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## Livelihood opportunities through agriculture and allied field in the mid-hills of Uttarakhand

**Kiran Rana, VLV Kameswari, Shweta Chaudhary and Dhirendra Kumar**

### Abstract

Uttarakhand, where the study will be carried out is a state with diverse agro-climatic features. In Uttarakhand more than 75 percent of the population depends on agriculture for their livelihood and farmers mainly practice subsistence farming. Farming in the state is characterized by mixed cropping and a mere merely 10 per cent of the agricultural land in the state has irrigation facility. Another feature typical of hill farming is the small and scattered land holdings. Out of the total cultivated area, about 50 per cent of landholdings (in number) are sub marginal, and 21 per cent of landholdings measure between 0.5–1 hectares. Major crops grown in the Uttarakhand hills are rice, wheat, maize, plum, peach, pear, mango, potato, tomato, green pea, cauliflower, capsicum, etc. Farmers or primary producers in the state face many challenges, of both technical and economic nature. More than 80 per cent of working population of the state is engaged in agriculture whereas only 25 per cent of the total area of Uttarakhand is under agriculture. The biggest challenges to agriculture sector in the state are small and fragmented land holdings and poor irrigation facilities. Difficult terrain, unfavorable climatic conditions for some crops, inadequate availability of inputs and technology has resulted in low agricultural yield when compared to the national average. Vegetable cultivation is one of the important components of agriculture sector of Uttarakhand. It provides the much needed opportunity for diversification in agriculture, especially in view of unusual topography and agro-climatic conditions of the state, where the scope for production of conventional field crops is confined to two plain districts; i.e; Haridwar and U.S. Nagar. Out of thirteen districts of the state, Nainital has been selected for the present study. The district has a highly varied topography i.e. hilly as well as plain areas therefore district has mixed population, and natural conditions and resources are different in all the eight blocks of the district. According to the 2011 census, 61.06 % of the population is in rural areas and the district has a population density of 225 inhabitants per square Kilometer indicating a dispersed habitation. Four villages (Syalikhet, Suryatala, Bhalyuti and Dogara) from Bhimtal block will be selected for the study. The bench mark survey revealed that about 20% of the households belong to Scheduled Caste community and 88% of the household have marginal land holdings. There are no large and medium land holders in the village. All the households in the village have agriculture land but a substantial number also depended on poultry for supplementary income. Overall low productivity, shortage of inputs and lack of marketing have confined production to self-consumption. Agriculture technology mission schemes have been launched in these districts to increase productivity, but their impact has not reached the farms. The present paper aims to discuss the agricultural practices including cropping season, cropping pattern, land use, production of crops and ecological aspect of agricultural system in this Uttarakhand state and suggest some measures for developing farming system, which could lead the sustainability, in terms of meeting the food grain needs of the people on the one hand and restoring the ecological balance on the other. Agriculture production as well as ensuring food security for all is an important challenge for the world community. This study shows a contribution of increased agriculture productivity to achieve food security.

**Keywords:** Livelihood opportunities, agricultural practices, agriculture technology, food security

### Introduction

Uttarakhand, where the study will be carried out is a state with diverse agro-climatic features. In Uttarakhand more than 75 percent of the population depends on agriculture for their livelihood and farmers mainly practice subsistence farming. Farming in the state is characterized by mixed cropping and a mere merely 10 per cent of the agricultural land in the state has irrigation facility. Another feature typical of hill farming is the small and scattered land holdings.

