

Underutilized Vegetables: A Sustainable and Alternate Food Resource in Manipur

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ABSTRACT

Vegetables are an important constituent of the human daily diet as they are rich sources of carbohydrates, minerals, vitamins and proteins needed for a healthier life. India's diverse climatic condition ensures the cultivation and availability of many kinds of vegetables. However, many kinds of vegetables need proper care, maintenance and techniques to be able to commercialize at a large scale to meet the demand of the increasing population. Agriculture practices in Manipur lacked modern farm equipment and technology, thereby limiting production to meet the demand of the local population. Remarkable production was contributed only by a few major vegetables in the State. Over-reliance on just a few staple crops in the State can have a high prevalence of food insecurity, dietary deficiency and immediate consequences on the well-being of the poor. Therefore focusing attention on neglected and underutilized vegetables as a source of alternate food resource will be a sustainable solution to combat over-dependence on a few major staple crops which is associated with deteriorating food baskets in future. Given the above, the study was carried out among three communities namely Meitei, Pangal and Kabui in Lilong sub-division, Thoubal district of Manipur. A random sampling technique was used in the selection of the respondents. A total of 10 underutilized vegetables namely Dasakusa mana (Chayote leaves), Yendem (Common aroid or Indo-Malayan), Chantrukman (Bittercress), Peruk (Indian pennywort), Laampaan (Taro), Kolamni (Water spinach), Sitafun mana (Passion fruit leaves), Chengkruk (Amaranth), Eshingekaithabi (Water sensitive plant or Water mimosa) and Morokman (Black night shade) were studied based on respondents awareness, mode of obtaining for consumption and medicinal properties associated with the selected underutilized vegetables. Findings indicated that almost all the respondents (97%) were aware of the selected vegetables however less than half of the respondents (45%) reported having obtained or grown these vegetables for consumption in their garden. Though many of the respondents were aware of the selected vegetables, consumption was less as many of them were not informed of their nutritional benefits. About 49% of the respondents reported having known about the medicinal properties associated with all the selected vegetables and they reported having utilized these vegetables in many health-related ailments. Therefore, it is suggested that increasing nutritional research, promoting and popularizing underutilized vegetables for consumption, and cultivation at large, and generating more awareness of the nutritional aspect and its health benefits would go a long way towards increase in consumption in future.

Key Words : Awareness, Medicinal properties, Manipur, Obtaining, Sustainable consumption, Underutilized vegetables

INTRODUCTION

Underutilized crops are those species grown in local production systems, highly adapted to a range of ecological niches, neither grown commercially on large scale nor traded widely, may be termed as underutilized vegetable

(Broin, 2006). The underutilized plants are those species with under exploited potential for contributing for food security, nutritional and medicinal importance as well as income generation and environmental services (Bull, 2000). Underutilized vegetables are those to which little attention is paid ignored by consumer, agriculture

researchers, plant breeders and policy makers though this species are traditionally used for food, fibre, fodder, oil and medicine (Chauhan *et al.*, 2020).

As the world population continues to grow at a rate which is inconsistent, the global food production has led to high prevalence of food insecurity and malnutrition particularly in many parts of countries including India. The number of food insecure, undernourished population has increased from 804 million in 2016 to 820 million by 2019 of which 2 billion people experiencing moderate or severe malnutrition (Food and Agriculture Organization [FAO] *et al.*, 2019).

Due to increase in population worldwide, agriculture is under increasing pressure to produce greater quantity of food, feed and bio-fuel on limited land resources for the projected nine billion people on the planet by 2050 (Godfray *et al.*, 2010). It is envisioned that agricultural production has to increase by 70% by 2050 to cope with an estimated 40% increase in world population (Bruinsma, 2009).

Vegetables are the key component of human consumption and balanced human diet as well as main drivers in achieving global nutritional security by providing nutrients, vitamins and minerals. In India, vegetables alone contribute 58.7% of total horticultural production and produced 162.89 million tonnes of vegetables from an area of 9.39 million hectare (Arora *et al.*, 1980).

