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Research

# Demographic and food frequency survey of a marginalized community in Almora, Uttarakhand, India

Smita Rana[1],Vasudha Agnihotri[1,2]*, Sofiya Anjum[1]

[1]G.B. Pant National Institute of Himalayan Environment, Kosi-Katarmal, Almora, Uttarakhand, India, 263643; [2]Himachal Regional Centre, G.B. Pant National Institute of Himalayan Environment, Kullu, Himachal Pradesh, 175126

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## Abstract

The demography and eating behaviour of the marginalized communities residing in the Almora district of Uttarakhand, India, was investigated. It was observed that agriculture was the main income source along with other work such as labourer, black-smith, etc. Food consumption was mainly dependent upon either the Government Public Distribution System or on traditional coarse grains which were being produced only for their own consumption. Traditional food crops were being neglected in the Himalayan region due to the deterioration of local food systems, changing food habits, and lack of awareness of the uses and nutritional value of traditional crops.

## INTRODUCTION

India is a country with diversified people having different religions, castes, and languages. Marginalized communities are an integral part of the country, which includes scheduled communities (SCs) i.e., the scheduled castes and scheduled tribes, so-called backward classes, and religious minorities (Vyas et al., 2022). SCs are relatively evenly distributed among the different states in the country. Uttarakhand, a North-West Himalayan state of India, is a geographically and socio-culturally diverse state because of its location and the fact that its population is scattered in hilly and plain regions, with population densities higher in the foothills. According to the 2011 census, the total population of Uttarakhand was 10.12 million people (https://censusindia.gov.in/census.website/) though the population likely has increased since then. 69.5% of the people in the state at that time were living in 15,761 villages. 90% population of such Himalayan Mountain districts of India were rural, out of which 18% belonged to scheduled caste people.

Analysis of the socio-economic characteristics of any society includes their demography along with eating behaviour, because this directly affects their health. Traditional knowledge about nature is an important part of rural people's capacity to manage and conserve agricultural systems over extended periods of time. Traditional knowledge is augmented through frequent interaction with the local environment based on the need to pursue daily requirements for food and economic provision. Transfer of this knowledge from one generation to another through observations and narratives is a key survival tool. It is deeply rooted within the society which contributes to cultural traditions, identities, beliefs, and worldviews (Ouma, 2022).

As Uttarakhand carries many cultural and ecological differences due to diverse topography, it has been highly diversified in terms of traditional food products (Agnihotri et al., 2021). In the hilly areas of Uttarakhand, people have well-established traditional food habits which depend upon the available food resources. The traditional hilly agricultural system of Uttarakhand has been impacted by severe changes in both climate and the economic state of the society. This has affected the traditional food practices of the region (Bisht et al., 2018). Traditional food consumed by the local people has long played a significant role in their identity, behaviour in social, cultural, religious, and economical domains which, in the form of heritage, passes on from generation to generation (Sebastia, 2016). Traditional food products are now facing severe competition from commercially processed products like fast foods and tinned foods. The substitution of traditional foods not only leads to a loss of production of traditionally and culturally important foods, but also eventually the loss of traditional knowledge related to food production (Sproesser et al., 2019).

* Corresponding author: vasudha@gbpihed.nic.in

Because of the rapid changes occurring, especially among the most vulnerable groups in such areas of India, there appears to be a reduction in the cultivation and consumption of local highly nutritious food grains. However, no research examining the context in which this is occurring has yet been reported for these areas. The present study is thus an attempt to examine the demography, lifestyle, and eating behaviour of people living in scheduled communities in one typical area, the Almora District of Uttarakhand, focusing on their own agricultural produce.

## METHODS

### STUDY AREA

Census-2011 (obtained from statistical and agricultural department, Almora, Uttarakhand) was consulted for the collection of secondary data on the population of scheduled communities residing in rural areas of Almora district. These data were verified through primary field surveys, based on discussions with the Gram Pradhan (the person who is elected as president of village council for a village or group of villages in India) and ASHA (Accredited Social Health Activist) of the respective villages. Based on the population data, six villages namely Katarmal, Hawalbagh, Matela, Panch Gaon, Shyona, and Kyala were selected. A map depicting the selected villages was prepared in 2020 using Google Earth (Figure 1).