Out of the total cultivated area, about 50 per cent of landholdings (in number) are sub marginal, and 21 per cent of landholdings measure between 0.5–1 hectares. Over 27 per cent of the area under cultivation consists of plots less than 1 hectare in size. Another 26 per cent of land holdings are between 1 and 4 hectares in size, and account for 51 per cent of the total cultivated area. 22 per cent of the cultivated land consists of plots over 4 hectares in size, and these account for 3 per cent of the land holdings in number. The average size of holding in the state is around 0.98 hectare. The average productivity of various crops in the state is also less than the national average. Thus, cultivation of some selected crops like Basmati rice, aromatic and medicinal plants, vegetables, flowers, and milk production is being promoted in a big way. Major crops grown in the Uttarakhand hills are rice, wheat, maize, plum, peach, pear, mango, potato, tomato, green pea, cauliflower, capsicum, etc. Farmers or primary producers in the state face many challenges, of both technical and economic nature.

The economy of Uttarakhand is predominantly agrarian. More than 80 per cent of working population of the state is engaged in agriculture whereas only 25 per cent of the total area of Uttarakhand is under agriculture. The state contributes around 0.8% to the total food grain production of India. The biggest challenges to agriculture sector in the state are small and fragmented land holdings and poor irrigation facilities. Difficult terrain, unfavorable climatic conditions for some crops, inadequate availability of inputs and technology has resulted in low agricultural yield when compared to the national average. Vegetable cultivation is one of the important components of agriculture sector of Uttarakhand. It provides the much needed opportunity for diversification in agriculture, especially in view of unusual topography and agro-climatic conditions of the state, where the scope for production of conventional field crops is confined to two plain districts; i.e; Haridwar and U.S. Nagar. The cultivation of vegetables in the state is mainly concentrated in Dehradun, Nainital and Tehri Garhwal districts. Together, these districts contribute up to around 40 % of total area under vegetables in the state. Uttarakhand stands out as one of the few states in India where an overwhelming number of women have always been a part of active agricultural workforce, especially in the hilly region of the state. This is due to their total involvement in agriculture, forest production, cattle care and dairying and in more recent times due to migration of male members of the household.

### District

Out of thirteen districts of the state, Nainital has been selected for the present study. The district has a highly varied topography i.e. hilly as well as plain areas therefore district has mixed population, and natural conditions and resources are different in all the eight blocks of the district. According to the 2011 census, 61.06 % of the population is in rural areas and the district has a population density of 225 inhabitants per square Kilometer indicating a dispersed habitation. Four villages (Syalikhet, Suryatala, Bhalyuti and Dogara) from Bhimtal block will be selected.

### Villages

Village Syalikhet has 53 households and total agricultural land in the village 49 acres (980 nali). The bench mark survey revealed that about 20% of the households belong to Scheduled Caste community and 88% of the household have

marginal land holdings. There are no large and medium land holders in the village. All the households in the village have agriculture land but a substantial number also depended on poultry for supplementary income. Haldwani is the nearest whole sale market for villagers of Syalikhet. Agriculture retail market is located in *Jeolikot* which is 3 km away and other agencies like Agriculture Co-operative Society, IFFCO, *KRIBHCO*, etc. are also located at *Jeolikot*. The main source of irrigation is nearby canal and there is scarcity of water for irrigation during April to June. The villagers grow two crops in a year and no summer crop is grown due to non availability of water. Wheat, paddy, urd, maize are the major crops grains cultivated by the villagers. Fodder crops include jowar and barseem. The villagers reported that pest infestation, plant diseases, *poor market access are the major problem face by the villagers*. Wide price fluctuation, *lack of storage facilities and existence of market cartels* are the other major constrain to agriculture. Lack of fodder (green & dry) and low market price were listed as constraints for dairying.

Village Dogara has 176 households and total agriculture land in the village is 197 acres (3940 nali). The bench mark survey revealed that 95% of the household have marginal holdings, two households have small size land holdings and three household have medium size land holdings. Villagers are dependent on agriculture and livestock for livelihood. All households have cultivable land and water for irrigation comes from a nearby canal. However, there is shortage of water for irrigation during January to May months. Major Kharif season crops is rice and maize and the villagers cultivate wheat during rabi season. Fodder crops cultivated by the villagers include barseem and maize. Wheat straw, dry *maize* and sorghum stalks usually form the bulk of feed in dairy farms. A large number of villagers are engaged in vegetables cultivation especially okara, brinjal, chilli, French beans, tomato, radish, green leafy *vegetables* and cabbage. The villages have very poor access to credit and other financial services. Despite scarcity of water for irrigation none of the village use drip irrigation or water harvesting structure. Poor market prices, lack of access to the credit, pest and plant disease, poor soil quality were listed as main constraints to agriculture. In case of dairy, low price of milk, lack of veterinary services and scarcity of fodder are reported as main constraints.

