



# Combating malnutrition through nutrition sensitive technological interventions: success case from high hills of Uttarakhand

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## ABSTRACT

Ensuring food security has become a big challenge in hills as farmers are already facing constraints of limited irrigated land, difficult terrains, physical isolation, limited market access and increased frequency of natural disaster. Local nutritional needs can be met out locally by reviving traditional practices along with amalgamation of current science and technology knowledge. Nutrition-sensitive agriculture interventions can be implemented in three broad areas Enhance food productivity to make enough food available and accessible at local level, Enhance food diversity through production of diverse crops, and Making food itself more nutritious. Impact of nutrition sensitive interventions such as enhanced dietary diversity, change in dietary consumption pattern, improved nutrient intake and gender mainstreaming and economic empowerment were recorded through projects interventions.

**Keywords:** food security, nutritional security, impact assessment, hill agriculture

A large population in the hill region of Uttarakhand depends on agriculture but production and productivity of various crops is very low due to rain fed agriculture, undulated terrains, soil erosion, uneven rain, dependence on local varieties and poor technological know-how of the farmers. With this, many farmers in hill region are still practicing traditional subsistence farming which hardly sustain farm families for three to four months in a year. Contribution of agriculture to state economy has declined considerably. As a result, most of the population is migrating to other places in search of livelihood options (Chandra et al., 2018). Many hill districts have 'ghost' villages as migration is very high from these areas (Jain, 2010). Reports of nutritional status of people in Uttarakhand shows that 39 percent women and 34 percent men are nutritionally deficient as per body mass index. Low weight among women in rural areas was more prevalent than their urban counterparts. More than one-fourth (27%) of children under five years age are underweight, an indicator which takes into account both chronic and acute undernutrition (IFPRI, 2016; Jethi et al., 2018). As per National Family Health Survey IV, report (2015-16), 42 percent of women in Uttarakhand have low haemoglobin level causing anaemia including 31 % with mild anaemia (10.0-10.9 g/dl), 10 % with moderate anaemia (7.0-9.9 g/dl) and 1 % with severe anaemia (<7.0 g/dl). Many studies revealed Chronic Energy Deficiency

among women residing in rural areas of Uttarakhand, which is associated with low intake of nutrients in diet. NFHS-4 report shows that in Uttarakhand only 56.3 %, 44.1 % and 17.6 % women were consuming pulses, vegetables and fruits daily, respectively which are good source of micro-nutrients. As food systems has been rapidly transforming, rural population on hills are forced to rely on purchased and processed food. These changes have increased the cases of over-weight, diet related chronic diseases such as diabetes. The survey also reported that under nutrition among women (indicated by Body Mass Index of less than 18.5 kg/m<sup>2</sup>) reduced from 30 to 18 per cent between 2005-06 and 2015-16. However, this period also witnessed a rise in the proportion of overweight or obese women, their share in the population was 20 percent in 2015-16.

Ensuring food security has become a big challenge in hills as farmers are already facing constraints of limited irrigated land, difficult terrains, physical isolation, limited market access and increased frequency of natural disaster.

One of the solutions to this prevailing problem of nutrition transition in Uttarakhand hills can be "Local need meet locally" and 'Atamnirbhar Uttarakhand'. Local nutritional needs can be met out locally by reviving traditional practices along with amalgamation of current science and technology knowledge.



### Nutrition Sensitive Technological Interventions

Nutrition-sensitive agriculture interventions can be implemented in three broad areas:

#### a) Enhance food productivity to make enough food available and accessible at local level

In order to address the issue of low productivity, high yielding varieties of cereals, pulses, millets, vegetables should be introduced in the hill region along with recommended package of practices.

#### b) Enhance food diversity through production of diverse crops

Nutrient rich diverse crops should be promoted through family farming. Nutri-gardens along with homestead food production of mushroom, honey, micro-greens etc. at local levels will ensure food and nutritional security of farm families.

#### c) Making food itself more nutritious

Production and incorporation of fortified crop varieties in diet can improve nutritional status. There are many fortified crop varieties released by ICAR which can be demonstrated and well adapted by farm families in hill regions.

