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HOMESTEAD VEGETABLE PRODUCTION FOR ENHANCING DIETARY DIVERSITY AND FOOD SECURITY IN HILL REGION

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ABSTRACT

Hill and mountainous ecosystem are highly fragile due to geological, topographical, climatic and demographic reasons, rugged terrain, less resource, fragmented farm and several other complexity of hill ecosystems. Cereal based cropping system is prevalent in hill regions. The present availability of food especially cereals, may be enough for consumption of all people, but it is not possible for all to consume nutritious diet. Fruits and vegetable availability cannot meet the population needs to achieve dietary recommendations. The strenuous physical activities, limited food intake, imbalanced diet, emphasis on staple crop production create malnutrition especially among children and women who are the backbone of hill farming. Low nutritional status makes women more prone to certain ailments. The strenuous physical task allocated to women combined with limited food intake, exacerbate malnutrition. Majority of rural women in Uttarakhand are suffering from Chronic Energy Deficiencies (CED) and their intake of micronutrients is lower than Recommended Dietary Allowances. Therefore, women require high quality nutrients as their work load and energy expenditure is more.One of the feasible pathways towards the improved nutritional status of hill community with special emphasis on women, is to diversify and intensify production system through a sustainable ecosystem approach. It will improve the food basket qualitatively and quantitatively in hill region. In Hill region of Uttarakhand, climatic conditions are very much favorable for growing many diversified crops round the year. Agriculture related interventions typically aim at improving nutrition by increasing food production and family income. Therefore, a project was designed under National Mission for Himalayan Studies to improve nutritional level of women in high hills of Uttarakhand through nutrition sensitive agriculture interventions. Homestead vegetable cultivation by developing a nutri-garden in the limited available land or roof gardening for family consumption is an affordable nutrition intervention for rural community as well as urban people irrespective of their available land resources and socio-economic status. Homestead vegetable gardening has resulted in enhanced intake of vegetables. Vegetables are the most affordable source of micronutrients especially for small land holders but there is a need in hill region to recognize its both economic and nutritional importance. Focusing on nutrition helps to build the resilience of rural households.

Key words : *Vegetable production, dietary diversity, farm women, food security, nutri-gardens*

Hunger has remained at the top of the global agenda as the world population is continually growing and agriculture research is basically focused on few staple crops such as rice, wheat and maize but now nutritional security of the growing population especially in children has been emerging as a major challenge. This disproportionate investment in research studies neglects the crop such as vegetables, fruits and pulses which are much more efficient to tackle malnourishment. According to the UN report on India, around 47 million or 4 out of 10 children in India are not meeting their full human potential because of chronic under-nutrition. At present emphasis is being given on nutrition improvement initiatives that support scaling up of nutritionally sensitive interventions. Although India is booming, economically, in many parts, nutrition among adolescent girls, women, and children remains a significant development challenge. As per National Family Health Survey 2015-16, 42 percent of women in Uttarakhand have anaemia including 31% with mild anaemia, 10% with moderate anaemia and 1% with severe anaemia. Low nutritional status makes women more prone to certain ailments. Among children between the ages of 6 and 59 months, more than half (55%) are anaemic. Therefore, Women require high-quality nutrients as their work load and energy expenditure is more; however, in some areas of rural Uttarakhand, women typically eat last and least. Some studies showed that majority of rural women in Uttarakhand were suffering from various degree of Chronic Energy Deficiency.

The intervention and innovations in farming system are further influenced by various factors such as available resources, landholding, water availability, topography of the region, infrastructure etc. There is a growing interest towards local food production system to mitigate the problem of nutritional security. Therefore household nutri-gardening is an effective strategy for food security of the household and to improve their nutrition. A nutri-garden is an integrated food production system, produces a range of food including vegetables, fruits and other herbs for home consumption or sale.Nutri-gardens have been associated with improved dietary diversity scores, more consumption of vitamin A rich vegetables and fruits and improved variety of food products. Homestead vegetable consumption improves the nutritional status through changes in food consumption,

maternal and child intake of a range of micronutrients and improved diet diversity of rural poor households. The success of a nutri-garden is affected by various socio economic factors such as age, health, gender, education and source of family income.

Concept of nutri-garden can be introduced in hill areas to encourage women to cultivate healthy food crops in their backyards. A well planned nutri-garden ensures regular supply of fresh vegetables rich in nutrients. The expert committee of Indian Council of Medical Research (ICMR) recommends that every individual should consume at least 300 g vegetables and 100 g fresh fruits/ day. Nutri-garden/home gardens earlier used to be a cornerstone of traditional farming, but over the years, they have slowly begun to loose their importance. But now, their importance is once again being recognised. Home gardens are a part of agriculture and food production system in many developing countries and are widely used as a remedy to alleviate hunger and malnutrition in the face of a global food crisis.