Village Suryatala has 204 *households* and total agriculture land in the village is 210 acres (4200 nali). The *benchmark* survey revealed that 85% of the household have marginal land holdings, 15 % are large and medium land holders in the village. All the households in the village have agriculture land but a substantial number also depended on dairy for supplementary income. Haldwani, home to one of the largest vegetable, fruit and food grain markets in Kumaon, is an important commercial hub for villagers of Suryatala. The villages grow horticultural crops such as tomato, strawberry, mango, radish, potato, pear, banana papaya and *Tejpata*. The village has one women's dairy. The villagers reported that wide *price fluctuation, lack of storage facilities* as the major constrain to agriculture. Lack of fodder (green & dry) and low market price were listed as constraints for dairying.

Village Bhalyuti has 96 households and total agriculture land in the village is 105 acres (2500 nali). The bench mark survey revealed that 80 % of the household have marginal holdings, 15% households have small size land holding and 5% households have medium size land holding. Villagers are dependent on agriculture and dairy for livelihood. All

households have cultivable land. However, there is shortage of irrigation facilities for agriculture. *K.V.K. Jeolikot* provides extension support to the farmers in the village. Village Bulyti does not have wholesale market, agriculture retail mart and seed store facility. The village also does not have access to the market. Many villagers are engaged in vegetables cultivation especially tomato, radish, green leafy *vegetables*, okara, brinjal, chilli, French beans and cabbage. Fodder crops cultivated by the villagers include barseem and maize. Wheat straw and dry *maize* and sorghum stalks usually form the bulk of feed in dairy farms. Some households use bio gas for cooking and also have solar power units. Water for irrigation comes from a nearby canal. The villages have very poor access to financial services, lack of access to the credit, pest and plant disease, poor market prices, poor soil quality were listed as main constraints to agriculture. In case of dairy, low price of milk, lack of veterinary services and scarcity of fodder are reported as main constraints.

### Rationale

Uttarakhand is primarily an agricultural state although its share in the country's total area and production is very small. The contribution of agriculture to the state's domestic product is about 22.4 per cent and 75-85 per cent of the population dependent on agriculture for their livelihood. is about 75-85 per cent respectively. This highlights the need for separate approaches for agricultural development in the hilly region of the state. The land use pattern of crops in Uttarakhand reflects a declining trend in the acreage of conventional crops like barley and increase in non conventional crops like vegetables. In all the hill districts of the state, farming and crop husbandry are the main economic activities. These districts also engage in dairy and poultry farming to diversify their source of earnings. The expansion of agriculture is limited due to limited irrigation facilities. Overall low productivity, shortage of inputs and lack of marketing have confined production to self-consumption. Agriculture technology mission schemes have been launched in these districts to increase productivity, but their impact has not reached the farms.

The hills consist of ridges and valleys that make agriculture difficult. Despite of presence of many rivers, the area under assured irrigation in the study area is almost negligible. Lack of water for irrigation coupled with poor soil health and soil erosion caused by heavy rainfall and landslides lead to overall low productivity. The hills in Uttarakhand predominantly feature small and marginal landholdings with majority of proportion being covered by horticultural crops such as vegetables, flowers, fruits and aromatic plants. These crops are perishable in nature and require immediate processing. As there is acute shortage of infrastructure like storage structures, post-harvest processing units, etc. the farmers derive very little profit from these high value crops. Also there is shortage of bio fertilizers, bio-pesticides quality seeds, fertilizers, plantation materials, veterinary services, poultry hatchery units, animal feed units, and power supply. Hence, there is a need for timely supply of seeds/ plantation material, improved marketing, cold storage and transportation facilities.

