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Natural Resource Management and Food Security in the Alaknanda Basin of Garhwal Himalaya

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Introduction

Natural resource management and food security is the prime concern in the whole world particularly in the wake of globalization, high growth of population and changing livelihood options. This remains greater in the third world countries where livelihood is depended on the subsistence agriculture. The Alaknanda Basin of Garhwal Himalaya is very rich in terms of presence of natural resources i.e., flora, fauna, water and rich agro-ecological conditions are also available for cultivation of various kinds of crops, subsistence as well as cash generating. Water resource has abundance as the major rivers origin and flow from the region. These abundant natural resources and suitable agro-ecological conditions are fully unutilized and thus the issues of food security are getting attention in the whole basin. This resulted in food insecurity and malnutrition, which is common and growing phenomenon. Lacking in infrastructural facilities further accelerate this problem. The economy of the region is largely depended on subsistence agriculture and on remittances. Meanwhile, the optimum utilization of these abundant natural resources can enhance livelihood and the people of the basin can attend food security. This paper aims to discuss on the management of natural resources and food security in the Alaknanda Basin of Garhwal Himalaya and to give suggestion for optimum utilization of natural resources for attending food security.

Study Area

The Alaknanda Basin is extended between 30^o 0' N - 31^o 0' N and 78^o 45' E - 80^o 0' E, covering an area about 10882 Km^2, represents the eastern part of the Garhwal Himalaya. Out of the total area of the basin, 433 km^2 is under glacier landscape and rest of 288 km^2 under fluvial landscape. The total number of villages is approximately 2310. The land under agriculture is 644.22 km^2, which is 5.9 percent of the total geographical area while only 64.8 km^2 (0.6%) land is under the horticultural crops. Forest covers about 65% land. The basin comprises eighteen development blocks of Bageshwar, Chamoli, Rudraprayag, Tehri and Pauri Districts. It is characterized by difficult terrain, wide variation in slopes and altitude (650 m to above 5000 m), high rainfall and high humidity, low solar radiation and extreme low (highly elevated regions) to very high temperatures (valley regions during the summer). Thus, the climate ranges from sub tropical to alpine. This study is mainly based upon the collection of primary and secondary data on natural resources conditions and food security in the Alaknanda Basin.

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Results and Discussion

Natural Resource Conditions

The Alaknanda Basin obtains a high degree of availability of natural resources in the forms of water, soil, flora, fauna and climate and consequently is rich in biodiversity and agro-climatic conditions. These natural resources have not been utilized optimally due the rough and rugged terrain, inaccessibility and harsh climatic conditions. The main natural resources discussed here are soil, water, forest and agriculture.

Soil contains and texture varies from the Greater Himalaya to the mid-slopes and valley regions and their potentials of growing crops varied accordingly. Soils of greater Himalaya consists of very steep to steep slopes, are dominantly occupied with very shallow to moderate shallow, excessively drained, sandy-skeletal and loamy skeletal, neutral to slightly acidic with low available water capacity soils without profile development in association with rock outcrops. In Lesser Himalaya, soil consists on steep to moderately steep slopes is shallow to moderately shallow, excessively drained, sandy/loamy-skeletal/loamy with moderate erosion and moderate to strong stoniness. In the side slopes or terrace slopes, soils are moderately deep to deep, excessive drained, fine loamy slightly too moderately acidic with slight to moderate erosion and stoniness. Soils in glacio-fluvial valley consist of moderately shallow excessive drained, coarse loamy, slightly acidic and moderately stony. Fluvial valley's soils are deep well-drained, moderately acidic, slightly eroded Typic Dystrochrepts.

Water is the most underutilized, at the same time most abundant resource of Himalaya. It is estimated that about 11, 00,000 million cubic meter water flows every year down the Himalaya offering a potentiality of generating electricity to the tune of 28,000 MW and making as much as 247,000 million cubic meters water available for irrigation in the Indo-gangetic plains (Valdiya, 1985). Per capita fresh water availability in the Himalayan Region is evaluated to range from 1757 m^3/yr in Indus, 1473m^3/yr in Ganges, 18417 m^3/ yr in Brahmaputra with an all India average of 2214m^3/yr. The Alaknanda Basin is endowed with bounty of water resource accounting for about 8% of the total water resources in the country. Unfortunately, this vast potential has not been rationally utilized yet. Endowed with huge water resources potential, it has also the worst water resource problems rendering untold sufferings to millions every year. The region experiences excessive rainfall and high floods during monsoon months and suffers from acute shortage of drinking water in many areas due to lack of management. The Alaknanda River and its numerous tributaries; Dauli Ganga, Vishnu Ganga, Nandakini, Pindar and Mandakini, which are perennial and glacial fed, presents huge water resource reservoir. In many areas, the tributaries and sub-tributaries provide ideal sites for construction of micro-hydropower projects. Since the area of unlimited water resources facing acute water shortage for drinking and irrigation purposes, sustainable utilization of water through construction of micro-hydropower projects will surely solve the problems. The basic issue underlying the water resources problems are: recurring floods, drainage congestion, soil erosion, human influence on environment and so on and calls for its integrated use for drinking, irrigation, generation of hydropower and recreation.

