J. ISSAAS Vol. 32, No. 1:137-153 (2026)

PROFILE OF FARMERS' PRACTICES AND MAPPING OF TRADITIONAL RICE VARIETIES IN NUEVA VIZCAYA, PHILIPPINES

Agustin B. Lunag
Department of Plant Science, College of Agriculture, Nueva Vizcaya State University, Bayombong, Nueva Vizcaya, Philippines
Corresponding author: ablunag@nvsu.edu.ph

(Received: August 21, 2025; Accepted: May 10, 2026)

ABSTRACT

The stewardship of traditional rice varieties (TRVs) predominantly rests with upland farmers. These varieties exhibit a rich source of genetic diversity and possess outstanding characteristics, including improved grain quality, health and nutritional values, and resistance to climate-related stress, pests, and diseases. However, limited information is available on their cultivation methods, geographic locations, and documented growers. This research examined farmers and their agricultural practices and created geographical distribution maps of traditional rice growers using a geographic information system. The research was carried out across nine municipalities in Nueva Vizcaya, Philippines, from September to December 2018. On-site interviews with 19 farmers and geotagging activities were carried out. Most farmers were members of indigenous peoples and resided in the province's undulating hills and steep mountains, specifically in the towns of Diadi, Bagabag, Villaverde, Solano, Ambaguio, Kayapa, Kasibu, Santa Fe, and Alfonso Castañeda. The *Kaingin* remained the locally utilized agricultural practice, with local farmers relying on traditional slash-and-burn techniques as their primary means of cultivating crops. There was little to no use of inorganic inputs in the rice ecosystems. Family labor was utilized for harvesting on small farms, employing manual techniques with tools such as *gapas* and *rakem*. Farmers continued to cultivate rice mainly to sustain their livelihoods. The applications Pic2map and Google Earth facilitated the online viewing of geotagged photographs. The study mapped the geographic coordinates of 30 TRVs currently cultivated by farmers in Nueva Vizcaya. The profiling of farmers and their agricultural practices, combined with geotagging, has improved access to the locations of existing TRVs in the province, paving the way for future research initiatives.

Key words: geotagging activities, *kaingin* system, EXIF data, GIS app, indigenous peoples

INTRODUCTION

The on-farm conservation of rice genetic resources involves the ongoing cultivation and management of diverse rice populations by farmers within the agroecosystems where these crops have evolved (Ocampo and Ocampo 2016). The development of improved rice varieties relies on the availability of genetic resources, including thousands of locally adapted varieties. These varieties face the risk of extinction in farming systems as farmers adopt new, improved varieties (Zhu et al. 2009). Also, farmers replace traditional cultivars with new ones because the new cultivars offer additional benefits (Laborte et al. 2015). Certain TRVs continue to be preserved and cultivated by farmers, potentially serving as valuable sources of germplasm for rice improvement, given their traits that are well-suited to adaptation to various abiotic and biotic stresses (Rabara et al. 2014).

Since TRVs are often grown in isolated, mountainous, or significantly fragmented areas, GIS helps identify the precise ecological location (e.g., geographic coordinate) where a particular rice variety thrives. This aids in mapping suitable areas for conservation and restoring lost varieties (Mosleh et al. 2015). In mapping, understanding spatial variation in crop responses to environmental and management factors is an essential component of agronomic research (White et al. 2002). Identifying the biophysical and socioeconomic characteristics of rice-producing regions is essential for formulating effective targeting strategies for disseminating new technologies and sustainable crop management and diversification options (IRRI 2018). Rabara et al (2015) used geotagging technology to locate and map TRVs in Aurora, Philippines, for genetic resources conservation. Similar studies have been carried out on rice geomapping: geographic information was gathered and analyzed through GIS technology to illustrate rice farming patterns and their correlation with environmental factors in West Java, Indonesia (Sondari et al 2024); utilizing remote-sensing and supplementary data sets developed for a geospatial database concerning the spatial distribution of rice cultivation areas and rice cultural varieties of major rice-producing countries of South and Southeast Asia (Manjunath et al. 2015); and the application of Satellite Remote Sensing improves the precision of paddy rice mapping, thus providing essential information for the government, planners, and decision makers to formulate policies (Zhao, Li, and Ma 2020).

Family farming is the typical operational farming model in the Philippines. It is a major contributor to socio-economic life in most rural areas (Ramos 2020). Rice is considered a staple food, and its production is an important source of employment and livelihood in the countryside (Laborte et al. 2015). Rice is still the main food crop grown by farmers in the province of Nueva Vizcaya. In irrigated lowlands, high-yielding varieties (HYVs) and hybrids dominate production. According to Andal and Sana (2008), in the highlands of Nueva Vizcaya, especially the rainfed areas, some farmers still cultivate TRVs. Still, production is considered marginalized even though traits dictate a premium price.

Because rice farmers contributed to rice diversity as they nurtured and selected rice cultivars throughout time, information about them, their geographic locations related to rice cultivation, and spatial distributions of traditional rice cultivars or landraces in the province are necessary for future crop improvement and conservation programs. Consequently, this research was conducted to document the current agricultural practices and to develop a geographical distribution map using geotagging technology through GIS for the TRVs in Nueva Vizcaya, Philippines.

