

Contribution of Millet Cultivation in Tribal Women's Farming Systems to Enhanced Nutritional Food Availability at the Household Level: A Case Study from Hazaribagh, India

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Abstract

Millets, a varied assortment of small-grained cereal grasses, hold a central position in ensuring nutritional stability by furnishing a steady and well-rounded food reservoir. They have become vital agents in ensuring nutritional stability, especially in areas where access to varied food options is constrained. *Eleusine coracana* L., commonly known as finger millet, assumes a significant staple crop status among tribal farming communities in developing nations like India. This study delves into the awareness levels of nutritional aspects related to millets among tribal women. The study employed an unplanned approach, in Hazaribagh district of Jharkhand, India, utilizing random sampling methods to ensure representation from marginal, small, and medium farmer. Descriptive analytical tools were employed to analyze data collected through personal interviews using a carefully designed questionnaire. Findings indicate notable awareness (72%) of millets' potential to enhance metabolism and widespread recognition (93%) of their superior nutrient content compared to rice and wheat. However, knowledge gaps exist, particularly regarding antioxidant properties (1%) and the lower glycaemic index for managing blood sugar levels (0%). The study emphasizes the necessity for targeted educational initiatives to augment tribal women's awareness, fostering informed dietary choices and positively impacting overall well-being, thereby contributing to nutritional security.

1.0 Introduction

Agriculture assumes a pivotal role in ensuring sustenance and economic stability across diverse societies (FAO, 2020). With the burgeoning global population, there arises an urgent need for enhanced food production and agricultural progression (United Nations, 2020). The World Summit on Food Security in 2009 projected that by 2050, a minimum increase of 70% in food production would be imperative to meet the escalating demographic demands. Projection of Annual Food Production Increase and Associated Percentage Surge: Insights from Tester and Langridge (2010). Climate variability, compounded by the swiftly expanding populace, poses significant challenges to agricultural productivity. The repercussions are anticipated to be particularly pronounced in hot tropical regions, primarily inhabited by developing nations, as they are poised to encounter substantial losses in food production (Cline, 2007). Moreover, a considerable segment of the population in developing nations grapples with nutritional inadequacies and the prevalence of myriad micronutrient deficiencies (Singh B et al. 2015; Thapliyal et al. 2015). In light of this context, advancements in agricultural productivity resulting in increased accessibility of nutrient-dense foods at the household level can function as a pivotal tactic in alleviating nutritional challenges.

Millet, as a collective term, encompasses a diverse array of small-grained cereal grass species. Millets are traditional food crops as per Muthoni & Nyamongo 2010. These millets are broadly categorized into principal types such as sorghum and pearl millet, alongside various minor grain millets, which encompass finger millet (*Eleusine coracana*, also known as ragi), foxtail millet (*Setaria italica*, also referred to as kangni), kodo millet (*Paspalum scrobiculatum*, also known as kodo), proso millet (*Panicum miliaceum*, also termed cheena) (Rajasekaran & Francis 2021), barnyard millet (*Echinochloa esculenta*, commonly known as sawan) (Renganathan et al. 2020), and little millet (*Panicum sumatrense*, also recognized as kutki). The cultivation of these millet species offers a plethora of advantages, including inherent drought tolerance, resilience to environmental stresses, short to medium growth durations, low labor requirements, minimal input necessities, and natural resistance to various pests and diseases. As C4 crops, millets are well-suited to adapt to climate

change. Some millet varieties, notably little millet and proso millet, mature in just 60–70 days, ensuring reasonably dependable yields even in challenging conditions. Biofortified improved varieties also can accelerate nutritional food security of the nation (Vinoth & Ravindhran 2017).

India possesses a rich reservoir of genetic diversity in millets. These crops also contribute to carbon sequestration, aiding in the mitigation of greenhouse gas emissions. Often referred to as "nutri-grains," millets are abundant sources of essential micronutrients such as minerals and B-complex vitamins. Furthermore, millets harbor health-promoting phytochemicals, thus positioning them as viable candidates for deployment as functional foods. Millet cultivation constitutes a cornerstone of rain-fed agriculture, upon which approximately 60% of Indian farmers depend. These crops serve dual purposes by providing both food and fodder and are amenable to intercropping (polyculture) with pulses and vegetables, thereby augmenting their versatility and utility. According to the latest available data, the foremost millet-producing nations worldwide include India, Nigeria, Niger, Mali, Burkina Faso, China, Sudan, Uganda, Ethiopia, and Senegal. See Table 1 for major millet-producing countries.

Table 1
World's leading millet-producing countries

Rank	Country	Production (Tonnes)
1	India	1,09,10,000
2	Nigeria	50,00,000
3	Niger	29,55,000
4	China	16,20,000
5	Mali	11,52,331
Source: World Atlas		

Fingers millet, as a main crop among tribals flourishing in arid regions, it demonstrates adaptability to harsh climatic conditions, necessitating minimal inputs while exhibiting superior nutritional attributes (Gull, A. et al. 2014; Lata, C. 2015; Sinha & Sharma 2022). This crop has garnered substantial attention in scientific circles due to its remarkable ability to thrive under high temperatures, low moisture levels, and nutrient-poor soils (Shukla A et al. 2015). Finger millet is no longer confined to the category of coarse cereals; it is now acknowledged as a nutri-cereal or nutraceutical crop, offering potential remedies for addressing global malnutrition and hidden hunger (Gupta, SM et al. 2017). Abundant in calcium, iron, magnesium, and the amino acid methionine (see Table 2), finger millet addresses deficiencies prevalent in the diets of nutritionally vulnerable households, which primarily rely on refined staples such as polished rice or maize (Farnandez et al. 2013, Gopinath et al. 2015). Furthermore, its dietary fiber and mineral contents are notably elevated (see Table 2). Moreover, its abbreviated growth cycle and adaptability for year-round cultivation render finger millet desirable within intensive cropping systems. The seeds exhibit prolonged shelf life with minimal susceptibility to storage pests, rendering them a dependable reserve during periods of famine and in regions susceptible to vulnerability (Singh & Raghuvanshi 2012). While crops like rice and maize contribute to food security, finger millet confers multifaceted benefits including food, fodder, fiber, nutrition, health, environmental sustainability, and livelihood enhancement at nominal expense, presenting significant opportunities for food and nutrition

security (Gupta, et al. 2017). Projected demand for millets by 2025 stands at 30 million tonnes, necessitating heightened productivity through the adoption of superior varieties, implementation of sound agronomic practices, efficient extension activities, and robust policy interventions.