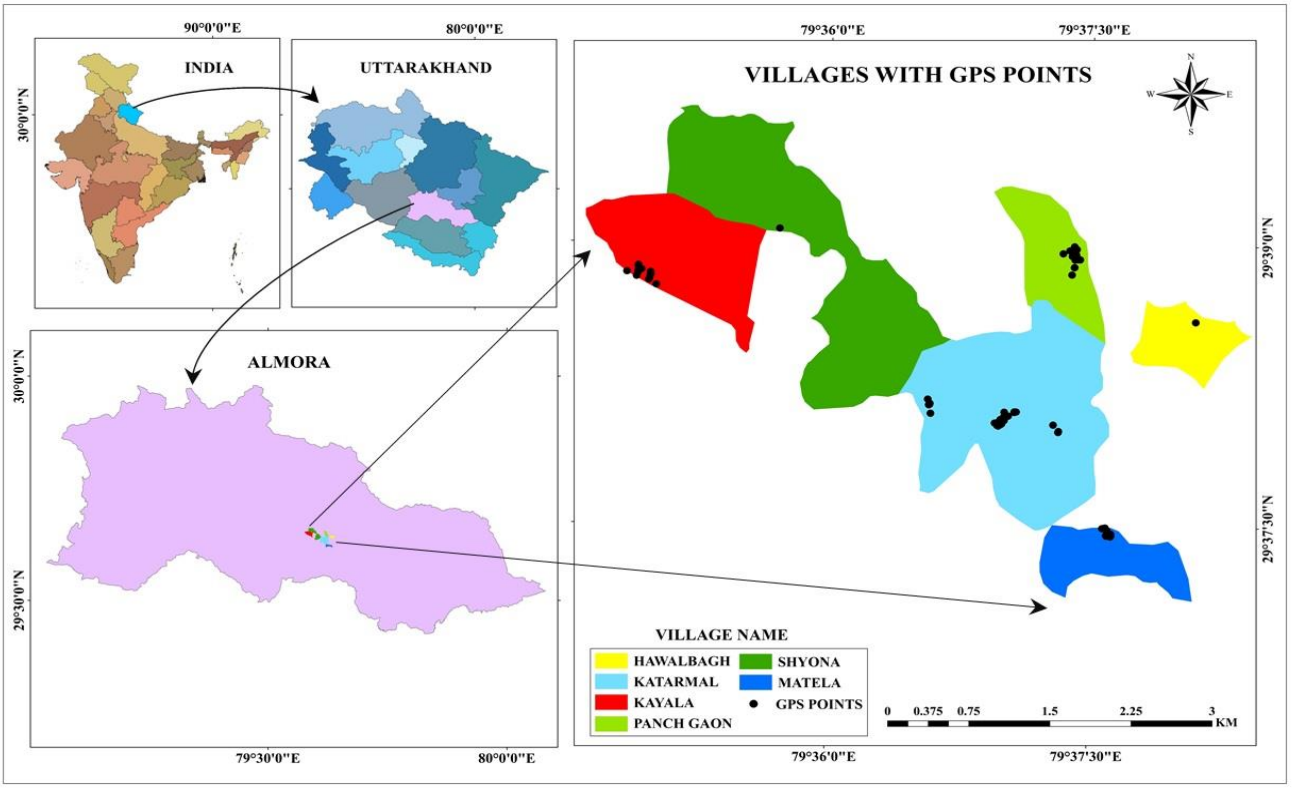


**Figure 1. Geographical location of the study area**

### DATE COLLECTION

Demographic study of the scheduled community was completed during the year 2020 through personal interviews. For the questionnaire-based personal interview, the whole family was taken as a unit instead of a single individual because on many occasions the key informers were aided by his/her family members in providing information. Moreover, it resembles a semi-group discussion, where members of various age groups from different villages contribute to making the information more comprehensive. Interviews were conducted onsite with each household. A total of 94 households were surveyed, out of which the total marginalized community population per village was also documented. From each household, one person was selected for the questionnaire survey, which means a total of 94 respondents (representatives of 586 people) were interviewed.

