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3. To facilitate close and reciprocal linkage among the institutions for sustainable rural development.
4. Promoting potential and practicing entrepreneurs.
5. To disseminate the documented knowledge to the global partners through approach abstracting and indexing.

## ABOUT THE JOURNAL

Journal of Community Mobilization and Sustainable Development (print ISSN 2230 – 9047; online ISSN 2231 – 6736) is published by Society for Community Mobilization for Sustainable Development twice a year. The Journal of Community Mobilization and Sustainable Development has NAAS rating 5.30. The Journal of Community Mobilization and Sustainable Development, is also available on our website [www.mobilization.co.in](http://www.mobilization.co.in) and it has been registered with [www.indianjournal.com](http://www.indianjournal.com) for national and global abstracting and indexing. MOBILIZATION envisages reorienting the young professionals and researches for imbibing the values of community participation in research, training and extension efforts.

**The aim and scope of the journal are:**

1. Sharing the relevant experiences and issues related to agriculture and allied fields at the grass root level and global forum to create the necessary academic and development climate.
2. Sensitizing the different stakeholders about the knowledge and innovation management system in pluralistic agri-rural environment.
3. Developing network among the related partners for convergence of their efforts for sustainable academic development of extension education discipline.

# Nutri-gardens: Key to Address Nutritional Needs of Hill Community

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## ABSTRACT

Prevailing malnutrition in rural areas of Uttarakhand and particularly in hill districts is a serious issue. The crop productivity in the hilly areas of Uttarakhand is low due to scattered land holdings, low soil fertility and mostly rainfed agriculture. Farmers are still practicing traditional subsistence farming comprising of mainly cereal crops which cannot sustain farm families for more than three to four months in a year. There is a large-scale migration of men towards plains, due to which the rural areas contain significantly higher female population and has led to demographic imbalance in the region. 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 solutions to this prevailing problem in Uttarakhand hills can be "Local need meet locally". Climatic conditions of hill region are suitable for seasonal and off seasonal vegetable and fruit production which are rich in micronutrients. As landholding size in the region is small and fragmented, establishment of nutri-garden is easy and remunerative way to address prevailing malnutrition among hill community. Local nutritional need of people can be met out locally by reviving traditional practices along with amalgamation of science and technological knowledge. Nutri-garden will have a positive impact on food security in rural areas as consuming such micronutrient rich food and improving dietary diversity will substantially reduce micronutrient deficiencies. Several studies reported that daily and frequent intake of fruits and vegetables is effective to check stomach, oesophageal, pancreatic, bladder and cervical cancers as they are rich sources of micro-nutrients.

**Keywords:** Nutri-garden, Malnutrition, Hill community, Fruits and vegetables

## INTRODUCTION

This paper deals with prevailing malnutrition and nutrition transition in rural areas of Uttarakhand with special emphasis on hill region and ways to address the issue. The Uttarakhand state comprising of the Central Himalayas is spread over 53.48 lakh hectare and inhabits 101.1 lakh population (Census, 2011). Uttarakhand is basically an agricultural state but its share in the country's total area and production is very small. Although 75-85 per cent population is dependent on agriculture but it contributes only 23.4 per cent in state domestic product. Out of the total reported area of 53.48 lakh hectare, only 7.44 lakh hectare (14%) is under cultivation (Uttarakhand at a Glance, 2016). In Uttarakhand more than 70 per cent of regional population lives in rural areas and is solely dependent on this traditional agro-ecosystem even though the availability of arable land is severely limited and the productivity is

considerably poor. The remaining 30 per cent regional population lives in urban areas (Census, 2011).

Crop productivity in the hilly areas of Uttarakhand is getting reduced because of scattered land, low soil fertility and higher incidences of pest and disease occurrences. The persistent changes in weather conditions have resulted in overall decrease in the quantity of water in almost all the water sources of the region. The area under irrigation is gradually decreasing due to drying of many water bodies for irrigation resulting in low productivity of crops. Rising temperature has led to the shift in forest biodiversity. Mountain people have learned to live and survive with hazards for thousands of years, but the present rate of climate change is very rapid and therefore demands attention for the socio-economic concerns in the area. Urbanisation in hill region is because of the rapid growth of road linkages, rural service centres and increased access to market.