The Hazaribagh district situated in the Jharkhand state of India experiences an average annual precipitation of approximately 1255 mm, with around 73 percent of this rainfall occurring during the month of August. The cold-weather season prevails from November to February, while the hot-weather season extends from March to mid-June. May emerges as the hottest month, with daily maximum temperatures soaring to the upper 90°F (approximately 37°C) and minimum temperatures hovering in the mid-70s°F (mid-20s°C). Sandy soil predominates in Hazaribagh and Dhanbad. Agriculture relies primarily on rainfall, with the kharif season (June–September) being the main cropping period. Within subsistence farming households located in the rainfed uplands of the district, sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum glaucum*), and finger millet (*Eleusine coracana*) emerge as principal staple food crops among the millets category, following closely behind paddy (*Oryza sativa*). The plateau area of Hazaribagh district comprises forests occupying around 45% of the total area. Cultivable land can be categorized into Upper land and Lower land, with fertile lands situated along riverbanks. Principal crops cultivated encompass rice (*Oryza sativa*), maize (*Zea mays*), pigeon pea (*Cajanus cajan*), black gram (*Vigna mungo*), and green gram (*Vigna radiata*), while predominant livestock reared include goats (*Capra aegagrus hircus*), pigs (*Sus scrofa domesticus*), cattle (*Bos taurus*), and buffalo (*Bubalus bubalis*). Tribal communities primarily engage in the cultivation of indigenous landraces of finger millet, such as Birhor, Korwa, Hill Kharia, Sauria Paharia, Mahli, Lohra, Karmali, and Chik Baraik, alongside Santhal, Munda, Oraon, Ho, Bhumij, and other ethnic groups, employing traditional agronomic methodologies. Millet cultivation primarily takes place during the kharif season on marginal lands in upland and hilly terrains, frequently with limited or no external inputs, either as a monoculture or in intercropping systems with diverse pulses, legumes, and oilseeds (Ali 2015). Beyond its nutritional significance, finger millet substantially augments the income of rural households, being either directly marketed as grain or utilized in the production of local beverages for sale in regional markets where demand is robust. Strategies aimed at enhancing the demand for millets encompass: (i) Heightened awareness campaigns highlighting their environmental sustainability and nutritional advantages, (ii) Facilitation of accessibility through the integration into Public Distribution Systems (Rajsekhar & Raju 2017), (iii) Implementation of value addition initiatives, and (iv) Inclusion in feeding programs such as the mid-day meal scheme, Integrated Child Development Services (ICDS) feeding, and proposed adolescent girls nutrition scheme (currently under deliberation by the Ministry of Women and Child Development).

1.1 Nutritional Security by Millets

Nutritional security via millets refers to the pivotal role these small grains play in ensuring a steady and balanced food supply, thereby enhancing the nutritional well-being of communities. Nutritional security constitutes a foundational aspect of food security, encompassing access to safe and nutritious food that meets dietary requirements (FAO, 2006). In this context, millets have emerged as significant contributors to nutritional security, particularly in areas with restricted access to varied food sources (Saleh et al 2019). Millets, encompassing finger millet (*Eleusine coracana*, also known as ragi), pearl millet (*Pennisetum glaucum*), sorghum (*Sorghum bicolor*), and other varieties, exhibit high levels of vital nutrients, including vitamins, minerals, dietary fiber, and protein (Saleh et al 2019). They are exceptionally well-suited to combat malnutrition

challenges and dietary deficiencies. Millets serve as abundant sources of crucial micronutrients like iron, zinc, calcium, and B vitamins (Gupta et al. 2016, Hakeem et al. 2020, Pragya et al. 2015). High in dietary fiber, millets promote digestive health and help prevent non-communicable diseases (Sharma et al., 2016). Additionally, millets provide essential plant-based proteins (Shobana et al 2013).

Table 2
Nutrient composition of millets compared to cereals (per 100 grams)

Millets/Cereals	Carbohydrate(g)	Protein (g)	Fat (g)	Energy (Kcal)	Crude fiber (g)	Mineral matter (g)	Ca (mg)	P (mg)	Fe (mg)
Sorghum	72.6	10.4	1.9	349	1.6	1.6	25	222	4.1
Pearl millet	67.5	11.6	5	361	1.2	2.3	42	296	8
Finger millet	72	7.3	1.3	328	3.6	2.7	344	283	3.1
Foxtail millet	60.9	12.3	4.3	331	8	3.3	31	290	2.8
Proso millet	70.4	12.5	1.1	341	2.2	1.9	14	206	0.8
Kodo millet	65.9	8.3	1.4	309	9	2.6	27	188	0.5
little millet	67	7.7	4.7	341	7.6	1.5	17	220	9.3
Barnyard millet	65.5	6.2	-	-	-	4.4	20	280	5
Rice (raw, milled)	78.2	6.8	-	-	-	0.6	10	160	0.7
Wheat (whole)	71.2	11.8	-	-	-	1.5	41	306	5.3

Source: Nutritive value of Indian foods, NIN, Hyderabad overall dietary protein intake (Shobana et al., 2013).