MATERIALS AND METHODS

The research was conducted during the wet season months, September to December 2018. In the province of Nueva Vizcaya, there are a total of fifteen (15) municipalities; however, only nine (9) municipalities were considered in this study, namely Diadi, Bagabag, Villaverde, Solano, Ambaguio, Kayapa, Kasibu, Santa Fe, and Alfonso Castañeda (Fig. 1). These towns are recognized for their cultivation of traditional rice varieties within the province. Details regarding the production locations of TRVs and farmers were derived from the information provided by the concerned Municipal Agriculture Offices (MAGROs). Also, a Certificate of Precondition was secured from the office of the Regional Director of the National Commission on Indigenous Peoples (NCIP) Region 02. Its purpose was to allow the researcher to collect various seeds and to promote, protect, and recognize the rights of Indigenous Cultural Communities/Indigenous Peoples (ICCs/IPs) living within the collection sites. In accordance with the protocol for obtaining consent or approval, the researcher presented the proposed study to concerned farmers and farmer/tribal leaders. During the on-site visits, geotagging of TRVs was done for the GIS-based mapping activity.

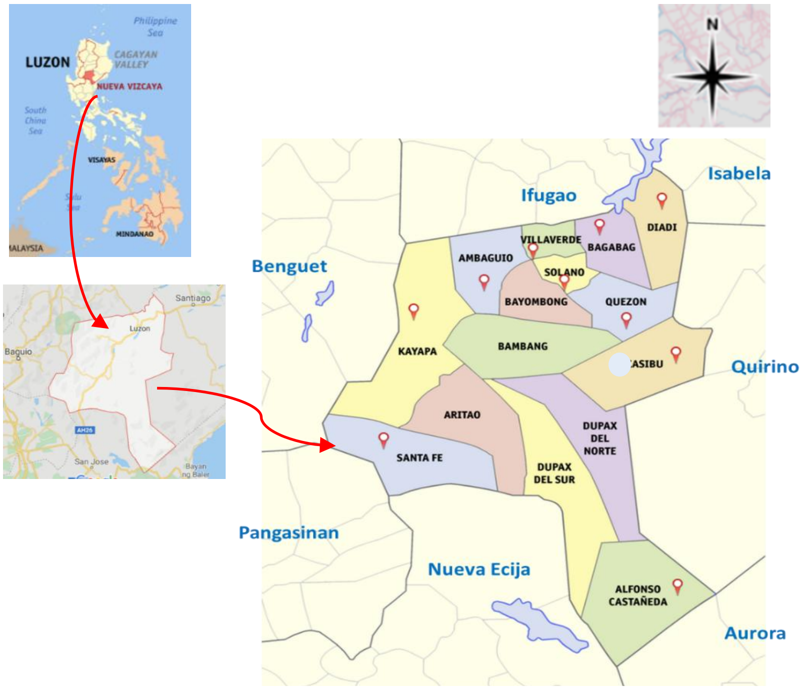

Figure 1. The production sites of TRVs in Nueva Vizcaya, Philippines.

Profile of selected TRV growers. Only farmers who planted TRVs for two cropping seasons were included in the survey. Nineteen (19) TRV growers were interviewed on-site using the prepared survey questionnaires and other documents for traditional rice. Farmers were asked open-ended questions to capture potential insights about the cultivation of TRVs. Documentation was centered on the different production techniques of farmers in the community. Location information, size of farms, yield, growing period, ethnicity, years in farming, reasons for planting, farmer's description, special traits or uses, and cultural practices are recorded to understand the present farming scenario and the level of commitment to continue on-farm production of TRVs in the locality.

The geotagging activity. The geotagging processes of the study adapted the concept of the National Greening Program (NGP) Geo-Tagging Manual of the Department of Environment and Natural Resources (DENR, 2013) and the procedures listed on the https://www.pic2map.com/ website. The Pic2Map was an online Exchangeable image file format (EXIF) data viewer with global positioning system (GPS) support, which allowed one to locate and view photos on Google Maps™. It analyzed EXIF data embedded in the image to find the GPS coordinates and location. The system used EXIF data available in all photos taken with the smartphone used during documentation activities. Hence, the Pic2Map photo mapper extracted the coordinates where all photos were taken in the study.

Geotagged photos from mobile phones were consolidated and saved on a laptop computer. A new folder was created in the desktop directory, and all pictures inside the geotagging device were copied and pasted into the created folder. The pic2map website was opened, and a selected photo was uploaded into the "Select Photo Files" icon for online viewing. The application automatically displayed the embedded data from a geotagged photo, like the location coordinates and elevation (Fig. 2).