Although, diverse agro climatic conditions of India permit to grow more than 60 cultivated and about 30 lesser known vegetable crops, not much attention has been given on underutilized vegetables known (Kumar *et al.*, 2018). As per various researches, there is overreliance on just a few staple food crops with limited nutritional value wherein maize, wheat, rice are the main staple food crops consumed globally accounting for greater than 50% of calorie intake. Too much dependence on few major staple food crops is associated with dwindling food basket (Allen and Allen, 2019).

According to Matenge *et al.* (2012), due to reduced cultivation, production and consumption is mainly common in rural areas particularly among the elders. Limited germplasm available, lack of technical information, lack of national policy and research, agriculturist and extension workers and lack of producer interest were found to be the key limitation in production and consumption (Williams and Haq, 2000). Consciousness about nutritional value of foods among common people was lacking leading to consuming unhealthy food besides lack of indigenous

technical knowledge was another constraint in neglecting underutilized vegetables for consumption.

Underutilized vegetables have been found growing in both Valley and Hilly regions of Manipur since time immemorial. Underutilized vegetables are rich in vitamins, minerals and other health promoting factors including high antioxidant activity and they played a major role in the diversification of diet leading to more balanced source of micronutrients. However, people awareness about its consumption, nutritional aspects, marketing and their medicinal value are not widely known and have not been given importance. Many studies were found in different state on underutilized vegetables, however not much have done in Manipur. Therefore the study aim to assess the awareness, mode of obtaining, frequency of consumption and medicinal properties associated or being used with the selected underutilized vegetables.

METHODOLOGY

The present study was carried out in Lilong, a sub-division of Thoubal district, Manipur. Majority inhabitants in this sub-division were Pangal community (93.3%), Meitei (5.4%) and Kabui (1%) as minority community. The communities have different socio-economic features. The study was carried out among this 3 mentioned communities. With regard to sample size, from Pangal community a sample of 35 respondents were drawn, among Meitei 25 respondents and 20 respondents from Kabui community. The sample size selection from each community were done using stratified random sampling with proportional allocation to size. The sample for the study were the husband or wife as they were the household head as well as bread earner in their families. It is also believed that husband or wife would have a good idea and experience about the selected underutilized vegetables in terms of study objectives such as awareness of the respondent, mode of obtaining and frequency of consumption of the selected vegetables. A semi-structured interview scheduled was used to gather information. Besides, the study also aim to collect information related to the medicinal properties associated with each selected underutilized vegetables if any.

RESULTS AND DISCUSSION

Sitafun mana (Local name),

Common name: Passion fruit leaves

Scientific name: *Passifloraedulis*

Table 1 showed, all the respondents were aware of sitafun mana as the plant bear fruits. Majority of the respondents (72.5%) reported to have obtained this vegetable (mainly consumed its fruit) from their garden and rest reported its availability in the market. With regard to frequency of its consumptions, 52.5% reported they had never consumed the leaves as vegetables, 28.7% reported they rarely consumed and only few (18.8%) reported they sometimes consumed this plant leaves. As much as 78.8% of the respondents were not aware of the nutritional benefits of this plant leaves. This plant leaves contain Vitamin A, Vitamin C, niacin and fiber. This plant leaves was being used by 42.5% of the respondents for treatment of insomnia as the plant leaves was believed to have medicinal properties which provide restful sleep.

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	58	72.5
Wild/Forest	22	27.5
Purchase in market	0	0.0
Frequency of consumption		
Always	0	0.0
Often	0	0.0
Sometimes	15	18.8
Rarely	23	28.7
Never consumed	42	52.5
Awareness about nutritional benefits of this vegetables		
Yes	17	21.2
No	63	78.8
Do you know the medicinal properties of this vegetables		
Yes	34	42.5
No	46	57.5

Yendem (Local name)

Common name: Common aroid or Indo-Malayan

Scientific name: *AlocasiaIndica*

As per Table 2, all the respondents were aware of Yendem vegetable as it is mainly used for eromba (spicy chutney) and kangsoi (curry without used of oil) in the State. Majority of the respondents (58.8%) reported to have obtained this vegetable from their farm/garden while

42.2% reported to have obtained it from the market. Frequency of consumptions shows, 60% of the respondents always consumed this vegetable, 28.8% often consumed while 11.2% reported to have consumed sometime. Though all the respondents reported to have consumed this vegetable many of them (61%) were not aware about the nutritional benefits of this plant. This plant is rich in Vitamin C, carbohydrate and support for astringent and styptic activity. However, as many as 85% reported to have knew the medicinal properties of this plant. This plant is used for treatment of jaundice, diseases of abdomen, spleen and inflammation. It is also given to mother’s post-delivery as it is believed that the plant have more iron content.