Gluten-Free: Most millets are naturally gluten-free, suitable for individuals with celiac disease or gluten sensitivities (Khokhar & Khokhar, 2015)

2.0 Material and Methods

India's Jharkhand state consists of 24 districts, which are divided into five divisions. For our research, because if tribal dominated state, study selected randomly North Chhotanagpur division. From this region, we have purposively chosen the villages of Kundwa and Jitpur in the Barhi block of Hazaribagh district (Fig. 1). A total of 60 households were selected from each villages using an unplanned approach. To attain a total sample size of 120, convenience sampling technique (type of non-probability sampling method) were used to. In the study region, study conducted personal interviews using a carefully designed questionnaire to gather primary data from the sampled households including key informant interviews with community leaders, elders, or individuals who are likely to have a significant influence. These interviews serve the purpose of obtaining information about various aspects such as family details, income, land ownership, and more. The approach to data collection involved utilizing both primary data obtained first hand and secondary data obtained from other sources. The study centered on the Jharkhand state in India, located in the northeastern region of the

country. Jharkhand shares its boundaries with Bihar to the north, West Bengal to the east, Odisha to the south, Chhattisgarh to the west, and Uttar Pradesh to the northwest. The capital city of Jharkhand is Ranchi (refer to Fig. 1). Agriculture stands as the primary economic activity, engaging approximately 63% of the rural population in the state. It serves as their main source of employment and income generation. Nevertheless, the agricultural sector's contribution to the gross state domestic product (GSDP) of Jharkhand amounted to only 23.3% between 2021 and 2022, suggesting relatively low labor productivity within Jharkhand's agricultural domain. Jharkhand is situated within Zone VII of the country, recognized as the Eastern Plateau and Hill Region (cite).

2.1 Questionnaire design

A survey was formulated with the aim of evaluating the comprehension levels regarding the nutritional attributes of millets among the indigenous tribal populace residing in the area. A preliminary study involving 30 participants was conducted to evaluate the questionnaire's reliability and validity. An expert team reviewed the questionnaire to ensure its content validity. Out of the eight items in the satisfaction questionnaire, strong validity was observed, with values ranging from 0.632 to 0.824. The examination of construct validity, incorporating Cronbach's alpha (CA) of 0.802, composite reliability (CR) of 0.923, and average variance extracted (AVE) of 0.862, satisfied the predetermined thresholds of $CA \text{ and } CR \geq 0.800$ and $AVE > 0.500$, with CR surpassing AVE. This confirmed the credibility of the questionnaire. The questionnaire comprised four demographic variables and ten questions related to awareness and consumption of millets in their diet, formulated through logical reasoning. Prior consent from participants was obtained by transparently stating the study's purpose. The questionnaire was supplemented with images of millets to facilitate easy identification and ensure unbiased responses.

Fig 1: Locale of study, Jharkhand's Hazaribagh, India.

2.2 Analytical Tools used/Data analysis

To explore the perspectives based on the nutritional status and health advantages associated with millet cultivation under tribal farmers, the data underwent cleansing, organization, coding, and subsequent statistical analysis utilizing the Statistical Package for the Social Sciences (SPSS) software. Subsequent to the data cleansing process, a total of 120 observations underwent further scrutiny. To fulfill the study's objectives, descriptive statistics methods such as calculating simple arithmetic means, totals, percentages, along with other statistical techniques, were employed to illustrate the knowledge and habits of the study participants. These analytical instruments were utilized to interpret the data and achieve the research objectives.

3.0 Results & Discussion

Table 3
Socioeconomic features of the women tribal farmers

Particulars	Frequency	Percentage (%)
Respondents age group		
18–25 years	34	28.33
25–50 years	66	55.01
50–75 Years	13	10.83
> 75 Years	07	5.83
Total	n = 120	100
Education qualifications of the respondents		
Illiterate	80	66.66
Literate	29	24.17
Highly educated	11	9.17
Total	n = 120	100
Income group of the respondents		
Less than ₹ 10,000	98	81.66
₹ 10,000 to 20,000	16	13.34
More than ₹ 20,000	06	5.00
Total	n = 120	100
Occupation		
Cultivators-cum-Housewives	76	63.33
Solely Housewives	22	18.33
Working profession	07	5.84
Students	12	10.0
Others	03	2.5
	n = 120	100

Source: compiled by researcher based on sample survey. ₹ – Indian National Rupees (INR)

Note

Illiterate means- Never enrolled for education, Literate means- Enrolled at least once in their lifespan, highly educated means- whatever they get education after higher secondary.

Above pie chart showing socioeconomic features of the women tribal farmers,

3.1 Socioeconomic features of the women tribal farmers

The profile of the tribal women studied reveals a diverse demographic distribution. Among the respondents (n = 66), the largest cohort, comprising 55.06%, falls within the 25–50 age range (see Table 3, Fig. 2). This is followed by 28.33% (n = 34) in the 18–25 age bracket, 10.83% (n = 13) between 50–75 years, and a smaller proportion, 5.83%, aged above 75 years, accounting for 7 respondents. To ensure an unbiased representation across income groups, the researcher aimed for equitable distribution. Around 81.66% of the female participants reported earnings below ₹ 10,000, with only 5% earning beyond ₹ 20,000 (see Table 3, Fig. 4). This stratification reflects an intentional effort to capture various income dynamics. Regarding education, a significant majority (66.66%, n = 80) of the women were either illiterate or lacked formal education. Higher education enrollment stood at a modest 9.17%. Notably, the overall literacy rate in the study area was approximately 33%, indicating potential challenges in educational accessibility (see Table 3, Fig. 3). In terms of occupation, a majority (63.33%, n = 76) were homemakers engaged in farming activities, while a smaller percentage (5.84%, n = 7) held professional roles (see Table 3, Fig. 5). Additionally, around 10% pursued studies or were self-employed, and 2.5% were engaged in varied occupations like hunting, running grocery shops, crafting, or basket making. This comprehensive profile highlights the varied socio-demographic aspects of the studied tribal women, showcasing their diverse ages, income levels, educational backgrounds, and occupations.

3.2 Revealing intrinsic findings based on the socioeconomic profile of the farmers

The findings indicate that 65.6% of women in the study exhibit awareness and cultivation practices related to millet, yet only 45.7% of tribal women consume millet, primarily driven by perceived nutritional benefits. Demographic factors such as age, qualifications, and income are identified as influencers on millet consumption. To broaden the scope of research, future inquiries could delve into the long-term health ramifications of millet consumption among the targeted respondents. Bhattacharya et al. (2014) astutely observes the pervasive tendency within social sciences, particularly among economists, to undervalue the significant contributions of women. This oversight is exemplified by the exclusion of domestic work from national income calculations, creating a substantial gap in recognizing the economic impact of women's labor (Mishra & Bantilan 2016).