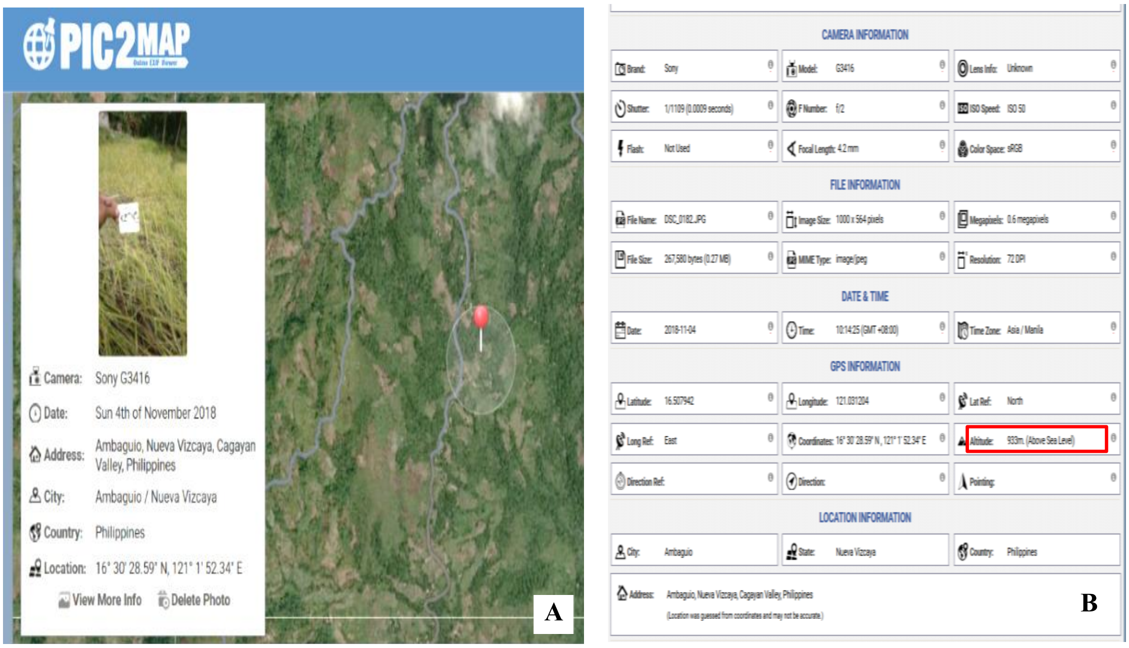

Figure 2. Example of a geotagged photo using a Pic2Map application: A) Photo EXIF data and B) Detailed file information.

RESULTS AND DISCUSSION

GIS-based maps of TRVs. Traditional rice varieties of the province are produced in different topographic locations, from plain level to mountainous. The geographic elevations were established on actual coordinates during the geotagging activity and not on estimated values. TRVs grown in upland rice land ecosystems are mostly located in the mountainous areas of Nueva Vizcaya and commonly under rainfed environments. These are found in the towns of Villaverde, Santa Fe, Kasibu, Solano, Alfonso Castañeda, and Diadi. There are some areas considered mountainous yet irrigated and terraced, like the production sites in Kayapa and Ambaguio, Nueva Vizcaya. Rice crop is cultivated under diverse environmental conditions and crop management regimes (Muralikrishnan et al. 2021). Particularly, traditional rice is primarily cultivated seasonally in marginal upland areas with highly degraded, infertile, and acidic soils (IRRI 2018).

Figure 3 shows geotagged photos plotted on a map, generated by geotagging production sites using Google imagery and a geographic information system. The thematic map of TRVs in Nueva Vizcaya showed the municipalities and names of TRVs where the photographs were captured. The procedure for creating a geographical distribution map through GIS involves utilizing spatial data, such as global positioning system (GPS) coordinates, to examine and visualize the production areas of TRVs.

Also, another example of a geotagged photo taken in the town of Diadi, Nueva Vizcaya, Philippines, showing the picture of panicles of the cultivated TRV (Milagrosa-Red), date/time taken (10-26-2018/11:26 AM), the model and brand of cell phone used (G3416, Sony), and the altitude of the area at 817.0 m (Fig. 4). The use of GIS and geotagging technology in agriculture allows farmers to update real-time field data, systematically organize and analyze it, and remotely monitor their crops, thereby connecting mapped information with agricultural communities (Yusopova 2024). Specifically, geotagged images of TRVs are essential for the *in-situ* conservation of genetic diversity, ensuring food security, and facilitating sustainable agricultural planning and policymaking (Mathenge et al. 2022).

Legend:

● = Municipality
📍 = Location of TRVs

The pink graph is an elevation profile. Every peak and valley of the pink shape corresponds to an actual mountain, ridge, or lowland on the Google Earth map.

Figure 3. A geotagged map showing the sites of traditional rice varieties grown in Nueva Vizcaya, Philippines.

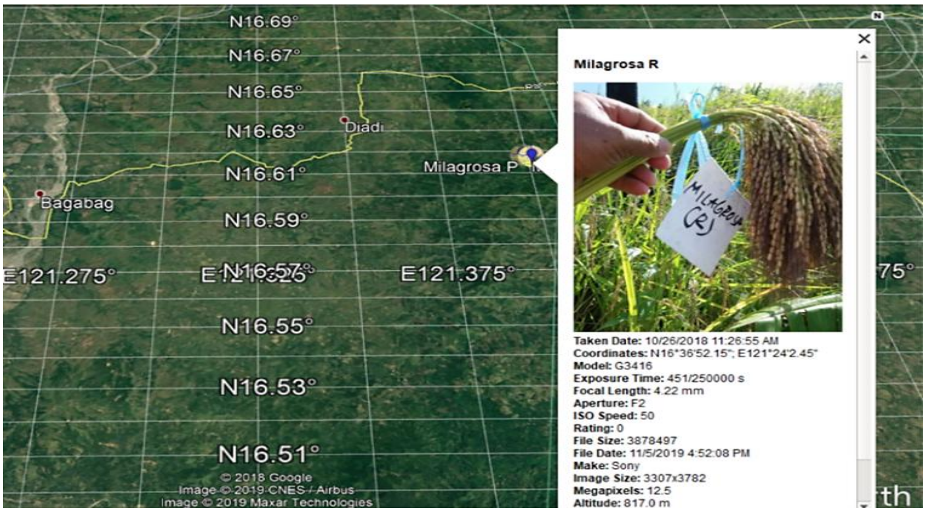

Figure 4. A geotagged photo of collected TRV (Milagrosa Red) panicles captured in Diadi, Nueva Vizcaya, viewed in Google Earth.

Farmers' profile growing TRVs. The interviewed farmers varied in ethnicity. A total of nineteen profiled farmers who belonged to the indigenous peoples (IPs) predominated in the cultivation of TRVs in Nueva Vizcaya (Table 1). The Ifugao, Ilocano, Kalanguya, and Iwak tribes comprised 7, 5, 4, and 2 farmers, respectively, and one farmer represents the Bugkalot group. These farmers largely owned undulating mountainous production sites of TRVs. The Ilocanos, the largest cultural group in Nueva Vizcaya, comprised 5 farmers who possessed most of the irrigated and plain-level traditional rice ecosystems in the community. Furthermore, the average age of all TRV growers documented in the study was 52 years. Also, farmers have been growing TRVs for a minimum of 2 to 42 years. Bolla and Galduen (2018) revealed that the wide age range and years in farming explained the involvement of younger and aging generations in the same farming practices for TRVs in Nueva Vizcaya. These findings show a mixture of young and old, new and seasoned TRV farmers in the area.

