



Millet and Its Significance on the Eve of International Year of Millets 2023: Culture, Consumption and Conservation Karnataka, India

Appaji Nanda ^{a,b*}
and Gungurumale Laxminarasimhacharya Janardhana ^{a,c}

^a Biodiversity Education and Research Lab, Environmental Study Centre, Kodachadri Integrated Development Society®, Rathnakaranagar. Opposite KSN University of Agricultural and Horticultural Sciences, Abbalagere, Shivamogga, 577204, Karnataka, India.

^b Department of Post Graduate Studies and Research in Applied Botany, Bioscience Complex, Jnana Sahyadri, Kuvempu University, Shankarghatta, 577451, Shivamogga, Karnataka, India.

^c Elder's Life Exhilaration Centre, Jnana Sagara Nave Trust, Rathnakaranagar, Opposite KSN University of Agricultural and Horticultural Sciences, Abbalagere, Shivamogga, 577204, Karnataka, India.

Authors' contributions

This work was carried out in collaboration between both authors. Authors AN and GLJ designed the study. Author AN managed literature searches, performed the statistical analysis, and wrote the manuscript. Both Authors AN and GLJ performed the corrections. Both authors read and approved the final manuscript.

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*Corresponding author: E-mail: nanda.biodiversity@gmail.com;

ABSTRACT

This study was performed to learn what millet is and its significance on the eve of the International Year of Millets 2023 for high school students in Karnataka. The present study was considered essential to know about the perception of the Millennium Year celebration and to gain knowledge about why it is a prerequisite in our society, culture, nutrition, health, and food security. We selected different agro-climatic conditions in Karnataka state, like Shivamogga, Tumkur, Hassan, Mandya, Dharwad, and Chikkamagaluru districts. Where millet growing and consumption have been common since time immemorial, the present status is different. We involved 1095 students from 23 schools, 46 teachers who physically participated in the survey, and the participants' family members, 3285 grandparents and 2190 parents, who supported the students in debating for the information. The data were analyzed quantitatively by descriptive statistics and qualitatively by Pearson's rank correlation. The findings revealed that most students do not know what millet is, and many do not hear of their name, their local name, or their importance as food, fodder, or health benefits. The majority of the students lack knowledge about millet, which is directly linked to their non-consumption of millet at home and in hotels. Why so much information and knowledge are not in the textbook is also one of the drawbacks of our system, as has been mentioned by the majority of the teachers. The only millets' knowledge bank is their elders (grandparents and parents). Our attempt to bridge the gap helped the students, parents, and teachers know what millet really is and why celebration matters to all, especially next-generation citizens (students), to know and act for their responsibility in food security in their region.

Keywords: Biodiversity; elders; food culture; food security; knowledge of millet; IYOM-2023; millet informal education.

1. INTRODUCTION

Our traditional food is millet, as we have evidence from our civilization; millets are grown and consumed in more than 100 countries covering semiarid tropical areas like Asia and Africa. [1]. Millets are suitable for sustainable means of food security [2]. Millets contain more proteins [3] are superior to other crops in getting essential amino acids. What people are consuming and why they are consuming some grains, pulses, cereals, and millet? Consumption is mainly based on what food is cooked at home and the agricultural practices they are following. Still, we have celebrated the National Millets Year 2018 and the International Year of Millets 2023 and how they impacted its reach to the community and students (the younger generation). India shares world millet production at around 41 percent [4]. Millets are one of the staple foods in India. However, the present food consumption scenario is lifestyle-dependent.

As we know, millets are rainfed crops that are eco-friendly, need less rain, and can even sustain erratic rain and maximum yield, with a high nutritional capacity to overcome many malnutrition deficiencies. Millets' decreasing cultivation area is a major concern; hence, few programs are launched by Krishi Vigyan Kendra (KVKs), and millet awareness through Mann Ki

Baat has created demand and ensured a continuous supply of millets [5,6,7].

The study by Sangappa et al. [8] examined millet strengthening activities through FPOs by ICAR-IIMR, Hyderabad, in the states of Andhra Pradesh, Telangana, and Karnataka by establishing millet-processing units at farm gates. In the global scenario, millet is gaining popularity due to its health advantages, etc. Body mass index and growth of schoolchildren have improved, according to a millet consumption study [9]. In the peri-urban region of Bengaluru, Karnataka.

