



## **Potentiality of Underutilized Vegetables for Contribution to Sustainable Development Goals (SDGs) in Bangladesh**

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### **Authors' contributions**

*This work was carried out in collaboration between both authors with equal contribution. Author MAH designed the study and wrote the protocol. Author SSH managed the literature searches and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.*

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### **ABSTRACT**

The vegetable species which are cultivated or grown but are underutilized and underexploited both regionally and globally are known as underutilized vegetables. Although the underutilized vegetables have poor market value and production, but these plant species are adaptive to local climatic conditions and require good management practices. However, the underutilized vegetables have good nutritional and medicinal values and which have capability to enhance food security of the poor people and have potential role towards sustainable development goals (SDGs) of Bangladesh. Currently, both the production and daily consumption of vegetable in Bangladesh is lower than the neighboring countries of it. Therefore, the underutilized vegetables can be an additional source of food for the people of Bangladesh which have potentiality to provide nutrition and income to the people. The role of underutilized vegetables are ignored and underexploited, sometimes, by agricultural researchers, policy makers, donor agencies, public and private investors, extension services and economists. Hence, it is important to promote these underutilized vegetables for food security and agricultural diversification which require further research.

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## 1. INTRODUCTION

Bangladesh is rural dominated agrarian country of the South Asia [1] with huge population of 144 million and is an agrarian country [2]. Population growth has been raising demand for agricultural goods mainly food grains as well as other goods and services. Bangladesh is faced with several challenges that might slow the growth of food production in the future. The Government has been undertaking various measures to reverse or arrest the negative trend. One of the important measures is to promote crop diversification. It is imperative for Bangladesh to grow faster in the short-run in order to reduce poverty. Therefore, a careful balancing act must be orchestrated where economic growth is maximized without compromising environmental protection and safety [3]. Policies and actions of the Government must not cause marginalization of the poor and force them to intensify over utilization of the open access natural resource base, or make them more vulnerable to pollution hazards. Production and consumption of minor/underutilized vegetables and fruits can be a good option for food diversification, and poverty reduction. Meanwhile, the underutilized vegetables and fruits have roles to implement Sustainable Development Goals (SDG) and food security in Bangladesh.

Throughout the world only few plants are largely used as food, although about 40000 to 100000 plant species are used as food, shelter and medicinal uses [4,5]. Underutilized or undervalued or minor crops are those crop species which are presently cultivated but are underutilized and underexploited both regionally and globally due to their lower production and market value [6-8]. Many of these underutilized species are used for food, fodder, fiber, oil, medicinal purposes for the local communities and found to confine into the local production system although these species are widely distributed around the globe [9]. As these plants species contain various valuable nutritional components and tends to adapt to marginal lands so constituting a good diet for the local communities [6].

The underutilized crops includes cereals, vegetables, legumes, oilseeds, roots, tubers, aromatic and medicinal plants, fruits and nuts [10,11]. Many of these species are utilized by the

poor people of many parts of the world. These underutilized species are part of local cultural tradition and crop diversity of local communities [12,13]. Underutilized vegetables and plants have better nutritional value and they can contribute nutritional support to the people [14,15]. Though these plants also contribute to food security during the time natural disasters like drought, famine, floods, shocks and risks [16]. The economic potentials of underutilized vegetables and plants are poorly addressed so their role is confined to local and traditional uses mostly [17]. Many of the underutilized vegetables are hardy, requires minimum production inputs and adaptive to marginal soil as well as climatic condition. So these vegetables not only support commercial, medicinal and cultural value but they are also found to be important for sustainable food production and exert less pressure on the environment [18].

There are an estimated 7000 plants species which have been utilized as crop plants in the world [19] and most of these many species exist as underutilized crops. Human beings depend for its basic food of carbohydrate, fats and protein and ultimately on a little number of crop species [20]. Rice, wheat and maize are the main human consumed carbohydrates sources [21]. However, considering the population pressure it is difficult to meet the challenges of food security with these current major crops and underutilized or minor crops may enhance the food security.

