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Ethnobotanical Inventory of Banten Local Food Plants: Strategic Reconstruction into Ethnoscience-Based Biology Instructional Materials

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Abstract

The botanical diversity found in Indonesia is contrasted by the country's dependency on imported foodstuffs. This paper aims to conduct an ethnobotanical survey of local food plants found in Banten Province, Indonesia, and develop a pedagogical reconstruction concept model that incorporates TEK into biology lessons at secondary and tertiary levels. An ethnobotanical survey of local food plants was carried out in March to May 2026 in the coastal, lowland agroforestry, and highland ecosystems of Pandeglang, Lebak, Serang, and Cilegon regions. Data were gathered using purposeful sampling through field observations, specimen collection, semi-structured interviews involving 45 local informants (elderlies, farmers, and indigenous community leaders), and secondary literature validation. Species recorded were identified taxonomically using Plants of the World Online (POWO) database and categorized in core biological subjects within TPACK framework. The ethnobotanical survey revealed 32 species of local food plants belonging to 7 functional groups. Some of the important findings include the underexploitation of valuable functional species like Xanthosoma undipes (Taro Beneng; starch 80.6%, GI 48) and Sonneratia caseolaris (Pedada), as well as species requiring conservation efforts, like Garcinia dulcis (Mundu) and Baccaurea racemosa (Jatake). The cyanogenic detoxification of Dioscorea hispida and the Leuit post-harvesting storage practice of indigenous people were conceptually linked to biochemistry, plant physiology, ecology, and taxonomy lessons. In order to translate traditional knowledge into a form compatible with contemporary digital learning, the framework considers the use of future AI-supported smart identification through the use of the Pl@ntNet API.

Keywords: Banten Local Food, Bioentrepreneurship, Ethnobotany, Ethnoscience, Instructional Materials

INTRODUCTION

Indonesia is renowned throughout the world as a mega-biodiversity hotspot, being ranked second in the world after Brazil in regard to the number of species of organisms. Being home to more than 30,000 species of vascular plants, the country exhibits a great potential for creating sustainable food security and sovereignty (Supriatna & Margules, 2022). Nevertheless, a significant contradiction exists since national food security is vulnerable due to the great dependency on food commodities from abroad (Hellegers, 2022), especially on wheat and soybeans, along with overconcentration in consuming only one type of staple grain (food homogenization), namely rice. According to national reports of international trade, Indonesia imports millions of tons of grains per year, which indicates great gaps between the biological resources of the indigenous origin and their rational use for the purposes of sustainability (Rahman, 2018).

The province of Banten in the western part of the island of Java covers diverse ecosystems including marine and coastal areas like mangroves, lowland forests and high altitude tropical rainforest of Mount Halimun Salak National Park (TNGHS) (Supriatna & Margules, 2025). The geographical diversity of the province is conducive to the development of plant germplasm that is traditionally used by the indigenous population, such as the Baduy and Kasepuhan ethnic groups (Iskandar & Iskandar, 2021). Nevertheless, despite this wealth, Banten's native food plants are under serious threat from the speedy land use changes, degradation of nature, and loss of traditional knowledge among young people (Hasim et al., 2025). Moreover, a number of wild and semi-domesticated food plants have not yet been documented formally (Gori et al., 2026).

Ethnobotany acts as a critical intermediary that facilitates the connection between TEK and biological sciences (Jyoti & Yadav, 2025). Incorporation of ethnobotanical insights into the formal teaching of biology using the framework of ethnoscience allows contextual learning of scientific concepts like plant classification, physiological adaptation, ecosystem function, and biochemistry (Husamah, 2015). To avoid confusion in this research, some terminologies are defined operationally: Ethnobotany: The scientific study of human interactions with plants in cultural and ecological settings. Traditional Ecological Knowledge (TEK): The cumulative indigenous knowledge and practices concerning ecosystem functions and natural resources. Ethnoscience: The body of indigenous scientific knowledge embodied in local cultures. Ethnoscience-based Biology Education: The deliberate process of transforming local ethnoscience into biological concepts and educational paradigms (Gökbulut, 2026).