According to the National Family Health Survey, half of the women suffered from malnutrition due to being underweight and anaemia, which is caused by a lack of micronutrients [10]. India's attempt at a school feeding program is aimed at improving the health and well-being of students through a mid-day meal scheme to encourage good health and enrolment [11]. In many countries, including India, millets are traditional food grains; hence, globally, millets are considered one of the smart foods because they are rainfed, climate-stress-resistant, and rich with micronutrients; hence, they are called a boon to humans and the planet [12].

What we grow is not directly proportional to our consumption; it shows what we are growing and

consuming is not properly suitable to their climatic condition, and health mismatches have lost many food habits and decreased habitats suitable in the region in the present study area at the global level. The scenario is a universal We need to know our identity through our food practices and our health benefits [13]. How society and community behavioural aspects matter and the individual role in consumption and conservation need an assessment.

1.1 Purpose of the study

About the status of Millet: The International Year of Millets and what do we achieve by celebrating IYM 2023? Millets are one of the traditional crops in several countries, like India, China, Japan, Nigeria, Zimbabwe, and several other Asian and African countries. Millet is generally considered a small-seeded grass that is cultivated in arid and semiarid regions. Among the most popular are pearl millet (bajra), finger millet (ragi), and sorghum (jowar). The minor millets include foxtail, barnyard, proso, and others. [14].

Data sourced from APEDA (Agricultural and Processed Food Products Export Development) Government of India. The United Nations (UN) General Assembly, at its 75th session, declared 2023 the International Year of Millets (IYM2023) (Fig. 1).

An old Kannada saying says: The rice (*Oryza sativa*) eater is weightless like a bird; the one who eats Jowar or sorghum (*Sorghum bicolor*) is strong like a wolf; and the one who eats Ragi or finger millet (*Eleusine coracana*) remains 'Nirogi' (illness-free) throughout his life.

1.2 Community Effort to Restore Millets

An attempt to revive millets as a multi-cropping system for food security has succeeded in enhancing their production in Theertha village of Kundagol, Dharwad, supported by NGO Sahaja Samrudha, which has empowered hundreds of millet women farmers, providing them training to become agripreneurs [15].

1.3 Millets in the Public Distribution System: The Government of Karnataka's Approach

The program of the Government of Karnataka to provide stable food sources like millet started with collecting millet from farmers (finger millet/ragi in south Karnataka and sorghum/jowar in north Karnataka) and distribution through the public distribution system in 2013–14. The scheme was launched as "Anna bhagyadinda Krishi bhagya" (Farmer welfare through food welfare) with the intention that by procuring these millets from farmers, substantial cash would flow to rural households while PDS cardholders would get access to nutritious food grains at low prices.[16].

