Traditional Vegetables of ASEAN

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In the countries of ASEAN (Association of Southeast Asian Nations) there are a lot of plants used as vegetables which are considered unusual or exotic in the industrialized countries. Some can be found growing in the wild or in fields as weeds but most are now cultivated on a small scale. A lot have become important parts of the diet especially in the rural areas where they are used to stretch the little meat or fish available in times of food scarcity. As urbanization takes place, the role of such vegetables decreases in importance. The diet then includes more European type vegetables grown on a larger scale.

The use of unconventional vegetables has been handed down from generation to generation. Information about them has also been extended to others through the media or schools in a sketchy way.

While there are countless plants that are considered traditional vegetables in ASEAN, only a few of them have caught the eye of scientists and in most cases only for taxonomic or nutritional studies. Some of them are truly indigenous but some, like the popular *Ipomoea reptans* are not of ASEAN origin.

The vegetables included in this paper are listed in Table 1.

The objective of this article is to give an overview of the traditional vegetables of ASEAN, in the hope that interest in their usage and in their nutritional values will be stimulated in places where they are available but underutilized and to introduce them to people who have adventurous tastes or will benefit from their usage by reducing the family budget, protecting their health and promoting their well being. While the only countries of ASEAN covered are Thailand, Indonesia, Malaysia and Philippines, the usage of the vegetables might be similar in Negara Brunei Darussalam and Singapore.

The abundance of wild plants that can be used as vegetables has been put forward as one reason for the lack of interest of households in rural areas to grow their own vegetables. In contrast to vegetables which can be purchased from local markets, these wild food plants involve no cash outlay and little physical effort to grow. However, some are found in the markets when they have been gathered for sale.

Vegetables are used to supplement the staple food but some are grown to please the taste. Due to their high prices, great demand, low supply and awareness of some medicinal properties, many are now produced commercially in increasing qualities. The better known species are those that are easily cultivated the whole year round. The majority though are produced on a small scale and grown in the wild or in home gardens. The tree vegetables are used as shade trees.

A lot of the vegetables are utilized for their leaves. There is a logical reason for utilizing the leaves of most of these plants. It is easier to raise plants for their leaves than for their flowers, fruits and roots. It takes also a shorter time to produce a unit volume. Moreover, the amount for food from the leaves is greater than from any other part of the plant. Yields up to 10 tons edible leaves/ha can be obtained from amaranth and from *Ipomoea reptans*.

Vegetables can be classified into five uses, according to Martin and Rubierte (1979). Salads are normally uncooked as a side dish. Garnishes are used principally to decorate a dish and not eaten. Small quantities that are pickled or sweetened and used to contrast with other foods are called relish. Spinach is cooked and eaten as a side dish. Potherbs are cooked by mixing in a stew or with other vegetables.

Seldom are traditional vegetables eaten raw as salads in the Philippines and Malaysia. More vegetables are eaten raw in Thailand and Indonesia. Garnishes and relishes are not common. Traditional vegetables are generally utilized as potherbs or spinach with many variations. They are not only boiled but sauteed, curried and fried. They are seldom cooked alone but in combination with noodles, soybean products, meat, shrimp, fish, clam, crab or other salt or fresh water foods and are cooked with water or coconut cream or sometimes with wine. They are consumed with different seasonings such as chili paste, shrimp paste, fish sauce and peanut butter sauce in many versions. They add flavour and variety to the diet. In Thailand and Indonesia, when plain boiled vegetables are served, they are usually topped with grated coconut emulsion (coconut milk).

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Table 1.
Traditional vegetables common to at least two countries of the ASEAN region or considered important in one country

I. Plants Grown or Utilized Mainly as Vegetables

Family	Scientific	English	Philippines	Thailand	Malaysia	Indonesia
Aizoaceae	*Tetragonia expansa*	New Zealand spinach	—	—	—	Kabak
Amaranthaceae	*Amaranthus spp.*	Amaranth Chinese spinach	Kulitis	Paagkhom	Bayam	Bayam
Asclepiadaceae	*Telosma minor*	Cowslip creeper	—	Khajohn	—	—
	Telosma procumbens (Blco) Merr.	—	Latok	—	—	—
Basellaceae	*Basella alba L.*[2]	Malabar spinach	Alugbati	Paag-prung	Remayong	Gendola
	Basella rubra L.	Ceylon spinach Indian spinach Gambian spinach	Grana			
Butomaceae	*Limnocharis flava Buch.*	Water lettuce	—	Paagpai	—	Genjer
Convolvulaceae	*Ipomoea aquatica Forsk*[2]	Tropical spinach Water convolvulus	Kangkong	Paagboong	Kangkung	Kangkung
	I. reptans Poir[2] *I. repens Roth.*	Swamp cabbage Water sweet potato				
Cruciferae	*Nasturtium officinale R. Br.*	Watercress	Watercress	—	Semanggi	Selada air
	Athyriaceae esculentum Copel. (Diplagium esculentum)	Fern	Paku	—	Paku	Paku
Cucurbitaceae	*Coccinia indica Wright & Aum.*	Ivy gourd	Melon-melonan	Tumlueng	—	Bolu teke pepasan
	C. grandis (L.) Voight					
	Momordica charantia L.	Bitter gourd Bittermelon Balsam pear	Ampalaya Amargoso	Mara	Peria	Pare
	Lagenaria siceraria (Mol.) Standl.	White flowered gourd	Upo	Namtao Nguang Chang	Labu air	Labu
	(L. leuchanta (Duch.)	Calabash gourd Melon Spaghetti squash Bottle gourd		Namtao	Labu jantung	
	Luffa acutangular (L.) Roxb. Angled loofah	Chinese okra Vegetable gourd	Patolang Tagalog	Boubliam	Petola	Emes Gambas Oyong
	Luffa cylindrica Roem	Dishrag gourd Sponge gourd Loofah Chinese okra Dishcloth gourd Strainer vine	Patola	Boubhorm	Petola	Belustru
	Trichosantes anguina L.	Snake gourd	Pakupis	Boubngoo	Petola ular	Pare belut
	Benincasa hispida (Thunb.) Cogn.	Ash pumpkin White gourd Chinese preserving melon Winter/wax melon	Kundol	—	Tong-kwah	Kundur
Euphorbiaceae	*Sauropus androgynus* Merr.	—	—	Paagwaan	Cekor manis	Katuk
	S. albican					
Gnetaceae	*Gnetum gnemon L.*	Spanish joint fir	Bago	—	Belinjau	Malinjo