Prior studies on education have shown the importance of the potentiality of the locale in biological learning materials (Nurjanah & Laguatan, 2025; Rachmawati et al., 2024a). Unfortunately, many ethnobotanical ventures in the local communities do not have a systematic curricular mapping process, scientific biochemical verification from primary sources, and clear demarcation of concept development and the learning product developed through the process. In addition, although modern digital technology, such as AI-based image recognition technology can be an opportunity in smart identification in botany learning (Syahara & Handoko, 2023), utilizing technologies like the Pl@ntNet API is a prospective development that can be done in the future.

METHOD

Study Site and Sampling Strategy

The field study was carried out between March and May 2026 in four selected administrative areas within Banten Province, Western Java, Indonesia: Pandeglang (slope area of Mt. Karang and low-lying coastal plain), Lebak (upland agroforestry region and Baduy indigenous people), Serang (coastal and secondary forest areas), and Cilegon (mangrove estuary). The respondents were purposively and snowball sampled (Amenu, 2007). A total of 45 key informants were involved in the study, including traditional village elders (n = 8), local farmers (n = 22), traditional food processors (n = 10), and local community leaders (n = 5). To be included in the study, the participants had to have been living in the area for at least three years and involved in local plant cultivation/harvesting/processing.

Selection Criteria for Local Food Plants

Local food plant species were documented based on four predefined inclusion criteria:

1. Species utilized traditionally for human consumption (staples, wild fruits, vegetables, spices, or famine foods) within Banten local communities.
2. Non-rice local plant genetic resources.
3. Species possessing cultural, biochemical, or ecological significance.
4. Plants currently cultivated, semi-wild, or wild in Banten ecosystems.

Field Data Collection and Taxonomic Verification

Data Collection Methods were semi-structured interviews, guided field walks (also known as Participatory Rural Appraisal), and direct field observation. Instruments used in the field were structured observation checklists, GPS recorders, cameras, and field notebooks. In order to ascertain taxonomic validity, Scientific name, Standard Author abbreviation, and Family Classification of plant species were rigorously checked through online taxonomic databases like Plants of the World Online (POWO, Royal Botanic Gardens, Kew) and World Flora Online (WFO). Plant specimens were collected, prepared and deposited in Biology Education Laboratory, Universitas Tangerang Raya.

Secondary Data Verification and Conservation Profiling

For the evidence presented about the nutritional and biochemical properties (such as starch content, glycemic index, and bioactive components), values stated in the ethnobotanical review tables have been extracted from the peer-reviewed literature and government sources, with direct citations provided according to each species. The IUCN Red List of Threatened Species (Version 2023-1/2024-1 database) was used for checking the conservation status systematically. The global IUCN Red List categorization was separated from local conservation concerns (such as habitat destruction in Banten) for accurate analysis.

Framework for Conceptual Pedagogical Reconstruction & AI Integration

The pedagogical reconstruction process turned the qualitative ethnobotany data into formal biology educational units according to the TPACK model (Gomes et al., 2026; Schmidt et al., 2009). The indigenous knowledge system (ethnoscience) was linked to the official biology learning outcomes of the national high school (Kurikulum Merdeka) level on four main analytical axes: Plant Morphology and Taxonomy, Plant Physiology and Biochemistry, Ecosystem Ecology and Conservation, and Bioentrepreneurship. In order to enhance the Technological Knowledge (TK) component of the framework, the API integration method is used with Pl@ntNet (an existing computer vision application based on artificial intelligence technology) for automatic visual identification of local food plants in potential e-modules (Arif, 2024; Desi, 2025).

RESULTS AND DISCUSSION

Ethnobotanical Diversity and Taxonomic Richness

The ethnobotanical survey recorded 32 local food plant species distributed across 21 botanical families and 7 functional categories: iconic tubers/carbohydrates (7 species), wild/cultivated fruits (8 species), coastal/mangrove foods (5 species), multipurpose superfoods/spices (5 species), protein pods/legumes (2 species), leafy vegetables (3 species), and staple landrace grains (2 species). The botanical families with the highest representation were Dioscoreaceae (3 species), Araceae, Arecaceae, Myrtaceae, and Phyllanthaceae. The detail we can see on Table 1, Table 2, Table 3, Table 4, Table 5, Table 7, and Table 8.