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Urban growth and changes in land use pattern has led to depletion and destruction of nature. In hill region farmers are practicing traditional subsistence farming which cannot sustain the farm families for more than three to four months in a year, therefore one or more family members are migrating to outside the state in search of job. Earlier farming communities in hills were mainly dependent on agri-products, horticulture but significant part of their food used to come from wild edible fruits. Due to agricultural policies adopted during green revolution, traditional agriculture with diverse crops and cropping pattern is under threat. These policies very much favoured production of wheat and rice but neglected traditional food crops. In India one of the consequences of the green revolution was that it brought in monocropping leading to a drastic reduction of crop diversity of farm lands. This shift in agriculture focusing on a market-driven economy where cash crops took precedent, had its toll; household needs for a range of cereals, pulses and vegetables are not met from the farm but purchased from the market (Vijayalakshmi and Thooyavathy, 2012).

The dietary and nutrition transition, characterized by improved agricultural practices, food supplies and advances in food processing techniques, while making more food available to people, has also resulted in imbalanced nutrient intakes changing health profiles (Dharmalingam *et al.*, 2009). Despite economic advantages, India is home to the highest number of malnourished children in the world, largest number of stunted children in the world, with a worse child stunting prevalence (Spears, 2013). Prevalence of clinical and sub clinical vitamin A deficiency in India is among the highest in the world. Although India is booming, economically, in many parts, nutrition among adolescent girls, women, and children remains a significant development challenge. Despite impressive gains in child nutrition in recent years as seen in the Rapid Survey on Children from the Ministry of Women and Child Development in India, several states still carry a high burden of undernutrition, with over a third of children stunted, and about half of the adolescent girl population chronically energy deficient. Anaemia has remained high in India for at least three decades. Evidence on what works to improve nutrition points to the role of important drivers, such as improvements in household assets, food security, women's status, sanitation, and provision of health care, in addition to targeted nutrition interventions. Yet, because undernutrition is complex and driven by several determinants at multiple levels, it cannot be attacked with

single-shot interventions (Kimberly Keeton, 2016; IFPRI, 2016). The major cause seems to be under-nutrition; the condition refers to inadequate intake of protein and calories for a long time that also leads to the deficiency of micronutrients such as minerals and vitamins. Body becomes more prone to diseases when adequate amount of nutrient is not provided through diet. The negative effects of malnutrition are compounded by many factors like heavy work demands, poverty, non-fulfillment of special nutritional needs, resulting in increased susceptibility to illness and consequently higher morbidity. In India nearly 70 per cent of women are estimated to be iron deficient (Rammohan *et al.*, 2012). Iron deficiency can exist without anaemia also. Anaemia has been the most common parameter employed to determine iron deficiency. Iron Deficiency Anaemia (IDA) is very late manifestation of iron deficiency because iron deficiency can be very well tolerated. Maternal anaemia during pregnancy increases the risk of prenatal and maternal mortality and contributes to low birth weight. Iodine deficiency during pregnancy can impair motor, physical and mental development of the foetus and increase the risk of miscarriage (Zimmermann, 2009). Anaemia does not develop till storage iron is exhausted (Shah 2004). The NNMB (2006) survey revealed that the intake of dietary iron is grossly inadequate in most of the states, meeting less than 50 per cent of RDA of males (28 mg) or females (30 mg). Micronutrient deficiencies afflict more than two billion individuals, or one in three people, globally (FAO, 2015). Such deficiencies occur when intake and absorption of vitamins and minerals are too low to sustain good health and development.

In hill region contribution of pulses, vegetables and fruits has drastically gone down in present food scenario. Changing food habits particularly after invasion of other crops there has been a sharp fall in health and nutritional status of rural mountain community and particularly women who are backbone of hill agriculture. Women are responsible for almost all the agricultural operations ranging from field preparation, sowing, weeding, harvesting and supporting men in ploughing the fields.