Family	Scientific	English	Philippines	Thailand	Malaysia	Indonesia
Malvaceae	*Hibiscus sabdariffa* (L.>)	Roselle Framboos plant	Rosella	Grajiab daeng	—	Rosella
	Corchorus olitorius	Jute mallows	Saluyot	Khai-chao-na	—	3
Mimosaceae	*Leucaena glauca*	Lead tree Tantan Zarcilla	Ipil-ipil	Kratin	—	Lamtoro
Moringaceae	*Moringa oleifera Lam.*	Horseradish tree Drumstick tree	Malunggay	Maroom	Kelor	Kelor
Papilionaceae (Leguminosae)	*Dolichos lablab L.*	Hyacinth bean Bonavist lablab Egyptian Kidney bean Chinese flowering bean Bonivist Frijoles caballero Seem Shink Val Chicharos Chicaros	Bataw	Tuapab	Kacang sepat	Kara
	Pachyrrhizus erosus L.	Yam bean Jicama Mexican turnip	Singkamas	Mungaew	Sengkuang	Bengkowang
	Psophocarpus tetragonolobus (L.) D.C.	Winged bean Goa bean 4-angled bean Princess bean Asparagus bean Blackeye bean	Seguidilyas Segarilyas Calamismis	Tuapoo	Kacang kelisa; Kacang botor	Kecipir
	Canavalia ensiformis (L.) D.C. *C. gladiata* (Jacq.) D.C.	Sword bean	Pataning dagat	Tua-praa	Kacang parang	Kacang parang
	Sesbania grandiflora (L.) Pers.	Sesban Agati Mother of cacao	Katuray	Dork-kare	Turi	Turi
	Parkia speciosa Hort. ex. Hassk.	Btai tree	—	Sator	Petai	Petai
	Cajanus cajan	Pigeon pea Dhal Congo pea Red gram Arhar tree bean	Kadyos	Tuamahae	Kacang Kayu	Gude
	Neptunia oleracea	Water mimosa	—	Paag gached	—	A species reportedly used as vegetable
	Cassia siamea Lemk.	Cassia	—	Kheelek	—	—
	Cassia tora L.	Tropical cassia	Katanda		—	+
	C. foetida	—	—	—	—	+
	Chempenia griffithii	—	—	—	Cempenai	—
	Pithecollobium jiringa Prain	—	—	—	Jering	—
	P. ellipticum	—	—	—	—	—
	Desmodium umbellatum	Grasshopper's parkia	—	—	Petai balalang	—
Polygonaceae	*Polygonium* sp.	—	—	Paagpai	Kesom	—
Pontederiaceae	*Monochoria vaginalis* Presl.	Monochoria	Gabi-gabihan	Paagjiad	—	Eceng
Portulacaceae	*Portulaca oleracea* L.	Purslane	Kolasiman	Tagong	—	Krokot
	Talinum triangulare	Water-leaf Surinam spinach	Talinum	—	—	Poslen
Rubiaceae	*Morinda citrifolia*	Awl tree Indian mulberry	1	Yor	Mengkudu	Pace Mengkudu

Family	Scientific	English	Philippines	Thailand	Malaysia	Indonesia
Umbeliferae	*Centella asiatica* Urb. (hydrocotyle asiatica)	Indian Pennyworth Hydrocotyle	Takip kohol	—	Pegaga	Daun Kaki Kuda
	Oenanthle javanica Aug D.C.	Water dropwort D.C.	—	—	Selom	Tespong pampung
	O. stolonifera D.C.					

1 Local name not known
2 Except for scientific name, all other names of the different species of the same genus are the same.
3 Not used as a vegetable
4 C Foetida and C Tora reportedly used in Indonesia but local names are not known

II. Conventional Vegetables With Other Edible Parts*

Family	Scientific	English	Philippines	Thailand	Malaysia	Indonesia	Countries Using other edible parts
Araceae	*Colocasia esculenta*	Taro Gabi Dasheen Melanga Coco Chinese potato	Gabi	Puerg	Keladi	Keladi (refers to leaf/stem	Leaves and petioles (M,P,T)
	Xanthosoma brasiliense	Coco yam Tanier spinach	Gabi		Keladi	Keladi	Leaves & peticles (P,T)
	X. Sagittifolium	Tahitian taro	Gabi		Keladi	Keladi	Leaves & peticles (P,T)
Convolvulaceae	*Ipomoea batatas* Lam.	Sweet potato Batatas	Kamote	Munted	Keledek	Ubi jalar	Tops (T.P) (not consumed in Indonesia & Malaysia)
Cucurbitaceae	*Curcurbita maxima* Duch.	Pumpkin Winter squash Calabasa	Kalabasa	Fugtong	Labu	Waluh	Tops & flowers (I,P,T)
	Sechium edule Swartz.	Choko Chayote Chocho Kajot choke Christophine Vegetable pear Alligator pear Pepineca	Sayote	Pugmeo	—	Labu siam	Tops (I,P)
Graminae	*Zea mays*	Young cob corn Cornflower	Mais	Khaopode fug-on	Jagung	Jagung	Young cob without kernels (I,M,P,T)
Leguminosae	*Vigna unguiculata*	Cowpea	—	Tuanung	—	Cacang Hoto	Tops (I,P)
	V. sesgundalis	Yardlong bean	Sitao	Tua-fug-yao	—	Kacang panjang	Tops (I,P)
	Pisum sativum	Sweet pea	Chicharo	Tua-luntao			Tops (T.)