Table 1. Iconic Tubers and Carbohydrates

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
1	Talas Beneng	Xanthosoma undipes K.Koch (Araceae)	Pandeglang (Mt. Karang slopes)	Staple carb substitute; starch 80.6% dw, GI 48, high fiber; processed into flour (Budiarto & Rahayuningsih, 2017; Pancasasti et al., 2016).	Least Concern
2	Ganyong	Canna edulis Ker Gawl. (Cannaceae)	Lebak, Pandeglang, Serang	Rhizome starch with large granules; easily digestible; used for weaning food and traditional cakes (Utami et al., 2023).	Least Concern
3	Garut / Sagu	Maranta arundinacea L.	Pandeglang, Lebak	Gluten-free arrowroot starch; used for digestive	Least Concern

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
	Belanda	(Marantaceae)		soothing, infant food, and bakery products (Majid et al., 2025).	
4	Gadung	Dioscorea hispida Dennst. (Dioscoreaceae)	Secondary forests, Pandeglang, Serang	Famine tuber; contains toxic cyanogenic glycosides (HCN); safe after ash-soaking and running water leaching (Erinda, 2021; Widiyanti & Kumoro, 2017).	Least Concern
5	Ubi Kelapa / Ubi Ungu	Dioscorea alata L. (Dioscoreaceae)	Lebak highlands, Pandeglang	Purple tuber rich in anthocyanins and resistant starch; boiled or steamed into local snacks (Majid et al., 2025).	Least Concern
6	Gembili	Dioscorea esculenta (Lour.) Burkill (Dioscoreaceae)	Lebak agroforests	Small tubers; fine starch texture; high in mucilage water-soluble fiber and inulin prebiotic (Utami et al., 2023).	Least Concern
7	Sagu Aren	Arenga pinnata (Wurmb) Merr. (Arecaceae)	Lebak, Pandeglang highlands	Pith starch extracted for traditional noodles, local porridge, and traditional snacks (B. S. Iskandar & Iskandar, 2021).	Least Concern

IUCN Red List status verified via IUCN (2024) Red List database (Version 2023-1). Quantitative biochemical values compiled from secondary accredited literature as cited.

Table 2. Wild and Cultivated Indigenous Fruits

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
1	Kawista	*Limonia acidissima* L. (Rutaceae)	Northern coastal Serang	Hard-shelled fruit; pulp rich in tannins, flavonoids, and vitamin C; processed into local syrup (John et al., 2025).	Not Evaluated[b]
2	Jatake / Menteng	*Baccaurea racemosa* (Reinw. ex Blume) Müll.Arg. (Phyllanthaceae)	Lebak, Pandeglang	Cauliflorous fruit; high anthocyanin and vitamin C content; eaten fresh or fermented (John et al., 2025).	Not Evaluated[b]
3	Gowok / Kepa	*Syzygium polycephalum* (Miq.) Merr. &	Serang secondary growth	Dark purple berries; rich in anthocyanins and polyphenols;	Not Evaluated[b]

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
		Perry (Myrtaceae)		traditional antidiabetic fruit (John et al., 2025).	
4	Mundu	*Garcinia dulcis* (Roxb.) Kurz (Clusiaceae)	Pandeglang, Serang	Rare yellow fruit; rich in xanthones and antioxidants; priority species subject to local scarcity (John et al., 2025).	Not Evaluated[b]
5	Kecapi / Sentul	*Sandoricum koetjape* (Burm.f.) Merr. (Meliaceae)	Pandeglang lowland forests	Fleshy fruit with sweet-sour pulp; rich in pectin and triterpenoids; eaten fresh or preserved (John et al., 2025).	Least Concern
6	Gandaria	*Bouea macrophylla* Griff. (Anacardiaceae)	Lebak agroforestry	Plum-like fruit; high vitamin C and carotene; used for chili paste (*sambal gandaria*) (John et al., 2025).	Not Evaluated[b]
7	Buni	*Antidesma bunius* (L.) Spreng. (Phyllanthaceae)	Pandeglang secondary growth	Cluster berries; high antioxidant and flavonoid content; used for local fruit salad and jam (John et al., 2025).	Least Concern
8	Juwet / Duwet	*Syzygium cumini* (L.) Skeels (Myrtaceae)	Coastal Serang, Cilegon	Astringent purple fruit; contains jamboline and anthocyanins; traditional antidiabetic snack (John et al., 2025).	Least Concern

[a]IUCN Red List status verified via IUCN (2024). [b]Not Evaluated globally on IUCN Red List, but identified as locally threatened in Banten due to land conversion.