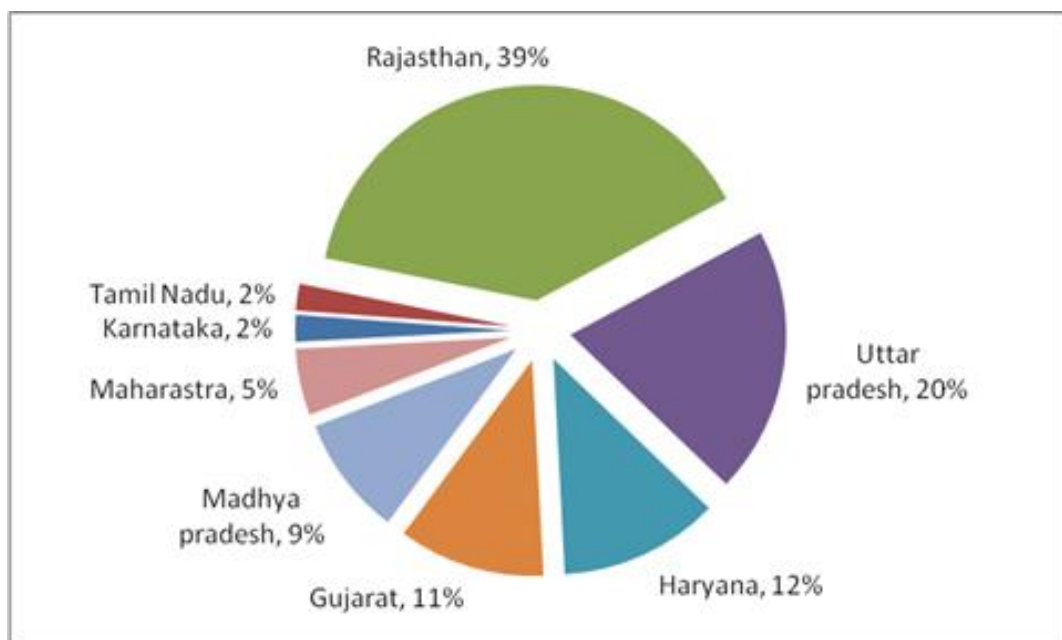


Fig. 1. The state-wise millet production in 2021-22

1.4 Millets and Sustainable Development Goals (SDG): FAO

The sustainable production of millets can fight hunger and contribute to food security and nutrition (Zero Hunger, SDG 2). Proper handling of millets is key to maintaining their high quality and nutritional benefits (SDGs 2 and 3). Millets can be an important part of a healthy diet (Good health and wellbeing, SDG 3). Greater consumption of millets can offer opportunities to smallholder farmers to improve their livelihoods (Decent work and economic growth, SDG 8). Greater trade in millets can improve the diversity of the global food system (Responsible consumption and production, SDG 12). The sustainable cultivation of millet can support climate-resilient agriculture (Climate Action, SDG-13, and Life on Land, 15). [17].

2. METHODOLOGY

2.1 Study Area

In the present study, we selected different agro-climatic conditions where millet growing and consumption have been common from time immemorial. Based on the extent and distribution

of rainfall, soil characteristics (texture, depth, and physio-chemical properties), elevation, topography, major crops and cropping systems, irrigation patterns, and types of vegetation, India is broadly divided into 15 agro-climatic zones. Karnataka's agro-climatic zones are based on rainfall distribution, soil characteristics, topography, and cropping patterns. Shivamogga and Chikkamagaluru are in the southern transition zone, where average rainfall varies between 610 and 1050 mm. The climate is hot, humid, and sub-humid. Soil types include red, black, alluvial, lateritic, and brown forest soils. Major crops like rice, pulses, millet, and sugarcane. Mandya Tumkur and Hassan are central to the southern dry zone, where average rainfall varies between 450 and 890 mm. The climate is hot, dry, and semi-arid. Soil type: red with patches of black, alluvial. Major crops like Jowar, Ragi, paddy, vegetables, pulses, and groundnut. Dharwad is in the north transition zone, where average rainfall varies between 450 and 830 mm. Climate: moist, wet, dry, and rainy. Deep black soil ranges from loamy to clay. Major crops like jowar, paddy, maize, sorghum, and little millet. But the present status is different due to changing lifestyles as well as agricultural practices (Fig. 2).