### DEMOGRAPHICS

During the field survey or while conducting interviews, socio demographic characteristics of villagers including their age, education, marital status, occupation, family income, and total number of family members were evaluated. Age dependency ratio was calculated using the equation (1) (Han and Cheng, 2017).

$$\text{Age Dependency ratio} = \frac{N(0-14)+N(>65)}{N(15-64)} \times 100 \quad (1)$$

where $N_{0\text{-}14}$ is number of SC people having age less than or equal to 14 years, $N_{>65}$ are people having age more than 65 years and $N_{15\text{-}64}$ is the main working people having age between 15 years to 64 years. As per census 2011, a person >7 years of age who can read and write was taken as literate for literacy rate calculation.

### ASSESSMENT OF DIETARY INTAKE THROUGH FFQ

Interviewers collected information based on a well-structured food frequency questionnaire (FFQ) (Fink, 1995), which was broadly divided into two categories i.e., first based on personal information and the other on the basis of information related to their dietary aspects and on the production of crops. The FFQ was designed to gather detailed information about their day-to-day dietary patterns as well as their annual consumption of the most commonly used

traditional foods of the region. Respondents were also asked about the extent of production of crops used for the preparation of such food items. Their traditional food practices and attitudes/beliefs toward such traditional foods including information about the detailed procedure of preparation of these ethnic cuisines were also documented. The survey questionnaire included five closed-ended questions with multiple response options and eight open-ended questions at the end of the survey.

STATISTICAL ANALYSIS

The descriptive statistical analysis was carried out using Microsoft Excel 2019 for understanding demographic characteristics, and FFQ data. The quantitative variables such as age, village-wise population and household income were summarized using mean and standard deviation. Categorical variables were summarized using frequency counts and percentages. Distributions of these variables are displayed using graphs (Eagle, 2010; Cooksey and Cooksey, 2020).

## RESULTS AND DISCUSSION

DEMOGRAPHIC CHARACTERISTICS OF THE STUDY PARTICIPANTS

Demographic data of these villages are shown in Table 1 containing information on their sex, age groups (years), marginalized community population of the selected villages, household income, and occupation. The majority of the population lies below the age group of 35 years (appx. 66%) (Figure 2). 48% of respondents were female. The population of females per thousand males was quite high or equal in three villages (Panch Gaon, Shyona, and Hawalbagh) and low in three others (Matela, Kayala and Katarmal) (Figure 3). The highest literacy rate in the community, 100%, was observed in the age group 15-30. For the 0-15 age group, the literacy rate was 60.9%, attributed to 38.34% of the population being children under 7 years old. Beyond 30 years of age, the percentage of literate individuals declines. The study depicts the positive impact of the right to education. The marginalized villages had a 49.7% age dependency ratio. Since 30% of the total population is between 0-15 years old, this situation will be improving in the coming years.

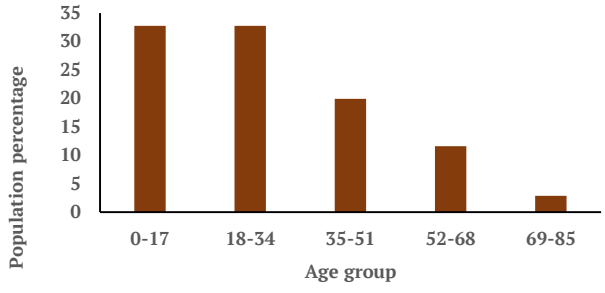


**Figure 2. Age-wise percentage distribution among the marginalized community population in the selected villages**

The monthly income of 58% of the marginalized community people was Rs. 5,000-20,000. It was observed that the people must be moving away from agriculture, as only 31% of the SC people were engaged in the agriculture among all the selected villages. The main reason mentioned in the literature for this is human-animal conflict (Patel & Pandya, 2014) where the animals such as *Sus scrofa* (wild boar), *Boselaphus tragocamelus* (Nilgai), *Macaca mulatta* (Rhesus monkeys), *Rusa unicolor* (sambhar), and *Presbytis sps* (langurs) are among many other animals which damage the crops (Meena et al., 2021; Pandey et al., 2019). Another reason is likely abrupt rainfall patterns which are discouraging farmers to practice agriculture as a livelihood option (Ritu, 2020; Datta et al., 2022). Only the crops which consume less water tend to be grown, and they are mainly for household consumption (Agnihotri et al., 2021). For these reasons, agriculture is often not seen as providing much direct economic benefit. The traditional crops grown by the villagers in our study areas were generally drought resistant (although water is required at some stages of their growth) and have very high nutritive values due to the presence of various types of bioactive constituents (Agnihotri et al., 2021; Rana et al., 2023a, 2023b).