RESEARCH METHODOLOGY

The study was conducted from May 2018 to July 2019 in Pithoragarh, a hill district of Uttarakhand. The project site selected is mainly agriculture based situated at 1787 meter above mean sea level having latitude and longitude 29º 49' 23.18" N, 80º 02' 42.75" E respectively. Families were engaged in subsistence agriculture of cereals and millets. A sample of total 85 farm women was taken for demographic study from the village. Women are selected as the main beneficiaries as women are the backbone of hill farming. Anthropometric measurements of selected women wastaken. On the basis of their anthropometric data and nutritional status, 25 families were selected in the village for developing a nutri-garden for homestead vegetable and fruit production. Different capacity building activities related to vegetable production for their nutritional security were conducted, including training, exposure visit and farmer-scientist interactions. Other nutrition related interventions such as mushroom, honey bee rearing was also demonstrated. Survey was conducted before introducing interventions to find out their dietary diversity. After one year of establishing nutri-garden, a post-survey was done to analyze the impact of homestead vegetable gardening on dietary diversity.

RESULTS AND DISCUSSION

Socio-economic characteristics of hill farm women : Baseline survey was conducted to know the demographic characteristics of farm families. Socio-economic status (SES) is a combined measurement of economic and social position of an individual or a group in relation to others in the society. It has a profound role in determining one's accessibility to the common resources, livelihood pattern, household food & nutritional security etc. Majority of farm women (54.1%), belongs to age group of 26-4 5years followed by35.3% women who belongs toage group of more than 45 years whereas, only 10.6% women were in age group of upto 25 years. The age at the time of first child birth is an important factor for women. Demographic and public health research focus on early age at child birth as the key event in women's lives leading to multiple adverse maternal and child health outcomes**.** The data reveals that 44.7% women's age was up to 20 years at the time of first child birth whereas 2.4% women's age was above 25 years at the time of their first child birth. In the study population 65.8% women belongs to nuclear family and 34.2% belongs to joint family. Main source of income for most of the households are farming (68.3%), jobs along with farming (12.9%) while 8.2% were working as a labourers. The majority of farm women was from Below Poverty Line families (78.8%). It was observed that 64.7% families had landholding less than 0.1 ha whereas only 8.2% families had landholding more than 0.2 ha. It shows that women of project area had very limited land

Table-1: Socio-economic characteristics of hill farm women.

S.No.	Variables	Categories	Frequency
1.	Age	Up to 25 years	10.6
		26-45 years	54.1
		Above 45 years	35.3
2.	Age at the time of first child birth	Up to 20 years	44.7
		20-25 years	52.9
		Above 25 years	2.4
3.	Type of family	Nuclear	65.8
		Joint	34.2
4.	Source of income	Farming only	68.3
		Farming and job	12.9
		Laborer	8.2
		Farming and pensioner	9.4
		Self employed	1.2
5.	Income status	Below Poverty Line	78.8
		Above Poverty Line	21.2
6.	Landholding size	Less than 0.1 hectare	64.7
		0.1-0.2 hectare	27.1
		More than 0.2 hectare	8.2
7.	Educational level	Illiterate	16.5
		Primary level	28.2
		Middle level	29.4
		High school level	7.1
		Intermediate level	14.1
		Graduation level	4.7
8.	Herd size of livestock	No animals	17.6
		1-2 animal	44.7
		3-5 animals	23.6
		More than 5 animals	14.1

resource which restricts food availability for the family round the year. It was also found that majority of the women (29.4%) had acquired middle level education followed by primary level (28.2%). Only 4.7% women were graduate level. Moreover, 16.5 women were illiterate. Livestock is an integral part of rural community. Maximum respondents (44.70%) had one or two animals followed by 23.59%families had 3-5 animals and only 14.11% had more than 5 animals. However, 17.64% respondents had no livestock.

Prevalence of Chronic Energy Deficiency (CED) among farm women by physiological status : Prevalence rate of Chronic Energy Deficiency (CED) is used as a measure of (adult) nutrition and health status for any region. Nutritional status of farm women was assessed using Body Mass Index (BMI). Body Mass Index of the respondents was computed using height and weight values and subjects were classified into various categories of Chronic Energy Deficiency. The nutrition deficiency disease may not essentially be due to lack of single nutrient. It may occur due to lack of more than one nutrient in the diet taken by the people for a specified duration of the year Nutrition deficiency is one of the major problems in the hilly region**.** Figure-1 shows that 25 percent subjects were Chronic Energy Deficient and 10 percent were in the category of Low-Normal. Only 45 percent subjects were in the category of Normal.

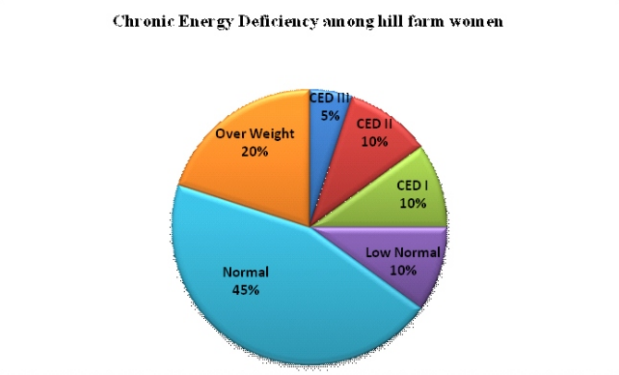

Fig.-1 : Chronic Energy Deficiency among hill fam women.

