and passed over the years.

DAPILO OR CHAPILO:

Discover the Swimming Colors of Amburayan River

By Crislyn B. Orcales with reports from Mary A. Tauli



In the riverbanks of Amburayan River, a small fish with vibrant red and greenish blue colors outshines the brown and black shades clinging in the river stones underwater. A chance encounter with these unique colors in the rivers led to the discovery of an additional name and number to the diverse aquatic life in the Cordilleras.

New fish species are identified and named almost every week. Some are discovered in the most unlikely places, from creeks, rivers, springs, and even caves, while some display unusual characteristics and magnificent colors. But it's not every day that fishes thought to thrive only in Japan appear

swimming in the Philippines, more so in the Amburayan River in Benguet.

The Amburayan River and its tributaries and watershed areas cover the provinces of Benguet, La Union and Ilocos Sur providing rich and abundant water resources

which are crucial for the agriculture and industry sectors in the said localities. With a total length of 96 km (60 mi), it empties into the West Philippine Sea.

Back in 2014, the National Stock Assessment Program (NSAP) team from the Bureau of Fisheries

and Aquatic Resources-Cordillera Administrative Region (BFAR-CAR) and the National Fisheries Research and Development Institute (NFRDI) started assessment studies in the Amburayan River in Benguet.

The NSAP team collected different fish species from the catches of local fisherfolk in Kapangan and Atok, Benguet, which they classified and identified. Since then, the NSAP has continuously collected fish species for identification in the Amburayan River.

Identifying fish species of Amburayan River

Many of the species in the Amburayan River have been collected through good old-fashioned fieldwork, especially from the monitoring conducted by NSAP field enumerators. The identification of these species is a result of morpho-meristic measurements and molecular techniques.

The scientific identification of fishes based on morpho-meristic measurements focused mainly on external characteristics such as body shape, length, depth, mouth, and nature of fish spines, scales, and other distinguishing characteristics of the fish. However, in many cases, fishes, especially in their developmental stages are difficult to identify based on morphological features alone. Hence, fish species collected in the Amburayan



River were also subjected to deoxyribonucleic acid (DNA)-based molecular techniques for identification.

The DNA identification of the fishes was conducted by the National Fisheries Research and Development Institute (NFRDI), the research arm and partner of BFAR in the implementation of NSAP in the country.

Fish Species in the Amburayan River

Since it started in 2014, the NSAP has recorded about 38 fish species in the Amburayan River, 30 of which are fin fishes while 8 are invertebrates.

Around 19 fish species have been identified up to the species level, while 22 are still up for further identification. The 38 fish species in the Amburayan River are

composed of 10 gobies, 4 eels, 3 carps, 2 catfishes, 2 perches, 1 freshwater mullet, 1 carangid, 1 glass fish, 1 pipefish, 1 tapiroid grunter, 1 tilapia, 1 snakehead, 1 loach, 1 millionfish, 2 crabs and 6 freshwater prawns. BFAR experts said that these fish species for further identification can not yet be claimed as a new species. This still needs to undergo verification studies and DNA analysis. Furthermore, there are limited studies on species composition and diversity in the Amburayan River. Thus, these studies being conducted are essential to provide proper documentation of local fish species that can later on support policies for its conservation.

Amburayan River's dapil or chapil

One of these identified fish species is the *Lentipes armatus*, or the red-cheek goby or locally



called as dapil or chapil, which is a goby species found thriving in the Amburayan River. This species of fish is thought to be endemic or found only in the Ryukyu Islands in Japan.

A study in 1944, however, found the species in the Taguibao River in the upstream of Sitio Bongodman (proper), in the east end of Ancicala, Province of Agusan del Norte, Mindanao Island, which set the first record of the goby in the Philippines.

In the Amburayan River in Benguet, the first record is set by its identification through the study of Mary P. Tauli, Marx Perfecto C. Garcia, Jee Remae Podeque, Lilibeth L. Signey, Katreena Sarmiento, and Mudjekeewis Santos of BFAR-CAR.

From the catch of the local fisherfolk of Kapangan and Atok, the red-cheek gobies were identified through its vibrant colors and unique characteristics. The male of the species has a greenish-blue body and belly. The head and the slim body of the male have bright red colors and bands. Even the fins of the fish shine bright with red colors, lined with black color at the tips. Its female, however, is often mistaken for other goby species as it is colored brown with a somewhat translucent body and a pale stomach. According to local fishermen of the Amburayan River, this fish illustrates the famous line



...this fish illustrates the famous line “may forever” as they always swim and are caught together. As they say, “Till death do us part.”



“may forever” as they always swim and are caught together. As they say, “Till death do us part.” Experts say that one of the best ways to identify an organism is through the blueprints of their bodies or their genes. Hence, through a genetic study, deoxyribonucleic acid (DNA) analysis, and identification, the identity of the *dapil* or *chapil* was further solidified. The physical and genetic identification of the

dapil or *chapil* constitutes its first record in the Cordillera Administrative Region, specifically in the Amburayan River.