**Table 1 - Characteristics of sample family members (N= 586 from 94 families).**

| Characteristics | Categories | Number (n) | Percentage |
|---|---|---|---|
| **Sex** | Male | 307 | 52 |
| | Female | 279 | 48 |
| **Age Groups (years)** | 0-17 | 192 | 33 |
| | 18-34 | 192 | 33 |
| | 35-51 | 117 | 20 |
| | 52-68 | 68 | 12 |
| | 69-85 | 17 | 3 |
| **Village (SC* Population)** | Katarmal | 246 | 42 |
| | Shyona | 6 | 1 |
| | Hawalbagh | 7 | 1 |
| | Matela | 72 | 12 |
| | Panch Gaon | 142 | 24 |
| | Kayala | 113 | 19 |
| **Household Income in Indian rupees**** | <5000 | 16 | 17 |
| | 5000-20000 | 61 | 65 |
| | >20000 | 17 | 18 |
| **Occupation** | Agriculture | 31 | 33 |
| | Business | 2 | 2 |
| | Others | 61 | 65 |

*SC = scheduled caste; **1 USD=76.38 Indian Rupees

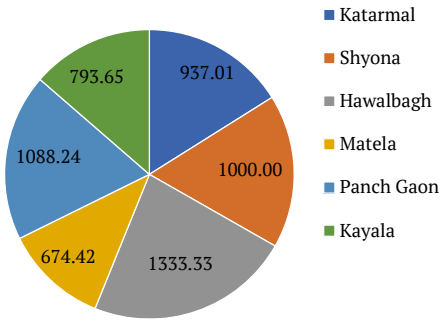


**Figure 3. Sex ratio (Female/ 1000 Male) among the marginalized community population in the selected villages (N= 586 from 94 families)**

Among the 94 surveyed households, 50% were knowledgeable about some medicinal properties of these crops, but they are not aware of their nutritional value.

DIETARY INTAKE

The FFQ report of the dietary survey is presented in Table 2. Our findings suggest that the people are mostly dependent on the Public Distribution System (PDS – the government system of distribution of foodgrain and other items at affordable prices to needy people in India) for their diet and are losing interest in agriculture. Only 33% of the total surveyed households were found to be involved in agriculture and nearly all had a very low level of production. Among the general food preferences, villagers were dependent mainly on the pulses that are not grown in the area, i.e., pigeon pea, red lentil, and chick pea. These are purchased from the local market, though traditionally grown crops such as horsegram and black soybean are also commonly eaten (Figure 4). The villages under study have a climate suitable for the production of certain drought resistant crops such as black soyabean (*Glycine max*; locally known as bhat), ricebean (*Vigna umbellate*; locally known as rais), horsegram (*Macrotyloma uniflorum*; locally known as gahat), and barnyard millet (*Echinochlora frumentacea*, locally known as jhangora) which are traditional in this area. 78% of the SC villagers said that they cultivate these crops only for their own consumption. The data on the total production of selected crops (Kg/annum) in the surveyed areas are shown in Table 2.