Moreover, the authors highlight an intriguing observation regarding the comparative status of women in tribal and non-tribal societies, noting that women in tribal communities often enjoy a more favorable gender dynamic. One plausible explanation for this phenomenon lies in the inclusion of millets, renowned for their high nutritional value, in the daily lives of tribal populations. Additionally, the emphasis placed on the cultivation of these crops underscores a societal regard for activities traditionally associated with women's roles (Kumar et al. 2018).

For heightened awareness, leveraging social media interventions is recommended to promote the nutritional advantages of millet consumption and stimulate increased acreage devoted to millet cultivation (Michaelraj & Shanmugam 2013). Practical implications underscore the involvement of extension workers in disseminating

advanced cultivation techniques, encouraging FMCG production units to create millet-based products, and organizing workshops to promote millet as a substitute for traditional grains.

Strategically promoting the cultivation, maintenance, and processing of indigenous millet varieties through effective marketing strategies has the potential to elevate their cultivation levels to that of cash crops. It is imperative to impart knowledge to farmers, particularly women belonging to tribal communities, regarding the significance of cultivating minor millets and their nutritional value. The novelty of this research lies in addressing the influence of modern lifestyles on dietary preferences, particularly among tribal women, and examining their awareness of the nutritional advantages offered by millet grains, renowned for their elevated protein and essential mineral content. This research is in alignment with recommendations from the WHO for maintaining a nutritionally balanced diet and engaging in regular physical activity to mitigate health risks, as supported by Rizwana et al., 2023.

3.3 Awareness of Tribal Woman about Nutritional Security by Millets

The study findings indicate a prevalent awareness among respondents regarding the cultivation of millet; however, there is a notable lack of knowledge concerning the nutritional benefits that contribute to overall health preservation. The survey's primary objective was to assess the awareness levels of tribal women regarding the nutritional advantages associated with millet consumption, aligning with the broader goal of achieving nutritional security. The dataset derived from 120 respondents is presented in the tabular format below (Table 4), detailing the percentage-based responses of tribal women to statements addressing nutritional security through millet consumption (Sahoo & Samantaray 2021).

Table 4
Awareness of tribal women about nutritional security of millets

Statements		Yes (%)	No (%)
1	Great metabolism	28	72
2	More nutrients as compared to rice and wheat	7	93
3	Presence of antioxidants	1	99
4	Lower glycemic index	0	100
5	Easily digestible and lowers cancer risk	47	53
6	Energy level increases	75	25
7	Protection from cardiovascular disease and improves respiratory health	2	98
8	Detoxifies body	4	96
9	Lowers cholesterol and blood sugar level	3	97
10	Nutritional content	0	100

The survey findings present a nuanced overview of tribal women's awareness concerning the nutritional benefits of millets, unveiling both areas of recognition and substantial knowledge gaps:

Great Metabolism- A noteworthy 28% of respondents acknowledge the role of millets in promoting great metabolism, indicating a partial awareness within the surveyed population (Table 4; Fig. 6). *More Nutrients*- Merely 7% recognize millets as containing superior nutrients compared to rice and wheat, emphasizing a prevalent lack of awareness among the majority (93%). *Presence of Antioxidants*- A mere 1% of respondents are aware of the antioxidant content in millets, underscoring a pronounced gap in understanding among the surveyed population (99%); *Lower Glycaemic Index*- Strikingly, none of the respondents (0%) are aware of the lower glycaemic index of millets, revealing a substantial knowledge deficit in this crucial aspect; *Easily Digestible and Cancer Risk*- A significant 47% acknowledge that millets are easily digestible and can mitigate cancer risks, showcasing a moderate level of awareness, while 53% lack this understanding; *Increased Energy Levels*- Impressively, 75% of respondents believe in the energy-boosting properties of millets, indicating a noteworthy awareness in this domain; *Protection from Cardiovascular Disease and Respiratory Health*- A mere 2% recognize the protective effects of millets against cardiovascular diseases and improvements in respiratory health, highlighting a substantial lack of awareness; *Detoxification*- A modest 4% understand millets as a detoxifying agent, while 96% remain uninformed about this potential health benefit; *Cholesterol and Blood Sugar Level*- A minimal 2% are aware of millets' capacity to lower cholesterol and blood sugar levels, with the overwhelming majority (98%) lacking this awareness; *Nutritional Content*- Strikingly, none of the respondents (0%) possess knowledge about the specific nutritional content of millets, underscoring a significant information void (Mishra et al. 2014) (see Table 4; Fig. 6).

These findings underscore the imperative for targeted educational initiatives and awareness campaigns tailored to enhance tribal women's understanding of the nutritional significance of millets. Addressing these knowledge gaps holds immense potential for fostering improved nutritional security within tribal communities by encouraging the integration of millets into their dietary practices.

4.0 Conclusion

In conclusion, the survey of 120 respondents among tribal women highlights varying levels of awareness regarding the nutritional aspects of millets. While a significant majority recognizes certain benefits, such as metabolism enhancement (72%) and superior nutrient content (93%), notable gaps persist in understanding other health advantages, such as antioxidant properties (1%) and the lower glycaemic index (0%). These findings underscore the necessity for targeted educational initiatives to address knowledge disparities and promote informed dietary choices (Mishra et al. 2014). Enhancing awareness has the potential to positively influence the holistic health and well-being of tribal populations. The study aligns with existing research by Kalaiselvi et al., (2016) and emphasizes the crucial role of disseminating knowledge to establish millets as a staple for preserving overall health. However, challenges persist, including low market demand and consumer awareness, suggesting the need for strategic communication approaches involving influencers and targeted messaging. Efforts should focus on leveraging opinion leaders, food bloggers, chefs, and healthcare professionals to enhance millet consumption among the population. Ali and Akter underscore the importance of recognizing and addressing the unique challenges faced by tribal women, while also acknowledging their enduring resilience and invaluable contributions to their communities and economies.