Dapil or *chapil* are being fished for food by locals. Fishermen usually sell it along with other goby species. According to Ms. Tauli, these species are usually abundant in the summer months from March to May. Fishermen

usually catch the *dapil/chapil* along other goby species through *sarep*, a traditional fishing technique which is done by partly draining a part of the river system and leaving it for hours if not overnight. Upon the return of fishermen, these goby fishes are now visible and easier to catch by hand. The discovery of the *dapil* or *chapil* in the Amburayan River suggests an expansion to its geographical range. It also proves that the water is not only a system for the navigators to explore other lands but is also a network of the fishes to their different habitats, associated through the different currents in the oceans.

With this discovery, it may also propose that the *dapil* or *chapil* is an indigenous fish species in the country, particularly thriving in the Amburayan River, Benguet and Taguibao River, Agusan del Norte, Philippines.//

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The research “First Record of the Goby *Lentipes armatus* Sakai and Nakamura, 1979 (Teleostei: Gobiidae) in the Amburayan River in Benguet, Luzon Island, Philippines” was published in *The Philippine Journal of Fisheries*; Jan-Jun 2022 issue. Published by the National Fisheries Research and Development Institute.

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YOOKAH:

Kalinga's Purified Native Pig

By Donabelle Garrido, DevCom Intern with reports from Sharmaine D. Codiam, Brenda B. Lumines and Mathew Jun P. Mariani

Early in the morning and before twilight, *Ikalingas* or Kalinga folks loudly shout "Yookah" to call on their stray native pigs in time for their feeding.

"Yookah" is not a native word at all, rather it is a term associated by *Ikalingas* to literally mean, "you come" or "you come and eat" specifically used when calling stray pigs during feeding time. Accordingly, the term was mainstreamed through time as the native pigs instantaneously responded to this call. Since the term is associated with the English words "you come," the *Ikalingas* would joke that the native pigs understand the English language.

Conserving Kalinga's native pigs

Kalinga, especially in its remote areas, has been known for raising native pigs through the free-range method. More often, you can see these pigs freely roaming around the village and sometimes obliging vehicles to stop as they mischievously cross the country roads as if it was their parade show.

Native pig refers to a pig that is raised locally in an area that has not been crossbred to an imported breed. Accordingly, they originated from wild pigs, but through domestication, the native pig has come to arise.

Generally, native pigs provide tastier and healthier meat compared to commercial pig meat due primarily to its genetics and way of raising. This is a valuable genetic resource reflecting each region's identity and rich biodiversity. Like in other localities in the region, native pig is an important requirement for cultural rituals and important occasions in Kalinga.

However, the declining trend in native pig populations in major native-producing regions signals a serious threat to the livelihood opportunities of small pig raisers and consequently to the regions' economy as native pig production is among the most popular farming activities in these areas. Thus, its improvement and conservation have now become a national and regional priority.





Characterizing Yookah

The implementation of the KSU Native Pig R&D Project led by Ms. Marcelina G. Saliwa-an and Ms. Sharmaine D. Codiam played crucial role in the development of the true-to-type Kalinga native pig breed. Hence, with the dedicated perseverance of the research team, the brand name “Yookah” was officially registered representing

the purified native of Kalinga known as Yookah.

Prior to the emergence of Yookah, extensive research was conducted at KSU to understand the unique characteristics of Kalinga’s native pigs. The initial study on the “Phenotypic Characterization of the Kalinga Native Pigs,” laid the foundation for subsequent characterization efforts specific to the Yookah breed. The KSU Native Pig R&D Project employed

- intensive breeding and selection processes to achieve 95% to 100% uniformity in morphometric traits, with a particular emphasis on the distinctive black coat color with white stockings.
- The characterization of Yookah involved the use of the animal genetic resources for food and agriculture (AnGR) characterization method,

encompassing phenotypic, genetic, and historical information. The team focused on capturing the breed’s external and production characteristics within its specific environment. This process led to the identification of distinct Yookah populations and the establishment of essential baseline data for the identification of Kalinga Native pigs.

Significance of Yookah

Regular phenotypic characterization of the native pig herd at the KSU station revealed the prevalence of Yookah’s distinct black coat color with white stockings, setting it apart from other native pig varieties involved in the nationwide program. The purification efforts undertaken by the researchers resulted in improved Yookah native pigs, showcasing predictable production performance and consistent product quality.

Ms. Codiam’s contributions extended beyond breed





development; she also developed and implemented production and management protocols for Yookah, ensuring its long-term success. Her expertise and dedication have been instrumental in the conservation and advancement of Kalinga's native pig breed.

Preserving Heritage and Empowering Farmers

The preservation of Yookah signifies more than the conservation of genetic resources. It encompasses the rich heritage, cultural traditions, and economic potential of Kalinga. By safeguarding the native pig population and promoting its sustainable utilization, the Kalinga

State University and its research partners are contributing to the preservation of Kalinga's identity and empowering local pig raisers for generations to come.