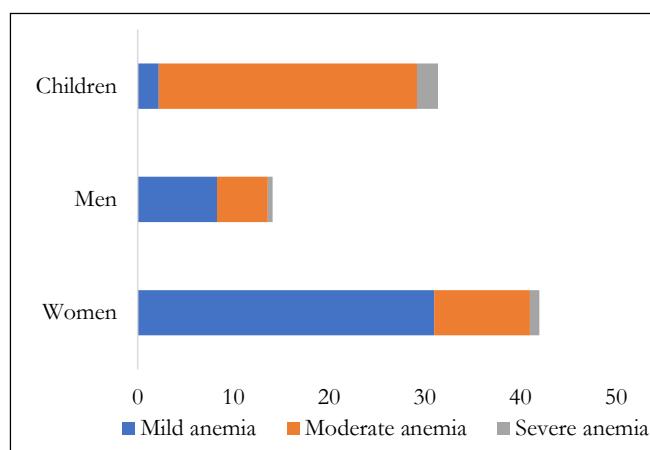
### **Health and nutritional status of hill community**

In Uttarakhand 74.4 per cent population lives in villages and out of this 50.2 per cent are women. Here women are the active workforce in agriculture, due to their increased involvement with agriculture, animal husbandry, fodder and fuel-wood collection and household activities. In the state, 43.75 per cent families are below poverty line

(Uttarakhand at a Glance, 2016). The large scale out-migration of men in search of employment in the plains has led to a demographic imbalance in the region. While men predominate in urban areas, the rural areas contain significantly high female population (Census, 2011; Rawat, 2004). Because of male migration and thus reduced workforce, women who already do a disproportionate share of work are now doing an ever-increasing portion of the work towards agriculture and earning livelihoods. Women spent maximum time in transplanting, transportation of manure, weeding, harvesting and other agricultural practices. Most of the women in hills suffer from lower back pain due to carrying heavy loads over long distances; they also suffer from various skin problems due to long exposure to sun. Due to use of agro-chemicals women are exposed to several health hazards and gynecological infection. In case of rice transplantation, arthritis, intestinal and parasitic infections may take place due to long hours of work in mud and water (Pandey, 2001). Backache and joints pain are common and in extreme cases curved spines and pelvic deformities can result creating complications in child birth. Women are particularly vulnerable to diseases during dry season. During this time the journey times to collect water are the longest, food stocks are lowest, the workload is highest and diseases most common. Women everywhere work for longer hours, the plight of poor rural women in hills is rather worse. It does not matter if the women are old, young or pregnant, crucial household needs have to be met every day. The agricultural and household workload in hill area is nightmarish to them in terms of drudgery involved in these activities. The strenuous physical tasks allocated to women, combined with limited food intake, exacerbate malnutrition. An imbalance diet and inadequate nutrient uptake could result in malnutrition. Malnourished women are prone to infection and the rate of morbidity and mortality also increases.

As per National Family Health Survey 2015-16, 42 per cent of women in Uttarakhand have anaemia including 31 per cent with mild anaemia, 10 per cent with moderate anaemia and 1 per cent 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.

Low health status manifest itself in lower life expectancy, higher rates of morbidity and mortality, lower levels of productivity and a decreased ability to earn and



**Figure 1: Prevalence of anaemia among women, men and children in Uttarakhand, NFHS-4**

support. According to some studies majority of rural women in Uttarakhand works for 16-20 hours per day. Out of average 16 hours, 10 hours are utilised for highly time and energy consuming outdoor works (Pant, 2016). 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 (Pant, 2016; Kukreti *et al.*, 2013). Studies also reported low intake of micro-nutrients by women in hills of Uttarakhand which is lower than Recommended Dietary Allowance (Upadhyay *et al.*, 2011; Jethi *et al.*, 2018). Cereals are the main staple food in women's diet which lack in various minerals and vitamins. Fruits and vegetables are rich source of vitamins, minerals, protein and carbohydrates which are essential in human nutrition. These are referred to as protective food and assume a great importance as nutritional security of the people. It was also reported in NFHS-4 that in Uttarakhand only 56.3, 44.1 and 17.6 per cent women were consuming pulses, vegetables and fruits daily, respectively which are good source of micro-nutrients.