Seventeen farmers acknowledged that the sources of their TRV seeds were held by other TRV growers within the locality. Ten farmers practiced preserving and storing their seeds for future planting within their households and for the benefit of their neighbors. Other seeds were brought by other farmers and their ancestors from nearby provinces of Ifugao, Quirino, Nueva Ecija, and Tarlac when they migrated to Nueva Vizcaya. Traditional crop biodiversity has, for centuries, been selected by farmers for the seeds' unique suitability to local growing conditions, making scientists claim they are more likely to adapt to changing climatic conditions (Singh 2018). Thousands of local and heirloom food-crop varieties are in farmers' hands, mostly treasured through home and community seed banks. Traditional crop varieties are preserved by local farmers, especially IPs living in the mountains (Camacho et al. 2015). Likewise, TRVs are preserved along with the terraces where they are grown and the culture and traditions of the IPs growing them (Cuevas et al. 2021).

All farmers agreed that they grew TRVs primarily for family food, valuing the good eating quality, health benefits, and aroma of the traditional variety. Muralikrishnan et al. (2021) reported that several traits, including stickiness, high starch content, waxy and aromatic qualities of TRVs, lead farmers to conserve these genotypes for future cropping seasons. Also, the consumption of unpolished traditional rice is rich in bioactive components like phytochemicals, antioxidants, vitamins, and minerals, helping regulate various diseases such as cancer, cardiovascular disease, and diabetes (Kowsalya, Sharanyakanth, and Mahendran 2022). Moreover, fourteen farmers described TRVs that exhibit pest resistance across production sites, enabling them to reduce pesticide usage and apply little to no fertilizers. Traditional rice possesses desirable traits such as resistance to insect pests and diseases, tolerance to abiotic stress, aromatic, pleasant taste, and excellent palatability, which are usually transferred to modern cultivated varieties to enhance rice crop improvement (Rogeno and Seville 2018).

Production practices of TRVs. For primary farm operations like land preparation, planting, and weeding, all farmers agreed they practiced the *bayanihan* scheme to expedite the work (Table 1). The strategy works when fellow farmers in the community come together and help one another to achieve a common purpose as a team. Ealdama (2012) described *bayanihan* as a Filipino tradition in which people go out of their way to help those in need without expecting a reward; and a representation of the Filipino approach to collaborative efforts and communal support, which has become fundamental to the fabric of family and community life in the Philippines (Melendres et al. 2022). However, other farmers mentioned that *arawan/purdiya* and *pakyawan* are also practiced on their farms. In the *arawan* scheme, the owner pays workers daily or weekly according to the number of days they worked (https://laborlaw.ph/wages-salaries-remuneration/), and meals are provided by the owner. The *pakyawan* basis of payment is determined by the completion of the work rather than the duration taken to complete it. Once the work is completed, the worker receives a fixed amount as a wage, without regard to the standard measurements of time generally used in pay computation (https://laborlaw.ph/workers-paid-by-results). The population of other pests, like birds and weeds, was managed manually by the farmers. The presence of birds was minimized by setting up a series of plastic bags and cassette films in the field as scarecrows. A scarecrow serves as a component of the agricultural landscape designed to repel animals, particularly birds, from damaging crops on the farm (Król et al. 2019).

Table 1. Information on ethnicity and production practices of nineteen TRV growers in Nueva Vizcaya, Philippines.

Farm Site	Ethnic group	No. of farmers	Age	Years of planting TRV	Reasons for planting TRV	Source/ Origin of TRV	Farmer's description of the cultivar	Special traits preferred by farmers	Cultural methods
Villaverde	Ifugao	2			Source of food & income, and variety conservation	Owned seeds in the community and MASIPAG varieties from Nueva Ecija	Difficult in panicle threshability (awned), pest & disease resistance, good taste (soft & tender)	Aroma, water, and fertilizer efficiency, high spikelet fertility, and high cooked kernel (linear) elongation	Direct seeded (*Kaingin*), transplanted, *bayanihan, arawan/ purdiya*
	Ilocano	2							
Mean			49	13					
Range			32-69	10-22					
Santa Fe	Iwak	1			Source of food & variety conservation	Owned seeds in the community	Good taste (soft & tender), pest & disease resistance, & high yielding	Aroma & nutrient efficiency	Direct seeded (*Kaingin*), transplanted, *bayanihan, arawan*
	Kalanguya	2							
Mean			51	21					
Range			31-72	17-25					
Solano	Ifugao	2			Source of food, variety conservation, and for breeding purposes (parent material)	Quirino province and MASIPAG varieties from Nueva Ecija	Good taste (soft & tender), pest & disease resistance	Aroma & drought stress tolerance	Direct seeded (*Kaingin*), transplanted, *bayanihan, arawan/ purdiya*
	Ilocano	1							
Mean			58	10					
Range			54-65	3-19					
Bagabag	Ilocano	1			Source of food & income	Tarlac province	Hard grains, when cooked, non-seasonal variety	Aroma & high amylopectin content in the preparation of rice dishes (*kakanin, bibingka, and biko*)	Transplanted, *bayanihan, pakyawan*
Mean			45	2					
Range			-	-					