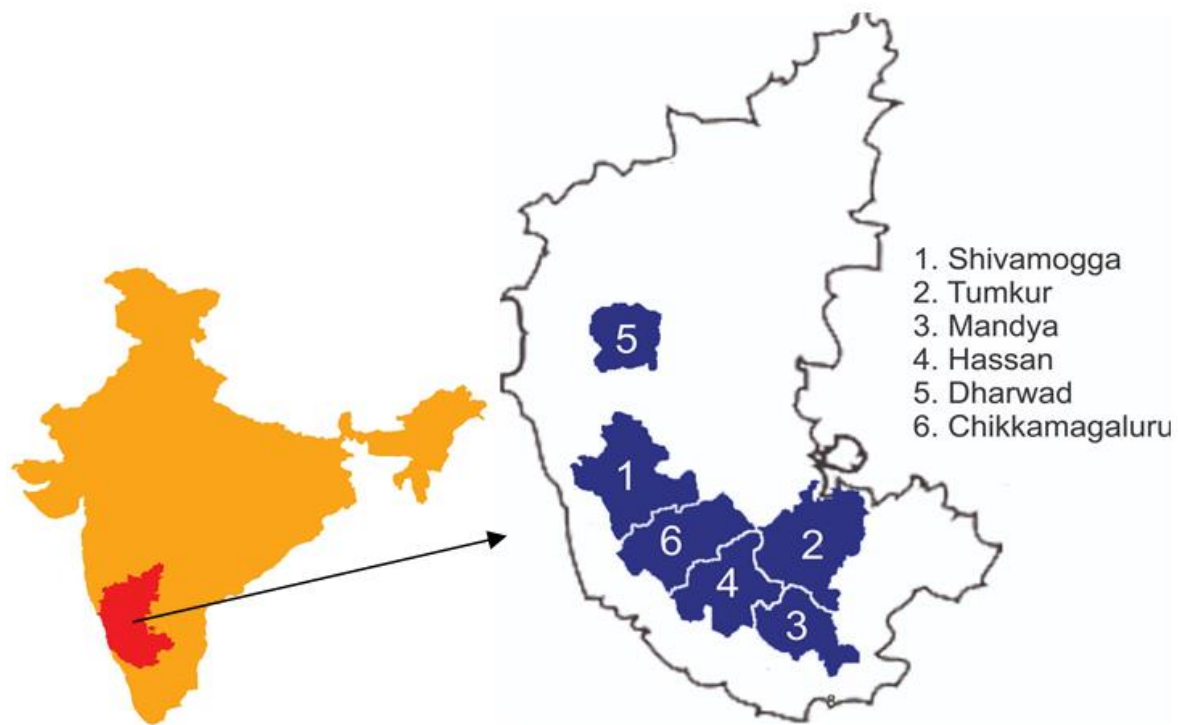


Fig. 2. Map showing the study area of the selected districts of Karnataka, India

Table 1. Schools involved in the present Millet study of Karnataka

District	School name	No. of Students	Teachers Involved in the study
1.Shivamogga	1.Sri Tunga Bhadra High School - Suguru	43	*Shekaraiah M, **Raju K M S
	2.Karnataka Public School – Gajanur	40	*Arun kumar B, **Shabnam Firdos
	3.Government High School – Ullur	75	*Indira N Bedkani, ** Nagaraj H M
	4.Malnad High School – Gowthamapura	60	*Shekarappa M.S, **Srikanth D. M
	5.Government High School – Kadekal	56	*Chandri Bai B, **Sumiah Parveen ** Chandrakala H
	6.Government High School - Thammadihalli	30	*Pushpa, **Prakash R # Dinesh Hosanagara
	7.Jawahar Navodaya Vidyalaya - Gajanur	54	*C Valliammai **Rashmi R S # Dinesh Hosanagar
	8. Government High School Malur- Thirthahalli	60	*Gopalakrishna T, **Nisha kanitkar
2.Tumkur	9. Government High School - Albur - Tiptur	29	# G. L Muralidhar
	10. Karnataka Public School – Nonavinakere, Tiptur	40	*Rukmini K.M **Jagdish S.C
	11. Government High School - Hongelakshmi	33	*Shivashankar D , **Vinutha P
3.Mandya	12.Bisilu Thimmappa Kamparahalli	38	*Nagabhushana Prasad N B, **G.N. Puttaswamy
	13. Government High School - Koochahalli	60	*Chetan .D, *Manukumar A.S
	14. Government High School - Kadabahalli	59	*Lingaraju , **Amulya
4.Hassan	15.Kitturani chennamma school - Kadabahalli	50	*Anitha G.B, **Srinivas murthy. S
	16.Sri Venkatehwara High school - Girikeshtra	43	*M.R. Ashok **Mani P.L
	17.Nirmala High school - Dasapura	60	# G. L Muralidhar
	18. Government High School Akkanahalli Cross	35	*M. C. Shekhar **V.D.Divya
5.Dharwad	19.Balabalaga – Shriram Nagar	48	*Pratibha Sanjeeva Kulakarni **Mrinalini Narasimha K
	20.Kalkeri sangeetha Vidyalaya – Kalkeri	34	*Vallekar **Vimala, # G. L Muralidhar
	21.Karnataka University school - Dharwad	45	*Anasuya B Nayak, ** Dr. Indu Ravikumar
6.Chikkamagaluru	22.Gubbacchi gudu school - Malapur	35	*Lakshmi **Suma
	23. Jawahar Navodaya Vidyalaya - Balehonur	68	*R. Premkumar, **Dorothy # Dinesh Hosanagara

(* Head master, ** Science teacher/involved teacher, # field assistant,)

2.2 Study group

We involved 1095 students from 23 schools and 46 teachers who physically participated in the survey (Fig. 3).