Nutritional transition from traditional and nutritionally rich food habits to the present lifestyle has already resulted in rapid increase in the risks of non-communicable diseases like hypertension, diabetes etc. one of the solutions to this prevailing problem of nutrition transition in Uttarakhand hills can be "Local need meet locally". Local nutritional needs can be met out locally by reviving traditional practices along with amalgamation of science and technology knowledge. A perfect model encompassing health and

**Table 1: Percent distribution of women and men by intake of specific foods in Uttarakhand**

Type of food	Daily		Weekly		Occasionally		Never	
	Women	Men	Women	Men	Women	Men	Women	Men
Milk or curd	49.9	52.2	22.0	35.0	22.5	11.3	5.6	1.4
Pulses or beans	56.3	52.0	36.9	42.1	6.7	5.8	0.2	0.1
Dark green leafy vegetables	44.1	31.2	40.0	59.7	15.6	8.7	0.3	0.3
Fruits	17.6	12.9	32.3	54.3	48.9	32.5	1.2	0.3
Eggs	2.9	2.9	24.6	35.3	46.8	48.3	25.8	13.5
Fish	0.5	1.2	10.9	17.7	48.1	48.3	40.4	32.9
Chicken or meat	0.5	0.8	12.5	23.7	53.6	55.4	33.3	20.1

Source: National Family Health Survey (NFHS-4), 2015-16

nutritional issues, local resources and income prospects will be more suitable for hills of Uttarakhand which can be replicated. High household production and dietary diversity in traditional farming landscape of Uttarakhand hills has the potential of combating malnutrition and food related non-communicable diseases. In hill areas of Uttarakhand, climatic conditions are conducive for production of seasonal and off-seasonal fruits and vegetables. As average landholding is very small and fragmented in Uttarakhand, establishment of nutri-garden in rural areas are easy and remunerative.

### Nutri-gardens to address nutritional needs

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 lose 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 (Johnson *et al.*, 2000). Mitchell and Hanstad (2004) reported that home garden provided multiple social benefits such as enhancing food and nutritional security, empowering women, promoting social justice and equity, and preserving indigenous knowledge and culture and so on. There are variety of vegetables that can be grown in a plot of 100 m<sup>2</sup> to 200 m<sup>2</sup> in hilly areas vegetables are rich source of nutritional bio-active compounds. They are

important sources of protective nutrients like vitamins, minerals, antioxidants, folic acid and dietary fibres. The unique advantages of a nutri-garden are:

- Supply fresh fruits and vegetables high in nutritive value
- Supply fruits and vegetables free from toxic chemicals
- Save expenditure on purchase of vegetables
- Vegetables harvested from home garden taste better than those purchased from market.

Usually a nutri-garden can be established in the backyard of house where there is enough water availability. In hills nutri-gardens should be maintained near house so that it can be protected from animal damage which is havoc in the region. A rectangular garden is preferred to a square plot. Nearly 200 m<sup>2</sup> land is sufficient to provide vegetables through out year for a family consisting of five members. Layout and crop allotment in nutri-garden can be modified depending on climatic and seasonal changes.

- Perennial vegetables should be allotted to one side of the garden so that they may neither shade remaining plot nor they interfere with intercultural operations. Shade loving vegetables may be planted in perennial plots. Compost pits can be provided on the corner of nutri-garden for effective utilisation of kitchen waste.
- After allotting areas for perennial crops, remaining portions can be divided into 6-8 equal plots for growing annual vegetable crops.
- By following scientific practices and crop rotation, two to three annual crops can be raised in the same plot. For effective utilisation of plot accession cropping, inter cropping and mixed cropping can be followed.