Findings from the study of Hughes [22] suggest that underutilized plants often serve a broad range of crucial purposes, especially in isolated, traditional communities. Some of them provide an essential nutritional safety net particularly during periods of food crop failure and times of unrest. In spite of their labeling as 'foods of last resort', underutilized indigenous food crops are now receiving wider attention by researchers, farmers and consumers in developing countries for both their nutritional and market values. Underutilized indigenous crops often excel in terms of environmental adaptability, low input requirements, fit to specific cropping systems, readily produced seed or propagules, and convenient harvest and post harvest processing characteristics. Many of them provide excellent sources of protein, minerals and vitamins to alleviate the 'hidden hunger' of micronutrient deficiency that worldwide affects more than three

billion people. In another study Idowu [23] showed the contribution of neglected and underutilized or minor crops (NUS) to household food security and health among rural dwellers in Oyo state, Nigeria. All these crops have received little research attention, poor commercialization and marketing and lacks effective policy framework for harnessing their potentials in Nigeria.

Malnutrition can be causes of different diseases like iodine deficiency, vitamin A deficiency, blindness, iron deficiency, anemia and mental impairments, as malnutrition and disease are intimately associated with each other [24]. Furthermore, in many developing countries of the world in recent years, different chronic diseases like cancer, diabetes and different cardiovascular diseases have been dramatically increased due to malnutrition and unbalanced diet (e.g. <http://www.afro.who.int/en/mediacentre/world-health-day/2016.html>). The frequency of these malnutrition or unbalanced-diet related diseases are high in low and middle income countries [25]. As such, various underutilized crops species can be incorporated into the local food system which can ease malnutrition in the rural communities.

In the recent decades, interest has been focusing on the wild edible plants due to their nutritional and medicinal values and human beings are now incorporating those into their diet [26,27]. Moreover, the underutilized crops species have become commercial crop due to their market values as well as potential nutritional importance [28]. In many developing countries both the rural and tribal people cultivating and harvesting wide variety of underutilized crops species of different types due to their taste, and cultural uses [29]. In Bangladesh many wild/underutilized vegetables are conventionally using with staple food in both urban and rural areas [30].

In Bangladesh, lots of underutilized vegetables are grown largely in the homestead, fallow, forest areas as well as in the road/rail sides with less care. Those fruits and vegetables are well adapted to the local climate, highly nutritious and contributing in poverty reduction, and household food security of rural peoples. The density of population of the hilly regions of Bangladesh has been increasing at an alarming rate and the present

cultivation practices have been deteriorating the soil fertility and nutrient status. Hence, huge numbers of tribal people are dependent on the underutilized fruits and vegetables. Underutilized or minor fruits and vegetables are also contributing significantly to herbal medicine [31]. With this study, it is aimed to determine the potentiality of underutilized vegetables for contributing to food security as well as towards sustainable development goals (SDGs) in Bangladesh.

## 2. METHODOLOGY

In this study, the potentiality of underutilized vegetables towards food security and contribution towards sustainable development goals in Bangladesh were revealed. For this reason, the statistics and relevant facts related to underutilized vegetables and policy papers of SDG of Bangladesh have been scrutinized and reviewed. In this study, assessments were firstly made on the underutilized vegetables and their potential role on dietary consumption as well as their nutritional status. In addition, consumption pattern and projected importance of vegetables in Bangladesh and elsewhere were also provided. Further, the data were examined to reveal different underutilized vegetables along with their edible parts and uses in Bangladesh.

## 3. CONSUMPTION PATTERN OF VEGETABLES IN THE DIET

It has been estimated that theper head consumption of vegetables in Bangladesh is about 26.5, 25.5 and 26 kg per year, which is much lower than that our neighboring countries (Table 1). Such a low rate of vegetable consumption in Bangladesh is particularly due to the traditional rice-based food habit of the people and high price of vegetables in the country. Considering the nutritional need of people, the daily requirement of vegetables for a person is 220 gram [32].

Based on the projected population and daily requirement of vegetables for a person, a supply of about 13985 thousand tones of vegetables will be needed for the year 2031 (Table 2). Since, it would not be possible to increase the production of vegetables up to that level due to limitation

**Table 1. Per capita consumption of vegetables in Bangladesh and neighboring countries**

Country	Per head consumption (kg/year)		
	2009	2010	2011
Bangladesh	26.5	25.5	26.0
Thailand	48.8	49.7	49.3
India	69.4	76.3	80.8
China	317	327	332
Japan	101	98.9	101
Korea	218	197	222

Source: [www.helgilibrary.com](http://www.helgilibrary.com)