The lack of market is another major constraint faced by the hill farmers. Innovative institutional arrangements for marketing of fruits and vegetables need to be developed. While both men and women are involved in agriculture, it has been observed that the proportion of women in vegetable cultivation and dairying is comparatively higher than in cultivation of other crops and they spend more time than men

in planting, harvesting, weeding, hoeing, transplanting and tending to animals. On the other hand, men are more engaged in irrigation, harvesting, packing and marketing which have now increasingly become the domain of women due to male migration in the hills. In effect, the burden of running the household is frequently being placed on the shoulders of women, who have to look for options to increase the income from limited land resource. The rural economy of the hill region of Uttarakhand is under increasing strain. Natural resources are becoming stressed with declining soil fertility and pressure on farm labour resources. These two are linked as out-migration of men has left women to do most farm-work, and there is not enough labour to maintain terraces and irrigation systems, and to look after the livestock needed to produce manure to make soil fertile, as well as to apply this manure and carry out other cultivation work. This has led to decline in yields and large areas of land being abandoned. Therefore, there is need to stop the deterioration of the productive infrastructure, make farm labour more productive and farming more remunerative.

### Objectives

1. To increase the adoption of improved varieties of vegetables by farmers in the study area.
2. To impart primary processing skills to farmers and facilitate marketing of vegetables and fruits through formation of Farmers' Interest Groups.

### Methodologies

In this study, an interview schedule, having statements, regarding different constraints normally faced by the farmer were asked on different aspect of vegetable cultivation practice. The responses observed from the different farmers were divided into two categories i.e. yes and no. the statement having „No“ responses were given zero mark and the statement having “Yes” were given one mark. To examine the changes in spatial land use patterns figures for various years have been gathered and computed from statistical diaries. Agroecoanalysis, background information through interview schedule. Demonstrations will be set up in the Farmers fields and farmer-to-farmer interactions will be arranged to encourage adoption.

### Review of Literature

The Indian agriculture is diversifying towards production of high value commodities along with increasing role of small farmers (Surabhi Mittal, 2009) <sup>[16]</sup>. The horticultural crops constituting fruits, nuts, and vegetables including potato, tuber and mushroom, ornamental plants including cut flowers, spices, and plantation crops have become a key driver for economic development in many states of the country and contribute significantly to the GDP of agriculture. The targeted growth rate for horticultural sector during the Five Year Plan was envisaged 7-8 per cent. With fruit production at 47.5 million tonnes in 2003-04, India accounted for about 10 per cent of the global production of fruits from an area of 4.0 million hectares. With 90 million tonnes of vegetables production in 2003-04, India ranked as the highest producer of vegetables. In the world, 4 India occupied first position in the production of cauliflower, second in onion and third in cabbage. (Ramesh Chand *et al.* 2008) <sup>[3]</sup>. During the past two decades, area, production, productivity, availability and exports of horticultural crops have increased manifolds, which provided ample opportunities for utilization of wasteland,

employment generation and effective land use planning. Diversification through horticultural crops has been recognized as one of the options for improving land use planning. Results of the paper by (Ramesh Chand et.al, 2008) [3]. Nowadays vegetable cultivation is highly commercialized, but there is still a wide gap between production realized and potential production. So, efforts have to be made by researchers, extension workers and policy makers to bridge this gap (George and Singh, 2006) [6]. By adopting improved techniques and high yielding varieties, production and productivity can be increased (Sahu *et al.*, 2009) [18].

### Result and Discussion

The present investigation was categorized into four major constraints, faced by farmer in this mid hill region of Uttarakhand area. The major constraints faced by farmer, in vegetable cultivation are as follows: 1. Resource constraints, 2. technical constraints, 3. Storage and management constraints and 4. Marketing constraints.