- Walking path should be provided at the centre as well as along four sides. Since fresh vegetables from garden are directly utilised for consumption, organic manure should be used which is abundant in villages. However, in order to harvest good crop free from pest and diseases, chemicals can be utilised in limited amount.
- It is important that preference should be given to long duration and steady yielding crop varieties than high yielding ones.
- A bee-hive may be provided for a plot of 200 m<sup>2</sup> for ensuring adequate pollination in crops besides obtaining honey.

A 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 substantial contribution to a family's income. Nutritional well being require regular access to enough nutritious and safe food to meet the dietary needs of family members throughout the year. Poor diet and inadequate food intake are not always the result of lack of food or money to buy food. People must have some basic knowledge of nutrition such as crops to be grown in backyard, kind of food to eat and method of preparing food in the right quantity. 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. Nutri-garden indeed has a positive impact in ensuring the food security among rural populations. It nearly doubled the intake of vegetables and facilitated improved availability and access; which forms two of the most important aspects of the food security concept (Ranawat, 2017).

Various agriculture research institutes has identified and released various target crops as cereals, pulses and vegetable crops that are rich in iron, vitamins and minerals as in rice addition of Fe, Zn, ProA & protein; Wheat (Fe & Zn); maize (Fe, Zn, ProA & protein), Pearl Millet (Fe & Zn), Sorghum (Fe & Zn), Small Millets (Fe & Zn), Vitamin A enriched carrots, spinach, pumpkin, vitamin C enriched bitter gourd, bathua, mustard, tomato, iron and calcium

enriched spinach and bathua, protein enriched beans and garden pea. These staple crops, when consumed regularly, will generate measurable improvements in human health and nutrition. In the long-term, increasing the production of micronutrient-rich foods and improving dietary diversity will substantially reduce micronutrient deficiencies. In the near term, consuming such crops can help address micronutrient deficiencies by increasing the daily adequacy of micronutrient intakes among individuals throughout the lifecycle (Bouis *et al.*, 2011).

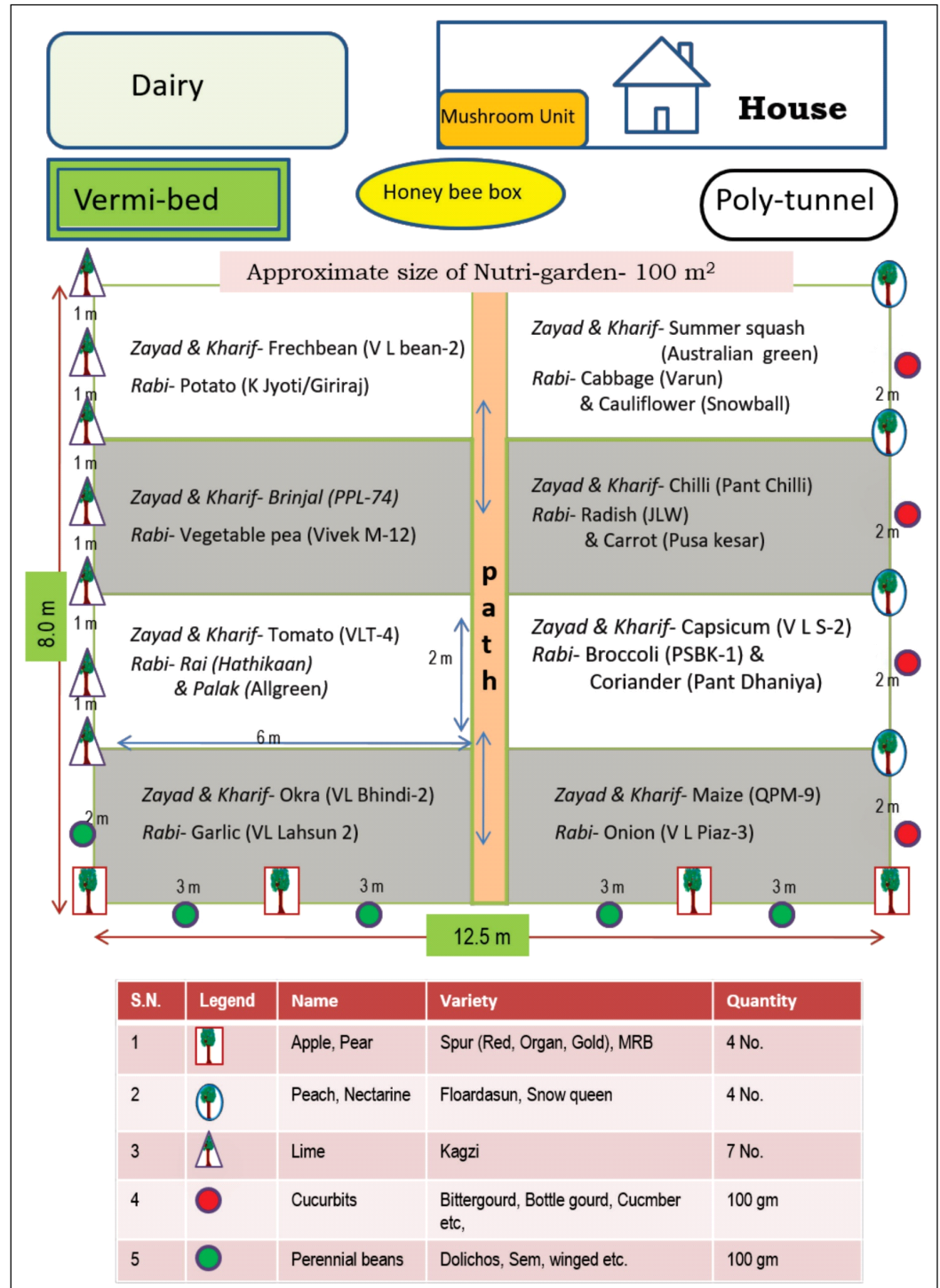
### **Health benefits of fresh vegetables grown in nutri-gardens**