* The parts used conventionally are not included
P — Philippines, T — Thailand, M — Malaysia, I — Indonesia

III. Forest/Horticultural/Agronomic/Plants with Parts Used as Vegetables

Family	Scientific	English	Philippines	Thailand	Malaysia	Indonesia	Countries using other edible parts
Anacardiaceae	*Artocarpus*	Seedless bread-fruit	Kamansi	Khanoon sumpalor	Sukun	Sukun	Unripe fruits (I,M,P,T)
	Artocarpus heterophyllus	Jackfruit	Nangka,	Khanoon	Nangka	Nangka	Young fruits (I,M,P,T)

Family	Scientific	English	Philippines	Thailand	Malaysia	Indonesia	Countries using other edible parts
Caricaceae	*Carica papaya*	Papaya	Papaya	Malagor	Betik	Papaya	Unripe fruits (I,M,PT) Young & mature leaves & shoots (I) Flowers (I)
Euphorbiaceae	*Aleurites moluccana*	Tung	Lumbang	—	—	Kemiri	Seeds (I)
Graminae	*Dendrocalamus* spp.	Bamboo shoot	Labong	Normaipai	Rebung	Rebung	Tender core of the shoots (I,M,PT)
	Bambusa spp						
	Schizostachyum spp.						
Leguminosae	*Phaseolus aureus*	Mungbean sprouts	Tugue	Tua-ngorg	Tauge	Kacang hijau	Sprouted seeds (I,M,PT)
	Glycine max	Soybean sprouts	Togue	Tua-leung Ngorg	Tauge	Kedelai	Sprouted seeds (I,M)
Palmae	*Cocos nucifera*	Coconut heart Palm cabbage	Ubod ng niyog	Yod-maprao	Umbut	Pondoh	Tender pith (I,M,PT)
Musaceae	*Musa* sp.	Banana heart	Puso ng saging	Hua-plee	Jantung pisang	Jantung	Male inflorescence (I,M,PT)

The practice of eating vegetables cooked has a sound basis in improving hygiene to protect against disease-causing organisms. However some vegetables have to be cooked because they contain toxic components which are detoxified by cooking. Examples are cassava leaves, bamboo shoots and taro petioles. Cassava leaves contain cyanogenic glucosides which yield the extremely poisonous hydrocyanic acid, often in dangerous proportions. The glucosides can be removed by boiling. Most varieties of bamboo shoots also contain cyanogenic glucosides, the amount varying from variety to variety. It is leached out in one or several changes of water before cooking as a viand. Some of the nutrients are also leached out or destroyed by such a process. In most cases, bamboo shoots that are sold have been boiled. Calcium oxalate crystals in the stems of taro cause itchness of the throat when eaten uncooked but are easily removed by cooking.

Invariably, traditional vegetables are used in their fresh forms. Drying, practiced in some African countries, is almost unheard of, mainly because these vegetables are so plentiful that if one is not available, others can be used in its place. Dehydration may extend the utility of such vegetables but is not generally used in S. E. Asia.

While many traditional vegetables are poor in caloric value, especially the leaves, they may be high in vitamins and minerals (Table 2 and Table 3).

Leaves are excellent sources of Vitamin A. Two cassava leaves contain sufficient carotene to provide the Vitamin A needs of a child for one day and some protein. Some are also good sources of vitamin C, riboflavin and thiamine. The cellulosic part of the leaves is also an important source of dietary fibre.

Some of the vegetables are so high in protein that they make a good supplement to the starch-based diets common in rural areas. On a dry weight basis, many of the leafy vegetables contain as much protein as beans (Table 4). However, the moisture content, is 80-90% in leaves as against 10% in beans. The essential amino acids in these vegetables are a boost to the family's nutrition, especially for children (Table 5).

The protein contents of the leaves vary with age and species. Younger leaves contain more protein and cassava leaves have more protein than those of the drumstick tree.

In this paper, plants which are used as vegetables are categorized into three groups, (I) Plants used mainly as vegetables, (II) Conventional vegetables with other edible parts and (III) Plants commonly grown for other purposes with some parts utilized as vegetables. Only those used mainly as vegetables are discussed in detail. This review does not include those used mainly as condiments. While those grown in at least two of the ASEAN countries have been included in the list, some vegetables important in only one country are also discussed. Unless the countries are specified it is presumed that the vegetable is eaten in Indonesia, Malaysia, Philippines and Thailand.

Plants used mainly as Vegetables

Ipomoea reptans Poir.
I. aquatica Forsk.
I repens Roth.

This is an important vegetable in the lowlands of ASEAN, although it has a lesser economic value in the Philippines than in the other three countries. It is high in protein, Vitamin A, iron, calcium and phosphorus.

Whilst the most known type is grown in water, there are two upland or dry types. One is a vine, growing wild in fields in Thailand and in the

Table 2.
Nutrient Composition, per 100 g edible portion of some traditional vegetables

Vegetable	K cal Energy	% Moisture	g Protein	g Fat	g CHO	g Fibre	g Ash	mg Ca	mg P	mg Fe	I.U. A	mg B1	mg B2	mg Niacin
Cha-ome	57	79.7	9.5	0.6	3.5	5.7	1.0	58	80	4.12	10066	0.35	0.24	8.3
Ivy gourd	35	90.7	3.3	0.4	4.5	1.0	0.1	126	30	4.6	8608	0.17	0.13	3.80
Tropical spinach	21	92.9	1.4	0.3	3.2	3.3	0.8	41	30	3.6	6326	0.09	0.09	3.20
Leucaena	62	80.7	8.4	0.9	5.0	3.8	1.2	137	11	9.2	7883	0.33	0.09	5.40
Indian mulberry	105	77.3	5.0	7.8	3.8	4.0	2.0	469	tr.	1.4	43333	0.30	0.14	7.20
Water mimosa	32	89.4	6.4	0.4	0.8	1.8	1.2	387	7	5.3	5155	0.12	0.14	3.20
Sator	150	70.7	8.0	8.1	11.4	0.5	1.3	76	83	0.7	794	0.11	0.01	1.00
Cowslip creeper	72	80.5	5.0	1.1	10.6	0.8	1.0	70	90	1.0	3000	0.04	0.10	0.10
Bamboo shoot	32	90.6	2.2	0.6	4.4	0.8	1.4	13	30	2.1	3	0.04	0.02	0.2
Sword bean	40	88.5	2.8	0	7.1	—	—	104	—	2.1	—	0.07	—	—
Fern shoot	30	90.5	2.5	0.2	4.6	1.1	1.1	94	100	4.8	243	0.04	0.14	—
Indian penny-worth	37	87.7	2.0	0.2	6.9	1.6	1.6	171	32	5.6	738	0.09	—	—
Plantain flower	41	88.7	1.8	0.9	6.4	1.0	1.2	73	30	2.1	35	0.03	0.03	1.1
Sweet potato shoots	23	92.4	2.6	0.3	2.5	1.1	1.1	11	15	5.2	585	0.09	0.23	0.9
Tapioca leaves	56	84.2	6.6	1.1	4.8	2.0	1.3	215	35	1.1	582	0.14	0.36	1.5
Cekor manis	74	79.8	7.6	1.8	6.9	1.9	2.0	234	64	3.1	2978	0.23	0.15	—
Cemperai	78	72.0	7.0	0.4	11.6	4.7	4.3	600	52	3.0	420	—	0.42	—
Kesom	91	73.2	2.8	0.7	18.4	2.8	2.1	232	19	3.2	420	0.15	0.24	—