Through training, farm visits, and consultations, the KSU Native Pig R&D Project has disseminated valuable information regarding production and management protocols to farmers and pig raisers. The project has equipped them with the knowledge and skills to raise native pigs more efficiently. Additionally, the establishment of nucleus breeding farms in strategic locations has provided quality genetics to small-scale and commercial pig raisers, boosting the production of various native pig breeds.

The preservation of Yookah and the native pig breed in Kalinga represents a remarkable endeavor that transcends mere genetic conservation. It embodies the profound connection between biodiversity, cultural heritage, and economic development. The dedication of the Kalinga State University and its partners in the KSU Native Pig R&D Project serves as a beacon of hope, ensuring the continuity of Kalinga's native pigs for future generations and fostering sustainable practices that honor the region's unique identity.





Enhanced Yookah Production

In the picturesque province of Kalinga, a groundbreaking project is transforming the way native pigs are raised. Led by researcher Sharmaine D. Codiam, the Kalinga State University (KSU) Native Pig R&D Project has developed an innovative feeding strategy, known as the Strategic Feeding Protocol, specifically designed for Yookah, the purified native pig breed. This strategic approach not only reduces feed costs but also maximizes local resources, establishes practical housing and health care management, and enhances the overall quality of the pigs.

Cost-Efficient Feeding Strategy

One of the primary goals of the KSU Native Pig R&D Project was to develop cost-efficient feeding protocols for Yookah. Through the establishment of Production and Management Protocols, researcher Codiam successfully reduced the feed cost to an impressive P12.10 per kilo. This represents a significant decrease of 48.4% compared to the average market price of commercial feed, which stands at P25.00 per kilo.

The strategic feeding protocol combines locally available feedstuffs with commercial feeds, making it economically viable for small-scale pig raisers in Kalinga. By utilizing indigenous resources, the community can now develop

an efficient feeding strategy while reducing dependency on costly commercial feed options.

Optimizing Feeding Practices

Feeding practices play a vital role in the growth and development of Yookah pigs. In the KSU Native Pig R&D Project, the animals are fed twice a day, in the morning and afternoon, using the specially developed feeds for Yookah. Additionally, Madre de agua, a plant with high crude protein content, is given to the pigs between meals. The leaves and small stems of Madre de agua (*Trichantera gigantea*) offer valuable nutrients, including true protein and a balanced amino acid profile.

The strategic feeding protocol also emphasizes the provision of clean and adequate drinking water at all times. These optimized feeding practices have not only

improved the health and well-being of Yookah pigs but also enhanced the organoleptic properties of their meat. Consumers have reported distinct and improved attributes such as the umami taste and marbling, setting Yookah meat apart from native pigs commonly found in the region.

Empowering Farmers through Knowledge Transfer

The impact of the KSU Native Pig R&D Project goes beyond breed development and feeding strategies. Local farmers and pig raisers have benefited greatly from the project's initiatives. Through extensive training, farm visits, and consultations, valuable information on production and management protocols has been disseminated, equipping farmers with the knowledge and skills to raise native pigs more efficiently. Ofelia, one of the raisers of Yookah,





said, “Nalaklaka ti magasto nu suruten jay strategic feeding nganaisuro ijay production and management protocols. Idi sinurot ko kt dakel ti natipid ko ta ada met available ngamulak as ingredients ijaymaipakan.” (The cost of feed was reduced as I used the Strategic feeding in the Production Management Protocols. When I followed the protocols of feeding and housing, I reduced the expenses since I have available plants in my backyard.) Rita said, “Sakon we awad tarakonnak borok ate pad-ing ni boroyko, pi-ok pagay we paaduwon da borokko tapnu awad go silakuk nu awan ngumina. Saawadengininak we Yookah eh borokni KSU ate ummoyak nan atendaran ate Yookah Fiesta, adupospagay de inadarko ta awad da experts we nanlecture ate bumaruwanni an taraken ate borok. Ummoy da gosdikani in tour ate Yookah farm da tapnu mail ani de usto we inonni an alagateborok.” (I, as a backyard

“ **The cost of feed was reduced as I used the Strategic feeding in the Production Management Protocols. When I followed the protocols of feeding and housing, I reduced the expenses since I have available plants in my backyard.** ”

raiser/famer, I want to produce more native pigs so that I can increase my gain. I learned a lot from the lectures from the experts of Yookah and Demo-tour in the Yookah R&D Farm; thus, I applied the protocols and management of the Yookah pig I bought at KSU

during the Yookah Fiesta).