There are different groups of vegetable crops which have some specific type of nutrients factors that can be grown in nutri-gardens. Onion, garlic, shallots are bulb vegetables rich in sulphur containing compounds thiosulphide which have been linked to reducing various chronic diseases (Kubec *et al.*, 2000). Onion is also an excellent source of the growth of beneficial bacteria and promote the absorption of calcium that is useful in the prevention of osteoporosis (Scholz-Ahren *et al.*, 2001). Onion and garlic are excellent source of calcium, manganese and potassium and can also accumulate selenium in the form of selenocysteine and seleno-protein. Vegetables like potato, tomato, brinjal, chilli etc are grouped as solanaceous vegetables. Potato have protein of very high quality as they are rich in essential amino acids such as lysin. Potato also contain moderate amount of vitamin C. Chilli have high levels of vitamins and minerals. Phytochemicals present in chilli can be very helpful in cure of gastric ulcer, toothaches, osteo and rheumatoid arthritis (Noda *et al.*, 2000). Egg plants is effective in the treatment of high blood cholesterol (Brennan *et al.*, 2005).

Cruciferous like broccoli, cabbage, brussels sprouts, radish are rich source of glucosinolates that protects against lung, prostate cancer, breast cancer (McNaughton *et al.*, 2003). When crucifers are chopped, chewed and digested glucosinolates are converted into compounds that acts to prevent normal cells from becoming cancerous cells. Chinopodiaceae vegetables like spinach, *Chenopodium album* have succulent leaves and stem that are used as green vegetables. *Chenopodium album* is rich in most important nutrients like iron, folic acid and fibre. These vegetables also have essential medicinal values as anti-viral, anti-fungal, anti-inflammatory, anti-allergic and anti-septic. Several researches indicate that daily or frequent intake of vegetable



Figure 2: A well planned layout of nutri-garden for higher and mid hills (1200-2000 m AMSL)



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 (Crawford *et al.*, 1994). Fruit and vegetables are dense with several vital nutrients but some components present in them (phytochemicals) are strong antioxidants which are responsible to modifying metabolic activity and detoxification of carcinogens and

even capable to influence the process that may change the abnormality of tumour cell (Wargovich, 2000). Their consumption has been given positive results regarding obesity prevention (Tohill *et al.*, 2004).