Table 3. Coastal & Mangrove Foods

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
1	Pedada / Bogem	*Sonneratia caseolaris* (L.) Engl. (Lythraceae)	Coastal mangrove, Cilegon, Ujung Kulon	Pneumatophore mangrove; fruit high in Vitamin C (65 mg/100g); processed into mangrove syrup and jam (Audah et al., 2025; Farhansyah et al., 2025).	Least Concern
2	Nipah	*Nypa fruticans*	Estuaries,	Stemless palm; young	Least

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
		Wurmb (Arecaceae)	Teluk Banten	endosperm consumed as fruit; sap tapped for palm sugar (Audah et al., 2025).	Concern
3	Api-api	*Avicennia marina* (Forsk.) Vierh. (Acanthaceae)	Cilegon tidal flats	Seeds contain complex starch; processed into mangrove flour after boiling and soaking detoxification (Audah et al., 2025).	Least Concern
4	Jeruju	*Acanthus ilicifolius* L. (Acanthaceae)	Estuarine mangroves	Leaves rich in alkaloids and antioxidants; processed into health crackers and herbal tea (Audah et al., 2025).	Least Concern
5	Sukun Laut / Sukun	*Artocarpus altilis* (Parkinson) Fosberg (Moraceae)	Coastal Serang, Pandeglang	Seedless carbohydrate fruit; processed into chips and gluten-free flour (Majid et al., 2025).	Data Deficient

[a]IUCN Red List status verified via IUCN (2024) Red List database.

Table 4. Multipurpose Superfoods & Spices

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
1	Kelor	*Moringa oleifera* Lam. (Moringaceae)	Widespread in home gardens	High protein (29% dw), calcium, iron, and 46 antioxidants; used as an anti-stunting food fortifier (Majid et al., 2025)	Least Concern
2	Kecombrang / Honje	*Etlingera elatior* (Jack) R.M.Sm. (Zingiberaceae)	Lebak, Pandeglang highlands	Inflorescence rich in essential oils; key flavor in local cooking, sambal, and fresh salad (John et al., 2025).	Least Concern
3	Katuk	*Sauropus androgynus* (L.) Merr. (Phyllanthaceae)	Home gardens, widespread	Leafy vegetable rich in iron, vitamin A, and papaverine; traditional galactagogue (Majid et al., 2025).	Not Evaluated

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
4	Melinjo	*Gnetum gnemon* L. (Gnetaceae)	Pandeglang, Serang plantations	Gymnosperm seed processed into emping crackers; rich in stilbenoids and antioxidants (Majid et al., 2025).	Least Concern

Table 5. Legumes / Protein Pods

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
1	Jengkol	*Archidendron pauciflorum* (Benth.) I.C.Nielsen (Fabaceae)	Pandeglang, Lebak	Seed pods rich in protein and djenkolic acid; boiled or stewed; folk medicinal use (Majid et al., 2025).	Not Evaluated
2	Petai	*Parkia speciosa* Hassk. (Fabaceae)	Pandeglang, Lebak agroforests	Pungent seeds high in protein and cyclic polysulfides; eaten raw as lalap; folk antidiabetic (Majid et al., 2025).	Least Concern

Table 6. Leafy Vegetables

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
1	Genjer	*Limnocharis flava* (L.) Buchenau (Limnocharitaceae)	Rice paddies / wetlands	Aquatic leafy vegetable rich in iron and vitamin A; commonly stir-fried (Desi, 2025) (Setiyadi, 2025).	Least Concern
2	Pakis / Paku Sayur	*Diplazium esculentum* (Retz.) Sw. (Athyriaceae)	Riverbanks, moist forests	Fern fiddleheads high in fiber and antioxidants; stir-fried as wild vegetable (Desi, 2025).	Least Concern

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
3	Leunca	*Solanum americanum* Mill. (Solanaceae)	Home gardens, widespread	Small berries eaten raw or cooked; contains solanine alkaloids, safe when mature (Desi, 2025).	Least Concern

Table 7. Staple Grain

No.	Local Name	Scientific Name & Family	Habitat / Distribution	Traditional Ethnobotanical Use & Biochemical Profile	IUCN Status
1	Hanjeli	Coix lacryma-jobi L. (Poaceae)	Kanekes/Baduy, Lebak	Traditional rice-substitute grain; rich in protein and fiber, low GI; processed into porridge	Not Evaluated
2	Pare Huma	Oryza sativa L. (local landrace) (Poaceae)	Kanekes/Baduy upland fields	Sacred upland rice landraces grown via traditional huma shifting cultivation; hand-harvested. (Iskandar & Iskandar, 2021)	Not Applicable[b]

[a]IUCN Red List status verified via IUCN (2024). [b]Cultivated local landrace.