To combat malnutrition in the hill areas the project 'Strategies to Improve Health and Nutritional Status of Hill Farm Women through Technological Intervention' funded by National Mission on Himalayan Studies (NMHS) was laid and villages were adopted to make them self-reliant by eradicating health and nutritional deficiency and providing nutritional technological backstopping for 'nutri-sensitive village'.

### Project Initiatives

Two project sites were selected in high hills of Pithoragarh and Uttarkashi for studying dietary pattern and nutritional status of women. Women were organized in three nutrition focused group mobilizing initiative by formation of groups namely Himalayan Self Help Group, Jogat in Uttarkashi district, Poshan Suraksha Self Help Group, Baitholi and Poshan Vatika Self Help Group, Kande-Kiroli in Pithoragarh district. These groups are formed to enhance feasibility and effectiveness of nutrition focused interventions.

- Concept of nutri-garden was introduced in the adopted villages which involved scientific cultivation of nutritionally rich vegetables in the backyard. There are variety of vegetables that were grown in a plot of 100

m<sup>2</sup> to 200 m<sup>2</sup> in hilly areas. They are important sources of protective nutrients like vitamins, minerals, antioxidants, folic acid and dietary fibres (Shubha et al., 2019). A well-planned layout of nutri-garden for high hills was developed along with its Standard Operating Procedure.



**Fig 1: participatory rural appraisal with women farmers**

- A bee-hive was provided for a plot of 200 m<sup>2</sup> for ensuring adequate pollination in crops besides obtaining honey.
- Women were trained to prepare nurseries with improved quality seeds and improved practices in poly tunnels.
- Vermi-composting was encouraged in nutri-gardens to get organic fruits and vegetables free from chemicals.
- Mushroom production was introduced in the area as a rich source of protein and other nutrients.
- Gender friendly tools were introduced for women for reducing work load during various agricultural activities.





A



B



C



D



E



F

**Fig 2. Field Demonstration of High yielding varieties, crop diversification and Value-addition of Products**  
A, B, Nursery preparation in poly tunnels; C, D, Gender friendly small agricultural tools; E, Vermicomposting, F, Bee Keeping





In order to address the issue of low productivity, high yielding varieties of wheat (VL *Gehun* 829, VL *Gehun* 953), finger millet (VL *Mandua* 352) and lentil (VL *Masoor* 126) were demonstrated in the project area along with the recommended package of practices. There



was 50-60 percent increase in yield of lentil as a result of improved variety and improved method of sowing. Similarly there was 30-32 percent increase in yield as a result of improved variety and improved method of sowing.



**Fig 2: Improved varieties in farmers field**

### Impact of nutrition sensitive interventions

#### a) Enhanced Dietary Diversity

Minimum Dietary Diversity for Women of Reproductive age (MDD-W) was calculated before the implementation of the interventions and after interventions with the same set of respondents. Women had very low dietary diversity score (3.9) with standard deviation of 0.9 as 69.8 per cent were found to be consuming less than five food group in their diet. After the implementation of nutrition sensitive agricultural intervention, MDD-W score reached to 5.5 with standard deviation 0.8. More than 90 per cent of women achieved minimum dietary diversity and they are more likely to have higher (more adequate) micro-nutrient intake.

#### b) Change in Dietary Consumption Pattern

There was an increase in respondents consuming diversified food groups in their daily diet after interventions. Cereals (including millets) were the staple food consumed daily by the women in order to meet daily requirements of calories. Earlier only 50.8 per cent women consumed pulses daily but after the intervention (high yielding varieties of pulse crop, health related awareness programmes) percentage of women consuming pulses daily has increased by 43 per cent. Similarly, percentage of women consuming green leafy vegetables and milk and milk products daily has increased by 15 per cent and 55.2 per cent, respectively. Before the nutritional awareness programme and interventions, roots and tuber consumption were very high among women of hill region,

which has now slightly decreased after interventions as it has been balanced with other micro-nutrient rich food groups. Consumption of mushroom is also introduced in the project area among women, which was earlier unknown food item for them.