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	47	58.8
Wild/Forest	0	0.0
Purchase in market	33	41.2
Frequency of consumption		
Always	48	60.0
Often	23	28.8
Sometimes	9	11.2
Rarely	0	0.0
Never consumed	0	0.0
Awareness about nutritional benefits of this vegetables		
Yes	31	38.8
No	49	61.2
Do you know the medicinal properties of this vegetables		
Yes	68	85.0
No	12	15.0

Peruk (Local name)

Common name: Indian pennywort

Scientific name: *Centilliaasiatica*

Table 3 indicate, all the respondents were aware of peruk vegetable as it is used mostly as eromba in the State. Majority of the respondents (52.5%) reported to have obtained this vegetable from the market through purchasing, 32.5% reported to have obtained it from the wild/forest while few (15%) reported to have obtained from their farm/garden. About 40% of the respondents reported to have consumed this vegetable always while

27.5% and 32.5% reported to have consumed often and sometime respectively. Though all the respondents reported to have consumed this vegetable many of them (70%) were not aware about the nutritional benefits of this plant. This plant contains different nutrients such as protein, carbohydrate, calcium, iron, fiber and sodium. With regard to medicinal properties of this vegetable, 61% reported this vegetables is mainly used for healing wounds and treat skin problems like psoriasis.

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	12	15.0
Wild/Forest	26	32.5
Purchase in market	42	52.5
Frequency of consumption		
Always	32	40.0
Often	22	27.5
Sometimes	26	32.5
Rarely	0	0.0
Never consumed	0	0.0
Awareness about nutritional benefits of this vegetables		
Yes	56	70.0
No	24	30.0
Do you know the medicinal properties of this vegetables		
Yes	49	61.2
No	31	38.8

LaamPaan (local name):

Common name: Taro

Scientific name: *Calocasia esculenta*

As found from Table 4, all the respondents were aware of laampaan vegetable. Majority of the respondents (65%) reported to have obtained this vegetable from the market, 23.7% reported to have obtained from the farm/garden while few (11.3%) reported to have obtained from wild/forest. Regarding frequency of consumption, 61% reported they consumed this vegetable sometime while 39% reported they often consumed this vegetable. Majority of the respondents (78.8%) were not aware about the nutritional benefits of consumption of this plant. This vegetable is an excellent source of dietary fiber which improve both the function of digestive system and can contribute to healthy weight loss. It also contain high levels of vitamin C, vitamin B6, and vitamin E also help to maintain a healthy immune system by eliminating free radicals from our body. None

of the respondents were found to be aware about the medicinal properties of this vegetable.

Table 4: Responses about LaamPaan (Taro)

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	19	23.7
Wild/Forest	9	11.3
Purchase in market	52	65.0
Frequency of consumption		
Always	0	0.0
Often	31	38.8
Sometimes	49	61.2
Rarely	0	0.0
Never consumed	0	0.0
Awareness about nutritional benefits of this vegetables		
Yes	17	21.3
No	63	78.7
Do you know the medicinal properties of this vegetables		
Yes	0	0.0
No	80	100.0

Dasakusa mana (Local name)

Common name: Chayote leaves

Scientific name: *Cucurbita*

Results in Table 5 showed, all the respondents were aware of Dasakusa vegetable as it bear fruit. As well as the leaves is commonly consumed among the households as kangsoi and bland curry (without salt). Majority of the respondents (78.7%) reported to have obtained the fruit from their farm/garden while 21.3% reported to have obtained it from the market. Frequency of consumptions of Dasakusa vegetable showed, 75% of the respondents had never consumed the plant leaves, 15% reported to have sometime consumed while 10% reported to have rarely consumed it. It was found that majority of the respondents (60%) were not aware about the nutritional benefits of this plant leaves. This plant leaves contain a high amount of vitamin C, folate and fiber. With regard to medicinal properties of this vegetable, only 40% of the respondents knew the medicinal properties of this vegetable. Consumption of this plant leaves was believed to regulate the heart and muscles.