**Table 2 – Traditional food and dry-land cultivation practices and beliefs of sample households (N=94)**

| Characteristics | Number (n) | Percentage |
|---|---|---|
| **What is the main motive for crop cultivation** | | |
| Self-Consumption | 73 | 78 |
| For Marketing Purpose | 0 | 0 |
| None given | 21 | 22 |
| **Do you give preference to nutrition while selection of your food items** | | |
| Yes | 5 | 5 |
| No | 76 | 81 |
| Often | 13 | 14 |
| **Do you have any medicinal knowledge regarding these crops** | | |
| Yes | 47 | 50 |
| No | 47 | 50 |
| **Total Annual Production of Black-Soyabean** | | |
| 1-10 kg | 47 | 50 |
| 11-20 kg | 17 | 18 |
| 21-30 kg | 4 | 4 |
| 31-40 kg | 1 | 1 |
| 41 ~ more | 2 | 2 |
| None | 23 | 24 |
| **Total Annual Production of Ricebean** | | |
| 1-5 kg | 48 | 51 |
| 6-10 kg | 3 | 3 |
| 11-15 kg | 2 | 2 |
| 16-20 kg | 31 | 33 |
| None | 10 | 11 |
| **Total Annual Production of Horsegram** | | |
| 1-5 kg | 33 | 35 |
| 5-10 kg | 23 | 24 |
| 11-15 kg | 8 | 9 |
| 16-20 kg | 2 | 2 |
| 21-25 kg | 5 | 5 |
| None | 23 | 24 |
| **Total Annual Production of Barnyard Millet** | | |
| 1-20 kg | 20 | 21 |
| 21-40 kg | 13 | 14 |
| 41-60 kg | 9 | 10 |
| 61 ~ more | 2 | 2 |
| None | 50 | 53 |

***Table 2: continued***

| | | |
|---|---|---|
| **Most commonly prepared recipes from black-soyabean** | | |
| Chutkani, Dubke, Jaula, Chatni | 39 | 41 |
| Chutkani, Dubke, Jaula | 21 | 22 |
| Chutkani, Dubke, Chatni | 8 | 9 |
| Chutkani, Dubke | 26 | 28 |
| **Most commonly prepared recipes from ricebean** | | |
| Dal, Khichadi, Badi | 7 | 7 |
| Dal, Khichadi | 43 | 46 |
| Dal | 38 | 40 |
| Dal, Badi | 3 | 3 |
| None | 3 | 3 |
| **Most commonly prepared recipes from horsegram** | | |
| Dubke, Dal, Khumdi, Badi | 5 | 5 |
| Dubke, Dal, Chutkani, Bedu roti, Badi | 2 | 2 |
| Dubke, Dal, Bedu roti | 7 | 7 |
| Dubke, Dal, Bedu roti, Badi | 5 | 5 |
| Dubke, Dal | 56 | 60 |
| Dubke, Dal, Khumdi, Bedu roti | 19 | 20 |
| **Most commonly prepared recipes from barnyard millet** | | |
| Bhaat, Kheer | 16 | 17 |
| Bhaat | 40 | 43 |
| None | 38 | 40 |
| **Cooking device used** | | |
| Chulah | 11 | 12 |
| Gas Stove | 2 | 2 |
| Both | 81 | 86 |

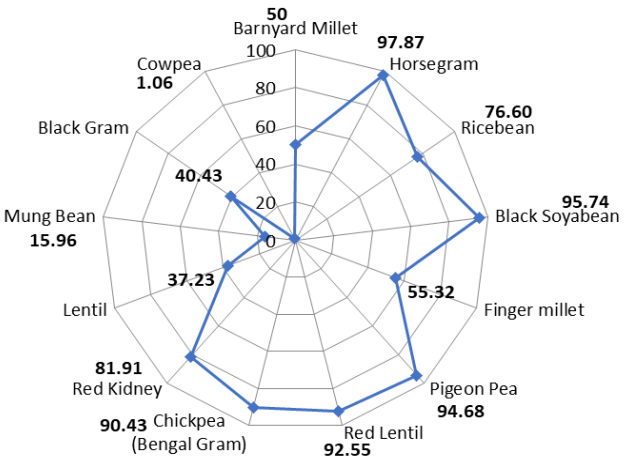


**Figure 4. Food grain preferences (%), except rice and wheat, among marginalized community people of selected villages**

Through FFQ, details of cuisines prepared using these crops were also documented, where it was observed that more recipes are prepared using black soybean than the other locally grown staple foods. Details of all the documented cuisines are shown in Table 3.