Traditional Knowledge and Biochemical Profiles

The recorded food species have highly sophisticated indigenous science (TEK) which resonates with the contemporary biochemical knowledge. One good example is the way the locals process Dioscorea hispida (Gadung) in Pandeglang and Serang. The raw form has a very lethal amount of cyanogenic glycosides (dioscorine and HCN) (Widiyanti & Kumoro, 2017). The locals use an empirical technique of detoxification involving cutting of the tubers, adding wood ash (alkali treatment), soaking in flowing water for 3 to 4 days and drying through sunlight (Erinda, 2021). From the biochemical point of view, the ash alkali breaks down the cell wall and hydrolyzes the cyanogenic glycosides while continuous leaching dissolves the liberated HCN. Another case is that of Xanthosoma undipes (Talas Beneng), a giant taro endemic to Mount Karang characterized by high starch content (80.6% dry matter) and low glycemic index (GI=48) (Budiarto & Rahayuningsih, 2017; Pancasasti et al., 2016). The local techniques of processing food such as boiling, flour milling and reduction of calcium oxalate via salt wash show how the locals apply food chemistry techniques to remove acridity due to calcium oxalate raphe crystals.

Conservation Status and Ecological Significance

For the determination of conservation priority, the status of each species was systematically analyzed using the global IUCN Red List database (IUCN, 2023). Most of the widespread species (such as Moringa oleifera, Sonneratia caseolaris, and Canna edulis) are classified as least concern (LC) globally while some of the wild and semi-cultivated species pose great conservation challenges in Banten. The species like Garcinia dulcis (Mundu), Baccaurea racemosa (Jatake), and Limonia acidissima (Kawista) are not evaluated (NE) on the global IUCN Red List, yet pose a great threat in local populations owing to agricultural land conversion, deforestation, and non-commercialization in Banten (John et al., 2025). Moreover, the Leuit postharvest conservation system of Baduy indigenous communities offers a sustainable in situ conservation approach, conserving more than 200 local rice landraces (pare huma) without chemical pesticides (J. Iskandar, 2022).

Conceptual Framework for Pedagogical Reconstruction & Pl@ntNet API Integration

According to suggestions for improvement of the scope from the reviewer's side, this paper introduces a theoretical reconstruction framework for teaching purposes instead of a full-fledged e-module product. For TK dimension in the TPACK framework, plant identification within the e-module can be digitally scaffolded through the Pl@ntNet API. Pl@ntNet is an application programming interface that employs machine learning on datasets of botanical images. In case it is embedded within the e-module interface, the students can upload images of plant organs (flowers, leaves, fruits) taken on field walk exercises. The API queries the database and provides scientific names of the plants, percentage of confidence and taxonomic linkage information, which can be matched with traditional names and TEK data.

Table 8. Conceptual Pedagogical Mapping of Ethnobotanical Findings into Biology Curricula

Ethnobotanical Phenomenon / Species	Core Biological Concept	Curricular Target Level & Learning Outcome (CP)	Proposed Pedagogical Activity (TPACK & Pl@ntNet Integrated)
Plant Identification & Morphology across 32 Banten species	Plant Morphology, Organography & Taxonomic Classification	High School (Grade 10) / Undergraduate Botany: Identify and classify plant diversity using digital tools.	Pl@ntNet API-Guided Identification: Students capture floral/leaf photos, run automated AI identification via Pl@ntNet API, analyze match confidence scores, and cross-reference scientific names with traditional local names.
Detoxification of *Dioscorea*	Plant Biochemistry & Secondary	High School (Grade 11) /	Interactive biochemical flowcharts, problem-based