Esingekaihabhi (Local name)

Common name: Water sensitive plant or Water mimosa

Table 5: Responses about Dasakusa mana (Chayote leaves)

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100.0
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	63	78.7
Wild/Forest	0	0.0
Purchase in market	17	21.3
Frequency of consumption		
Always	0	0.0
Often	0	0.0
Sometimes	12	15.0
Rarely	8	10.0
Never consumed	60	75.0
Awareness about nutritional benefits of this vegetables		
Yes	32	40.0
No	48	60.0
Do you know the medicinal properties of this vegetables		
Yes	32	40.0
No	48	60.0

Scientific name:*Neptuniaoleracea*

All the respondents were aware of esingekaithabi vegetable as this vegetable is commonly used in making Singju and Iromba (a delicacy for Manipurians). Majority of the respondents (77.5%) reported to have obtained this vegetable from market and rest reported to have obtained from their garden. With regard to frequency of its consumptions, 57.5% reported they often consumed esingekaithabi vegetable while 42.5% reported they sometime consumed it. As much as 72.5% of the respondents were found to be aware of the nutritional benefits of this plant. This plant content Vitamin A & C, protein and riboflavin. This plant leaves was being used by 53.7 % of the respondents for treatment of dysentery and for ear ached (Table 6)

Kolamni (Local name)

Common name: Water spinach

Scientific name:*IpomoeaCordata*

All the respondents were aware of kolamni vegetable. Majority of the respondents (52.5%) reported to have obtained this vegetable from wild/forest, 40% reported to have obtained it from the market while few 7.5% reported to have it obtained from farm/garden. Frequency of consumptions shows, 61.2% of the respondents sometime consumed this vegetable while 38.8% often consumed this vegetable. Though all the respondents reported to have consumed this vegetable

Table 6: Responses about Esingekaithabi (Water sensitive plant)

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100.0
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	18	22.5
Wild/Forest	0	0.0
Purchase in market	62	77.5
Frequency of consumption		
Always	0	0.0
Often	46	57.5
Sometimes	34	42.5
Rarely	0	0.0
Never consumed	0	0.0
Awareness about nutritional benefits of this vegetables		
Yes	58	72.5
No	22	27.5
Do you know the medicinal properties of this vegetables		
Yes	43	53.7
No	37	46.3

many of them (68.7%) were not aware about the nutritional benefits of this vegetable. This plant has a nutritional benefits of vitamins, minerals and carotene. However, as many as 73.8 % reported to have knew the medicinal properties of this plant and they had reported to have used this vegetable in some way or the other for treatment of ringworm and the leaf juice as antidote for opium and arsenic poisoning (Table 7).

Table 7: Responses about Kolamni (Water spinach)

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100.0
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	6	7.5
Wild/Forest	42	52.5
Purchase in market	32	40.0
Frequency of consumption		
Always	0	0.0
Often	31	38.8
Sometimes	49	61.2
Rarely	0	0.0
Never consumed	0	0.0
Awareness about nutritional benefits of this vegetables		
Yes	55	68.7
No	25	31.3
Do you know the medicinal properties of this vegetables		
Yes	59	73.8
No	21	26.2

Morokmaan (Local name):**Common name:** Black night shade**Scientific name:** *Solanum nigrum* Linn

Majority of the respondents (85%) were aware of Morokmaan vegetable. Half of the respondents (50%) reported to have obtained this vegetable from farm/garden and rest reported to have obtained from wild/forest. As much as 60 % of the respondents reported they had never consumed this vegetable while 26.2 % reported to have consumed sometime and 13.8 % reported they rarely consumed this vegetable. Sixty one percent (61.2%) of the respondents were not aware about the nutritional benefits of this vegetable. This vegetable is a rich source of riboflavin, nicotinic acid, Vitamin C and beta-carotene. With regard to medicinal properties of this vegetable, 30% reported this vegetable is mainly used to cure severe stomach ached and the unripe fruit is used for treating ringworm (Table 8).