Suggestions & policy Implications

FAO designated 2023 as the International Year of Millet, following a recommendation from India. Despite India's prevalent consumption of rice and wheat, millets demonstrate resilience to drought conditions and flourish in regions characterized by low rainfall and poor soil quality, owing to their extensive genetic diversity (Nepal et al. 2019). Policy measures, including technology dissemination, awareness campaigns, and integration into the Public Distribution System (PDS) (Rajsekhar & Raju 2017), can promote millet cultivation. Notably, millets contribute to soil health, offering an alternative for monoculture farming in arid regions. Emphasizing organic cultivation, establishing village-level processing units, and facilitating market linkages can enhance millet production and income for tribal farm. Aligning with the National Food Security Act, incorporating millets into government programs and school meals fosters their nutritional value. Media, particularly in local languages, plays a crucial role in disseminating information on millet cultivation and consumption benefits. This comprehensive approach, integrating nutrition into agriculture policy, not only encourages millet cultivation but also provides a blueprint for climate-smart agriculture in developing nations where millets are staples (Satyavathi et al. 2021).

Declarations

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Ethical Standards: The research conducted adhered to the Declaration of Ethics-cum-research Committee of the Department of Agricultural Economics, BHU, India. Oral informed consent was obtained from the respondents before collecting the information, for all subjects selected for nutrition awareness and millet cultivation assessment.

Data Availability: In this study, data was collected through primary sources, with researchers personally visiting respondents at their doorsteps. All data pertinent to the study, whether generated or analyzed, are fully documented and included within the article, ensuring comprehensive transparency and accessibility.

Conflict of Interest: We, Sachin Rathour and Prakash Singh Badal, hereby provide our voluntary consent to participate in the research study titled "Contribution of Millet Cultivation in Tribal Women's Farming Systems to Enhanced Nutritional Food Availability at the Household Level: A Case Study from Hazaribagh, India" conducted by Kumari Megha from BHU Varanasi. We understand the nature and purpose of the study, as well as my role as a participant.

The absence of a Clinical Trial Number in the manuscript is attributed to the nature of the study, which relies on surveying targeted respondents rather than conducting a clinical trial.

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Figures

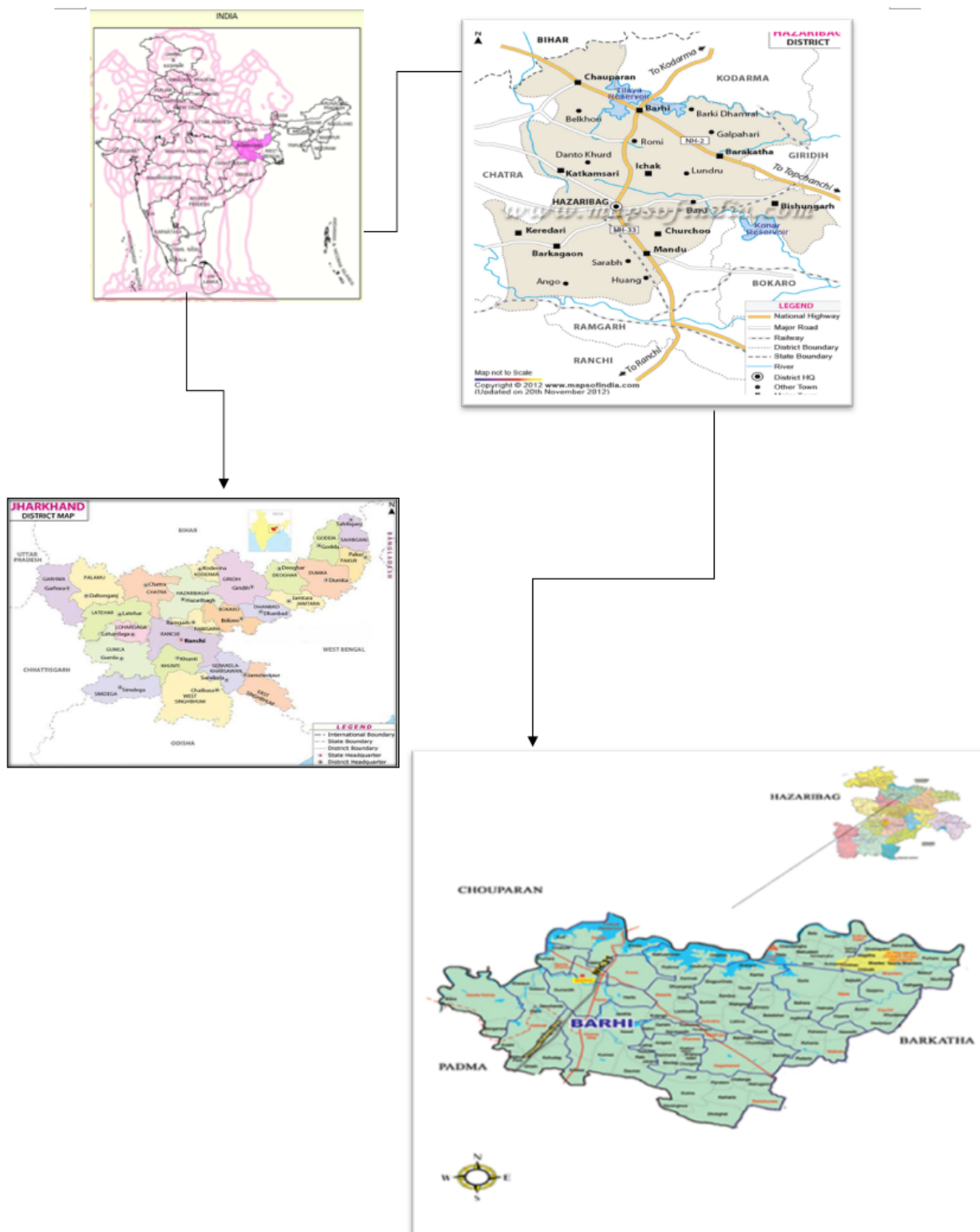


Figure 1

Locale of study, Jharkhand's Hazaribagh, India.