The strategic feeding protocol developed by the KSU Native Pig R&D Project has revolutionized pig rearing in Kalinga, specifically for the Yookah breed. By reducing feed costs, optimizing feeding practices, and empowering local farmers, this innovative approach is driving sustainable and efficient pig production in the region. The project’s success in preserving and improving native pig breeds not only highlights the rich biodiversity and cultural heritage of Kalinga but also serves as a model for other regions seeking to enhance their local livestock industries. With the strategic feeding protocol, Kalinga is paving the way for a prosperous future in native pig farming.//

Program Title: Conservation, Improvement and Profitable Utilization of the Philippine Native Pigs
Study Title: Phenotypic Characteristics of Yookah Native Pigs of the Kalinga State University R&D Project

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A TREASURE TROVE OF HEALTH REMEDIES: Science & IK in the healing plants of Palina and Kadaclan

By Ruth S. Batani

At a time when the biomedical system seems to dominate the healthcare system, there coexists a healing system that has become an important source of wellness in communities where hospitals and other healthcare facilities are not so accessible.

Among women villagers in most Cordilleran communities, it is an everyday thing to pick a plant with medicinal properties or approach a local healer for guidance as to what plants to get for a particular kind of illness or even a hunter locating a medicinal plant for centipede bite. These become extraordinary when seen from a nuanced perspective such as the lens of ethnobotany, where local knowledge complements scientific knowledge.

The intriguing wisdom behind such traditional practices that are somehow proven true as per scientific lens opens a complementing partnership of two knowledge sources. In most Cordilleran communities, health seekers approach either of these to resolve their health issues but common sicknesses such as colds, coughs, bites, or wounds are usually remedied at home using readily available herbs.

knowledge among generations. However, as advanced medical services and medicines dominate these traditions nowadays, these ancient treasures of knowledge may diminish through time.

With such, the project titled 'Traditional Knowledge and Health Practices and Digitization of Library on Health: the case of Kankanaey and Ekachakran ethnolinguistic groups was implemented to capture traditional knowledge and practices on health and healing of at least two communities; and uphold the community's rights to this healing tradition.

Cordillera villages still observe traditional healing practices evidenced by the existence of traditional healers such as those locally called *hilots* and *manpokhus*; and the continuing chain of indigenous

The project was funded by the Department of Science and Technology-Philippine Council for Health Research and Development (DOST-PCHRD) and was implemented by Benguet State University headed by the Project leader Ruth S. Batani, an anthropologist. Along with her is her multi-disciplinary team Dr. Jones T. Napaldet, a taxonomist; Andrew V. Basbas Jr., agriculturist and Rhea S. Loncio, an educator.





Why Palina and Kadaclan?

Palina and Kadaclan are semi-subsistence communities that still depends in growing their own food for household consumption. Since the community road development started in 2018, these communities was able to preserved their primary healthcare system where local healers and medicinal plants serves as their health remedies.

A series of capacity-building activities on documenting plant resources were conducted from 2018-2020. With indigenous knowledge (IK) on health, the project underwent ethical review and the required free prior

informed consent (FPIC) with the community reflecting the project's great respect toward these community-owned IK before proceeding with the IK documentation.

The project generally conducted participatory approach that aims to intentionally involve the communities in the process and teach them both the IK and scientific background and importance of this nature's bounty.

Biodiversity Walks

Through the participatory approach where in group discussions and interviews

were conducted. The identified medicinal plants with the guide of experts shows that there are a total of 101 documented medicinal plants belonging to 73 genera under 49 families in Palina, Kibungan, Benguet and 70 medicinal plants belonging to 62 genera under 37 families in Kadaclan, Barlig, Mt. Province.

Additionally, it is reported that that 101 medicinal plants at Palina were used in treating 31 reported illnesses while Kadaclan's 70 herbal plants were used in 37 illnesses.