Fruits are rich source of micronutrients, which includes vitamins and minerals. It was reported that more fruits and vegetables intake was related to prevention of several non-communicable diseases like, cardiovascular, type-2

**Table 2: Nutritional composition of vegetables appropriate for nutri-gardens**

Vegetables	Protein (g)	CHO (g)	Calcium (g)	Iron (mg)	$\beta$ - Carotene ( $\mu$ g)	Thia- mine (mg)	Niacin (mg)	Ribo- flavin (mg)	Ascorbic acid (mg)
French bean ( <i>Phaseolus vulgaris</i> )	2.12	2.63	49.9	0.98	388	0.05	0.77	0.05	1.38
Brinjal ( <i>Solanum melongena</i> )	1.48	3.52	16.59	0.37	146	0.06	0.53	0.11	2.09
Chilli ( <i>Capsicum frutescens</i> )	2.36	5.86	18.45	1.2	125	0.09	0.89	0.11	94.07
Tomato ( <i>Solanum lycopersicum</i> )	0.76	3.2	8.9	0.22	1513	0.04	0.5	0.02	25.2
Ladyfinger ( <i>Abelmoschus esculentus</i> )	2.08	3.62	86.1	0.84	69.1	0.04	0.6	0.07	22.5
Maize ( <i>Zea mays</i> )	3.57	22.69	6.35	0.71	36.27	1.13	0.7	0.12	4.26
Potato ( <i>Solanum tuberosum</i> )	1.54	14.89	8.53	0.53	–	0.06	1.04	0.01	23.1
Cabbage ( <i>Brassica oleracea var. capitata</i> )	1.36	3.25	51.76	0.35	20.48	0.03	0.24	0.05	33.25
Cauliflower ( <i>Brassica oleracea var. botrytis</i> )	3.9	3.39	96.7	2.42	146	0.05	0.21	0.05	52.8
Vegetable Pea ( <i>Pisum sativum</i> )	7.2	11.8	41.06	0.71	121	0.27	1.28	0.03	38.4
Radish ( <i>Raphanus sativus</i> )	0.7	6.5	30.2	0.36	-	0.02	0.3	0.02	19.9
Carrot ( <i>Daucus carota</i> )	1.04	6.7	41.06	0.71	2706	0.04	0.25	0.03	6.76
Coriander ( <i>Coriandrum sativum</i> )	3.52	1.93	146	5.3	3808	0.09	0.73	0.05	23.87
Mustard leaves ( <i>Brassica juncea</i> )	3.52	2.41	191	2.84	2619	0.08	0.58	0.1	60.3
Garlic ( <i>Allium sativum</i> )	6.75	21.8	17.63	0.88	-	0.2	0.36	0.23	13.57
Spinach ( <i>Spinacia oleracea</i> )	2.14	2.05	82.29	2.95	2605	0.16	0.33	0.1	30.28
Onion ( <i>Allium cepa</i> )	1.5	9.56	19.92	0.53	1.10	0.04	0.34	0.01	6.69
Bitter gourd ( <i>Momordica charantia</i> )	1.6	2.29	17.6	1.28	130	0.06	0.3	0.04	54.3
Bottle gourd ( <i>Lagenaria siceraria</i> )	0.53	1.68	15.4	0.26	44.05	0.03	0.14	0.01	4.33
Cucumber ( <i>Cucumis sativus</i> )	0.83	2.83	16.39	0.46	5.3	0.02	0.35	0.01	6.2
Ridge gourd ( <i>Luffa acutangula</i> )	0.9	1.72	13.7	0.42	38	0.02	0.2	0.01	5.42
Pumpkin ( <i>Cucurbita maxima</i> )	0.8	4.22	24	0.29	363	0.03	0.44	0.02	7.29
Colocasia ( <i>Colocasia antiquorum</i> )	3.3	17.8	30.18	0.66	6.5	0.06	0.51	0.03	1.83
Amaranth ( <i>Amaranthus tricolor</i> )	3.29	2.28	330	4.64	8553	0.01	0.7	0.19	83.5
Agathi ( <i>Sesbania grandiflora</i> )	8.0	5.2	901	4.36	12582	0.26	1.18	0.33	121
Fenugreek ( <i>Trigonella foenum-graceum</i> )	3.68	2.17	274	5.69	9245	0.11	0.7	0.22	58.2