Reference: Division of Nutrition. 1981. Table of Nutritive Values of Thai Foods.
Tee, E.S. (1985)

Table 3.
Nutrient composition per 100 g edible portion of some traditional vegetables

Vegetable	Edible portion	Moisture	Food Energy	Protein	Fat	Total Carbohydrate	Fibre	Ash	Calcium	Phosphorus	Iron	B-Carotene Equivalent	Thiamine	Riboflavin	Niacin	Ascorbic Acid
	%	%	KCal.	g	g	g	g	g	mg	mg	mg	meg	mg	mg	mg	mg
Bitter gourd, fruit	82	93.5	22	0.9	0.4	4.5	0.9	0.7	42	38	0.8	185	0.05	0.04	0.2	40
Bitter gourd, leaves	46	84.0	45	4.5	0.6	8.8	1.5	2.4	339	78	4.8	4105	0.12	0.38	1.5	90
Malabar spinach	64	92.5	18	20	0.3	3.0	0.9	22	128	40	4.9	2735	0.04	0.12	0.5	89
Spanish joint fir, leaves	75	78.1	74	6.6	0.5	12.8	1.8	1.0	131	61	0.6	1925	0.07	0.19	1.2	109
Spanish joint fir, fruit	—	59.7	136	5.6	0.9	33.3	1.4	1.0	25	63	1.6	40	0.29	0.11	0.7	19
Pigeon pea fresh seed	100	62.6	140	8.2	0.7	26.0	5.0	2.5	77	178	1.7	0	0.42	0.16	1.4	28
Sesban flower	79	86.8	45	1.6	0.6	10.2	1.3	0.8	33	35	1.2	90	10.0	0.08	2.3	32
Amaranth	72	86.7	39	3.4	0.8	6.8	1.4	2.3	364	88	11.1	4745	0.02	0.27	1.4	84
Water-leaf	62	92.9	21	1.9	0.5	3.4	0.8	1.3	95	21	6.8	4385	0.09	0.15	0.6	59
Horseradish tree, pod	49	76.2	80	2.5	0.4	19.9	1.2	1.0	41	51	0.8	60	0.04	0.09	0.8	196
Horseradish tree, leaves	56	77.5	75	6.1	1.9	12.4	1.8	2.1	346	118	4.5	14945	0.21	0.52	3.1	231
Snake gourd	86	95.2	16	0.6	Tr.	4.0	0.5	0.2	22	15	0.3	140	0.02	0.03	0.3	12
Jack bean	82	9.4	354	24.1	2.8	60.7	2.2	3.0	210	318	1.6	Tr.	0.30	0.17	0.8	0
Sponge gourd	71	94.1	20	0.6	0.2	4.7	0.5	0.4	19	24	0.8	35	0.04	0.02	0.3	7
Roselle	—	88.9	45	0.4	1.6	8.5	1.6	0.6	174	18	0.1	50	0.01	0.02	0.4	9
Jute	42	83.0	51	6.5	1.0	7.5	2.0	2.0	488	114	11.6	7325	0.15	0.28	1.5	95
Goa or winged bean	97	91.0	29	2.5	0.4	5.5	1.4	0.6	85	54	0.6	510	0.21	0.08	1.0	15
Goa or winged bean, boiled		94.2	17	2.0	0.2	3.0	2.1	0.6	108	27	1.3	530	0.53	0.18	Tr.	10
Watercress	49	93.3	22	1.0	0.3	4.8	0.2	0.6	204	37	1.2	775	0.07	0.06	1.1	30

Reference: Food and Nutrition Research Center. 1982.

Table 4.
Protein content of some traditional vegetables on a fresh and dry weight basis

Vegetable	Parts Utilized	Moisture	Protein % Fresh Weight basis	Protein % Dry Weight basis
Leucaena glauca	Leaves	80.7	8.4	43.52
Morinda citrifolia	Leaves	77.3	5.0	22.03
Parkia speciosa	Seeds	70.7	8.0	27.30
Sauropus androgynus	Leaves	79.8	7.6	37.62
Cassava leaves	Leaves	84.2	6.6	41.77
Gnetum gnemon	Leaves	78.1	6.6	30.14
Cajanus cajan	Fresh seed	62.6	8.2	21.92
Moringa oleifera L.	Leaves	77.5	6.1	27.11
Athryium esculentum	Leaves	89.9	3.8	37.62
Canavalia ensiformis	Seeds	9.4	24.1	26.60
Corchorus oletorius	Leaves	83	6.5	38.24
Psophocarpus tetragonolobus	Pods	91	2.5	27.78
Ipomoea aquatica	Leaves	92.9	1.4	19.72
Centella asiatica	Leaves	87.7	2.0	16.26
Nasturtium officinale	Leaves	93.3	1.0	14.92

Values used for computation of protein on a dry weight basis were taken from Tables 2 and 3

Table 5.
Amino acid content of selected green leafy vegetables (expressed as mg per 100 g.)