**Table 2. Projected demand for vegetables in Bangladesh on the basis of projected population by the year 2030-31**

Indices	2006-07	2010-11	2020-21	2030-31
Population (million)	142.60	151.41	171.71	191.60
Production of vegetables (000 mt)	2047	2047*	2047*	2047*
Demand for vegetables based on nutritional requirement (000 mt)**	10408	11051	12533	13985
Production and demand gap for vegetables (000 mt)	8361	9004	10486	11938

Source: [32]

\*Considering the level of production same as of 2006-07;

\*\*Considering 220 g / head / day

of land and other practical reasons, efforts should be made to minimize the gap between the present level of production and demand through research efforts leading to increase in yield per unit area. As with all other crops, the well-recognized tools for increasing the yield per unit area are, cultivation of other important minor vegetables, use of improved varieties, high quality planting material and modern technology of production covering optimal soil management, plant density, plant nutrients, irrigation, disease management and pest control.

#### 4. DIFFERENT UNDERUTILIZED VEGETABLES IN BANGLADESH

Bangladesh has been blessed with high yielding varieties (HYV) of rice, and plenty of vegetables and fruits. There are 141 varieties of leafy vegetables (commonly known as shak) and 25 varieties of non-leafy vegetables in Bangladesh [33]. Among the leafy vegetables, 97 of them are identified as minor varieties, and the rest are consumed by both the general and ethnic people. Many of the poor and homeless people depend on these minor fruits and vegetables [34]. Many underutilized vegetable species have been identified in Bangladesh (Table 3), so far. All of these vegetable species have been utilized by the people of Bangladesh. A list of these are provided in Table 3 below:

#### 4.1 Relevance of Underutilized Vegetables towards Implementation of SDGs and Food Security in Bangladesh

The Sustainable Development Goals (SDG) of the 2030 Agenda for Sustainable Development adopted by the United Nations in September 2015 (<https://sustainabledevelopment.un.org/>) aims to adopt total number of 17 agenda. Of which, in Bangladesh, having zero hunger, good health and well being and no poverty as one of the Sustainable Development Goals (<https://sustainabledevelopment.un.org/sdg2>) can be achieved through production as well as consumption of underutilized/wild vegetables and fruits. As malnutrition reduced physical and mental development of children [35], while this malnutrition can be overcome by nutrient rich food [36] and with new food strategies. Various neglected/underutilized crops can offer an alternative source of micronutrients, vitamins, as well as health-promoting secondary plant metabolites. Moreover, both vegetables and fruits are well known for their essential biochemicals like proteins, fats, carbohydrates, vitamins, minerals [37,38], moisture, fiber, ash and energy [39,40]. The traditional wild vegetables and fruits have also some medicinal value like antibacterial and anticancer activity, which makes it a valuable addition to the diet

**Table 3. List of underutilized vegetables in Bangladesh with edible parts and uses**

Sl.	English name	Local name	Scientific name	Family	Edible part	Uses
1.	Winged bean	Kamranga sheem	<i>Psophocarpus tetragonolobus</i>	Leguminaceae	Pod, seed, tuberous root	Vegetable, medicine, snack food
2.	Sword bean	Makhan sheem	<i>Canavalia ensiformis</i>	Leguminaceae	Pod, seed	Vegetable, medicine
3.	Lima bean	Rukuri	<i>Phaseolus limensis</i>	Leguminaceae	Pod, seed	Vegetable, medicine
4.	Yam bean	Sakalu	<i>Pachyrhizus tuberosa</i>	Leguminaceae	Pod, seed	Vegetable
5.	Cucumber (short)	Khira	<i>Cucumis anguina</i>	Cucurbitaceae	Fruit	Curry, salad, pickle, medicine
6.	Ivy gourd	Talakuchi	<i>Coccinia grandis</i>	Cucurbitaceae	Fruit	Vegetable, medicine
7.	Tripatri leaves	Tripatri Shak	<i>Desmodium trifolium</i>	Leguminaceae	Leaf	Vegetable, medicine
8.	Spiny amaranth	Katanotey	<i>Amaranthus spinosus</i>	Amaranthaceae	Leaf and stem	Vegetable, medicine
9.	Leaf amaranth	Shaknotey	<i>Amaranthus viridis</i>	Amaranthaceae	Leaf and stem	Vegetable, medicine
10.	Haicha	Chanchi	<i>Alternanthera sessilis</i>	Amaranthaceae	Leaf and stem	Vegetable, medicine
11.	Goose foot	Bathua	<i>Chenopodium album</i>	Chenopodiaceae	Leaf and stem	Vegetable, medicine
12.	Marsh herb	Helencha	<i>Enhydra fluctuans</i>	Compositae	Leaf and stem	Vegetable, medicine
13.	Indian penny wort	Thankuni	<i>Centella asiatica</i>	Umbelliferae	Leaf	Vegetable, medicine
14.	Sorrel	Tak palang	<i>Rumex vesicarius</i>	Polygonaceae	Leaf	Vegetable, medicine
15.	Malencha	Malencha	<i>Jussiaea repens</i>	Onagraceae	Leaf	Vegetable, medicine
16.	Wood sorrel	Amrulshak	<i>Oxalis corniculata</i>	Oxalidaceae	Leaf	Vegetable, medicine
17.	Garden purslane	Nunia	<i>Portulaca oleracea</i>	Portulacaceae	Leaf	Vegetable, medicine
18.	Laffa	Laffa	<i>Malva verticillata</i>	Malvaceae	Leaf	Vegetable, medicine
19.	Fern	Dhekishak	<i>Dryopteris filix-mas</i>	Polypodiaceae	Leaf	Vegetable, medicine
20.	Water cress	Shachi	<i>Nasturtium officinale</i>	Cruciferae	Leaf	Vegetable, medicine

