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Research Article

PERCEPTION AND ATTITUDE REGARDING UNDERUTILIZED PLANT SPECIES IN GOWAINGHAT UPAZILA, SYLHET

Chayon Raj Ghosh[1,2], Subrata Das[1,2], Md. Omor Sharif[1] and Mohammad Samiul Ahsan Talucder[1,2*]

[1]Department of Agroforestry and Environmental Science, Sylhet Agricultural University, Sylhet 3100, Bangladesh
[2]Climate-Smart Agriculture & Geospatial Lab, Department of Agroforestry and Environmental Science, Faculty of Agriculture, Sylhet Agricultural University, Sylhet 3100, Bangladesh

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****Corresponding author***
Mohammad Samiul Ahsan Talucder
E-mail: talucdermsa.aes@sau.ac.bd

Abstract

Global food systems are advancing towards vulnerable due to over reliance on a narrow range of staple crops (rice, wheat, maize), creating risks from climate change, environmental degradation, and malnutrition. Neglected and underutilized plant species (NUPS), are known as Future Smart Foods which are offering climate-resilient, nutrient-dense alternatives adapted to marginal environments, with potential dietary diversity, ability to combat hidden hunger, and support sustainable livelihoods. This study was conducted with the objectives of knowing the people perception and attitude towards the NUPS in Gowainghat Upazila of Sylhet District, Bangladesh. The research area is located in a humid sub-tropical region with heavy monsoon rainfall (~5,000 mm annually) and having diverse agroecology covering 200 randomly selected respondents from four unions (Fatehpur, Rustampur, Purba Jaflong, Alirgaon) with the above objectives during June 2022 to and April 2023. Data were collected by using semi-structured interviews, pre-tested questionnaires, field observations, and focus group discussions. The data were analyzed using descriptive statistics and Likert scales. Results revealed strong appreciation for NUPS, with fruits dominating usage (55.5%) followed by vegetables (16.5%) and medicinal applications (15%), and were primarily for self-consumption (55%) and contributing to nutrition, health, and income security. Women played the prominent role in labor-intensive production tasks (e.g., planting 57.5%, harvesting 65.5%), creating gender empowerment, while marketing remained male-dominated (71.5%). Respondents hold positive attitudes toward NUPS benefits including nutritional security and women's empowerment. But showed low awareness of environmental contributions (e.g., biodiversity enhancement), limited knowledge levels (47% nil), with a perceived decadal decline in availability/production (66.5%) attributed to marketing constraints (79 % respondents), uneven precipitation (72%), lack of training (69%), and inadequate knowledge (64%). These findings are aligned with global patterns of NUPS erosion due to policy negligence and climate stresses. The study underscores NUPS' viability as climate-smart resources in vulnerable rural Bangladesh, affirming their role in advancing SDGs 1 (No Poverty), 2 (Zero Hunger), 3 (Good Health and Well-being), 5 (Gender Equality), and 15 (Life on Land). Promoting awareness, gender-inclusive training, market linkages, and resilient cultivation could reverse declining, boost up food/nutrition security, and foster diversified, sustainable food systems in similar agroecological contexts.

Introduction

Global food systems face mounting pressure from a rapidly growing population, climate change, environmental degradation, and persistent malnutrition, yet they remain heavily reliant on a narrow range of staple crops primarily wheat, rice, and maize which collectively supply a substantial portion of global caloric intake and have led to increasing dietary homogenization worldwide (Ali and Bhattacharjee, 2023; Hunter et al., 2019b). Although estimates suggest that 25,000 to 30,000 plant species are edible, with over 7,000 historically cultivated but human currently exploiting only 150–200 species for food, underscoring a dangerous over dependence on limited genetic diversity that compromises of resilience to biotic and abiotic stresses (Joshi et al., 2019; Malkanthi, 2017). This vulnerability is exaggerated by climate-induced fluctuations in temperature and rainfall patterns, which disrupt conventional agriculture optimized for