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	68	85.0
No	12	15.0
How do you obtain this vegetables		
Farm/Garden	32	40.0
Wild/Forest	48	60.0
Purchase in market	0	0.0
Frequency of consumption		
Always	0	0.0
Often	0	0.0
Sometimes	21	26.2
Rarely	11	13.8
Never consumed	48	60.0
Awareness about nutritional benefits of this vegetables		
Yes	31	38.8
No	49	61.2
Do you know the medicinal properties of this vegetables		
Yes	32	40.0
No	48	60.0

Chantrukman (Local name):**Common name:** Bittercress**Scientific name:** *Cardamine hirsute*

All the respondents were aware of Chantrukma vegetable. Majority of the respondents (67.5%) reported to have obtained this vegetable from the garden while 32.5% purchased it from the market. Regarding frequency of consumption, 75% of the respondents

reported they consumed this vegetable sometime while 25% reported they often consumed this vegetable. Majority of the respondents (61.2%) were not aware about the nutritional benefits of consumption of this vegetable. This plant contains nutrients like calcium, potassium, Vitamin K and besides the seed yield fatty oil. About 49% of the respondents were found to be aware about the medicinal properties of this vegetable. This plant leaves was believed and used it for treating vision problem like cataract (Table 9).

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100.0
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	54	67.5
Wild/Forest	26	32.5
Purchase in market	0	0.0
Frequency of consumption		
Always	0	0.0
Often	20	25.0
Sometimes	60	75.0
Rarely	0	0.0
Never consumed	0	0.0
Awareness about nutritional benefits of this vegetables		
Yes	31	38.8
No	49	61.2
Do you know the medicinal properties of this vegetables		
Yes	39	48.7
No	41	51.3

Chengkruk (Local name)**Common name:** Amaranth**Scientific name:** *Amaranthus viridis*

All the respondents were aware of Chengkruk vegetable. Majority of the respondents (71.3%) reported to have obtained this vegetable from their garden and rest reported its availability in the market. With regard to frequency of its consumptions, 55% reported they consumed Chengkruk vegetable sometime while 45% reported they often consumed this vegetable. As much as 80% of the respondents were found not aware of the nutritional benefits of this plant leaves. This plant leaves contain different types of nutrients such Vitamin A & C, calcium, iron, phosphorus, potassium, sodium and zinc. This plant leaves was being used by 45 % of the respondents to reduce hair fall and treat wounds (Table

Table 10: Responses about Chengkruk (Amaranth)

Parameters	Frequency (n=80)	Percentage (%)
Are you aware of this vegetables		
Yes	80	100.0
No	0	0.0
How do you obtain this vegetables		
Farm/Garden	57	71.3
Wild/Forest	0	0.0
Purchase in market	23	28.7
Frequency of consumption		
Always	0	0.0
Often	36	45.0
Sometimes	44	55.0
Rarely	0	0.0
Never consumed	0	0.0
Awareness about nutritional benefits of this vegetables		
Yes	16	20.0
No	64	80.0
Do you know the medicinal properties of this vegetables		
Yes	36	45.0
No	44	55.0

10).

Conclusion:

Overall study showed that almost all the respondents (98.5%) were aware about the selected underutilized vegetables. Less than half of the respondents (45.8%) reported to have grown and obtained the selected vegetables from their garden. Comparison on highest responses on mode of obtaining selected underutilized vegetable from the garden were found to be Sitafun mana, Yendem, Dasakusa, Chantrukman and Chengkruk and highest responses on mode of obtaining underutilized vegetables from wild/forest were Kolamni and Marokmaan whereas the highest responses on mode of obtaining from market are Peruk, Laampaan and Eshingekaithabi.

With regard to frequency of consumption, always consumed underutilized vegetables by respondents were highest in yendem and peruk and often consumed underutilized vegetables was found to be highest in Eshingekaithabi. Sometime consumed underutilized vegetables were reported highest in Laampaan, Kolamni, Chantrukman and Chengkruk. Never consumed underutilized vegetables was reported to be highest in Sitafun mana, Dasakusa and Marokmaan.

Majority of the respondents (57%) did not have

much knowledge on the nutritional aspects of the selected underutilized vegetables though they have a long history of consumption. Awareness about nutritional benefits was found to be low for Sitafun mana, Yendem, Laampaan, Dasakusa mana, Morokmaan, Chantrukman and Chengkruk. With regard to its medicinal properties, about half of the respondents (51%) were not aware about the medicinal properties of the selected underutilized vegetables and found to be low for Sitafun mana, Laampaan, Dasakusa mana, Morokmaan, Chantrukman and Chengkruk. This above were the reasons for less frequency in their consumption thus narrowing the options of the consumer to depend on fewer and fewer crops which in the long run this underutilized vegetables will soon become extinct from the surface of the land and will further result in high prevalence of food insecurity in the State. Too much dependence on a few major staple crops is not safe not only in terms of dwindling food basket but its consequences towards people for its nutritional aspect too.