PALINA, KIBUNGAN, BENGUET



101 Medicinal Plants

belongs to 73 Genera under 49 Families



Among the 101 medicinal plants identified,

31 illnesses

were treated

2

Common plants used for cleansing and treating wound



Pinit

Scientific Name: *Rubus fraxinifolius* Pior
English Name: Raspberry



Bayabas

Scientific Name: *Psidium guajava*
English Name: Guava

2

Most culturally important medicinal plants



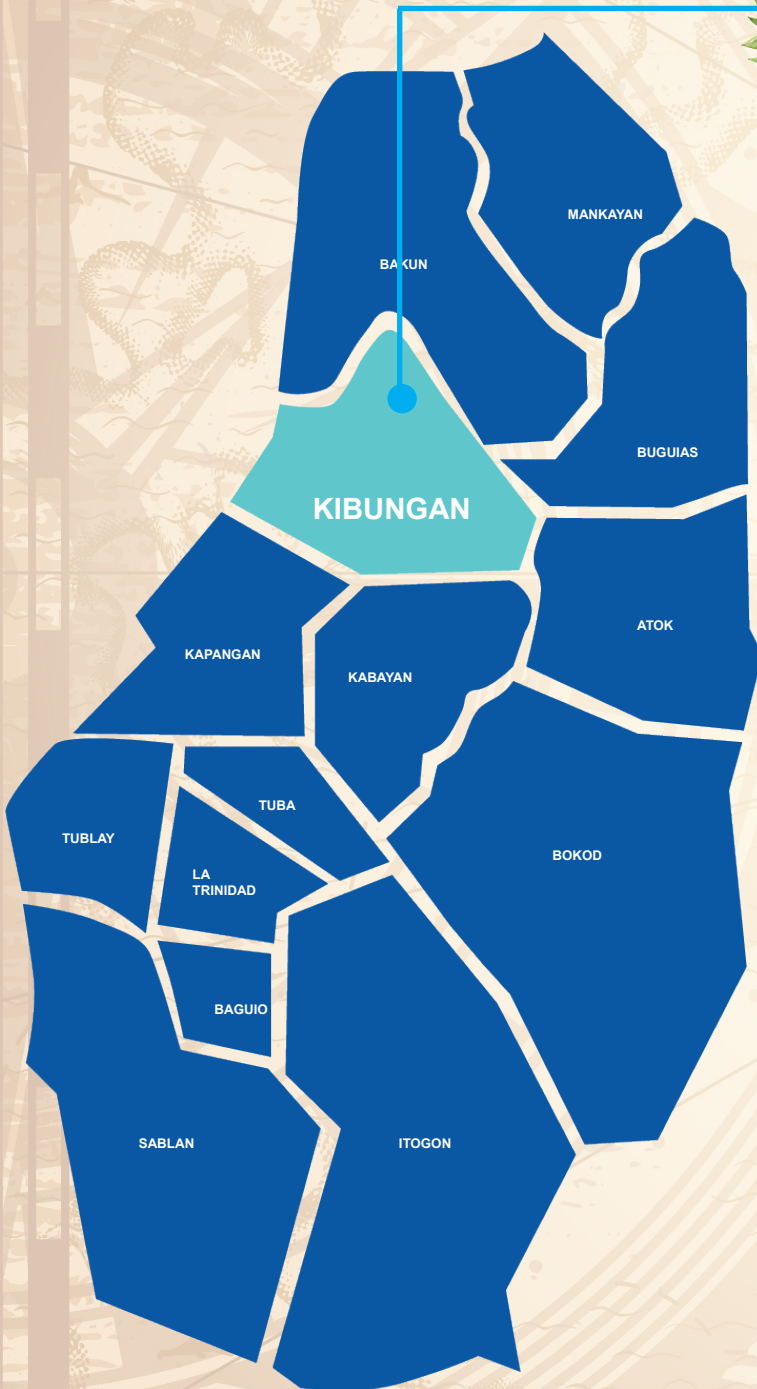
Oregano

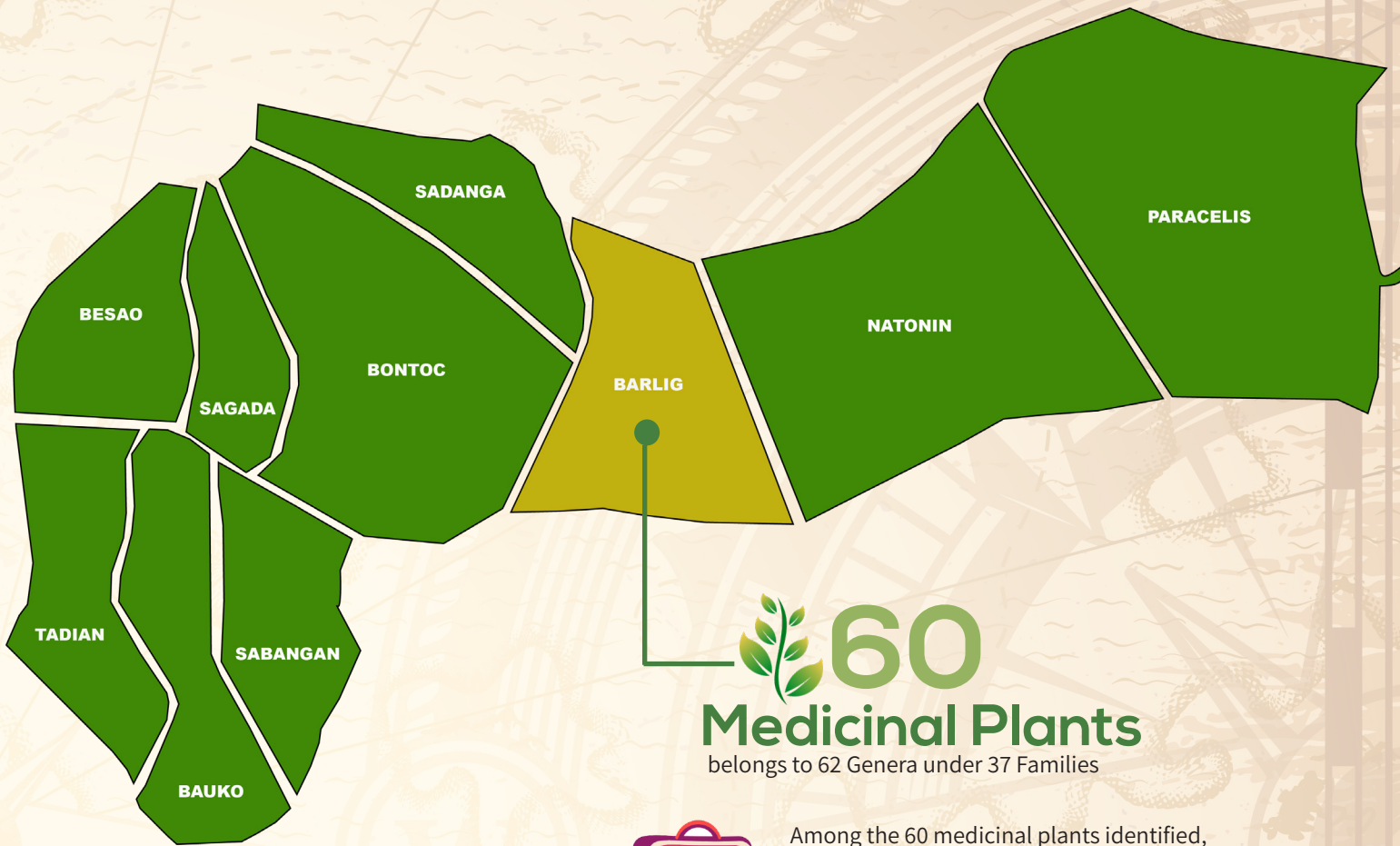
Scientific Name: *Origanum Vulgare* L.
English Name: Mints