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uniform conditions, threatening yields of major staples and amplifying risks to food security and nutritional adequacy (Li and Siddique, 2020a). In contrast, neglected and underutilized plant species (NUPS) also termed underutilized crops or Future Smart Foods offering promising alternatives, many are adapted to marginal, stressful, or low-input environments, exhibiting superior tolerance to drought, heat, salinity, and poor soils compared to mainstream crops (Dansi et al., 2012b; Conti et al., 2019; Talucder et al., 2024). These species not only enhance agroecosystem resilience and sustainability but also provide rich nutritional profiles, delivering essential macronutrients (carbohydrates, proteins, fats), micronutrients (vitamins, minerals such as iron and calcium), dietary fiber, and bioactive compounds that support balanced diets, combat hidden hunger, and address non-communicable diseases with low-glycemic-index options and high essential amino acid content as for examples (*Vigna unguiculata* and *Cyperus esculentus*) (Toledo and Burlingame, 2006b;Dansi et al., 2012b; Mudau et al.2022). Beyond nutrition, NUPS contribute to economic opportunities through multipurpose uses (food, medicine, forage, fuel) and income generation at household and small-scale levels, particularly in marginal lands and among indigenous and rural communities where wild and semi-domesticated plants have long sustained livelihoods and cultural practices (Magbagbeola et al., 2010; Padulosi et al., 1999; Konsam et al., 2016; Alam, 2020Ruba & Talucder, 2023)**.** Initiatives such as the FAO's Future Smart Food program highlighted their strategic role in achieving Zero Hunger by promoting nutrient-dense, climate-resilient, and locally adaptable species (Siddique 2000a; Gruère et al., 2006). Despite these advantages, NUPS face significant barriers including limited research, market integration, policy support, and sociocultural perceptions that cornered them to "poor people's food," resulting in their gradual erosion from modern diets and agricultural systems. In regions like Gowainghat Upazila of Sylhet district, Bangladesh, where diverse agroecological conditions and traditional knowledge persist, documenting and evaluating NUPS holds critical potential to boost up food and nutritional security while addressing production challenges. Thus, this study aims to: (1) document perception and attitude of the people towards the neglected and underutilized plant species in the area; (2) assess their potential for enhancing food and nutritional security; and (3) explore barriers to scaling up their production and utilization, thereby contributing to sustainable, diversified, and resilient food systems in the face of global challenges.

Materials and Methods

The research was conducted at four unions of Gowainghat Upazila of Sylhet District, Bangladesh (coordinates approx. 25.1028°N, 91.8917°E), bordered by Meghalaya (India) to the North, Sylhet Sadar and Jaintiapur Upazilas to the South, Jaintiapur to the East, and Companiganj to the West. This upazila spans approximately 481–486 km², comprises of 9 unions (including Alirgaon, Fatehpur, Rustampur, and Purba Jaflong as the focused study unions) and 266 villages, and had a population of 355,979 according to the 2022 Bangladesh Census (with earlier 2011 data reporting 287,512 residents, density ~599/km², and significant agricultural land, tea gardens, and forest cover). The region features a humid subtropical climate with hot, humid summer and cooler winter; annual mean temperature ~23.6°C (peaking at ~27°C in August and the lowest at ~17.3°C in January), and heavy annual precipitation of ~5,000–5,048 mm, ~80% of which (~3,300–3,334 mm) falls during the monsoon (May–September), with June being the wettest month (~956 mm) and high humidity (up to 88% in June). Due to limited formal agricultural record-keeping, a survey method was employed, involving multiple field visits to minimize errors; a semi-structured questionnaire (mix of open- and closed-ended questions) was developed, pre-tested with key informants and a pilot sample of 50 participants, revised based on feedback, and finalized. Data were collected during June 2022 to April 2023 through personal interviews in simple Bengali at respondents' homes or fields, with immediate review of schedules. Using simple random sampling, 50 respondents were selected from each of the four focal unions (Fatehpur, Rustampur, East Jaflong, and Alirgaon), with a total sample of 200. The dependent

variable—status of neglected and underutilized plant species (NUPS)—was assessed via field observations, availability surveys, and respondent discussions. Data were coded, tabulated, and analyzed using descriptive statistics (frequency, percentage, mean, SD, rank), graphical tools (bar/pie charts, histograms, box plots). The study evaluated contributions to five SDGs (No Poverty, Zero Hunger, Good Health and Well-being, Gender Equality, and Life on Land) through survey data, value assessments, and focus group discussions, highlighting factors such as income/livelihood opportunities, food/nutrition security, medicinal properties, women empowerment, and biodiversity enhancement. The map of Gowainghat Upazila was presented below in Fig.1.