Farm Site	Ethnic group	No. of farmers	Age	Years of planting TRV	Reasons for planting TRV	Source/ Origin of TRV	Farmer's description of the cultivar	Special traits preferred by farmers	Cultural methods
Diadi	Ilocano Ifugao	1 1			Source of food, high price of commercial rice, and absence of commercial fertilizers	Quirino province, Ifugao province, and owned seeds in the community	Good taste (soft & tender), big grains, awned varieties minimize bird scaring, tall plant height, easy panicle threshability (awn less)	Aroma, pest & disease resistance, and nutrient efficiency	Direct-seeded (*Kaingin), bayanihan, arawan/ purdiya*
Mean			64	23					
Range			59-70	22-24					
Kayapa	Kalanguya Iwak	1 1			Source of food & income	Owned seeds in the community	Good taste (soft & tender), long growing cycle, resistance to pests, tall plant height	Aroma & nutrient efficiency	Transplanted, *bayanihan, arawan/ purdiya*
Mean			56	8					
Range			45-65	5-10					
Ambaguio	Kalanguya	1			Source of food	Owned seeds in the community	Long growing cycle, mixed with other rice grains for food	Aroma & high amylopectin content in the preparation of rice dishes (*kakanin, bibingka, and biko*)	Transplanted, *bayanihan, pakyawan*
Mean			41	13					
Range			-	-					
Kasibu	Ifugao	2			Source of food	Ifugao province and owned seeds in the community	Soft & high fiber content for long satiety	Aroma, pest & disease resistance, and nutrient efficiency	Direct-seeded (*Kaingin*), transplanted, *bayanihan, arawan*
Mean			46	25					
Range			30-62	8-42					
Alfonso Castañeda	Bugkalot	1			Source of food	Owned seeds in the community	Hard grains, when cooked	Aroma, pest & disease resistance, and nutrient efficiency	Direct-seeded (*Kaingin*), *bayanihan*
Mean			40	20					
Range			-	-					

The *Kaingin* or the swidden type (slash-and-burn) of farming was still practiced for growing TRVs in the upland rainfed areas of Diadi, Sta. Fe and Kasibu, Nueva Vizcaya. Farmers grew TRVs annually, commencing in June or at the beginning of the rainy season, as the growth of TRVs relies on rainfall for irrigation. Palay (rice) seeds were dibbled in the soil using a wooden stick or *asad* in Diadi and Kasibu, while bolo (*sinanggap*) was used in Sta. Fe (Fig. 5).

Figure 5. The dibbling method of planting TRVs using *Sinanggap* by farmers in Santa Fe, Nueva Vizcaya, Philippines.

The swidden type is practiced by upland farmers in the Philippines, which involves cleaning an area to be farmed by slashing or removing all types of plants and trees, and burning the uprooted plants (Pollini 2014). The system is believed to rid the soil of pests' damage and make it fertile through nutrient-rich ash (Zapico et al. 2020). Additionally, rice seeds are established by dibbling in dry soil before the onset of the rainy season (Rao et al. 2017).

Concerning the management of nutrients and pests, eighteen farmers did not utilize inorganic inputs in the cultivation of TRVs. Farms in Diadi, Kasibu, and Sta. Fe are considered "organic by default," or no agrochemicals have been used for many years of production. Farmers who practiced 'organic-by-default' (Dankers and Liu 2003) are those who refrain from using chemical inputs either because they do not require them or cannot afford them (Seufert et al. 2023). During harvesting, both *rakem* and *gapas* were utilized to gather panicles of TRVs under the *Bayanihan* scheme. Sun drying of palay was commonly practiced in the community. Some farmers in Kayapa put harvested palay inside rain-sheltered gardens for temporary drying and protection from birds. However, on rainy days, harvested palay was dried at home using the kitchen fire, especially for the immediate food of the family. Dried palay for food was pounded using a mortar and pestle or *alsong* to separate the husk and produce rice grains for food. The village-type rice mills can be found in rural communities and are used for service milling paddy of farmers for home consumption. The conventional method of milling for TRVs involves hand pounding paddy using a mortar and pestle (IRRI 2019).

In irrigated areas, TRVs were transplanted when seedlings reached 25-30 days after sowing (DAS), with 5-10 seedlings per hill, at 20 cm and 30 cm for small rice cultivars; tall TRVs were usually transplanted 30-35 DAS. A similar study on traditional rice was conducted using a row-to-row distance of 30 cm and a plant-to-plant distance of 25 cm, with 5 seeds per hill (Lumba and Posadas 2018). Wider row spacing is recommended for traditional rice cultivars. Wider spacing lessens mutual shading, making plants sturdier, encourages higher tiller production, and makes plants less prone to lodge (http://www.knowledgebank.irri.org/ericeproduction/bodydefault.htm#pop_up_spacing.htm), and quantity of tillers per stand and number of panicles per square meter were both significantly reduced under closer spacing (20 cm x 20 cm) compared to wider spacing (20 cm x 25 cm) in a rain-fed lowland rice ecosystem (Moro et al. 2016). Furthermore, traditional rice varieties are transplanted 40 to 80 days after seeding (IRRI 2007). During the harvest, the manual method was employed in which family members or hired workers, referred to as *pakyawan,* cut individual hills using a sickle (*gapas*). Other farmers opted to use a finger knife (*rakem*) to harvest tall TRVs in the towns of Kayapa, Diadi, and Solano. The finger knife is used to harvest individual panicles in an area where the rice has ripened unevenly (Murphy 2017). Traditional taller varieties, commonly located in the upland areas, are more effectively harvested using small hand-held knives.

Farm descriptions of TRVs. A brief profile of TRVs and their production sites is presented in Table 2. Thirty (30) distinct rice cultivars were profiled in their growing areas. Five TRVs were considered early maturing varieties (≤110 days) from seeding to harvest. Ten TRVs were under medium-maturing varieties (113-125 days), six TRVs were late-maturing varieties (126-136 days), and nine varieties were beyond 136-day maturity. TRVs under the early-maturing varieties were planted twice a year, while the rest of the cultivars were grown once a year due to photoperiod sensitivity, with a range of maturity of 120-170 days. Traditional rice varieties are mostly photoperiod-sensitive, which influences their flowering time, which ranges from 65 to 124 days and can therefore be categorized, based on duration, as short, medium, and long duration varieties (Dwiningsih 2023; Susmitha and Divya 2020).