Ethnobotanical Phenomenon / Species	Core Biological Concept	Curricular Target Level & Learning Outcome (CP)	Proposed Pedagogical Activity (TPACK & Pl@ntNet Integrated)
hispida (Ash leaching of HCN)	Metabolites	Undergraduate Biochemistry: Analyze plant metabolic pathways and chemical toxicity.	learning (PBL) on enzymatic hydrolysis and pH-dependent leaching.
Xanthosoma undipes low GI starch & functional flour	Cellular Nutrition, Carbohydrate Structure & Metabolism	High School (Grade 11) / Undergraduate Physiology: Evaluate starch digestibility, amylase activity, and glycemic impact.	Virtual lab experiments comparing amylose/amylopectin ratios; bioentrepreneurship design project for gluten-free flour.
Pneumatophores of *Sonneratia caseolaris* & mangrove adaptation	Plant Anatomy, Morphological Adaptation & Respiratory Physiology	High School (Grade 10) / Undergraduate Botany: Explain structural adaptations to saline, anoxic coastal environments.	Digital herbarium exploration, microscopic virtual tissue analysis (aerenchyma and lenticels), and coastal ecosystem modeling.
Leuit traditional storage & 200+ landrace preservation	Genetics, Agrobiodiversity & In-Situ Conservation	High School (Grade 12) / Undergraduate Ecology: Evaluate biodiversity conservation strategies and genetic resistance.	Case study analysis of TEK vs. modern seed banking; digital infographics on sustainable post-harvest ecological controls.
Declining populations of *Garcinia dulcis* & wild forest fruits	Conservation Biology, Threats to Biodiversity & IUCN Profiling	High School (Grade 10) / Undergraduate Conservation: Analyze anthropogenic threats and design local conservation plans.	Webquest using IUCN Red List databases; student group projects proposing local ex-situ conservation action plans.

In linking the field study to core biological concepts (Table 8), the system translates contextual education, which is rooted in ethnoscience (Arif, 2024; Sudirman et al., 2025). Converting local use of the plants into PBL cases helps students learn about biological mechanisms through concrete, culturally relevant instances (Iriansyah, 2026; Rachmawati et al., 2024b).

CONCLUSION

In this study, the systematic ethnobotanical inventory of 32 species of local food plants in Banten Province was completed, showing their uses, biochemical composition, and conservation status. For instance, iconic plants such as Xanthosoma undipes, Sonneratia caseolaris, and Dioscorea hispida exemplify the interaction between the traditional ecological knowledge system and biological sciences. From this finding, the conceptual framework of reconstruction was formulated through the lens of TPACK, whereby ethnobotanical information was mapped in core units of biology curriculum, together with architectural integration of Pl@ntNet API AI. In summary, this study offered a structured and culturally based pedagogical approach. Since no physical and digital learning materials were empirically tested in the classroom setting, further empirical research is needed to create functional digital e-modules, and to use the Pl@ntNet API function.

SUGGESTIONS

Based on the findings and scope of this study, several recommendations are proposed for future research and pedagogical implementation:

1. Empirical Validation and Implementation: Further research is recommended to empirically test the effectiveness of the reconstructed ethnoscience-based e-module in classroom settings, particularly evaluating its impact on students' critical thinking skills, botanical literacy, and conservation attitudes.
2. AI Technology Refinement: Future studies should focus on expanding and validating the image database for the AI Smart-Identification feature, ensuring higher accuracy in identifying rare, wild, and endemic Banten food plants under various field conditions.
3. Nutritional and Phytochemical Profiling: Comprehensive laboratory testing (e.g., detailed glycemic index, shelf-life analysis, and bioactive compound profiling) is suggested for underutilized species such as *Garcinia dulcis* (Mundu) and *Baccaurea racemosa* (Jatake) to strengthen their scientific justification for functional food and bioentrepreneurship development.
4. Conservation and Policy Integration: Local governments, educational institutions, and conservation agencies are encouraged to collaborate in establishing *in-situ* and *ex-situ* conservation reserves for threatened species identified in this study (e.g., IUCN Endangered and Vulnerable species), while formally integrating indigenous food plant literacy into local school curricula.

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REFERENCES

Amenu, E. (2007). Use and management of medicinal plants by indigenous people of Ejaji area (Chelya Woreda) West Shoa, Ethiopia: An ethnobotanical approach. *Addis Ababa University*.

Arif, K. (2024). *Dari Warisan Leluhur ke Laboratorium Modern : Etnosains Mewarnai Pembelajaran IPA*.