Species	Isoleu-cine	Lysine	Meth-ionine	Cys-tine	Phenyla-lanine	Tyro-sine	Thre-onine	Trytop-nan	Valine
Cassava	339	437	118	77	386	274	327	102	401
Talinum	73	75	30	32	103	51	71	—	102
Horseradish tree	385	476	164	148	483	—	368	—	491
Kangkong	116	144	60	—	192	112	132	52	160
Amaranth	218	234	96	74	255	172	197	57	256
Ceylon spinach	54	89	20	27	87	49	56	—	67

Source: Food Policy and Food Science Service, FAO, 1970.

Philippines. Another is cultivated in all four countries but only to a limited extent in the Philippines. Since not all the types are aquatic, the common name tropical spinach, is adopted as the English name in this paper, instead of swamp cabbage or water spinach.

The wild tropical spinach of Thailand and the Philippines has a slender stem with light reddish brown colour and crunchy texture. In Thailand, it is generally served with green papaya salad or somtum. It is not considered good for other recipes. It is rarely used as a vegetable in the Philippines.

The water loving type, *Ipomoea aquatica* Forsk, has pale green coloured leaves and a very succulent plump stem. It is perennial and trails over water or mud, rooting at the nodes. It is usually untended. The tops and to a lesser extent the tender portions of the stem of the water loving type are utilized for various recipes. This is the most popular type in the Philippines and in Indonesia. It is commercially produced in Thailand.

The upland tropical spinach has a thinner stem than the aquatic types and greener coloured leaves. It is a fast growing vegetable suitable for high temperature areas. It is usually grown from seeds or cuttings and after 6 weeks is uprooted. It is popular as a quick cooking vegetable and is preferred over the aquatic type in Thailand and Malaysia. It is a very versatile vegetable, suitable for various recipes. It is commonly eaten uncooked with hot chili and other spices in West Java, Indonesia. In Thailand, it is used to accompany beef stew, noodle soup, wine sauce for barbecued chicken and red wine sauce for shellfish. A fancy way of serving tropical spinach is stir-fried with oyster sauce. In some Thai wayside restaurants, to attract clients, the cooked tropical spinach is served airborne, that is the cook may throw the cooked vegetable to a waiter who catches it on a plate. In Malaysia, it is commonly fried with vegetable oil and mixed with shrimps or anchovies.

All parts of the young upland tropical spinach except the roots are eaten. When allowed to grow old the stem becomes fibrous, so only the succulent portions are used as a vegetable.

Psophocarpus tetragonolobus (L) D.C.

Winged bean has recently gained worldwide attention due to its nutritional potential. It is a very good source of protein. It is an annual vine although some varieties are known to be perennial due to the presence of big storage roots. The vines can reach 6 metres or more. The main part of this plant that is eaten is the immature pod but the tops, flowers, dried seeds and storage roots can also be eaten. The immature pods are eaten raw and are popularly taken with ground chili in Malaysia. The Thais have several recipes for these including stir-fried, spicy fish cake and salad. The tops are eaten in Indonesia and in the Philippines to a limited

extent. In Irian Jaya, Indonesia winged bean is grown for its roots which is used as a staple. Thus varieties which produce large roots are grown. The flowers and dried seeds are seldom utilized in ASEAN, because the flowers turn into fruits, which are used and rarely allowed to toughen and dry up.

Amaranthus sp.

Amaranth is grown for its leaves in ASEAN. In Mexico and Central America it is grown for its seeds. The species grown for their leaves are different from those grown for seeds which are used as grain. Species commonly cultivated in Indonesia are *A. tricolor* and *A. hybridus*. In the Philippines, the more common species is *A. gracilis*. While it is a popular vegetable in Malaysia and Indonesia, it is practically unknown to a major part of the Philippines. In the Philippines and Indonesia, small segments of the population use wild thorny amaranth (*A. spinosus*) as vegetable before it develops spines.

The cultivated amarath is usually uprooted and sold from 3 weeks of age. While the shoot tips of older plants can be utilized as vegetable, the pulled young amaranths are considered superior in quality.

Amaranth is considered superior to real spinach in food value, although its high oxalic acid content may decrease the availability of calcium. The young leaves are fried with vegetable oil or boiled.

There are some closely related vegetable crops that are mistakenly known as amaranths in Indonesia: the red amaranth (*Alternanthera amoena Voss*) and "jawer hajam" amaranth (*Celosia argentea L.*). *Alternanthera sessilis* is also used as vegetable. These plants are actually ornamental plants but the tops are sometimes consumed by small segments of the population in both Indonesia and the Philippines.

Basella alba L.
Basella rubra L.

Basella is a popular vegetable in the Visayan islands of the Philippines. In Indonesia it is commonly grown as a perennial ornamental vine in frontyards. It is commonly served as a cooked vegetable with a peanut butter sauce.

It has a slight slimy texture when cooked, because the leaves contain mucilaginous substances. The succulent young and mature leaves and the succulent stems are eaten. The green form, *B. alba* retains its fresh green colour after cooking. The red *B. rubra* loses much of its pigment to the water and is less attractive when cooked. The odour of the cooked leaves is strong but the leaves themselves have a mild flavour. It contains oxalic acid which may decrease the availability of calcium in the diet.

Talinum triangulare (Jacq.) Willd.

Talinum is a perennial crop which may be grown as an ornamental. It is either wild or cultivated. It has flattened triangular stems. It is a soft mucilaginous vegetable with 1-2% oxalic acid. It is considered a delicious vegetable in Indonesia. It is practically unknown to a majority of Philippine families. It has remarkable drought resistance.

Sesbania grandiflora Pers.

This is an elegant quick-growing small tree with white or red flowers often used to shade beds of vegetables. The *S. roxburghii* Mera or dork sano has yellow flowers and is used as a vegetable in Thailand. The flowers of sesban are used as a vegetable. The young leaves are also used in Thailand and Malaysia. The leaves have a slightly bitter taste. The young pods are also used as vegetables in some areas of the Philippines and in Indonesia. The seeds from mature or dried pods are preferred in Java.