Resource constraints in improved vegetable cultivation practices The major constraints, in this area is no availability of resources, major constraints faced by the farmers in this area is availability of seed of improved varieties (87.77%) is the first resource constraints. The second (75%) and third constraints (75%) are the non-availability of pest resistant varieties, as well as high cost of seeds. Farmers are also unaware of seed treatment and its effect on crop yield, beside it high cost of fertilizer is one of the major constraint in applying sufficient doses of fertilizer, (75.50%), which ultimately hampering the production, other factors which re preventing the farmer in adoption of recommended vegetable cultivation practices are, non-availability of fertilizer labour availability in peak season (50%) as well as scattered and small holding (60%). The similar result was also reported by Mandeep Sharma (2014) [19] that high cost of chemicals for seed treatment, is a major constraints for non-adaptation of modern cultivation practices. Three fourth of respondents (74.50%) were unaware regarding importance of fertilizer, to the crop, farmers were not applying proper dose of fertilizer, second most important constraints were the lack of knowledge, on proper method of fertigation (60%) third most important constraints faced by the farmers, are knowledge of improved varieties (70%), as we know, most of the improved varieties are fertilizer responsive, improver fertigation leads to less yield, other major technological constraints faced by the farmers are lack of availability of publication of modern technique of vegetable farming (70%), lack of farmers training on modern vegetable production technique (60%), lack of soil testing facility are the other constraints faced by the farmers in field. These findings were partially supported by Meena (2003) [15] and Rai *et al.*, (2010) [17]. Plant management parts are non-availability of skilled labour (77%) during peak season. High cost of weedicides (59%), high cost of insecticide/fungicide, improper knowledge on proper dose of weedicide/ insecticide/fungicide (65%). These are in accordance with findings of Dhillon and Kumar (2004) [4]. The data further reveals that unavailability of chemicals (weedicide/ fungicide/ pesticide). Technical knowledge on weed application (50%), knowledge on weedicide, lack of technical knowledge, non-availability of proper spraying instruments, are the major constraints in adoption of improved cultivation practices of vegetables. Marketing system plays a crucial role in agricultural sector as efficient functioning of agricultural markets is supposed to add to the welfare of

producers as well as consumers. An efficient agricultural marketing system helps in the optimization of resource use, output management, increase in farm incomes, widening of markets, growth of agro-based industry, addition to national income through value addition, and employment creation (Garg, 2010) [5]. The issues and concerns in marketing mainly relate to the performance (efficiency) of the marketing system, which depends on the structure and conduct of the market (Acharya, 2006) [1]. Agricultural marketing system in the country presently is marked by fragmented supply chain, dominated by multiple market players which results into high wastages thus, adversely affecting efficient marketing (GOI, 2013) [11]. This requirement becomes much more intense in difficult terrains and remote areas. Larger part of Uttarakhand is characterized by a difficult terrain, undulating topography, remote and inaccessible villages, sparse population, tiny land holdings, agriculture based economy and weak infrastructure; the topographical, infrastructural and environmental constraints do not allow proper utilization of resources available in the inner parts of this fragile region (Tuteja, 2013). Development of the hills is primarily linked to the development of agriculture and its allied activities as the mountainous region of the country has tremendous potential for cultivation of many high value added and rare commodities. Uttarakhand is such state with dominance of agriculture and dependence of about 70per cent of the population on agriculture. The average land holding is around 0.68 ha. The consumption of large marketable surplus available with farmers is outside the state and it further adds to the losses due to lack of proper infrastructure in form of cool chains, pack houses, mechanized grading and packing machinery, efficient transportation/connectivity, markets, etc. (Tuteja 2013). Exploitation by commission agent (50%), poor transport facility (55%), non-standard weighing procedures (55%), poor condition of road (57%), high cost of transportation (50%), poor shelf life (50%) and sprouts in vegetables, are the constraints which discourage farmers in adopting modern vegetable cultivation practices.