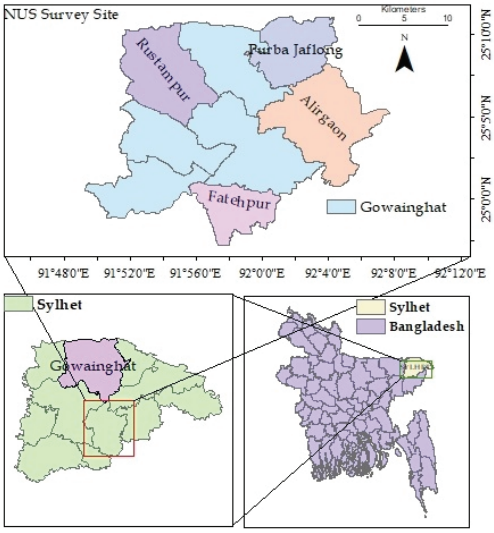

Figure 1. Map of Gowainghat Upazila, Sylhet.

Results

Respondents' opinion regarding uses of NUPS

Participants of four chosen unions were requested to provide their perspective on the utilization of NUPS. Based on the data gathered, fruits were mostly used (55.5%) part of NUPS. Conversely, the use of NUPS for aesthetic motives was found to be the least prevalent, accounting for a mere 5.5% of overall usage. A total of 16.5% of NUPS were utilized as vegetables, while 15% were utilized for medical applications. The remaining 7.5% of NUPS were allocated for diverse uses (Table 1).

Table 1. Respondents' opinion regarding uses of NUPS

Use of NUPS	Frequency	% of total sample
Medicinal	30	15.0
Fruit	111	55.5
Vegetables	33	16.5
Aesthetic	11	5.5
Others	15	7.5

Purpose of NUPS farming

The study was undertaken to investigate the utility status of cultivating NUPS. The analysis of the gathered data revealed that self-consumption was the most prevalent interest which accounted for 55.0% of the total 110 individuals among NUPS farming participants. In contrast, recreational purposes were found to be the least common interest, with only 16.5% of participants (33 individuals) engaging in NUPS farming. Further the data presented in Table 2 showed that the frequency consisted of a collective of 57 individuals, among which about 28.5% participants cultivate NUPS for commercial reasons (Table 2).

Table 2. Purpose of NUPS farming

Categories	Frequency	Percentage
Self-consumption	110	55.0
Recreational	33	16.5
Commercial	57	28.5

Gender participation in NUPS production activities

During the production process of NUPS, a comprehensive analysis revealed the existence of eleven major activities (Fig. 2). These activities include soil preparation, planting, sowing, seedling raising, and weeding, mulching, water management, and pest management, fertilizer management, harvesting, and marketing. Interestingly, there was a near parity in the involvement of both males and females throughout many stages of the production system. Notably, male engagement disengagement was higher in activities such as soil preparation (51%), weeding (48.5%), mulching (50.5%), pest control (55.5%), and marketing (71.5%) when compared to the participation of females and children. In contrast, there was a higher percentage of female involvement observed in several agricultural activities, such as planting (57.5%), sowing (54%), seedling growing (69.5%), water management (74.5%), fertilizer management (56%), and harvesting (65.5%), as compared to the engagement of males and children. Children were found to participate in five tasks, including planting (7%), weeding (5.5%), water management (4%), harvesting (8.5%), and marketing (28.5%). In the field of marketing, it was observed that there was a complete absence of female participation.