Coccinia indica Wright and Arm.
C. grandis (L.) Voigt
C. cordifolia Cogn

This is a slender climber with 5 lobed leaves 5-10 cm long and with tendrils. It grows wild over fences and trees in cleared land. While the green fruits are considered edible and the ripe fruits can be candied, only young tips and tender leaves are generally consumed. It is a very popular vegetable in Thailand, even in big restaurants. The vegetable is sold in wet markets and supermarkets in bundles of 100 g. The edible portion costs about 30 baht per kg (about US$1.20). It is sauteed or used in soups with minced pork, cooked in Kang liang which is a mixed vegetable soup containing ground shrimp and ground pepper. Some farmers grow it as a cover crop. It has been introduced in the Philippines in recent years and is a common wild plant in some places but it is practically unknown as a vegetable. It grows wild and is sometimes cultivated in Malaysia. It is hardly known in Indonesia.

Centella asiatica Urb. *(Hydrocotyle asiatica)*

This is a perennial creeping weed whose leaves and runners are eaten raw in Malaysia, Thailand and Indonesia. While it is a fairly common weed in the Philippines, it is unknown as a vegetable, but is prized by some for its medicinal properties.

Gnetum gnemon L.

This is an attractive tree which may grow to as high as 15 m. It is a popular vegetable in Indonesia and is also used as a vegetable in some areas of Malaysia, Philippines and Thailand. It may be wild or cultivated for its leaves, inflorescence, unripe and ripe fruits. The mature seeds are used to make flakes or chips in Indonesia.

Moringa oleifera Lam.

This is a medium sized tree with feathery foliage. The young leaves, young pods and young seeds are eaten as vegetables and to a limited extent the flowers, in the Philippines and Indonesia. Only the young pods are eaten in Thailand and Malaysia. The leaves and fruits contain significant levels of protein and iron. The edible parts are always eaten cooked. The leaflets are stripped from the petioles before cooking. The young pods have a flavour reminiscent of asparagus. The thick soft root has the strong flavour of horseradish. The tree is commonly used as trellis for viny vegetables and Piperaceae plants.

***Parkia speciosa* Hort. ex Hassk.**

This is a large forest tree which can reach 35 m tall. It is cultivated in heavy rainfall areas in Thailand, Malaysia and Indonesia for its mature or slightly immature pods. While it is found in the Philippines, it is not utilized there as a vegetable. The pod is 5 cm wide and up to 60 cm long with a maximum of 32 seeds which are the edible parts. They are firm and nutty and have 8% protein and not so much fat content. It has a strong flavour and is considered good for diabetics. The flavour and odour can be somewhat reduced through roasting the whole pod. The seeds are used in curries, sauteed with meat, prawn and curry paste or roasted and eaten with a number of dips.

Harvesting is a problem due to the height of the tree. Sometimes trained monkeys do the job.

***Sauropus androgynus* Merr.**

This is a low growing shrub with reddish flowers on the axils of the small leaves. It is either wild or cultivated as hedges. It is a very prolific plant in terms of the production of leaves. It is shade loving. It is a popular vegetable in Malaysia and Indonesia and used also in Thailand. It is unknown in the Philippines. Its young tender leaves are cooked with coconut milk or sauteed in Malaysia. It has a strong characteristic odour and contains 6-8% protein. The flowers and the small fruits are also used as vegetables. The fruits can also be used for sweets.

***Tetragonia expansa* Murr.**

This is a vegetable grown usually in the highlands of the Philippines and Indonesia though it is more popular among the Europeans and Chinese than among the local people. It has thick flat succulent stems with equally succulent leaves. It is a fairly drought resistant plant. It has thick spreading stems and succulent short petioled leaves. The young leaves and about 8 cm of the stem are eaten, usually as a spinach. It has a high saponin content so is not to be eaten raw.

***Corchorus olitorius* L.**

This is an annual, upright, branching, slightly woody, herb. The young leaves and tops are cooked for a short period of time. When cooked too long, the leaves become mucilaginous, which make them unappealing to some persons. It is eaten in the Philippines and Thailand.

***Luffa acutangula* L.**
***L. cylindrica* Roem.**

Luffa is a climber. There are two types, the smooth and the angled loofa. Besides using the fruits as a vegetable, the dried fibre skeleton of the fully matured fruit is used in filters for removing oil from water in ship's boilers, as a shock absorber and for washing or bathing. It is a cultivated vegetable crop in Indonesia, Malaysia, the Philippines and Thailand.

Momordica charantia L.

This is a cultivated vine. The young fruits which are used as a vegetable in all 4 countries are bitter, some varieties more so than others. The leaves and tender shoots, which have only a slightly bitter taste, are also marketed and eaten as vegetables in the Philippines and Thailand. The leaves retain their colour and firm texture, with little of the bitterness of the uncooked foliage. Adding salt to the sliced fruit, before slightly squeezing out the juice, reduces the bitterness of the fruit. The salted slices are then soaked for an hour in one or two changes of water to remove the salt before cooking. The small fruit may be preserved in brine or pickled.

***Nasturtium officinale* R. Br.**

Nasturtium is a perennial herb with angular hollow much-branched stems. It grows either wild or cultivated in cool clean water in hilly or mountainous regions. Its roots freely form at nodes below water. It is consumed raw in salads or cooked in soups or with peanut butter and other spices. It is used in Indonesia, Malaysia, the Philippines and Thailand.

***Athyrium esculentum* Copel.**
(*Diplagium esculentum*)

This is a fern which grows wild in ditches or stream borders. Shoots are steamed or cooked with coconut milk. It is used in all the ASEAN countries by some segments of the population.

***Hibiscus sabdariffa* L.**

The roselle is an annual drought resistant woody plant utilized for its young leaves in Thailand and in certain parts of the Philippines and Indonesia. The leaves are slightly sour and mucilaginous when cooked but are sometimes eaten raw. The calices are used as vegetables in some parts of the Philippines to make a colourful sauce but have lesser nutritional value than the leaves. The calices are also used as colorant for jams and jellies and in Indonesia for juices and cakes. The seeds are eaten after toasting.

***Leucaena glauca* L.**

This is found wild and cultivated throughout ASEAN. The leaves are commonly used in fresh or dry form as animal feed.