Audah, K. A., Marpaung, A. M., & Anisa, A. S. (2025). PEMANFAATAN TANAMAN MANGROVE SEBAGAI BAHAN PANGAN OLAHAN. *Prosiding PKM-CSR*, *8*(1), 7.

Budiarto, M. ., & Rahayuningsih, Y. (2017). Potensi nilai ekonomi talas beneng (Xanthosoma undipes K.Koch) berdasarkan kandungan gizinya. *Jurnal Kebijakan Pembangunan Daerah*, *1*(1), 1–12.

Desi, A, S. (2025). *Etnobotani Keanekaragaman Pangan Pada Suku Dayak Tamambaloh Di Desa Tamao Kecamatan Embaloh Hulu Kabupaten Kapuas Hulu Sebagai Pengembangan Atlas*.

Erinda, S. (2021). Uji Organoleptik Pemanfaatan Garam Dan Abu Dapur Terhadap Detoksifikasi Umbi Gadung (Dioscorea Hispida Dennst) Dalam Pembuatan Tepung. *SOSAINS*, *1*(8), 881–891.

Farhansyah, M., Rostini, I., & Pratama, R. . (2025). UTILIZATION OF PEDADA MANGROVE FRUITS (Sonneratia sp .) IN THE DEVELOPMENT OF FRUIT JUICE DRINKS WITH CARRAGEENAN AS A STABILIZER. *Jurnal Perikanan*, *15*(5), 2558–2568.

Gökbulut, B. (2026). Enhancing Pre-Service Teachers ' AI-TPACK Through Sustainable Development Goals : A Mixed-Methods Study on. *MDPI*, *18*(1), 23.

Gomes, F. M., dos Santos, M. S. S. L., Ramos, L. O. L., & Viegas, L. M. D. (2026). Ethnobotany in science education: A pathway for biology teachers to engage with climate change and local knowledge. *Ethnobotany Research and Applications*, *34*, 1–13.

Gori, B., Cossu, T., El Zein, H., Liu, U., Ulian, T., & Bacchetta, G. (2026). A comprehensive checklist of Mediterranean wild edible plants: Diversity, traditional uses, and knowledge gaps. *Plants, People, Planet*, *8*(5), 1616–1633.

Hasim, I. S., Faisal, B., & Sudradjat, I. (2025). Vernacular knowledge under threat: Insights from the Baduy Comunity in Kanekes Village, West Java, Indonesia. *J. Int. Soc. Study South Am. African Asian Knowl*, *2*(2), 1–17.

Hellegers, P. (2022). Food security vulnerability due to trade dependencies on Russia and Ukraine. *Food Security*, 1503–1510. https://doi.org/10.1007/s12571-022-01306-8

Husamah. (2015). Blended Project Based Learning : Metacognitive Awareness of Biology Education New Students. *Journal of Education and Learning*, *9*(4), 274–281.

Iriansyah, H. S. (2026). *Pengantar Ilmu Pendidikan: Berbasis Outcome Based Education*. PT Bukuloka Literasi Bangsa.

Iskandar, B. S., & Iskandar, J. (2021). Kawung: Landraces, management, uses, and conservation based on moral versus economic interest among Outer Baduy community, South Banten, Indonesia. *Biodiversitas: Journal of Biological Diversity*, *22*(12), 5572.

Iskandar, J. (2022). *Ekologi perladangan Orang Baduy: pengelolaan hutan berbasis adat secara berkelanjutan*. Penerbit Alumni.

Ismail, I. A., Mawardi, M., Kurniawati, D., & Arif, K. (2024). *Dari warisan leluhur ke laboratorium modern: Etnosains mewarnai pembelajaran IPA*. LPPM AAI.

Ismiati, I. (2020). Pembelajaran Biologi SMA Abad ke-21 Berbasis Potensi Lokal : Review Potensi di Kabupaten Nunukan-Kalimantan Utara The 21 st Century High School Biology Learning Based on Local Potency : Review of Potency in Nunukan Regency , North Kalimantan. *Jurnal Penelitian Dan Pengkajian Ilmu Pendidikan : E-Saintika*, *4*(2), 234–247.

IUCN. (2024). *The IUCN Red list of threatened species. Version 2023-1*.

