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RESEARCH ARTICLE

Women And Natural Resource Management: A Study Of 'Communities Of Practice' Prevailing In Women Farmers' Community for Management of Water and Forests of Lesser Himalayan Region in India

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Abstract

This paper draws on a case study of women involvement in the water and forest management in lesser Himalayan region of Nainital District, India and provides insights into the characteristics of Communities of Practice (CoPs) prevailing in the hill women community for water and forest management of the region. Social participation in formal and informal communities by the women indicated that more number of women participates in informal community practices. Majority of the women were not the member of any formal organization. Though, most of the women were member of the one society, the office bearers were least, majority of the women were peripheral members in the CoPs of village community and least were active members. As nature of participation of the women, they considered knowledge features as very important giving I rank to "Having informal meetings, fun and non-work-related activities". Mediocre sense of belongingness in community of practices was shown by majority of women. The percentage of attitude of women towards Community of Practice as measured by people's participation index was highly favorable. Lesser Himalayan region of Nainital district has demonstrated that Communities of Practice and smallholder's tacit knowledge can work for each other complementarily and therefore CoPs through smallholder's tacit knowledge is highly operational. The CoPs model for natural resource management is of great relevance to other fragile parts of Asia, which are losing natural resources in terms of the twin goals of national and food security.

INTRODUCTION

Hill women depend on water and forest resources to rear livestock, collect fuel and a wide range of products for consumption and trade as the food and water security of the entire region depends on natural resources. Agricultural production systems depend on natural resources viz., land (over 55 per cent of non-forest land), water (about 80 per cent of total fresh water), biodiversity, forests, pastures, and wildlife. Farm activities can also have major impacts on the quality and availability of these resources well beyond the boundaries of the production system (downstream pollution and soil erosion). Thus, rural livelihoods are intricately linked to the condition of natural resources, particularly for those people living on fragile lands. Uttarakhand state is well endowed with water and forest resources. The Himalayan Watersheds of the State are under constant threat of mass wasting and erosion caused by

depletion of forest cover, unscientific agronomic practices, hydrologic imbalances and natural calamities. The ever increasing population, the need to provide a better quality of life to the people and the pressure on natural resources is further compounding the problem. Mountains are the important physical barriers which impose restrictions on social interaction and support isolation of the societies. Higher the mountains bigger is the isolation and when we talk about the highest mountain of the globe the level of isolation also reaches to its apex and the spatial variations becomes quite important. Uttarakhand is divided into four parallel transverse ecological zones ranging from South to North i.e. Shiwalik, Lesser Himalaya, Great Himalaya and Trans Himalaya. Shiwalik is the southernmost transverse belt of the state, covers the foothills, largely forested and sparsely populated with scattered type settlement. Lesser Himalaya, the study area, is the second transverse belt, parallel to Shiwalik and located to its north. It occupies the largest area and is the largely populated with nucleated settlements, which comprise more than three fourth populations of Kumaun hills. It's the most degraded area where human pressure on natural resources is very high, the present study was done in this zone (Dube and Panigrahi, 2012).

Women are the backbone to the farming system of the Uttarakhand hills as they have intrinsic knowledge of different farming activities (Agrawal, 2008). Women are quite knowledgeable both about the environment and about the natural resource base and its uses with responsibility for providing a significant share of household income and subsistence needs all of which impact biological and natural resources (Mehra, 1993). As the women work ahead in the environment, they are the one who suffer more from the adverse changes/pollution/environment degradation. As a result of deforestation and monoculture practices in agriculture, there has been an extreme loss of ground water, along with flooding, landslides and destruction of biomass, which has further increased the workload on women. However, women are no longer viewed as mere victims, it is increasingly recognized that women can play key role in natural resources management as they have the knowledge and experience gained from working closely with their environment.