2.3 Objectives

Based on our biodiversity exploration, our research always makes a way for outreach. We aim to involve students, teachers, and the community with face-to-face interaction with students and teachers to cover a maximum number of individuals to minimize the error. We asked a few questions, like, What is millet to school students and the community? B. Who knows Millet (student, teacher, and parents)? C. Who taught Millet to the respondent students? D. Does our behaviour (culture, society, and consumption) play a significant role?

We interacted with students and teachers in their schools during their class hours with a mission of working what is millet to students literally. The schools and students involved in the present study are listed in (Table 1).

2.4 Statistical Analysis

The data were processed for quantitative assessment by descriptive statistics and qualitatively by Pearson's rank correlation [18]. The collected information or data from 1095 students in (8 and 9) grades, 46 teachers, 3285 grandparents, and 2190 parents was analyzed.

3. RESULTS AND DISCUSSION

In the context of the International Year of Millets, we wanted to know what millets mean to school students. Very few students have heard of the word millet, have seen it eaten, or can identify it. The main reason we noticed was that it was very

difficult for them to differentiate between millets, pulses, and oil crops (Table 2).

An earlier study by Janardhana et al. [13] indicates a decline in millets and mixed cropping patterns. Changes in food consumption patterns are determined by many parameters, like irrigation, lack of awareness, lack of desired price, climate issues, modern lifestyles, etc. Even a public distribution system started providing rice and wheat, resulting in maximum consumption, a major threat to millet consumption, and adversely affecting millet cultivation.

3.1 Student and Millet Awareness

In the present study, the correlation between the number of students and millets known had a negative significance (boys $r = -0.01$, <0.3 , and girls $r = -0.07$, <0.6), because the relationship between the number of students and millets awareness is very poor (Fig. 3).

The main reason behind the lack of awareness and consumption is a change in agricultural practices (shifting from agriculture to horticulture), changing food practices (cooked to packed food), and the knowledge of food cooking style is not yet transferred from generation to generation (respondent student knowledge information). As students mention, we were not yet exposed to such activities in school, the community, or scientific exploration. Knowing our traditional agricultural practices and food sources is also one of the drawbacks of the present system.

Food consumption is a special area of study, and it is important for both the individual and the economy. It provides nutrients for individuals, and its economic role is significant [19].

Table 2. List of millets and students response

Millets name	Common name (Kannada)	Per cent of students (%)			
		Heard the name of millet	Saw the millet	Ate the millet dishes	Can identify the millet
1. Great millet/sorghum	Joola	15%	10%	10%	5%
2. Pearl millet/ bajra	Sajje	20%	12%	15%	3%
3. Finger millet	Ragi	80 %	80%	60%	55%
4. Fox tail millet	Navane	10%	6%	2%	5%
5. Little millet	Same	1%	3%	1%	2%
6. Kodo millet	Haarka	0	1%	0	0
7. Proso millet	Baragu	0	0	0	0
8. Barnyard millet	Odal	0	0	0	0