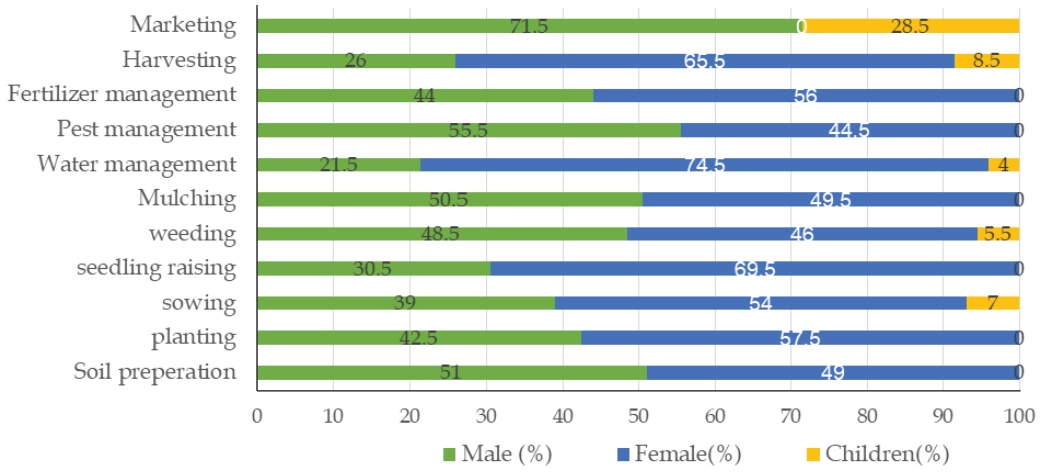

Figure 2. Gender participation in NUPS production activities.

Respondent's attitude on NUPS

The attitudes of respondents towards the production of NUPS and its pertinent features were evaluated within the selected unions (Fig. 3). A total of 10 statements viz., NUPS create Income opportunity, NUPS hamper food security, NUPS ensure nutritional security, NUPS reduce diversification, Livelihood of marginal people can be improved by NUPS, Contribution of NUPS on health is insignificance, NUPS empower women empowerment, NUPS unnecessarily occupy land with low return, Cultural status could be improved by NUPS based homestead and Effect of NUPS on conserving environment is negligible were assessed using the Likert scale, which is a commonly employed rating system for measuring views, attitudes, or behaviors. The statements were based on the collected data. It was evident that 51% of the respondents expressed a strong agreement about the notion that NUPS generates revenue opportunities for producers. Conversely, 61.5% of the respondents strongly disagreed with the assertion that NUPS negatively impacts food security. Consistent findings were seen across all affirmative notions, however, majority of participants expressed disagreement with the negative statements. All respondents completely agreed that the implementation of NUPS has been crucial in ensuring nutritional security, enhancing the livelihoods of marginal population, empowering women, and elevating cultural status. However, majority of the participants had a different viewpoint about the potential negative effects of NUPS, asserting that they do not hinder diversification efforts, have negligible implications for public health, and do not unduly occupy productive land. Regrettably, a significant proportion of the respondents, about 61.5%, exhibited a lack of awareness of the potential of NUPS in terms of their capacity to contribute to environmental conservation efforts.

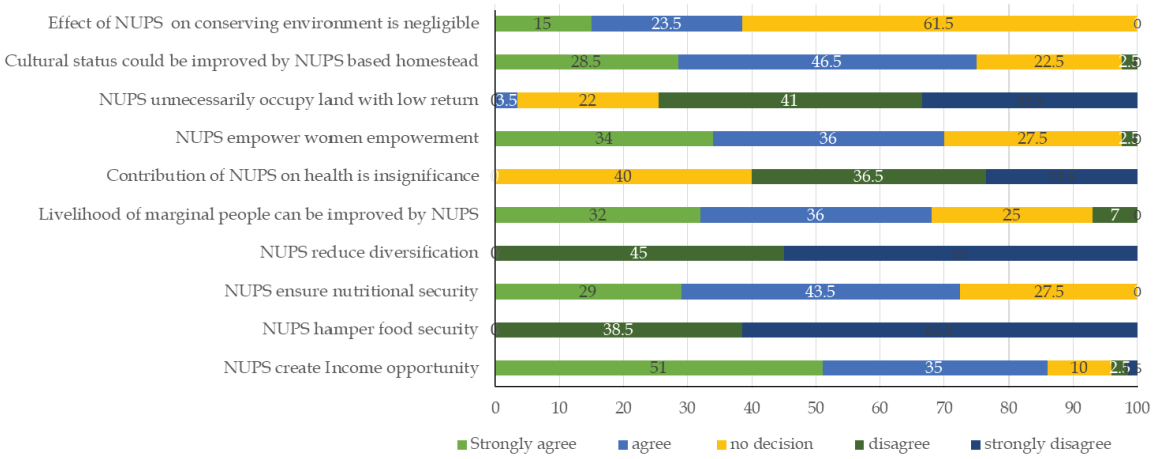

Figure 3. Respondent's attitude on NUPS.