Lagundi

Scientific Name: *Vitex negundo*
English Name:





 **60**
Medicinal Plants
 belongs to 62 Genera under 37 Families



Among the 60 medicinal plants identified,
37 illnesses
 were treated



KADACLAN, BARLIG MT. PROVINCE

2 Common plants used for
 cough and most important
 medicinal plant

Marcelia

Scientific Name:
 English Name:



Fiatonnek

Scientific Name: Euphorbia hirta L.
 English Name:





The use of these medicinal plants and traditional healers have always been a part of the primary health care in these communities and remains option for health seekers. However, this local health system is being marginalized due to the interplay of various factors. Some factors include the road concreting which disturbs hills and mountains where the medicinal plants thrive. Some women prefers to bring their sick children to the hospital. These scenario depicts the slow erosion of medicinal plants as health option.

Yet, it is good to note that there is a wide recognition that these knowledge can be digitized.

From Field to Pages

The precious gems of ancient wisdom was packaged through a book titled “Agas ay Nabe-as ken Pokhus: Medicinal Plants of Palina, Kibungan, Benguet and Kadaclan, Barlig Mt. Province”. This was the

result of the communities’ request of coming up a book drawn from the two communities.

The pages of the book marry the indigenous knowledge and the scientific knowledge enriched by the communities’ stories.

The book was soft-launched in December 2021 and was turned-over to the knowledge bearers and communities of Palina and Kadaclan. The book rests on the belief that ‘research in communities without giving back is unethical.’

Integrating local healing systems

Ethnobotany has proven its potential as complementary to the formal health system which rests on how much of this knowledge continues to be circulated and practiced. This is a timely response to the call for a community-based healthcare system in this time of pandemic.

With the Cordillera region’s Strategic plan for Indigenous Peoples’ health (2020-2022), the need to recognize and integrate the local healing system of communities that depend on the naturally abundant plant resources for healing guided by traditional healers becomes imperative. These medicinal plants as complementary if not alternative health can prove to be more efficient and culturally sensitive considering that the human resources found in hilots and manpokush or herbalists, can be symbolic of accessible and culturally sensitive health resources.//

Project Title: ‘Traditional Knowledge and Health Practices and Digitization of Library on Health: the case of Kankanaey and Ekachakran ethnolinguistic groups

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SHADE TREES

for Coffee-based Agroforestry Systems in La Trinidad, Tublay and Atok, Benguet

By Sharilyn B. Rufino with reports from Janet P. Pablo

Agroforestry is a land-use practice of integrating the cultivation of crops with trees and shrubs, creating a symbiotic and sustainable eco-system between the interacting organisms. In coffee production, most coffee farmers do not use fertilizers and are dependent on nutrient cycling occurring in agrisilviculture systems.

This means that the nutrient source such as Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), and Magnesium (Mg), of coffee primarily comes from the litter fall or debris from the shade plants when decomposed.

However, there are particular species that produce litter falls

that are much more beneficial and productive compared to the others due to their properties.

Nutrient Transfer and Litter fall

The productivity of coffee trees goes hand in hand with the nitrogen availability in the soil. The

naturally occurring nutrient cycling meanwhile, also affects nitrogen mineralization or the process where nitrogen from plants is converted into inorganic forms. This process leads to the leaking and the loss of nitrogen content in the soil.