Source: Indian food composition tables, 2017

**Table 3: Nutritional composition of fruits appropriate for nutri-gardens in hills**

Fruits	Protein (g)	CHO (g)	Calcium (g)	Iron (mg)	$\beta$ - Carotene ( $\mu$ g)	Thia- mine (mg)	Niacin (mg)	Ribo- flavin (mg)	Ascorbic acid (mg)
Apple ( <i>Malus domestica</i> )	0.3	13.9	5.39	0.25	2.08	0.01	0.09	0.01	4.0
Grapes ( <i>Vitis vinifera</i> )	0.6	11.8	14.22	0.24	25.46	0.04	0.12	0.03	16.47
Guava ( <i>Psidium guajava</i> )	1.44	5.13	18.52	0.32	298	0.05	0.6	0.04	214
Lemon ( <i>Citrus limon</i> )	0.41	6.9	22.68	0.12	2.62	0.04	0.1	0.01	48.16
Pear ( <i>Pyrus communis</i> )	0.36	8.09	6.55	0.28	13.16	0.02	0.13	0.02	3.31
Plum ( <i>Prunus domestica</i> )	0.64	12.1	7.6	0.25	1.32	0.02	0.44	0.02	2.26
Pomegranate ( <i>Punica granatum</i> )	1.33	11.6	10.65	0.31	2.05	0.06	0.2	0.1	12.69
Orange ( <i>Citrus aurantium</i> )	0.7	7.9	19.52	0.81	31.94	0.07	0.28	0.02	42.72

Source: Indian food composition tables, 2017

diabetes and cancer (Ganry, 2006). Different fruits like mango, papaya, citrus, guava, grapes etc. are rich in vitamin A, B and C. They also loaded with Ca, Mg, Fe and K. Citrus group contains ample quantity of vitamin C (Kazi et al. 2015).

The stone fruits, including peach, apricot, cherry and plum are rich in antioxidants, vitamin A and C. Antioxidant property of plum, prevent damage to our neuron cells. It has anti-cancerous agents and effective in preventing human influenza A (Prajapati et al., 2012). Apricot and peaches are rich in vitamin A and carotenoids-  $\beta$ -carotene,  $\alpha$ -carotene and  $\beta$ -cryptoxanthin (Campbell et al., 2011).  $\beta$ -carotene strengthens immunity system and act against skin problems. Apricots also provide relief in sunburn (Anand, 2009). Apple contains fibres and rich in phytochemicals, they are alkaline in nature and effective in liver cleansing (Tahseen 2015).

### 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. Therefore, creating awareness about the nutrition and health is an important task especially in the rural areas of hills. Awareness campaign regarding the proper nutrition, nutri-gardening, dietary habits, should be demonstrated in the rural and remote areas. Nutri-gardening is one of the advantageous ways to improve nutrition level in women with minimum investment. In these nutri-gardens horticultural crops can be grown which covers a wider range of crops such as fruits, vegetables, root and tuber crops, aromatic and medicinal plants, spices and plantation crops, which enhances diversity in nutrition. The geographical and climatic attributes in the hill region are suitable for production of temperate and subtropical fruit crops like apple, pear, peach, plum, citrus, apricot and walnut. 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. "There is a horticultural remedy for every nutritional malady" says Prof. M.S. Swaminathan, the Father of Green Revolution in India. Thus, through nutri-gardening, fresh and safe to eat vegetables will be available for domestic consumption all

the year round and improved consumption of vegetables will help to address nutrient deficiency disorders like anemia, goiter, night blindness and so on

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