The Thais have been using it as a vegetable for centuries, since it was introduced to Thailand. It is commonly grown along fences as a vegetable. The tender shoots of about 15 cm long, young inflorescence and young pods are popular as vegetable. It is available in both wet markets and supermarkets in bundles of 80-100 g. It is eaten raw with a number of gravies and dips such as boodoo gravy which is a chili dip or nam prig which is a seasoned paste consisting of high quality shrimp paste, ground dried shrimp, garlic, sugar, fish sauce, hot pepper, a kind of solanum and lime juice. Since leucaena contains mimosine it could be toxic, but it is not consumed everyday. Moreover, it is taken only in small amounts of less than 50 g fresh weight per meal.

In Indonesia, it is the young pods and sometimes the mature seeds that are eaten although a small segment of the population also eat the leaves. The young pods are either eaten fresh or cooked. The mature seeds are considered to be a powerful anthelmintic.

The dried seeds are used as a substitute for coffee in some parts of Indonesia and in the Philippines.

Canavalia gladiata (Jacq.) D.C.
C. ensiformis (L.) D.C.

This is a wild or cultivated woody twining perennial with large trifoliate leaves and axillary long stalked raceme bearing several flowers in succession. The two species are quite distinct and can be distinguished by their pods and seeds. The seeds have medicinal properties and the pods are eaten raw in salads in Malaysia. It is eaten cooked in Indonesia, Thailand and the Philippines.

***Cajanus cajan* L. Huth.**

This legume is a deep rooting, short lived small perennial. The plants are sometimes used as hedges or wind breaks. It is resistant to drought. Its young pods, immature seeds and mature fresh or dried seeds are used as vegetables in ASEAN except in Thailand where the plant is used only as a cover crop.

***Lagenaria siceraria* (Mol.) Standl.**

This is a climber bearing 90-180 cm long fruits. The fruits are eaten as a vegetable when young. It has a rather insipid taste. The dried gourd is a hardy wooden shell used for water bottles, ladles, cups, musical instruments, small boxes and floats for buoying fish nets and rafts in some countries of ASEAN.

***Acacia insuavis* Laca.**

In Thailand this vegetable is known as cha-ome. The tender shoots, about 15-20 cm long, are used as a vegetable. They have a strong aroma which decreases upon cooking. It is generally used in mixed vegetable soups or cooked with omelette using the more tender parts and served with nam prig. However, it can be eaten uncooked.

***Telosma minor* Craib**

The cowslip creeper is a vine which grows wild or is made to climb fences or trellises in Thailand. The flowers which are in clusters, are considered a delicacy in Thailand. They are sold in small banana leaf container for about 45 baht (US$1.50) per kilogram. It is eaten raw in salads or cooked as a vegetable served with dips. It is also cooked in omelettes or served in clear pork soup. Occasionally young fruits are eaten with nam prig and condiments. In the Philippines, both the flowers and fruits of *T. procumbens* are eaten by a small segment of the population.

***Morinda citrifolia* L.**

The Indian mulberry is a shrub with shiny dark-green leaves and fruits like young pine cones. Young and half mature leaves are used in Thailand in a special kind of curry called hor moke which is somewhat custard-like or glutinous. The vegetable is very high in calcium and provitamin A. It has a mildly bitter taste. It grows wild in the Philippines but is not used as a vegetable.

Neptunia oleracea

The water mimosa or paag gached in Thai is an aquatic plant floating with its spongy stem. The shoot is harvested 60-80 cm long although only the uppermost 20 cm of it is utilized. This tender stem portion includes nodes which are hard and somewhat tough, so sometimes only internodes and tender tips of about 5 cm long are used. It is sauteed or used in shrimp or fish soups that are sour and hot. The vegetable is served as a delicacy in certain restaurants which select plump and tender paag gached for their own soup recipe. The young leaves of another species of Neptunia are also used as a vegetable in Indonesia.

***Cassia siamea* Lemk.**
C. tora L.
C. foetida L.

The leaves of the *Cassia tora* are somewhat ill-smelling but the odour decreases upon cooking. Only the young leaves are used as vegetables. The *C. tora* is used by a small segment of Filipinos. The shoots of *Cassia siamea* are used as a vegetable in Thailand. The flowers of *C. siamea* contain an alkaloid hence are considered poisonous. *Cassia foetida* and C. tora are used in Indonesia for their young leaves.

***Monochoria vaginalis* Presl.**

This is an erect annual herb with fleshy leaves. It is a common weed in rice field or marshes. The young leaves are used as a vegetable in West Java, Indonesia, in North Eastern Thailand and in some parts of the Philippines.

***Pithecollobium jiringa* Prain**
P. ellipticum

This is a small tree which usually grows wild. The fruits are eaten either raw or boiled, in Thailand and Malaysia.

***Trichosanthes anguina* L.**

This is a viny plant with very long (60-180 cm) narrow succulent often twisted fruits. It is utilized in soups in Malaysia and in the Philippines to a limited extent.

***Portulaca oleracea* L.**

This common creeping weed is cultivated up to an elevation of 1800 m above sea level. Although the leaves are very succulent it has a high degree of drought resistance. The shoots can be eaten raw. It is usually eaten cooked as a spinach. It is more commonly utilized in Indonesia than in the Philippines where only a few people use it as a vegetable.

***Polygonium* spp.**

This is an aromatic herb commonly cultivated in backyards. The young leaves are taken with laksa sauce or gravy and can be eaten raw. It is used in Thailand and Malaysia.

***Benincasa hispida* (Thumb) Cogn.**

This vine has elongated fruits which have a very thick, waxy deposit on their surfaces. The young fruits are used in soups while mature ones are cooked into sweets. The skin is pared and the seed cavity is scooped out before cutting into desired pieces.

***Oenanthe javanica* Aug. D.C.**
***O. stolonifera* D.C.**

This is a wild or cultivated perennial creeping plant which is frequently found near ponds or water bodies. It is a very popular vegetable consumed as

a salad in West Java, Indonesia. It is also used in Thailand and Malaysia.

***Limnocharis flava* Buch.**

This is an aquatic plant which is sometimes considered a weed in paddy fields. It is a common vegetable in West Java where the young leaves and flowers are cooked with chili, shallot and garlic. It can also be simmered and mixed with shredded coconut and spices. Cooking reduces the bitter taste of the leaves.