**Table 3. Brief description of traditional recipes used by sample households for the most common dry-land crops they grow: Black soyabean, Barnyard Millet, Horsegram, and Ricebean**

| Food crops | Traditional cuisines | Brief food description | Ingredients |
|---|---|---|---|
| **Black Soyabean (*Glycine max*)** | Bhatt ki Chutkani | Greyish black soupy recipe served either with rice or chapattis. | Bhatt (seeds), oil, onion, wheat flour, salt, red chilli pepper, cumin, turmeric, black chilli pepper, coriander powder, water. |
| | Bhatt ke Dubke | Greyish black slurry recipe served with rice | Bhatt (soaked and ground), oil, onion, flour (wheat or rice), salt, red chilli pepper, garlic, turmeric, coriander powder, jambu, gandharein, water. |
| | Bhatt ka Jaula | Mostly served during jaundice, with supplementary salt | Bhatt (soaked and ground) sometimes ground directed without soaking, rice, salt (may or may not), water. |
| | Bhatt ki Chutney | Extra supplementary food item served with chapatti or rice to enhance the taste of food. | Bhatt seeds (roasted), garlic, chilli powder, cumin, clove, salt, water. |
| | Bhatt ki Chains | Soupy recipe served with rice | Bhatt (ground), oil, cumin, onion, garlic, wheat flour, salt, turmeric, coriander powder, red chilli pepper, water |
| **Barnyard Millet (*Echinochlora frumentacea*)** | Jhangora ka Bhaat(rice) | An alternative to rice, used by low-income people. | Jhangora rice (roasted), water |
| | Jhangora ki Kheer | A dessert made with milk, jhangora and dry fruits. | Jhangora (roasted), sugar, ghee, milk, available dry fruits. |
| **Ricebean (*Vigna umbellate*)** | Rains ki Dal | Soupy recipe served with rice or chapatti | Rains (seeds), oil, onion, garlic, tomato, cumin, salt, red chilli pepper, garlic, turmeric, coriander powder, water. |
| | Rains ki Khichadi | Rice kind of food item served with salad, pickle, chutney or curd. | Rains (seeds slightly ground), rice, oil, onion, garlic, tomato, cumin, salt, red chilli pepper, garlic, turmeric, coriander powder, water. |
| **Horsegram (*Macrotyloma uniflorum*)** | Gahat ki Chutkani | Brownish soupy recipe served either with rice | Gahat (seeds), oil, onion, salt, red chilli pepper, cumin, turmeric, black chilli pepper, coriander powder, water. |
| | Gahat ke Dubke | Brownish slurry recipe served with rice. | Gahat (soaked and ground), oil, onion, salt, red chilli pepper, garlic, turmeric, coriander powder, water. |
| | Gahat ki Dal | Soupy recipe served generally during winter season along with rice or chapatti. | Gahat (seeds), oil, onion, garlic, tomato, cumin, salt, red chilli pepper, garlic, turmeric, coriander powder, water. |
| | Gahat ki Badi | Soupy vegetable served with chapatti | Gahat (soaked and ground), guard vegetable, papad leaves, oil, onion, tomato, cumin, potato, salt, red chilli pepper, garlic, turmeric, coriander powder, water. |
| | Gahat ki Bedu Roti | Stuffed chapattis, puris or parathas. | Gahat (Soaked and ground), oil, red chilli powder, salt, wheat flour, water. |
| | Gahat ki Khichadi (Khumdi) | Rice-like, served with salad, pickle, chutney or curd. | Gahat (fried or boiled), rice, oil, onion, garlic, tomato, cumin, salt, red chilli pepper, garlic, turmeric, coriander powder, water. |
| | Gahat ki Chutney | Extra supplementary food item served with chapatti or rice to enhance the taste of food. | Gahat seeds (roasted), garlic, chilli powder, cumin, clove, salt, water. |

Horsegram is mainly consumed in the form of daal and dubke, rice bean for khichdi, black soybean in the form of chudkani and dubke, and barnyard millet as bhaat. Respondents showed more interest toward consumption of horsegram dal and dubke, black soybean dubke and chutkani, and ricebean dal among all the documented traditional cuisines (Figure 5).