Respondent's opinion regarding decadal trend of NUPS

The assessment of the decadal trend of the availability and production of NUPS based on the opinions by the respondents has been shown in Table 3. A majority of the participants (66.5%) expressed the belief that the availability and production of NUPS had experienced a decline over the past decade. A total of 18.5% of the respondents expressed the perspective that the situation of NUPS remained unaltered during the past decade. Conversely, 15% of the respondents said that the availability and production of NUPS had witnessed a rise over the span of decade.

Table 3. Respondent's opinion regarding decadal trend of NUPS

Respondent's opinion	Frequency	% of total sample
Increasing	30	15.0
Unchanged	37	18.5
Decreasing	133	66.5

Respondent's knowledge regarding importance of NUPS

Table 4 depicted the current level of knowledge among respondents on the importance of NUPS. Based on their degree of expertise, the participants were classified into four distinct groups, namely Nill, Low, Medium, and High. Approximately 47% of the participants showed a lack of awareness of the importance of NUPS, whilst a mere 6.5% of respondents possessed rudimentary understanding of NUPS and its value. A total of 22.5% of the participants exhibited a low level of knowledge, while 24% of the respondents showed a medium degree of understanding on the importance of NUPS.

Table 4. Respondent's knowledge regarding importance of NUPS

Respondent's knowledge	Frequency	% of total sample
Nill	94	47.0
Low	45	22.5
Medium	48	24.0
High	13	6.5

Respondent's opinion regarding problems in NUPS production

The participants have expressed their viewpoints about problems they encountered in the production of NUPS, and the analyzed data have been shown in Fig. 4. There were six issues/problems namely lack of training facilities, lack of funds, high price of inputs, uneven distribution of precipitation, lack of marketing and lack of proper knowledge shown in Fig.4. Among these problems, the major one identified was as the lack of marketing, which was supported by 79% participants. Conversely, the issue of lack of funds deemed to be of lesser significance as indicated by 44% participants' opinions. The study revealed that the second most prevalent issue, with 72%, was the uneven distribution of precipitation. This was closely followed by lack of training facilities (69%), proper knowledge (64%) and high price of input (51%).

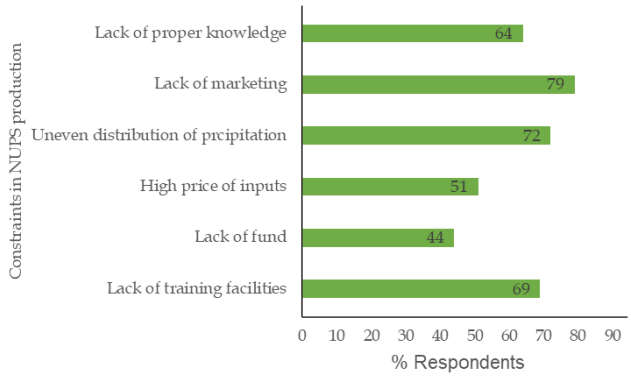

Figure 4. Respondent's opinion regarding problems in NUPS production.