Fig. 2 Age group of the respondents,
Percentage(%)

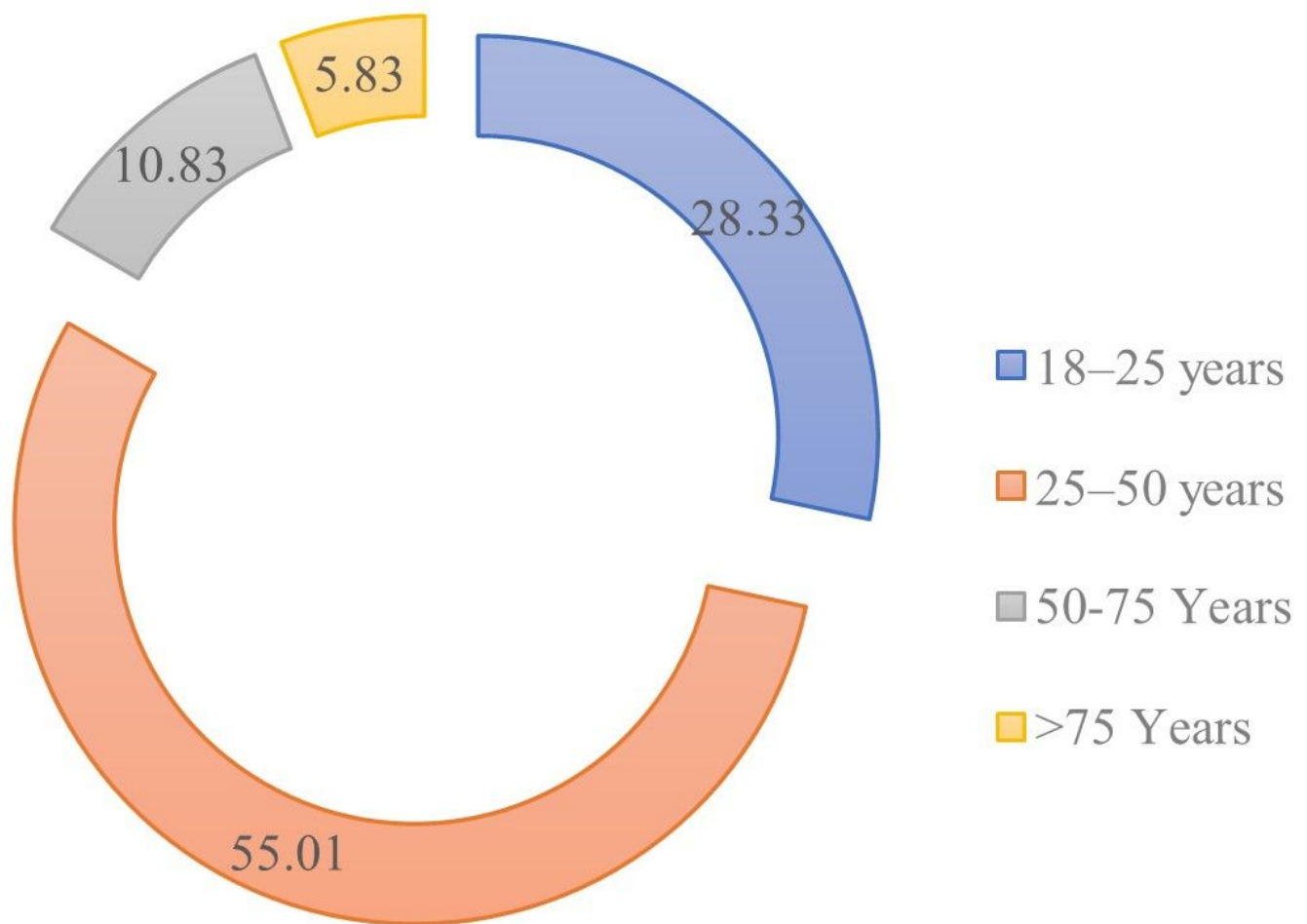


Figure 2

See image above for figure legend.

Fig. 3 Education qualifications of the respondents, Percentage(%)