Horsegram is believed to have kidney stone-breaking power as believed by local villagers (Bhartiya et al., 2015; Rana & Agnihotri, 2018; Rana et al., 2023a, 2023b), barnyard millet is thought to be beneficial in diabetes (Ugare et al., 2011), whereas rice bean (Bajaj, 2014; Bepary et al., 2017) and black soybean (Patel & Pandya, 2014) are thought to have high nutritional properties. In total, 11 spices were identified which are being used in the preparation of these local recipes. These spices are also thought to be useful from a medicinal point of view (Agnihotri et al., 2020).

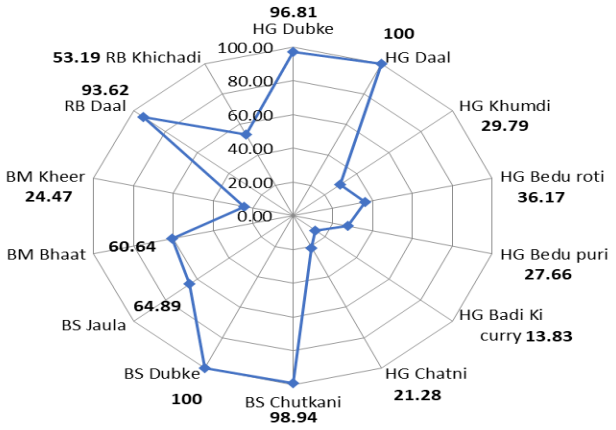


**Figure 5. Commonly consumed traditional recipes prepared using *BM: barnyard millet; BS: black soybean; RB: rice bean; HG: horsegram (Number of households=94)***

These traditional crops are now considered to be a vital food source and now promotional days known as future foods take place annually (Chahota et al., 2020; Adhikari et al., 2019). These crops can significantly contribute to the Sustainable Development Goals of the 2030 Agenda (Loke et al., 2016)) by supporting national food security efforts in dry-land areas.

The household air pollution caused by cooking food in traditional stoves (locally known as chulhas) using wood and other natural fuels is causing harm to the health of the women who cook food in most of the households and also to exposed children (Rohra and Taneja, 2016). Women, in particular, do not generally seek treatment or take time away from work for minor illnesses, which sometimes accumulate, creating serious health issues (Parikh, 2011). Improvement in cooking stoves in India has proven to be a challenging task (Khandelwal et al., 2017). For the betterment of women's health in India, the Government of India had introduced the 'Pradhan Mantri Ujjwala Yojana' (PMUY) as a flagship scheme in the year 2016 with an objective to make clean cooking fuels such as liquid petroleum gas (LPG) available to the rural and deprived households which were otherwise using traditional cooking fuels such as firewood, coal, cow-dung cakes etc. To understand its impact, the documentation of methods used for cooking was investigated in the identified households. It was found that in general cooking is carried out using both the traditional chulhas, and gas stoves. Around 64% of our sample households had a LPG gas facility. This was likely due to the PMUY, as usage of LPG gas stoves (often along with traditional chulhas) increased from 19% to 83% (Agnihotri et al., 2021).

## CONCLUSION

Agriculture, the backbone of the Indian economy, finds an environment in the Indian Himalayan region suitable for cultivating traditional drought-resistant and nutritionally rich crops like horsegram, barley, millet, sorghum, ricebean, buckwheat, and black soybean. Increased production of these crops, particularly by the disadvantaged groups whose practices are documented in this study, could enhance both food security and healthy diets. Encouragement for scheduled community members to pursue agriculture with these crops requires government support. In addition, if these crops were included in the PDS and purchased locally, this could be a source of encouragement and increased income for these groups. Increased demand for these Himalayan crops, along with fair pricing, will also attract local youth to agriculture, addressing ongoing migration and rural decline issues.

## AUTHOR CONTRIBUTIONS

Smita Rana: Data Curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – Original Draft Preparation; Vasudha Agnihotri: Conceptualization, Data Curation, Visualization, Formal Analysis, Funding Acquisition, Project Administration, Resources, Supervision, Validation, Writing – Review & Editing; Sofiya Anjum: Investigation, Methodology

## CONFLICT OF INTEREST

Author declares that there is no conflict of interest.

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