#### c) Improved Nutrient Intake

An attempt was made to assess the change in diet and nutrition profiling of women as a result of nutrition sensitive agriculture interventions. Information regarding food intake was obtained from farm women using 24 hours recall method using pre-structured interview schedule. This data was taken before and after nutrition sensitive agriculture interventions in the project area. The goal of nutrition sensitive intervention was to improve dietary intake of nutrients like protein, calcium, iron, zinc, vitamin A, thiamin, riboflavin and niacin through a healthy and balanced diet composed of balanced amount of cereals, pulses, vegetables (roots, GLV and other vegetables rich in micro-nutrients), milk products and fruits in daily diet of women. There was significant improvement in consumption of all nutrients in diet of beneficiaries as a result of technological interventions.

#### d) Gender mainstreaming and economic empowerment

For economic sufficiency, farmwomen were provided with seedlings of vegetables initially. Gradually with the progress of project, nurseries were raised by farm women under low-cost poly-tunnels. More than 8 nutritionally rich vegetables were grown per seasons in nutri-gardens. As a result, women were able to save Rs



1500-3300 per season on buying vegetables and surplus were sold to the market for additional income. Women were also trained in other entrepreneurial activities as bee keeping, microgreen production etc. Capacity development of women were also done for scientific bee-keeping practices and are able to fetch Rs. 700 for 1 kg of honey in local market. Groups of women were also motivated towards production and consumption of micro-green as they are the most affordable source of

micronutrients even for land less poor farm families. Microgreens have potential to overcome mineral malnutrition because of the presence of antioxidant, vitamins, minerals and several other bioactive compounds. They are easy to grow in home as they have potential to provide a range of phytonutrients per gram plant biomass as compared to mature vegetables.



Fig 4: Vegetable production in nutri-gardens



Fig 5: Mushroom production and bee keeping by women farmers

### Conclusion

The results show that dietary diversity was low among women in the hills. Agriculture based nutrition interventions had positive impact on enhancing dietary diversity and food security by increasing round the year availability of diverse food. Homestead food production has the potential to increase micro-nutrient availability and improve the nutritional status of rural women in hills. The issue of increasing malnutrition among people and particularly women is not always due to poor living status or lack of sufficient food, but can be due to a lack of awareness about the right kind of diet required for the

proper growth and functioning of the body. Therefore, creating awareness about nutrition and health is an important task especially in the rural areas of hills. The awareness campaign regarding proper nutrition, nutri-gardening, dietary habits needs to be demonstrated in the rural and remote areas. Local nutritional needs can be met out locally by reviving traditional practices along with amalgamation of science and technology knowledge. The geographical and climatic conditions in the hill region are highly suitable for the production of micro-nutrient rich fruits and vegetables. Micronutrient malnutrition can be overcome by including a variety of fruits and vegetables in the daily food basket. Increasing variability in diet is





one of the important dietary strategies that can help in improving both situations of undernourishment and overweight. Enhancing agriculture production at local level makes more food available and affordable, which improves nutrition, health and economic status of rural households. More emphasis should be given on farming of diverse crops through family farming, nutri-gardens and homestead food production of vegetables, fruits, mushroom, honey, micro-greens etc at local levels. Nutri-gardening along with other nutri-sensitive agriculture interventions are advantageous ways to improve nutrition levels in women with minimum investment. Nutrition interventions focusing on improving dietary diversity and dietary quality should give emphasis in developing region-specific interventions instead of generalized interventions.

## References

- IFPRI (2016). Improving Nutrition in Uttarakhand: Insights from Examining Trends in Outcomes, Determinants and Interventions between 2006 and 2016. *Policy Note*.
- Jain A 2010. Labour migration and remittances in Uttarakhand. Kathmandu: ICIMOD
- Jethi R, Joshi P, Chandra N, Roy ML and Joshi K (2018). Investigation of nutritional and health status of Indian Rural Hill Farm Women. *Journal of Community Mobilization and Sustainable Development* 13(1): 169-176.
- NFHS (2018). National Family Health Survey-4. International Institute for Population Sciences. Ministry of Health and Family Welfare. Government of India.
- Chandra, N., Roy, M. L., Mukherjee, A., Jethi, R., & Joshi, K. (2018). A study of migration pattern in Kumaun Hills and associated socio-economic factors. *Journal of Community Mobilization and Sustainable Development*, 13(1), 107-112.
- Shubha, K., Koley, T.K., Mukherjee, A. and Kumar, U. (2019). Nutri-garden: A promising approach to enhance rural household food and nutritional security. *Food and Scientific Reports*. 1(A) 1-4.