Forests are most important, both economically and environmentally among the other natural resources in the Alaknanda Basin. The geographical area covered by forest is reported to be 1021156 hectares, which accounts for around 42.2 per cent. Ownership of the forest in the state is mainly shared between the forest department (69.1) and Civil and Soyam (community forest (23.4). Forest Panchayats (6.9) and private forests manage the remaining area. The alpine, temperate and sub-temperate forests that cover most parts of the basin make natural habitats of some of the best-known wildlife creatures. Alpine forests in the region include Valley of Flowers National Park (known for its amazing variety of flowers), Nanda Devi National Park, Govind Ghat National Park and Gangotri National Park. Altitude regulates diversity in flora in the Alaknanda Basin. According to the altitudinal zonation, various kinds of flora with great

economic value are found. Most of the forests belts in the basin are inaccessible. Consequently, their economic use is just negligible.

Agriculture is the main occupation of the inhabitants of the Alaknanda Basin and it is the main source of livelihood of the majority of people as about 80% population is engaged in the production of cereal crops and livestock rearing. Along with subsistence cereal farming, rearing of animal has an equal proportion in the economy and income of the farmers. Horticultural practices are also carried out but its proportion in terms of land cover, production and productivity is just negligible. The farming system in the basin is peculiar, which is based upon the centuries old practices and carried out mainly on the narrow patches of the terraced fields. The main crops grown are paddy, wheat, barley, millets, pulses and oilseeds. The economic viability of these crops is insufficient even to meet the food requirement of the populace but these crops are environmentally sound and suitable for this ecologically fragile terrain. The scope for further expansion and modernization of agriculture farming is not viable due to the fragility of terrain and precipitous slope. Therefore, an exodus of population emigrated to the foothills of the Himalaya for the search of job or recruited in national Army. Enhancing and diversifying the livelihood options, other than biomass based production, will definitely raise the income and food-security of the rural mountain people. This study reveals that the scope of cultivation of off-season vegetables, fruits, medicinal plants and collection of non-timber forest products are feasible. It suggests that the optimum harnessing of these products will surely provide a base for sustainable livelihood in the region.

In the Alaknanda Basin, snow-clad mountain peaks, rocky and precipitous surface, and barren land (21.3%) cover largest percentage of geographical area, which is no more useful for cultivation and other development activities. Land use pattern varies from one place to another depending upon altitude, aspects of slope and slope gradient. In the highlands, the area under net sown and gross sown is considerable low as Joshimath block has 1.0% net sown and 1.3% gross sown areas. Contrary, in the lowlands, sown area is considerably high as Karanprayag block has 18.4% net sown and 29.0% gross sown areas.

Food security

The carrying capacity of the Alaknanda Basin is decreasing day by day due to the heavy pressure of population. A majority of the rural people does not get sufficient nutrition in their diet; consequently, they suffer from nutrition deficiency related diseases (Pant 1996). Natural resources as a form of minerals and petroleum products are lagged behind in the region. Therefore, the area is industrially backward. Furthermore, whatever the minerals are found they are not properly mined because the fragility of terrain does not permit to do so. Heavy investment and lack of technological development on the other hand, are making slow the process of utilization of these resources. However, the availability of forests resources, agricultural crops, extensive grasslands, varieties of herbs, flowers, fruits, vegetables, water, rearing of animals, goats and sheep is high. The feasible climatic conditions will boost up the suitability for growing horticultural crops, on the one hand and on the other, they play a vital role for sustainability of the populace. Cultivation of fruits, herbs, flowers, off-season vegetables, tealeaves and rearing of high yield variety (HYV) animals can attend the food security. However, fragility of landscape and poor infra-structural facilities could not manifest a way for their optimum utilization. Crop yield is low in hills as compared to that in plains (Kumar and Tripathi 1989). The region has relatively infertile land with poor irrigation facilities. Difficulties in using modern technology and little use of modern inputs are because of both their unsuitability and non-availability. The productivity per capita in the region was 173 kg, while national average is 220 kg. Agriculture is practiced on the terraces of river valleys and mid-altitude slopes. In spite of the relative infertility of land and poor irrigation facilities, the farmers use their land intensively. The cropping intensity of cultivated land is thus quite high. So far the hill economy was self-contained at low level equilibrium with low aspirations of people, but improvement in access to other areas and

increased flow of information have exposed the people to the higher and different standards of living else where, resulting in raised aspiration (Papola 1996), which cannot be satisfied by the traditional farming. The basin has the potentials, in a various other ways, to get the appropriate level of sustainable livelihood through encouraging cultivation of fruits, off-season vegetables and medicinal plants and implementing the innovation in the field of agriculture along with maintaining traditional farming.

Conclusions

In spite of being rich in natural resources, the basin has not been able to provide for endured supplies of food on sustainable basis. Harnessing of natural resources such as water, forest and suitable agro-ecological conditions optimally will enhance the food security and help for sustainable development of the basin. Improvement in traditional agricultural practices with integrated watershed management approach is the best solution for the problems related with sustainability of production systems and food and nutritional security of the people. Furthermore, micro-watershed based farming systems with various land uses such as a combination of agriculture, horticulture, pastoral and livestock need to be popularized. In the basin, research conducted on various farming systems has shown that micro-watershed based farming systems are more remunerative and helpful in conservation of soil and water. The eco-system of the basin, characterized by undulating hilly terrain limits the scope for utilization of water resources for irrigation. Rainfed agriculture is mostly practiced in the region following old traditional cultivation methods. Conservation of water resource through construction of micro-hydropower plants will generate electricity and supply water for irrigation. Optimum utilization of land resources as per land capability classification along with new farming systems and cropping patterns, according to the local agro-climatic conditions would ensure higher productivity and resources sustainability. Development of pilgrimage and eco-tourism can improve economy and employment. Large-scale afforestation programmes either of timber, horticultural plants and plantation crops or agro- forestry systems should be encouraged largely.

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