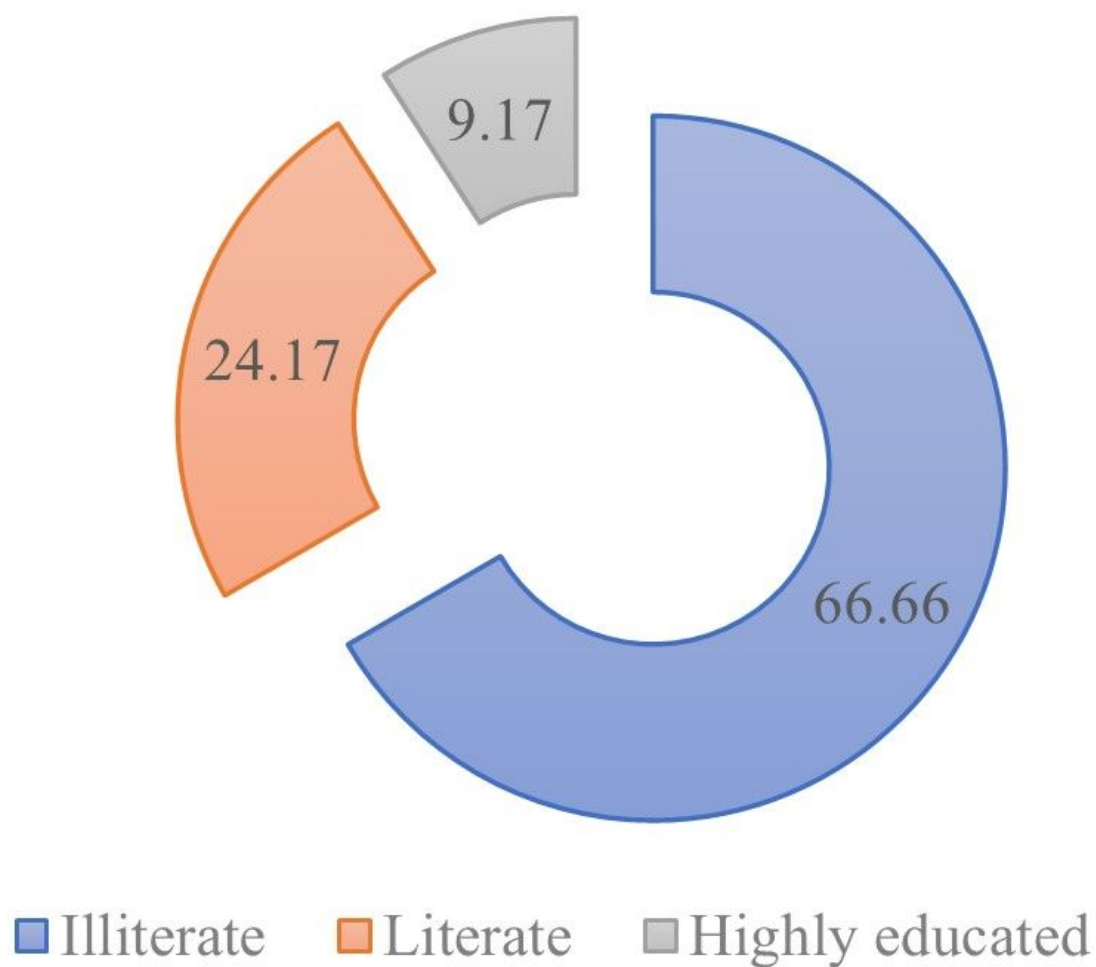


Figure 3

See image above for figure legend.

Fig. 4 Income group of the respondents, Percentage (%)

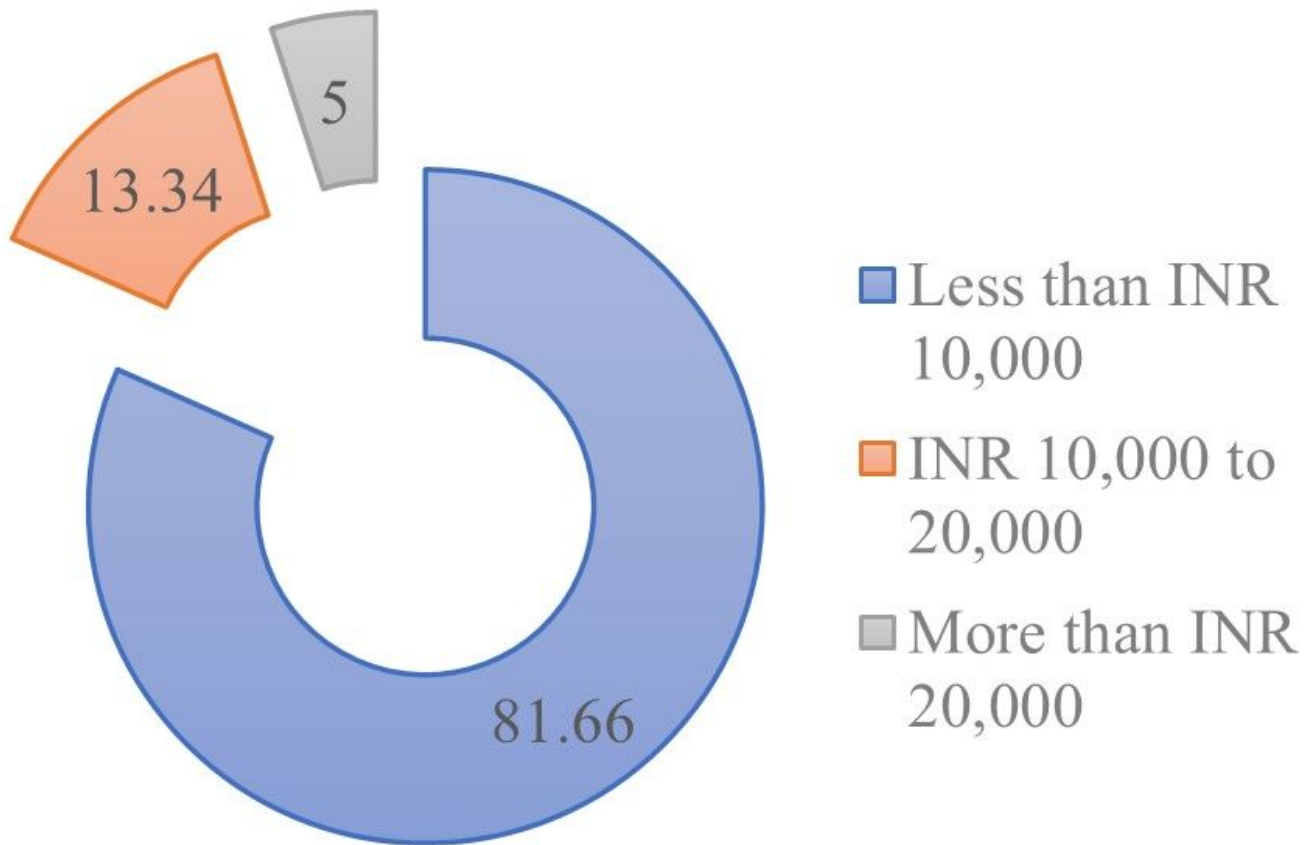


Figure 4

See image above for figure legend.