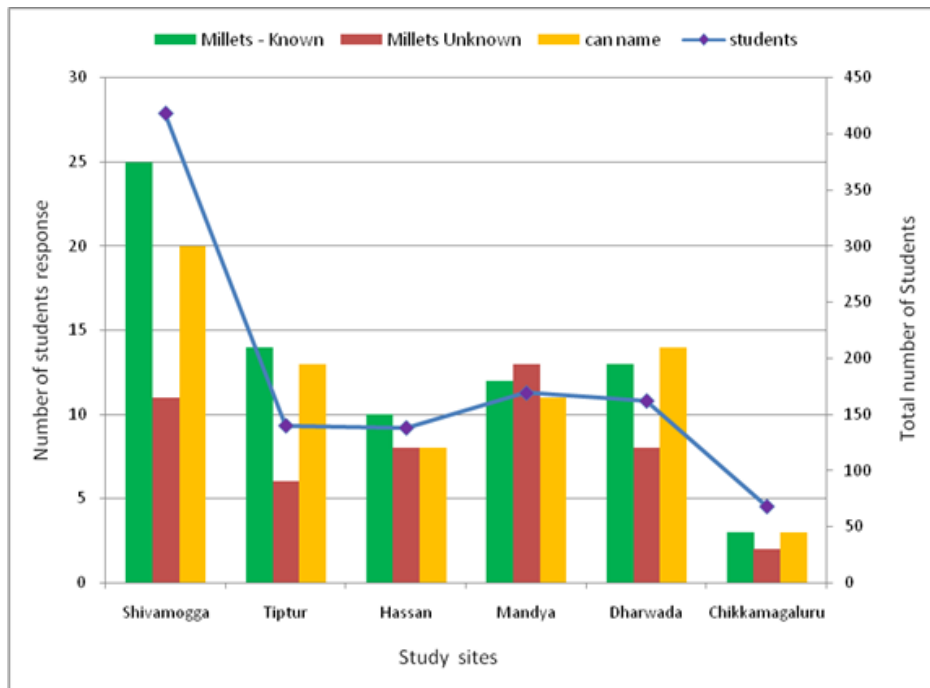


Fig. 3. Student's response towards millets knowledge from the study area

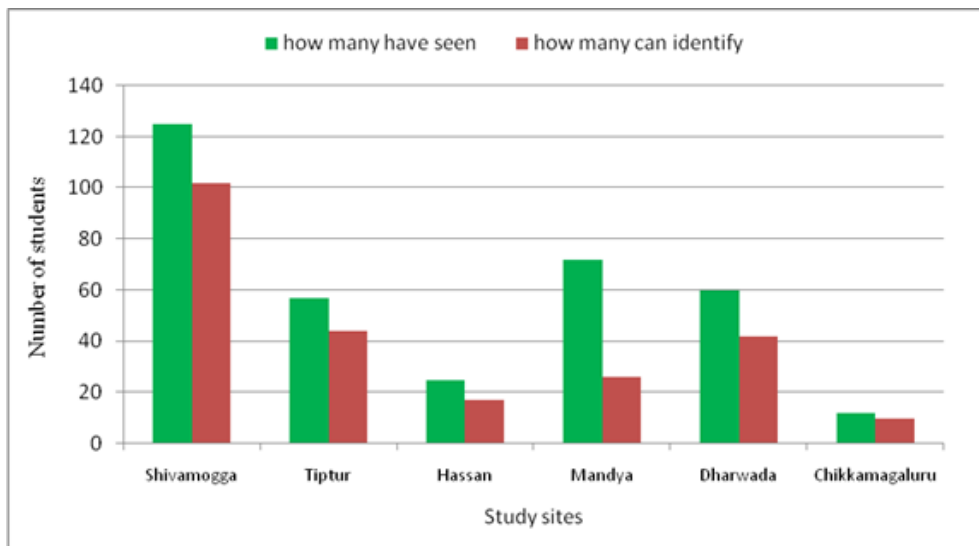


Fig. 4. Student's response towards millets knowledge in the present study area

In our interaction with students for the Millets International Year celebration in schools, we asked who knows about millets, like how many have seen (Boys $r = -0.22$, <0.3 , and Girls $r = -0.098$, <0.6), the response is negatively significant, and who can identify (Boys $r = -0.047$, $p < 0.8$, and Girls $r = -0.187$, <0.3) had a strong negative significance, as it differs from the study site; it all depends on their exposure (Fig. 4). The awareness and advertisement programs at the school level, such as millet fairs, seminars, and

workshops at school festivals and village and gram panchayat levels, required them to see, feel (touch and food/dishes), and identify them. We learned from respondents, students, teachers, and the community that the lack of exposure is the main reason.

Millet production and consumption have decreased over the past decade [20]. The reason they quote that millet food preparation requires skill and knowledge is declining. The majority of

the respondents and students are familiar with one or two millets that, till date, they have used as staple foods, like ragi (finger millet) at 60%, followed by bajra at 30%, and sorghum at 20% because it is one of the major staple foods in the study areas. Respondent students learn more about millets from their grandmother (Boys $r = 0.72$, <0.0009 and Girls $r = 0.79$, <0.0006) and grandfather (Boys $r = 0.69$, <0.009 and Girls $r = 0.76$, <0.006). Grandmother's influence had a stronger positive significance than grandfather's about the mode of consumption (Fig. 5) and its health importance rather than a textbook. The major reason behind diabetes is poor knowledge; hence, education about millet matters. [21].