Homestead vegetable cultivation for food and nutritional security : Small landholdings, low agricultural productivity, poor trade conditions and fewer job opportunities have given rise out migration in the project area.

Climatic conditions in these hill regions are very much favorable for growing many diversified crops round the year. Agriculture related interventions typically aim at improving nutrition by increasing food production and family income. Therefore, a project was designed under National Mission for Himalayan Studies to improve nutritional level of women in high hills of Uttarakhand through nutrition sensitive agriculture interventions.

Vegetable cultivation was not much popular among the farmers of the project sites due to lack of improved seeds, lack of scientific knowledge, wild animal menace, limited landholding etc. farm families were mainly engaged in subsistence farming comprised of cereals, millets, potato and colocasia. Crop productivity was very low. Cereal based diet is the mainstay of food among the rural households. Focus group discussions and personal interviews were conducted to find the prominence of constraints faced by women in agriculture production in hill region. Among many factors, animal menace is the most prominent constraints faced by women in hill region followed by lack of irrigation facilities, unavailability of improved seeds, insect and pest infestation, lack of manpower and lack of market opportunities (Fig.-2).

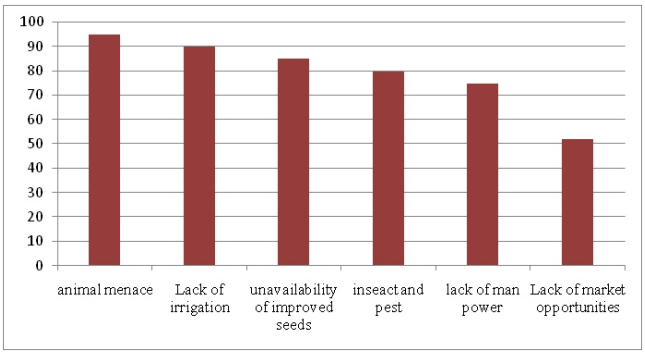

Fig-2 : Constraints faced by women in vegetable production.

In order to enhance food security, 25 nutri-gardens were developed with active participation of farm women. Due to scattered and small size of landholdings in hills, these nutri-gardens were designed for 100 m^2 to 200 m^2 of land in backyard. These were near to the house so that can be managed by family members using locally available low cost inputs. Twenty different types of vegetables including root and tuber crops, leafy vegetables and other vegetables were introduced for round the year cultivation. Women were trained in mushroom production and bee keeping technique and were encouraged to include it in their diet to meet protein requirement. Encouraging results from the project suggested that household production of fruits, vegetables, mushroom and honey by women farmers could be possible in hills throughout the year with some technical assistance and support.

Output from homestead gardening : Well planned and maintained nutri-garden can provide enough nutritious food, including some staple foods for all the family members round the year. It may supply households with nearly all the non-staple foods they need such as fruits, vegetables, legumes, roots and tubers and spices. Sometimes sale from the nutri-garden can make a

Table-2 : Vegetable output from homestead vegetable production.

Vegetables	Average production (kg)	Quantity kept for family use (Kg)	Quantity sold out (Kg)	Income from sale
Cauliflower	40	25	15	225
Cabbage	40	25	15	225
Broccoli	35	20	15	600
Onion	10	10	-	-
Tomato	50	25	25	375
Capsicum	50	20	30	900
French bean	45	25	20	800
Maize	30	30	-	-
Potato	25	25	-	-
Lahi	6	5	1	20
Spinach	5	5	-	-
Garlic	25	25	-	-
Summe squash	25	25	-	-
Radish	30	10	20	200
Pea	40	25	15	375
Amaranth	4	4	-	-
Buckwheat	4	4	-	-
Okra	40	20	20	400
Brinjal	35	20	15	150
Chilli	10	5	5	50

substantial contribution to a family's income. Data shows that farm women were able to sell some vegetables in local market after fulfilling family consumption needs (Table-2). Nutri-gardens are also very much required in places and villages which are isolated and far from the local market. In hills, usually fruits, vegetables and other food stuff are transported from far away therefore it is expensive and mostly stale. These are some of the factors that make it difficult to ensure adequate household food supply.

Several researches indicate that daily or frequent intake of vegetable and fruits is effective to check stomach, oesophagal, pancreatic, bladder and cervical cancers and 20% of most common type of cancer could be prevented by adopting a diet full of fruit and vegetables.

CONCLUSION

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 lack of awareness about the right kind of diet required for the proper growth and functioning of the body. An intervention, however old, can still be the life changing for hill region which is generally experiencing lack of food availability and nutritional security. It is concluded from the present study that homestead vegetable production in nutri-gardens has positive impact in ensuring nutritional security among hill farm women. Micronutrient malnutrition can be overcome by including a variety of fruits and vegetables in daily food basket. Increasing variability in diet and improving fruits and vegetable consumption is one of the few dietary strategies that can help in improving both situations of undernourished and overweight.

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