The largest areas planted with TRVs were in barangays (the smallest administrative divisions and local government units or villages) of Ibung and Careb, found in the municipalities of Villaverde and Bagabag, Nueva Vizcaya, Philippines. Each production area of 1.5 ha was planted with Wag-wag and R5 cultivars, respectively. Farms of 200 m^2 each in Labang, Ambaguio, planted with Balasang and Ketnel cultivars, and in Wacal, Solano, planted with MASIPAG varieties (Elmer, PBB 410, Pilit, AG5, & Batangas), respectively, were considered the smallest production areas of TRVs. The recorded yield average of TRVs is 2.90 tons/ha. MASIPAG (*Magsasaka at Siyentipiko para sa Pag-Unlad ng Agrikultura)* is a farmer-led network of people's organizations, non-government organizations (NGOs), and scientists working towards the sustainable use and management of biodiversity through farmers' control of genetic and biological resources, agricultural production, and associated knowledge (FAO 2022). The Raminad in Villaverde and Palawan in Kayapa varieties had the highest 4.5 tons/ha yield. The lowest yielder of all TRVs was the Batangas cultivar in Solano with a total production of 1.2 tons/ha. Traditional rice varieties in the Philippines are rarely grown for commercial production due to their generally low yield characteristics (Rogeno and Seville 2018).

Table 2. Profile of TRVs and their production sites in the study.*

Genotype (Local name)	Maturity (days)	Land area planted (m^2)	Yield (t/ha)	Location			Rice Land Ecosystem
				Geographic Coordinate	Municipality	Topography	
Red C4	110	3500	2.9	16°34'50.16"N; 121°8' 38.69"E; 425 masl	Villaverde	Undulating	Irrigated
Palawan	143	5000	2.5	16°36'4.33"N; 121°7' 5.99"E; 742 masl	Villaverde	Mountainous	Upland
Bongkitan	135	17000	2.9	16°37'30.98"N; 121°10' 48.9E"; 244 masl	Villaverde	Plain level	Irrigated
Raminad	135	3900	4.5	16°37'31.36"N; 121° 10'25.56"E; 248 masl	Villaverde	Plain level	Irrigated
Wag-wag	125	15000	4.0	16°36'31.0"N; 121°10' 58.8"E; 240 masl	Villaverde	Plain level	Irrigated
Mindoro	134	1000	2.5	16°14' 0.61"N;120° '22.15"E; 994 masl	Santa Fe	Mountainous	Upland
Palawan	143	1000	2.5	16°14'50.18"N; 120° 57'23.7"E; 996 masl	Santa Fe	Mountainous	Upland
Imelda	120	3000	3.3	16°9'49.73"N; 120° 57'0.79"E; 525 masl	Santa Fe	Undulating	Irrigated
Wag-wag	150	5000	4.0	16°9'35.46"N; 120° 57'1.44"E; 583 masl	Santa Fe	Undulating	Irrigated
Mindanao (W)	127	7500	1.7	16°15'15.11"N, 121° 23'47.2"E; 694masl	Kasibu	Mountainous	Upland
Patata	122	3000	4.2	16°15'33.52"N, 121° 23'42.0"E; 604masl	Kasibu	Undulating	Irrigated

Genotype (Local name)	Maturity (days)	Land area planted (m^2)	Yield (t/ha)	Location			Rice Land Ecosystem
				Geographic Coordinate	Municipality	Topography	
Elmer, PBB 410, Pilit, AG5,	100	200 (each)	4.0 (each)	16° 32'8.99"N; 121° 9'19.5"E; 307 masl	Solano	Plain level	Irrigated
Batangas	150	5000	1.2	16°35'43.76"N; 121°5' 43.9" E; 878 masl	Solano	Mountainous	Upland
Mindanao (R)	127	1500	1.3	16°35'40.12"N; 121° 5'45.88"E; 741 masl	Solano	Mountainous	Upland
Kotse	170	1000	2.5	16°22'15.76"N; 120° 52'47.8"E; 1229 masl	Kayapa	Mountainous	Irrigated
California	154	2500	2.0	16°22'16.22"N; 120° 52'38.4"E; 1211 masl	Kayapa	Mountainous	Irrigated
Bongkitan	161	1000	2.5	16°22'20.24"N, 120° 52'37.0"E; 1187 masl	Kayapa	Mountainous	Irrigated
Tuddoy	159	1000	2.5	16°22'19.87"N, 120° 52'41.6"E; 1165 masl	Kayapa	Mountainous	Irrigated
Palawan	145	4000	4.5	16°17'45.2"N; 120° 54'04.3"E; 1487 masl	Kayapa	Mountainous	Irrigated
R5	125	15000	4.0	16°35'39.3"N; 121° 12'52.5"E; 272 masl	Bagabag	Plain level	Irrigated
Milagrosa (R)	125	1000	3.0	16°36'52.15"N; 121° 24'2.45"E; 817 masl	Diadi	Mountainous	Upland
Milagrosa (P)	123	1000	3.0	16°36'52.19"N; 121° 24'2.42"E; 818 masl	Diadi	Mountainous	Upland

Genotype (Local name)	Maturity (days)	Land area planted (m^2)	Yield (t/ha)	Location			Rice Land Ecosystem
				Geographic Coordinate	Municipality	Topography	
Mimis	120	3000	3.3	16°36'52.17"N; 121° 24'2.72"E; 803 masl	Diadi	Mountainous	Upland
Sta. Maria	121	2000	1.75	16°36'54.32"N; 121° 23'54.3"E; 732 masl	Diadi	Mountainous	Upland
Balasang	135	200	2.5	16°30'29.28"E; 121° 1'51.81"E; 886 masl	Ambaguio	Mountainous	Irrigated
Ketnel	125	200	2.0	16°30'28.21"N; 121° 1'51.59"E; 934 masl	Ambaguio	Mountainous	Irrigated
Puk-puklo	125	3500	1.4	16°1'15.83"N; 121° 14'40.8"E; 725 masl	Alfonso Castañeda	Mountainous	Upland

* Adopted from the Philippine Specialty Rice: Understanding Production, Culture, Quality, and Market (Beltran et al. 2020).
W = White, **R** = Red, **P** = Purple.