Sl.	English name	Local name	Scientific name	Family	Edible part	Uses
21.	Tannia	Moulavikachu	<i>Xanthosoma atrovirens</i>	Araceae	Leaf and stem	Vegetable, medicine
22.	White yam	Matey alu	<i>Dioscorea rotundata</i>	Dioscoreaceae	Fruit	Vegetable, medicine
23.	Water plantain	Shamkala	<i>Ottelia alismoides</i>	Hydrocharitaceae	Fruit, flower (top of inflorescence) and central part of stem	Vegetable, medicine, livestock feed, leaf as wrapping material
24.	Lotus	Padma	<i>Nelumbo nucifera</i>	Nymphaeaceae	Rhizome and seed	Rhizome as vegetable, seed as processed product, ornamental plant, leaf as wrapping material.
25.	Water lily	Shapla	<i>Nymphaea nouchali</i>	Nymphaeaceae	Modified root, stem and seed	Root, stem as vegetable, seed fried as puff, ornamental plant, medicine

[41]. Moreover, many indigenous food plants grow wild, they are accessible, they can be collected freely and are thus available to everyone, including the poor which have a high possibility of high returns since most of these plants have short life span and can be cultivated 3-4 times a year. Thus, the indigenous vegetables and fruits can be treated as to reduce poverty as an agenda of SDG.

The nutritional status of Bangladesh is quite alarming with a great number of the populations suffering from malnutrition and the per capita consumption of vegetable is about 166 g, well below the minimum level of 200 g. The extent of micronutrient deficiency in Bangladesh is far greater than energy malnutrition [42]. Neglected or underutilized crops have the potential to play a number of roles in the improvement of food security that include being: (i) part of a focused effort to help the poor for subsistence and income; (ii) a way to reduce the risk of over-reliance on very limited numbers of major crops; (iii) a contribution to food quality; and (iv) a way to preserve and celebrate cultural and dietary diversity.

## 5. CONCLUSIONS AND RECOMMENDATIONS

The vegetable species which are traditionally used for food, fodder, oil and which have medicinal properties but which have been overlooked by the scientific research and development workers are considered as underutilized vegetables. However, these have great potentialities towards food security and implementation of sustainable development goals (SDGs) in Bangladesh. Moreover, they have potentiality to provide economic return to the rural poor people of Bangladesh. The climate and soil of Bangladesh are favorable for production of minor fruits and vegetables. Sometimes, the minor leafy vegetables are treated as weeds by the extension officers and researchers, and the farmers are criticized for not keeping these weeds population under control, thus labeling these crops as not worth the space they occupy. So, the government of Bangladesh needs to take some steps for highlighting the underutilized/minor vegetables. Bangladesh Agricultural Research Institute, different agricultural Universities, Department of Agriculture Extension (DAE) and some NGOs have been implementing some development projects to increase the underutilized vegetables production.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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