3.2 Food, Society and Culture

Changing the cooking method from firewood to a stove and a modern smart kitchen is also not helping to cook the traditional dishes of millet. Cooking methods and utensils are also important components in influencing the decrease of the millet dish's behaviour or changing food preparation and the continuity of the present cooking behaviour or cooking pattern (personal observation as mentioned by the community respondents). Due to a lack of cooking skills, millets are consumed as festival food in North Karnataka [22]. This indicates the knowledge of elders being followed in festivals, as our study supports. Based on elders knowledge of millets, few millets dishes are prepared for some festivals. The majority of the students do not know what millets are; they do not know their local names, and they cannot identify them, but they know that food products like paddy, wheat, pulses, fruits, vegetables, and a few greens that are available in the market get advertised, and our dependency is maximum. Millets help in improving the height, weight, and haemoglobin level of primary school children was conducted in Thondamuthur block of Coimbatore District, India, for improving nutrition security and livelihoods through increased use of small millets [23]. An awareness program study [24]. revealed that nutritional knowledge of millets increased with their program related to millet.

The intervention of technology for millets and its scope is the need of the hour, as the [8]. study shows the value chain of millets is enhanced by adapting improved technologies, which boosts increased investment in infrastructure. As the [20]. study demonstrates, the ability to recognize

millets varies across the state with respect to diverse agro-climatic conditions and cropping patterns in India.

A study indicates that when farm women were trained for the value addition of millets-based products, the millets survived in their demography [25]. The present study shows the student's knowledge from their grandmother revealed gender knowledge, and their participation in food and sweets at home made their significance, and they even mention that their intervention in the restoration of millets in their region is recognized. The student's knowledge acquired revealed boys (Boys $r = -0.28$, $p < 0.01$ and Girls $r = -0.36$, $p < 0.08$) knew very little because the textbook had strong negative significance as it covered very meager information or less than other commercial crop information. (Fig. 5).

Millets have been replaced by some cash crops in the present study areas due to a lack of market, and demand is less (personal observation). Millets area of production and productivity of time are decreasing gradually from year to year (parental remarks). There are attempts to introduce millets among communities and schools in Myanmar [26] and Central and Northern Tanzania [27] to change the perception and preference of food choices with millets. We are missing the relationship between our food, culture, and tradition. It needs a relook, and we need more interaction with a farming community that holds skill, knowledge, and scientific and policy-driven acts. Apart from this, we need to educate our next generation of future students on millets to meet SDGs (Sustainable Development Goals). The present project on millets with students revealed they learned (boys $r = 0.49$, $p < 0.00006$ and girls $r = 0.51$, $p < 0.00001$) from our interaction had a strong positive significance on both, hence it matters (Fig. 6).

The present study shows how many student respondents can name millets and how many can identify unknown students about millets who are more than the known. It makes sense that we have forgotten our next generation intervention in learning and educating about the decision for the future who deserves to know a sustainable living with millets for the future. Our intervention was to involve school students, teachers, and the community to celebrate, making them aware of the different millet's common names and centers of origin and their relevance in the present climate change to meet sustainable development goals.