This is where the concept of Agroforestry enters.

This practice is being utilized by the municipalities of La Trinidad, Tublay and Atok, using Alnus, Chayote, and Mango and Pine as shade plants in coffee production, whereas the nutrient levels of coffee under each species exhibited significant differences. A study conducted in the different municipalities of Benguet reveals the recommended shade plants for maximum productivity of coffee trees under an agroforestry system.

Nutrient return measurement of Shade Plant Litter

The nutrient content of shade plants is affected by many factors such as nitrogen-fixing properties, applied fertilizers, decomposition rate, and many others.

The Alnus plot and leaf possess higher N content among the other shade plants observed. This could be associated with the symbiotic relationship between the Alnus tree and the nitrogen-fixing Frankia, a type of nitrogen-fixing bacteria in the soil. This relationship allows for nitrogen fixation to take place, where N from the atmosphere is converted into a form that could be absorbed by the plant's root system.

Aside from Alnus, the plot under the Chayote tree also contained high amounts of N as well as P, although this can be attributed to

the fertilizers supplemented by farmers.

The lowest N content was exhibited by the Pine tree due to its high Carbon to Nitrogen ratio, slowing down the decomposition rate of its leaves. The slower the decomposition rate, the slower the release of nutrients, and thus fewer available nutrients to be absorbed. The acidic soil under pine trees as a result of low pH level also causes the low K content of pine needles.

Nutrient Return Measurement of Coffee Tree Leaf Litter

It is then safe to say that the

Alnus tree already contains high amounts of N. The N stored in its roots when released into the soil as fluids or exudates could then be absorbed by the coffee plant under it. Additional N can also be derived from the Alnus leaf litter. As part of an agroforestry system, other nitrogen-fixing plant species such as genera Erythrina from the pea family may also contribute to provision of this nutrient.

In terms of K content, the highest amount was found in coffee leaf litters under mango agrisilviculture. Since mango already has high K content, its leaf litters when decomposed give off substantial amount of K to supplement its





corresponding coffee plant.

Aside from this, K content is also associated with age since older trees contain higher K than their younger counterpart. More mature trees also shed greater amounts of leaves, which equates to more leaf litter and more nutrients from decomposition.

Cup Quality of Products

How does this affect the quality of coffee as a beverage then? The research on coffee conducted an assessment to measure the performance of Arabica coffee berries produced under diverse

shade trees in Tublay and in Atok.

Coffee grown in shaded and unshaded areas exhibit significant differences when it comes to volume of production. This is because coffee trees cultivated or grown in shaded areas have some degree of access to the portion of sunlight that is utilized by plants for photosynthesis.

Ripening would then require lesser time in open areas, but this would risk the cup quality of the coffee. This hastens the maturation process of the berries, where some biochemical steps may be rushed.

The low temperature in shaded areas is a large factor in causing the slow maturation of coffee berries, thus guaranteeing a good beverage quality.

The Verdict!

When it comes to the production of leaf litter, the coffee under alnus trees as shade plants shed more leaf litter compared to the other trees and have a higher nutrient content of coffee litters. Chayote is however a more recommended option for other sources of income as cash crops to augment income from coffee growing.

Economically wise, utilizing the Alnus tree is less costly since it doesn't require the use of fertilizer to enhance its nutrient productivity, although Chayote

can also be an alternate source of income, especially for its fruits or vine as profitable commodities.

Breaking the score between Alnus tree and chayote would be the cup quality of their corresponding coffee tree products. Arabica coffee berries are grown in shaded areas beneath Alnus trees topped among other shade trees in terms of the following aspects: aroma/ fragrance, flavor, aftertaste, acidity, body, balance, and overall taste. Chayote, on the other hand, scored the lowest in the said aspects. //



Project Title: Soil Conservation, Microclimate Management and Climate Change Vulnerability of Coffee Production in Upland Sloping Areas: Towards a Sustainable Arabica Coffee-Based Agroforestry system

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Traditional Weather Forecasting:

THE UMA TRIBE WAY

By Sharilyn B. Rufino with reports from Clivene O. Toctocan

Around us, there are numerous natural indicators of the day's forecast. When we look up to a grey sky muffled by dark clouds, we consequently assume for rain or perhaps a storm, even without hearing from the weatherman.

In one of the most historic towns of Kalinga, the home to the Uma Tribe-Lubuagan, Kalinga, an indigenous group of people with deep regard to their endowed traditional knowledge, the observance of nature's behavior has become a practice used to predict the weather, even without the presence of gloomy clouds.

This has been at most, beneficial to their livelihood as a community relying on agriculture. Through the close observance of critters, birds, trees, and other behaviors of their environment, they are able to predict the weather as well as the upcoming season.

Up Above and Down Below: Watch and Forecast!