Fig. 5 Occupation, Percentage (%)

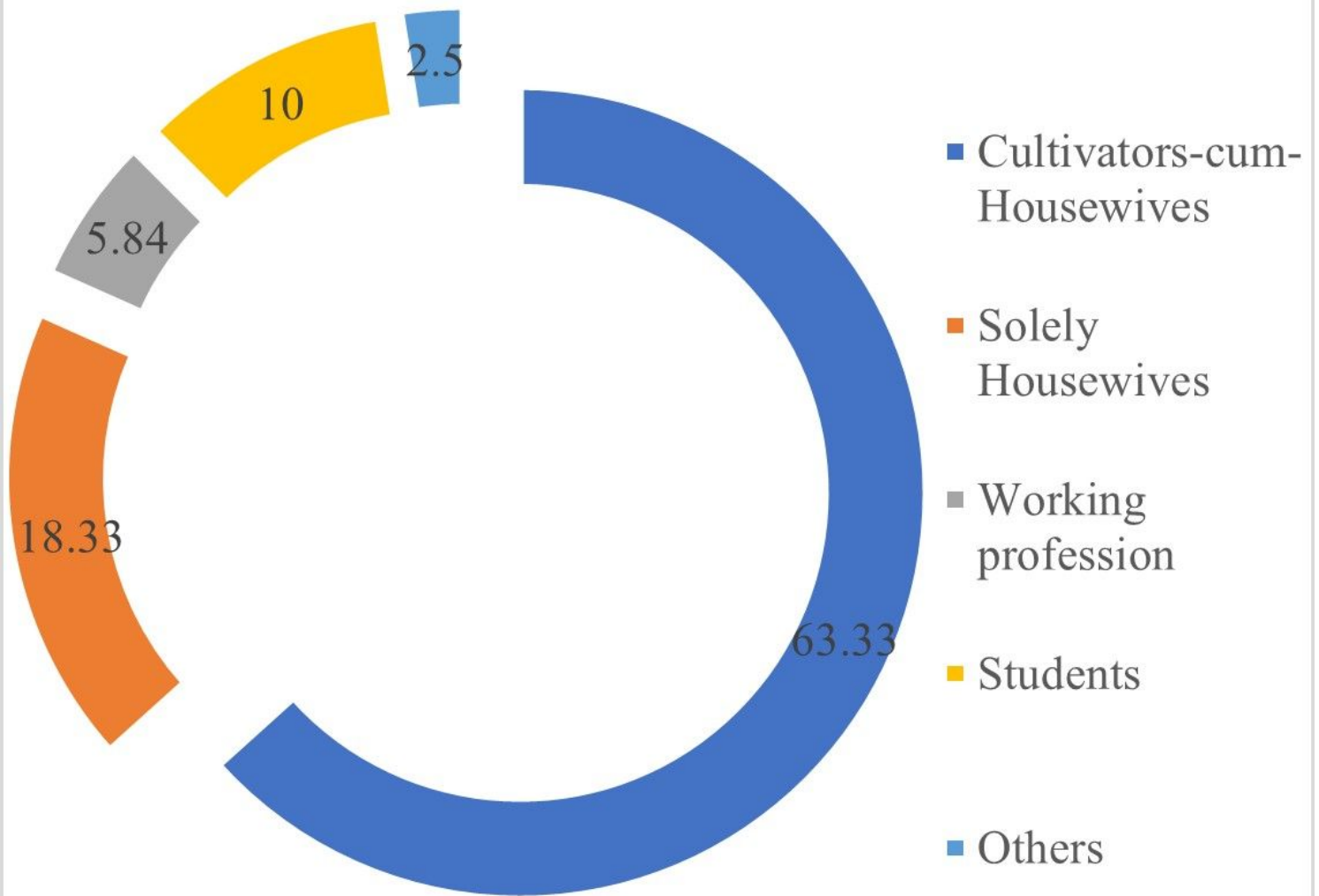


Figure 5

See image above for figure legend.

Fig. 6 Awareness Level of Tribal Women's about Nutritional Security by Millets

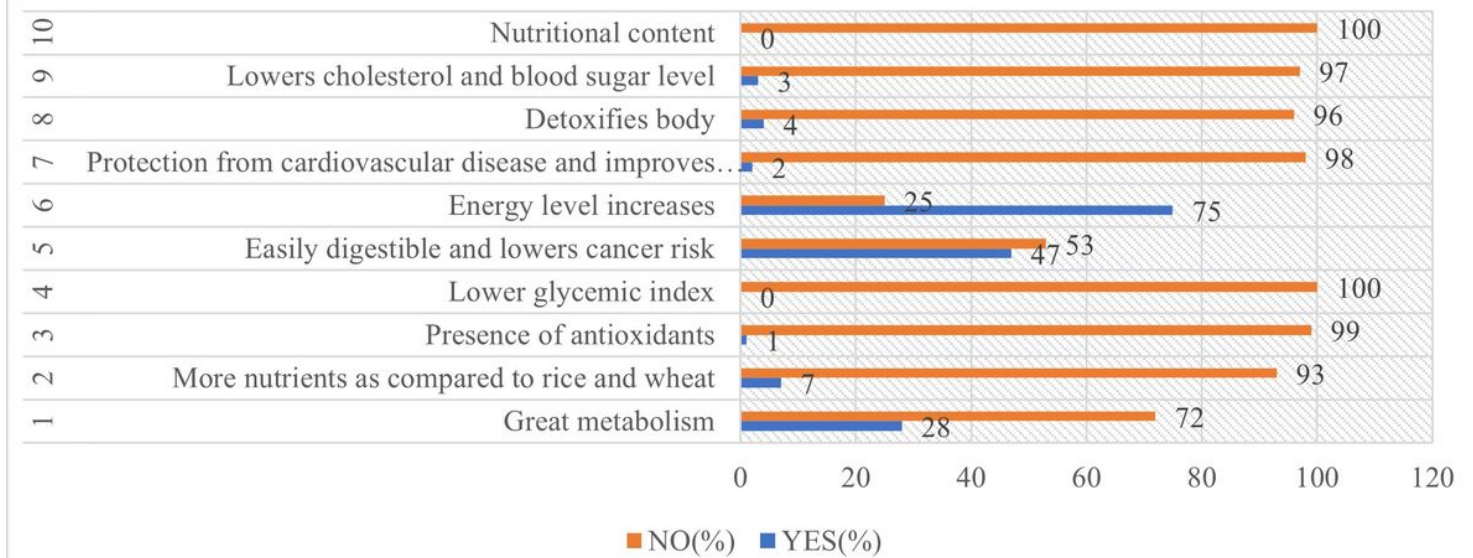


Figure 6

See image above for figure legend.