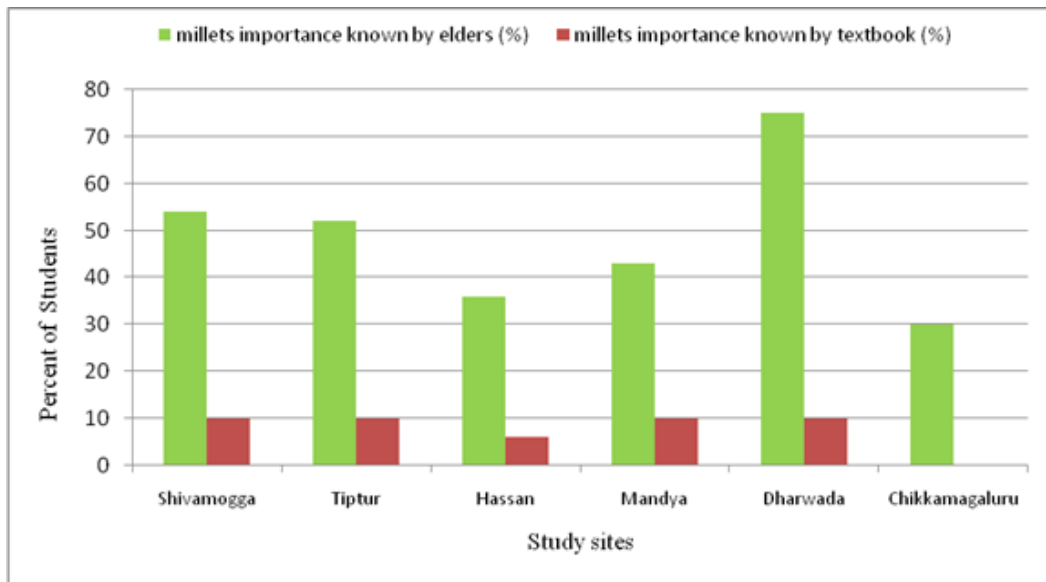


Fig.5. Millets knowledge for students from family members and textbook

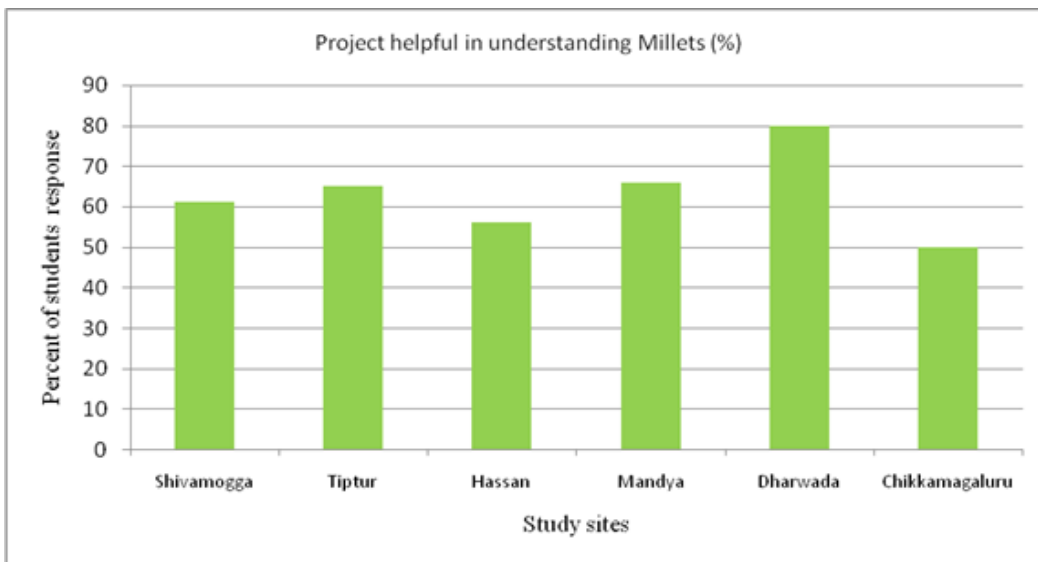


Fig. 6. Per cent of student's basic knowledge gained from the millet project

4. CONCLUSIONS

Our study revealed that students do not know what the different types of millet are and how they are related to our geography, tradition, food, and culture. We strongly feel that if they were unaware of the millet name, it is a problem of the system, education, community, government, and policies. We need to have a strong commitment to retaining its importance as food and culture. Our biodiversity education and research lab commitment is to make them know the millet's name, origin, how, and why millets are disappearing, how we are struggling to sustain

ourselves with the present climate change, and our (individual) role to restore and retain them to make an impact. Equally important are the initial knowledge, practices, and individual attitudes toward these traditional crops while planning and implementing any nutrition-related interventions using them with a better understanding of acts and policies in the future to make a grand success introducing millets in mid-day meals and stories on origin, health benefits, and environmental resilience in the textbook and recognizing local unnoticed farmers for the survival of millets. As millets are cultivated or available in less or non-irrigated areas, the food

is considered poor community stable food and indicates social status. This behaviour of the present community is a threat to growth and consumption, as well as deteriorating society's nutritious food and food practices. From the present survey and interaction, we found that societal behaviour and commonsense in recognizing our food, health, and community to restore the biodiversity of food, fodder, and climate are the needs of the hour. We need to advertise our millet bowl to the students where it is currently cultivated and allow the community to interact with school students and teachers who are currently nurturing and consuming millet. This will truly serve the aim of Food and Agriculture Organizations and United Nations awareness about our millet wealth and health benefits and India's celebration of IYOM-2023.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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