Much of indigenous knowledge is built upon years and years of interacting and adapting to the environment, eventually bearing understanding, philosophy, and skills.

In this regard, insects have been already observed by various researchers as potential indicators of weather. In the context of the Uma tribe, ants and dragonflies can be used to predict the arrival of continuous rain and its contrary.

The construction of black ants locally known as *Igom*, of their nests in elevated places such as trees, usually signifies continuous rain, while burrowing or building their nests underground would indicate the opposite. *Gililing* or dragonflies on the other hand manifests the same implication in a slightly different manner.

When a swarm of *gililing* fly low or near the ground, it suggests rainfall within a few hours, while seeing these species fly higher would indicate the dry season. When dragonflies with crimson-colored tails appear in swarms, it usually means an upcoming dry season.

This behavior is similar to observations done on Avians. In 2019, The Editors found that air pressure affects the flight of birds since lower air pressure (which indicates the approach of rain or storm), makes it difficult for birds to fly at heavier elevations.

Lower air pressure in the simplest, would mean that there is less oxygen present, thus accelerating exhaustion. This should explain the belief of the Uma tribe that when a *bukaw* or the Philippine hawk-eagle flies in high altitudes, it would signal the onset of the summer season.

Other behavior aside from flight can also come in the form of appearance in groups or in flocks. Accordingly, when *seyaksak* (Spotted-wood Kingfisher) are spotted in groups, it would also signify a lengthy dry season or perhaps even El Niño.

This can be explained by the decrease in water levels in the rivers near the Uma community when summer comes. The

shallower the river, the easier it is for the *sayeksek* to hunt for food.

Aside from this, as Disney has formerly shown us, the singing of birds does signify good days! In the Uma tribe, the singing or playful singing of the *bisukat* or the Arctic warbler, the sound of the *kuling* (Siberian Rubythroat) and the clucking of the *itaw* or wild chicken all indicate the beginning of summer.

As opposed to the singing of birds, the croaking of *toktok* or frogs indicate rain since they are able to accordingly detect changes in air pressure, which is one of the indicators of weather. High air pressure would equate to sunny days while its counterpart would mean the opposite.



Source: Google images



Bukaw or Philippine Hawk Eagle

Photo by: Jayson Pueda, BMB-DENR

Budding Rain, Blooming Sunshine

Budding Rain, Blooming Sunshine Flowers bloom with the sun. At least for the anos bamboo (*Schitzostacyum lima*). When this plant starts to bloom, the Uma tribe already begins an anticipation of drought or el niño. Interestingly, the locals specified this occurrence to only happen in a cycle of 20 years.

Likewise, when deciduous trees such as the narra (*Artocarpus blancoi Merr.*), and mahogany

(*Sweitenia macrophylla*) King, start shedding their leaves, rainfall is not expected to visit for a long period. However, drought is observed to be ending once these trees start sprouting fresh new leaves.

The Moon and the Stars Can Tell

Signs observed through celestial bodies are recognized as guides for what type of commodity to plant.

Kamote and Kalabasa are said to be planted best when the sky

is decorated with many stars as it would signify a bountiful harvest. The last quarter of the moon (usually in September) is meanwhile seen as the most recommended time to plant vegetables as it signifies imminent rainfall.

Some other predictions associated with the appearance of the night sky include a full moon in clear skies would of course mean a sunny day ahead while the presence of stars gathered really close indicates a forthcoming rain, and vice versa.

Odd Behaviors, Omens and Beliefs

Aside from pure observations, the weather-predicting Indigenous Knowledge of the Uma tribe is not based purely on observations but also on their beliefs in relation to the supernatural. The following are then odd behaviors, omens, and beliefs associated with the Uma Tribe in terms of forecasting.

Crabs serve as warning signs for an approaching typhoon or strong rains. It is claimed that agama/river crabs (*Sundathelphusa spp.*) and egat/eel (*Monopterus spp.*) jump out of the river because they are able to sense flood-causing rainfall and are thus fleeing to “evacuate”.

Indigenous Knowledge gives high regard to respect towards the environment and those that live in it. When people make fun of animals (Lublubo), it is believed that this is a considerable bad omen for rain. To contradict this, the Uma tribe performs a practice called kontra.

This practice is done through the mixing of water from the Butigi and Savangan rivers especially when irrigation is needed for the community’s rice fields. This is believed to bring about rain enough to water the community’s crops.

As demonstrated by the Uma tribe Indigenous or Traditional

Knowledge does not necessarily connote that this knowledge is outdated or is ancient since they are continuously and constantly being updated as they are passed from one generation to another. Aside from this, it also carries properties complementary to scientific knowledge such as being long-term, holistic, local, embedded, moral and spiritual. //

Project Title: Traditional Weather Forecasting of the Uma Tribe in Kalinga Philippines

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Seyaksak or Spotted-Wood Kingfisher

Photo by: Jayson Pueda, BMB-DENR

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