CONCLUSIONS AND RECOMMENDATIONS

The cultivation of TRVs in Nueva Vizcaya, Philippines, is primarily a food security product for individual households rather than a market-oriented commodity. TRV-growers are part of the indigenous peoples and actively engaged in preserving the rich biodiversity of traditional rice varieties within the community. Characteristics such as aroma, pest and disease resistance, and nutrient efficiency have become important indicators of the conservation of TRVs. Documenting farmers' practices and traditional rice varieties is necessary to conserve agrobiodiversity and ensure food security. Furthermore, the Geographic Information System technology effectively maps the different locations of TRVs cultivated in the province, which enhances decision-making and efficiency.

Additional collection is suggested for various TRVs grown by other farmers, which were not part of the profiling study, for conservation purposes. Considering the significance of analyzing genetic diversity, it is essential to conduct studies that emphasize the morphological and molecular characterization of both the collected and the existing traditional rice varieties, aiming for possible enhancements in crop yield in the future.

ACKNOWLEDGMENT

The financial assistance provided by the Department of Science and Technology – Science Education Institute (DOST-SEI) for the Accelerated Science and Technology Human Resource Development Program (ASTHRDP) scholarship is highly recognized in this paper. The author also appreciates the expertise of Dr. Rosemarie T. Tapic, Dr. Franz Marielle C. Nogoy, Dr. Ariel G. Mactal, affiliated with Central Luzon State University, Science City of Muñoz, Nueva Ecija, Philippines, and Dr. Jerwin R. Undan, and Dr. Jonathan M. Niones of the Philippine Rice Research Institute, Maligaya, Science City of Muñoz, Nueva Ecija, Philippines.

REFERENCES CITED

.

Andal, J.A. and E.A. Sana. 2008. Profile of traditional rice cultivars and their culture in Nueva Vizcaya. Undergraduate Thesis, Department of Plant Science, College of Agriculture, Nueva Vizcaya State University, Bayombong, Nueva Vizcaya, Philippines.

Beltran J.C., F.H. Bordey, P.F. Moya, R.Z. Relado-Sevilla, and M.V. Romero. 2020. Philippine Specialty Rice: Understanding Production, Culture, Quality, and Market. Philippine Rice Research Institute and International Rice Research Institute, Manila. 380 p.

Bolla, B.L. and R.M. Galduen. 2018. Mapping and profiling of traditional rice cultivars in Nueva Vizcaya. Undergraduate Thesis, Department of Plant Science, College of Agriculture, Nueva Vizcaya State University, Bayombong, Nueva Vizcaya, Philippines.

Camacho, L.D., D.T. Gevaña, A.P. Carandang, and S.C. Camacho. 2015. Indigenous knowledge and practices for the sustainable management of Ifugao forests in Cordillera, Philippines. International Journal of Biodiversity Science, Ecosystem Services & Management. 12(2): 5-13.

Cuevas, R.P., M.C. Custodio, J. Ynion, A. Samaddar, and M. Demont. 2021. Gastronomic Systems Research. Gastronomy and Food Science. Academic Press. Pp. 55-74.

Dankers, C. and P. Liu. 2003. Environmental and social standards, certification and labelling for cash crops. Vol. 2. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy.

David v. Macasio, G.R. No. 195466 (Supreme Court July 2, 2014). https://elibrary.judiciary.gov.ph/

DENR [Department of Environment and Natural Resources]. 2013. NGP Geo-tagging Manual. Quezon City, Philippines.

Dwiningsih, Y. 2023. Utilizing the genetic potentials of traditional rice varieties and conserving rice biodiversity with system of rice intensification management. Agronomy. 13(12): 3015.

Ealdama, Y.G. 2012. BAYANIHAN: The indigenous Filipino strengths perspective. International Conference on Strengths-Based Practice in Social Work and Human Services, Kathmandu, Nepal.

FAO [Food and Agriculture Organization of the United Nations]. 2022. Magsasaka at Siyentipiko para sa Pag-unlad ng Agrikultura (MASIPAG). https://www.fao.org/mountain-partnership/members/detail/magsasaka-at-siyentipiko-para-sa-pag-unlad-ng-agrikultura-masipag/en. Accessed August 27, 2023.

IRRI [International Rice Research Institute]. 2007. Planting the rice. Pili Drive, Los Baños, Laguna 4031, Philippines.

________________ . 2018. Helping shape the future of rice value chains. Pili Drive, Los Baños, Laguna 4031, Philippines.

________________ . 2019. Step-by-Step Rice Production: Planting. Rice Knowledge Bank, [Link: http://www.knowledgebank.irri.org/step-by-step-production/growth/planting]. Accessed June 10, 2019.

Król, K., R. Kao, and J. Hernik. 2019. The scarecrow as an indicator of changes in the cultural heritage of rural Poland. Sustainability. 11(23): 6857.