Desmodium unbellatum

This is a wild shrub from which the pods are eaten raw in Malaysia. The flavour of the pods is not as strong as *Parkia speciosa*.

***Dolichos lablab* L.**

This is an annual vine with flattened pods common to the 4 countries of ASEAN. It is usually grown in home gardens along fences.

***Pachyrrhizus erosus* L.**

The brown peeled and white fleshed storage root of this cultivated vine are used as a vegetable or as a raw snack item in all four countries. It is sweet and watery. The thin tough skin is easily peeled manually. The young pods are also used as a vegetable by a few groups in the Philippines. Mature seeds are poisonous as they contain rotenone.

Conventional Vegetables with other Edible Parts

The young and old leaves as well as the petioles of *Colocasia esculentum* and *Xanthosoma brasiliense* are cooked as vegetables in addition to the corms which are the traditional edible part. In order to hasten the cooking time, the fibrous outer peel of the petioles is removed. They are cooked in coconut cream or used in soups mixed with meat or shrimp.

The tops of sweet potato, squash, choko or chayote, cowpea and yardlong bean are also used as vegetables. In Thailand, the tips of chayote and sweet peas are stir-fried and are very tasty. They are always used in cooked form. Some sweet potato varieties have a slightly bitter taste, hence some varieties are more suitable as a source of tops than others. The flowers of squash are also eaten as vegetables. The fibre from the stalk of squash tops is removed before cooking.

Young cob corn (baby corn) or the young ear before kernel formation which in fact is an inflorescence is a specialty item in restaurants in the Philippines and Indonesia but is common in Thailand and Malaysia. Sweet corn varieties are commonly used for this vegetable instead of field corn since the former contains more sugar in the cob. When grown for this purpose the corn is grown at very high densities and harvested 2-5 days after silking.

Forest/Horticultural/Agronomic/ Plants with Parts used as Vegetables

Banana

The male inflorescence of the banana, which is harvested after all the banana hands have emerged, is a common sight in the markets of ASEAN. Some varieties are more suitable for this purpose since they impart no bitter taste upon cooking. Those with a slightly bitter taste can be utilized by boiling them in at least 2 changes of water and mashing them with salt before cooking. Usually the bract and flower that have been fully formed are removed until the pale yellow "heart" remains. The fully formed flowers can be cooked after removal of the pistil and the tough elongated sepal which will remain hard even after cooking.

Papaya

Immature papaya, jackfruit and seedless breadfruit are used as vegetables all over ASEAN. Uncooked grated papaya is served as a salad in Thailand. It is very commonly eaten with fish sauce, ground dried shrimp, garlic, lime juice and sugar. Papayas may be either cooked or pickled. The fruits are prepared for cooking by paring the skin and cutting them into pieces. The seeds are scooped out before cutting it into pieces. Pickled grated papaya is a common fare in ASEAN. In Indonesia, the young and mature leaves of papaya are also cooked as a vegetable. The leaves retain their form and texture upon cooking. They have a bitter taste and have a flavour reminiscent of asparagus.

Bamboo shoots

Bamboo shoot is a common vegetable. The sheaths are removed leaving only the tender core. It is boiled in several changes of water before or after cutting up into the desired pieces. Bamboo shoot is canned because it is not available the whole year round and some dishes, especially in restaurants, require it. In Thailand, there is an etiolated shoot which is almost bitterless.

Cassava

The young leaves of cassava is more commonly consumed in Indonesia and Malaysia than in the Philippines. The leaves are boiled at least once and the water thrown away before cooking again for use as a vegetable. It has a slightly bitter taste. When grown for this purpose, cassava plants are usually grown close to one another to discourage formation of storage roots and encourage more leaf production.

Bean sprouts

Sprouted mungbean and soybean are common items in the markets of ASEAN. In the Philippines and Thailand, mungbean are generally used. Soybean generally has the advantage of bigger and stouter sprouts. Sprouts are cooked quickly to retain their texture.

Coconut heart

The tender pith of the coconut, known as heart, is very common in many parts of ASEAN, but a high priced delicacy in restaurants. It has a slightly sweetish taste. It does not require long cooking and in fact can be eaten raw.

Conclusion

Aside from those discussed here, there are many traditional vegetables in each of the four countries which are not found in the other countries or if

present are not utilized as a vegetable. There are also reports of the use of other parts of conventional vegetables or trees in other areas of the world which are practically unknown in ASEAN. Examples are the young leaves of okra or ladies finger (*Hibiscus esculentum*), carrots, potato, eggplant, peanut, chico and coffee. Some might be worth exploring. It might also be more useful to extend information about traditional vegetables to other segments of the population or to improve existing species than to introduce new vegetables from other countries.

References

Chornsamue, Ch. Let us promote sator cultivation. Forestry J. 21(4):294-296; 1962. (In Thai).

Division of Nutrition. Table of nutritive values of Thai foods. Dept of Health. Min. of Pub Health. 1981. (In Thai).

Domen, H.A.P.C. and Grubben, G.J.H. Tropical Leaf Vegetables in Human Nutrition. Royal Trop. Inst. and Orphan Publ. Co. Amsterdam. 140 pp., 1978.

Food and Nutrition Research Center. Food Composition Table Handbook. No. 1. Manila., 1982.

Limpladisai, Ch. Sator: an interesting crop. Kasikorn 44:295-303; 1981 (In Thai).

Lugod, G.C. Wild Plants Used as Vegetables. In Vegetable Production in Southeast Asia. ed. by J.R. Deanon Jr. and J.E. Knott. University of the Philippines, College of Agriculture, Los Banos, Laguna. pp 342-347; 1967.

Martin, W. and Rubierte, R.M. Edible Leaves of the Tropics. Antillan College Press. 233 pp.; 1979.

Satiadiredja, S. Cara Menanam dan Mempergrunakan Sauran Indonesia. J.B. Walters-Groningen, Jakarta; 1950.

Suwanwajokkasikij. The value of Kratin. Kasikorn. 32:43:47; 1959 (In Thai).

Tee, E.S. Nutrient Composition of Malaysian Foods. A Preliminary Table. Division of Human Nutrition, Institute for Medical Research, 1985.