John, O. D., Surugau, N., Kansedo, J., & Panchal, S. K. (2025). Plant-Based Functional Foods from Borneo. *Nutrient*, *17*(2).

Jyoti, B., & Yadav, P. (2025). Medicinal Plants and Ethnobotany: A Nexus of Traditional Knowledge and Modern Science. *The PLANTA Research Book Series*, *6*(1), 1838–1843.

List, I. R. (2004). The IUCN red list of threatened species. *Di Sponí Vel Em:< Http://Www. Iucn Red List. Org/Info/Cat e Go Ries_cri Te Ria2001. Html>. Aces so Em*, *12*.

Majid, M., Umar, F., & Yani, F. I. (2025). *Gizi berbasis potensi pangan lokal*. Penerbit NEM.

Nurjanah, E., & Laguatan, R. P. (2025). Enhancing plant diversity learning with an ethnobotany-based e-booklet: A focus on the Pandeglang community. *J. Acad. Biol. Biol. Educ*, *2*(1), 58–68.

Pancasasti, R., Manajemen, J., Sultan, U., Tirtayasa, A., Oksalat, A., & Beneng, T. (2016). *Pengaruh Elevasi Terhadap Kadar Asam Oksalat Talas Beneng (Xanthosoma undipes K . Koch) Di Sekitar Kawasan*. *5*(1).

Rachmawati, R. N., Rohman, F., & Novianti, V. (2024a). Development of e-module toward mangrove species diversity based on local potential of Pulau Dua Nature Reserve Serang

Banten to improve students' digital literacy. *Bioedukasi: Jurnal Biologi Dan Pembelajarannya*, *22*(1), 129–139. https://doi.org/10.19184/bioedu.v2i1.44313

Rachmawati, R. N., Rohman, F., & Novianti, V. (2024b). Designing e-modules on mangrove species diversity leveraging local potential through pbl to foster environmental attitudes. Biosfer: Jurnal Pendidikan Biologi, 17(2), 406-420. Rahman, W. (2020). *SYSTEMATIC CONSERVATION PLANNING By. July*.

Rahman, W. (2021). Systematic conservation planning of wild relatives of food crops in Indonesia (Doctoral dissertation, University of Birmingham).

Schmidt, D. A., Baran, E., Ann, D., Mishra, P., & Koehler, M. J. (2009). Journal of Research on Technology in Education Technological Pedagogical Content Knowledge (TPACK). *Journal of Research on Technology in Education*, *1*(November 2014), 37–41. https://doi.org/10.1080/15391523.2009.10782544

Setiyadi, D. (2025). Ethnoscience-Based Instructional Materials for Natural and Social Sciences in Elementary Schools: A Bibliometric Analysis. *EduBase: Journal of Basic Education*, *6*(1), 101–115.

Sudirman, S., Sutikno, S., Indriyanti, D. R., Sumarni, W., & Rahayuningsi, M. (2025). Integration of ethnoscience in natural science learning: Literacy study. *Jurnal Penelitian Pendidikan IPA*, *11*(6), 68–77.

Supriatna, J., & Margules, C. (2022). *The national parks of Indonesia*. Yayasan Pustaka Obor Indonesia.

Syahara, R. A., & Handoko, A. (2023). SYSTEMATIC LITERATURE REVIEW : INTEGRASI ARTIFICIAL INTELLIGENCE DALAM PEMBELAJARAN BIOLOGI ERA DIGITAL SYSTEMATIC LITERATURE REVIEW : INTEGRATION OF ARTIFICIAL INTELLIGENCE IN BIOLOGY LEARNING IN THE. *Jurnal Kelitbangan(Inovasi Pembangunan)*, *13*(2), 1–20.

Utami, W. ., Mirajiani, & Sumantri, A. . (2023). Program Diversifikasi Pangan Sebagai Salah Satu Upaya Pencapaian Ketahanan Pangan Di Desa Cikeusik Kecamatan Wanasalam Kabupaten Lebak Provinsi Banten. *Jurnal Pengabdian Dinamika*, *10*(1), 26–35.

Widiyanti, M., & Kumoro, C. (2017). Kinetika Detoksifikasi Umbi Gadung (Dioscorea hispida dennst.) Secara Fermentasi dengan Kapang Mucor racemosus. *Reaktor*, *17*(2), 81–88.