Marketing of agricultural produce in Uttarakhand is still in a emerging stage as most of the districts in hills still lack a functional regulated marketing system that adds to the backwardness of a potentially lucrative state in terms of horticulture and grain production. All these facts accentuate the need for detailed study on the state of marketing system and practices existing across various markets of the state. The aggregate level evidences have also been validated with the field level realities at farmers' fields. The markets in the state are dominated by the existence of wholesaler-cum-commission agents, the highest number of such functionaries was observed in Haldwani and lowest in Tanakpur. Haldwani market has the highest number of functionaries and covers about 20% of total functionaries as the market has highest number of wholesaler-cum-commission agents. But, no commission agents and transporters were found in Haldwani market. Further, we could not get the information on number of functionaries in Dehradun market. However, Haridwar market is relatively better off with 15% of total functionaries and stands at the second position in the state, followed by Rudrapur. Simply, the number of market functionaries in the markets does not provide a clear idea about their functioning. It is important that how much quantity is handled by each trader in a year. A significant deviation is observed across the markets in terms of quantity handled. It can be observed that arrival of green-pea, tomato and paddy are largely

concentrated during October to March, while potato is received throughout as markets are fed from plain areas as well as cold storages. On an average, a trader in Haldwani handles as low as 8 quintals of potato in April to as high as 32 quintals in January. The quantity of tomato dealt is much higher in Haldwani as compared to potato. Around 51 % farmers reported distress sale as a marketing constraint, which is quite obvious as there is lack of scientific storage and most of the horticultural commodities are perishable in nature. About 44% farmers reported lack of transportation facilities; as Uttarakhand is basically a hilly state and most of the produce from hills comes to the plain region of the state for disposal, it becomes important to provide specialized and improved transportation facilities for quality maintenance and timely delivery. Extension worker should conduct demonstration in farmers' field, Kisanmela should be organized at the site of demonstration. Financial assistance and subsidy should be provided timely to the farmer

### Conclusion

Vegetable farming assumes a special importance in the hills of Uttarakhand, on both ecological and socio-ecological ground while the condition of women in the plains have been examined by the scholar, the hilly remote areas have not received the same attention. Knowledge about latest technological changes, Know How and education level of the person are significant factors that affect business. In India, around 34.55% of women are still illiterate. Due to the lack of education, women do not have business, technology and market knowledge. Also, lack of education causes low achievement motivation among women. Entrepreneurs need different kinds of information to succeed in their ventures, especially information on market, industry and competitors. The ability to access and utilize information is critical for all entrepreneurs in order to operate in an increasingly competitive and challenging business environment. The farmers' perception reveals that the farmers were satisfied with the boarding/lodging, weigh ment, grading, cleanliness, information sharing etc. Moreover, the validation of infrastructure availability at farmers' fields reveals that most of the farmers had proper connectivity in terms of pukka road that plays a major role in movement of produce. It may be inferred that the hilly regions of the state require special attention on the marketing interventions and infrastructure due to difficult terrains and limited capacity of the growers resulting from lower size of holding and lack of resources. Stringent measures should be taken against commission agents who are exploiting farmers. Strengthening of storage infrastructures and make them available to the farmer at cheaper rate. This study reveals that non-availability of improved variety, disease free seeds, high cost of chemicals (weedicide/ fungicide/ pesticide), timely availability of chemicals, lack of knowledge on seed treatment, lack of Skilled labour, technical knowledge gap, financial problem, poor shelf life of vegetables, inappropriate equipment's, poor storage facility, poor market infrastructure, less support price and price fluctuation were the main constraints faced by the vegetable grower in the adoption of recommended vegetable cultivation practices by the vegetable growers, therefore, training as well as extension programme should be well planned before cropping season. Planners should give importance to major constraints like technical literacy, infrastructure development and strengthening storage and marketing facility.

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