Many neglected and underutilized vegetable can play a sustainable food resources available to the people of the State as underutilized vegetable has a potential of alternate food resource to the people for consumption to help maintain a diverse healthy diet as well as to combat micro-nutrient deficiencies. These vegetables are easily grown and not difficult to managed or cultivated. Besides, price of this vegetables are cheap compare to other commonly cultivated vegetables and they are also nutritionally rich. Their enhanced used can bring about better nutrition and health to the people of the State. Hence, from the findings it is further suggested that-

a) More awareness should be generated among the households on the nutritional aspects of the selected underutilised vegetables and its medicinal benefits so as to enhance consumption among the households in the State. Cost effective media like TV, radio, local newspaper could be used to generate mass awareness in the State.

b) As most of the selected underutilised vegetables were obtained by respondents from their garden/farm, it can be encouraged to the local people in the State to plant /grow this vegetables in their garden.

c) Measure should be taken by the State government to popularise and conserve underutilised vegetables in the State as they played an important role for sustainable alternate food resource for the future.

d) Strengthening research on available underutilised

vegetables in the State will played a great role in enhancing awareness and consumption among the local population in the State.

REFERENCES

- Allen, P. and Allen, P. (1990). How many plants feed the world? *Conservation Biology*. 4(4), 365-374. Retrieved from <http://pubs.sciepub.com/jfs/9/3/4/index.html>
- Arora, D., Chandel, K.P.S., Joshi, B.S. and Pent, K.C. (198). Rice bean: Tribal pulse of eastern India. *Economic Botany*. **34** : 260-263.
- Broin, M. (2006). The nutritional value of *Moringaoleifera* Lam. Leaves: what can we learn from figures, Moringa news workshop.
- Bruinsma, J. (2009). The Resource Outlook to 2050: By How Much do Land, Water and Crop Yields Need to Increase by 2050? In Proceedings of the Technical Meeting of Experts on How to Feed the World in 2050, Rome, Italy, 24–26 June 2009; Food and Agriculture Organization (FAO): Rome, Italy, 2009, 1-33.
- Bull, E. (2000). What is nutraceutical, *Pharmaceutical Journal*, **265**: 57–58.
- Chauhan, A., Sharma, D., Divya, Madhvi, Sanjeev, K., and Banyal (2020). Underutilized vegetables crops: A lost treasure. Retrieved from <https://doi.org/10.20546/ijcmas.2020.904.259>
- FAO, IFAD, UNICEF, WFP and WHO .2019. *The state of food security and nutrition in the world 2019. Safeguarding against economic slowdowns and downturns*. Retrieved from <https://pubs.sciepub.com/jfs/9/3/4/index.html>
- Godfray, H.C.J., Beddington, J.R., Crute, I.R., Haddad, L., Lawrence, D., Muir, J.F. *et al.* (2010). Food security: The challenge of feeding 9 billion people. *Science*, **327** : 812-818.
- Kumar, R., Rajashree, V., Sagar, L., Tripura, U., Karthick, K., Karthick, R. and Prasath, G., 2018. Underutilized vegetables as rich source of medicinal value: A boon for the Pharmaceutical industries and farmer income. *Internat. J. Chemical Studies*, **6**(4) : 3320-3323.
- Matenge, S.T.P., Van der merwe, D., de beer, H., Bosman, M.J.C. and Kruger, A. (2012). Consumer' beliefs on indigenous and traditional foods and acceptance of products made with cow pea leaves. *African J. Agric. Res.*, **7** : 2243-2254. Retrieved from <http://www.sciepub.com/reference/367422>
- Williams, J.T., Haq, N., Padulosi, S. and Hodgkin, T. (2000). underutilised crops: trends, challenges and opportunities in the 21st century. Retrieved from <http://www.nuscommunity.org/nus/neglected-underutilised-species/>