Laborte, A.G., N.C. Paguirigan, P.F. Moya, A. Nelson, A.H. Sparks, and G.B. Gregorio. 2015. Farmers' preference for rice traits: Insights from farm surveys in Central Luzon, Philippines. PLoS ONE. 10(8): 1966-2012.

Lumba, A.L. and M.F.G. Posadas. 2018. Varietal trial of traditional upland rice (*Oryza sativa* L.) varieties collected in the province of Negros Occidental. Philippine Social Development and Resource Management Journal. 1: 2651-7027.

Mathenge, M., Sonneveld, B. G. J. S., and J.E.W. Broerse. 2022. Application of GIS in agriculture in promoting evidence-informed decision making for improving agriculture sustainability: A systematic review. Sustainability, 14(16), 9974. https://doi.org/10.3390/su14169974

Melendres, C.N., J.Y. Lee, B. Kim, and R.M. Nayga. 2022. Increasing Yield and farm income of upland farmers: The case of Panay Island Upland Sustainable Rural Development Project in the Philippines. Journal of Asian Economics, 82, 101524. https://doi.org/10.1016/j.asieco.2022.101524

Mosleh, M.K., Q.K. Hassan, and E.H. Chowdhury. 2015. Application of remote sensors in mapping rice area and forecasting its production: A review. Sensors. 15(1): 769–791. https://doi.org/10.3390/s150100769

Muralikrishnan, L., R. Padaria, N. Dass, A., A.K. Choudhary, B. Kakade, S. Shokralla, T.K.Z. El-Abedin, K.F Almutairi, and H.O. Elansary. 2021. Elucidating traditional rice varieties for consilient biotic and abiotic stress management under changing climate with landscape-level rice biodiversity. Land. 10(10): 1058.

Murphy, K.M. 2017. A quiet harvest: Linkage between ritual, seed selection, and the historical use of the finger-bladed knife as a traditional plant-breeding tool in Ifugao, Philippines. J Ethnobiology Ethnomedicine. 13(1). https://doi.org/10.1186/s13002-016-0124-9

Ocampo, R.O. and R.B. Ocampo. 2016. On farm conservation practices of upland rice varieties in selected towns of Apayao. International Journal of Interdisciplinary Research and Innovations. 4(3). 26-42.

Pic2Map.com. (n.d.). *What is Pic2Map?* Retrieved August 27, 2025, from https://www.pic2map.com/

Pollini, J. 2014. Slash-and-Burn Agriculture. Encyclopedia of Food and Agricultural Ethics. Springer. Pp. 1648-1657.

Rabara, R.C., M.C. Ferrer, C.L. Diaz, M.C.V. Newingham, and G.O. Romero. 2014. Phenotypic diversity of farmers' traditional rice varieties in the Philippines. Agronomy. 4(2), 217-241.

Rabara, R.C., M.C. Ferrer, M.I.C. Calayugan, M.D. Duldulao, and J. Jara-Rabara. 2015. Conservation of rice genetic resources for food security. Adv Food Technol Nutr Sci Open J. SE (1): S51-S56.

Rao, R.N., S.P. Wani, M.S. Ramesha, and J.K. Ladha. 2017. Rice Production Systems. Springer International Publishing. Rice Production Worldwide. Pp. 185-205.

Rogeno, L.A. and C. Seville. 2018. Adaptability of traditional rice varieties under PhilRice Negros. Philippine Journal of Crop Science. 43(1): 97.

Seufert, V., S.E. Austin, M.G. Badami, S. Turner, and H. Ramankutty. 2023. The diversity of organic farmer motivations and livelihoods in the Global South – A case study in Kerala, India. Geoforum. 138.

Singh, R. P. 2018. Integration and commercialization of local varieties under sub-optimal environments for food security, promoting sustainable agriculture and agrobiodiversity conservation. MOJ Eco Environ Sci. 3(2): 65-67.

Sondari, N., N.F. Putri Daliesta, R.A. Hadi, L. Amalia, C.P. Nurlukman, H. Mulyana, and I. Ulfah. 2024. Ethnoagronomic study of rice plants (*Oryza sativa* L.) based on the geographic information system in Tanjungkerta Sumedang District, West Java, Indonesia. Journal Agrosci. 1(6): 294-299.

Susmitha, G. and K. Divya. 2020. Study of Consumer awareness and knowledge of traditional rice varieties in Erode City, Tamil Nadu. International Journal of Agriculture Sciences. 12(24): 10506-10509.

White, J.W., J.D. Corbett, and A. Dobermann. 2002. Insufficient geographic characterization and analysis in the planning, execution, and dissemination of agronomic research? Field Crops Research. 76(1): 45-54.

Yusupova, F.E. 2024. Effectiveness of using GIS technologies in agriculture. Czech Journal of Multidisciplinary Innovations. 25, 5–10. https://doi.org/10.5281/zenodo.10643273

Zapico, F.L., J.T. Dizon, E.S. Fernando, T.G.H. Borromeo, K.L. McNally, and J.E. Hernandez. 2020. Upland rice: Cultural keystone species in a Philippine traditional agroecosystem. Asian Journal of Agriculture and Development. 17(2), 93-104. https://doi.org/10.37801/ajad2020.17.2.6

Zhao, R., Y. Li, and M. Ma. 2021. Mapping paddy rice with satellite remote sensing: A review. Sustainability, 13(2), 503. https://doi.org/10.3390/su13020503

Zhu, Y., Y. Wang, H. Chen, and B. Lu. 2009. Conserving Traditional rice varieties through management for crop diversity. BioScience. 53(2): 158-162.

Authorship contributions:

Conceptualization: ABL; Study design: ABL; Sample collection: ABL; Conduct of experiment: ABL; Data curation: ABL; Visualization: ABL; Formal analysis: ABL; Supervision: ABL; Writing – Original Draft preparation: ABL; Writing – Review and editing: ABL