Discussion

The findings from the survey in Gowainghat Upazila revealed a strong appreciation from the respondents for their multifaceted uses and benefits of the neglected and underutilized plant species (NUPS), despite their declining trends and persistent production challenges. However, potential of the NUPS is still remained underscored and untapped as climate-smart, nutrient-rich resources in rural Bangladesh. Fruits of NUPS emerged as the predominant use (55.5%), followed by vegetables (16.5%) and medicinal applications (15%), reflecting primary role in enhancing household dietary diversity, nutrition, and health security **(**Mudau et al.2022)—key contributors to SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being)—while aesthetic (5.5%) and other uses remained marginal. The present results are aligned with global evidence (Li and Siddique 2020b; Padulosi, et al. 2013) that NUPS, often rich in micronutrients, bioactive compounds, and stress tolerance, serve as vital supplements to staples in marginal environments, helping combat malnutrition and hidden hunger prevalent in resource-poor farm families in the study area of Sylhet. Self-consumption dominated NUPS farming purposes (55%), with commercial (28.5%) and recreational (16.5%) motives trailing, indicating that these species primarily boost up subsistence resilience and food sovereignty, though modest market engagement suggests opportunities for income generation under SDG 1 (No Poverty). Gender participation showed near parity in many production activities, with women dominating labor-intensive tasks such as planting (57.5%), sowing (54%), seedling raising (69.5%), water management (74.5%), fertilizer application (56%), and harvesting (65.5%), while men handled more physically demanding or market-oriented roles like soil preparation, pest control, and marketing (71.5% male). Notably, women's complete absence from marketing highlights persistent gender disparities in value chain access, yet their central role in homestead-level NUPS cultivation aligns with widespread patterns in rural Bangladesh where women manage homestead gardens for nutrition and family well-being, contributing to SDG 5 (Gender Equality) through empowerment and livelihood diversification (Turin et al., 2025). Respondents exhibited overwhelmingly positive attitudes toward NUPS, with strong agreement on income opportunities (51%), nutritional security, livelihood improvements for marginal farmers, women's empowerment, and cultural enhancement, while rejecting negative perceptions such as hampering food security or occupying land unproductively; however, 61.5% showed limited awareness of NUPS' environmental benefits, like carbon sequestration and biodiversity enrichment, pointing to a knowledge gap relevant to SDG 15 (Life on Land) and SDG 13 (Climate Action). This optimism is tempered by a perceived decadal decline in NUPS availability and production (66.5%), attributed to factors such as replacement by high-yielding staples, loss of traditional knowledge, and climate-induced stresses like uneven precipitation—consistent with broader trends in Bangladesh where erratic rainfall, floods, salinity, and extreme weather aggravate erosion of agro-biodiversity and marginalize resilient Knowledge levels on NUPS importance were low, with 47% reporting nil awareness and only 6.5% high understanding, further compounded by major production constraints: lack of marketing (highest concern), uneven precipitation, inadequate training, limited knowledge, high input costs, and funding shortages. These barriers mirror global challenges for NUPS, including underdeveloped value chains, insufficient extension services, and policy negligence, which hinder scaling up despite their climate resilience and low-input requirements. Overall, the results affirm NUPS' viability as a pathway to sustainable, diversified food systems in climate-vulnerable areas like Gowainghat, where promoting awareness, gender-inclusive training, market linkages, and research could reverse declines, enhance resilience, and advance multiple SDGs by integrating these species into homestead and smallholder farming for improved nutrition, livelihoods, and environmental sustainability.

Conclusion

This study highlighted a significant role but not enough for appreciation with this single piece of work of the neglected and underutilized plant species (NUPS) in the agroecological and socio-economic fabric of Gowainghat Upazila, Sylhet. But the results gathered from the respondents demonstrated strong positive

attitudes toward NUPS, recognizing their contributions to household nutrition, income opportunities, women's empowerment and cultural value, while primarily using them for self-consumption and dietary diversity. Despite these benefits, NUPS face a remarkable decline in the availability and production over the past decade, driven by limited marketing, uneven rainfall, lack of training, inadequate knowledge, and high input costs. Gender roles showed encouraging involvement of women in key production activities, supporting their empowerment, although market access remains male-dominated. Overall, the findings affirm that promoting NUPS through targeted awareness campaigns, gender-inclusive training, improved market linkages, and climate-resilient cultivation practices can enhance food and nutrition security, boost up livelihoods of marginal farmers, and contribute meaningfully to multiple Sustainable Development Goals (SDGs 1, 2, 3, 5, and 15) in vulnerable rural landscapes of Bangladesh. Revitalizing NUPS offers a low-cost, sustainable pathway to strengthen resilience against climate change and malnutrition in similar agroecological settings.

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