A community range from as small village within a specific geographical region to virtual communities where members are located throughout the world and connected through ICT. In its broadest sense, community can simply be sees as a set of people with some kind of shard element, which can vary widely from a situation to situation such as living in a particular place, to some kind of interest of belief (Obst and White, 2007). Community refers to a heterogeneous group of people who share residence in the same geographic area and access to a set of local natural resources. The degree of social cohesion and differentiation, strength of common beliefs and institutions, cultural diversity and other factors vary widely within and among communities. A Community of Practice is an environment where knowledge is created, codified, and stored in a decentralized manner, shared among the community members and applied to practice. Tacit knowledge emerges from the sharing of the knowledge from the continuous practice in the community, which is mostly present as traditional knowledge of the community. Proximity or a shared location helps to sustain the community, but it is the involvement and engagement of the members that is critical to the effectiveness of the community. Connections with community members produce a collective practice. Trying, adopting, accepting, and rejecting practices creates associations of shared accountability critical to practice. Such behaviors as sharing stories and having informal discussions form a collection of agreed upon information and techniques to be utilized by members of the group (Eveleth et al., 2005). As stated by Wenger (2000), Communities of Practice or social learning environments exhibit four characteristics; i. learning as a process of becoming a part of something (identification), ii. learning as a set of shared experiences that create a common understanding (meaning), iii. learning as a process of engagement or learning by doing (involvement) and iv. learning as a process of attachment to the community (belongingness)**.** Community of Practice is an activity system about which participants share understandings concerning what they are doing and what that means in their lives and for their community (Lave and Wenger, 1991). Two key dimensions of Communities of Practice are participation in the community by the members and the connectivity or relationships among the members of the community (Chindgren-Wagner, 2009). Hills diversity in respect of its climatic conditions led to innovative ways of water and forest conservation and management by the hill people, which are location specific. Even when a community's actions conform to an external mandate, it is the community not the mandate that produces the practice. In this sense, Communities of Practice are fundamentally self-organizing systems (Wenger, 1998). Inherent in the definition of Community of Practice is the importance of relationships, or the connectivity, among the members. Connectivity reflects a sense of community among the members and entails a feeling of belonging and identification, opportunity for influence, integration and fulfillment of individual and community needs, and a shared emotional connection (McMillan & Chavis, 1986). Because it is difficult for others to imitate or CoPy tacit knowledge, which is transferred only in communities as their traditional wisdom, there is growing agreement that this type of knowledge is a key element in sustaining natural resource base (Liedtka, 1999). Therefore, by giving attention to local women's traditional knowledge, regarding water and forest resource management, and encouraging the utilization of their analytical skills in their community (Parpart, 2002), can

develop the water and forest resource in sustainable and equitable basis along with the development of traditional knowledge among hill women. One reason for focusing on women therefore, relates to the impact on women's lives for involving women in natural resource management. The other equally important reason is the impact on the resource themselves. Thus, a focus on women would not only address their need for increased income and a reduction in drudgery, but would also give them control over the resource they work with. There women do the survival work and create a community and network of support for each other while they work together to gather fuel, fodder, food and even medicine from the forest areas (Fracchia, 2006).

The paper brings special attention to CoPs of those involved in the village water and forest management to watershed project and their shared water and forest practices. This involves both local (inside the community of implementation) and external (outside the community) members. CoP treats communities as bodies of recurring knowledge where individual members develop new knowledge. Knowledge is self-perpetuating and increased practical activity and it is increasingly used in development studies, including watershed based development projects. To analyze rural water and forest management in a watershed project though CoPs aimed at overall village development, improving socioeconomic welfare and also expand the freedom to choose different ways of thinking and living (Sen, 1999). Thus, if welfare improvements are not coupled with increased capabilities weather they create beneficial or deleterious results, then true development has not occurred. This is especially important in rural communities that often adopt where simple and labor-intensive technologies are used to best match the community's skill set. In grounding CoP analysis in participatory mode, the questions addressed were: what is the type of social attitude towards programme participation, the level and nature of participation, sense of belongingness and attitude towards programme participation.

The paper first briefly discusses various roles of women. Next, the paper grapples with the objectives of the study. The paper then reports on the characteristics of CoPs with respect to women community engaged in water and forest management. The paper next articulates the importance and potential of the CoPs model towards sustainable water and forest management and hill agriculture.

Role of women

It is widely acknowledged that women play a key role in the collection and safeguarding of water for domestic and - in many cases - agricultural use, but they have a much less influential role than men in management, problem analysis and in the decision making process related to water resources. Attention to gender is essential to sound development practice and at the heart of economic and social progress. Development results cannot be maximized and sustained without explicit recognition that every policy, program and project affects women and men differently. Addressing gender as a cross-cutting goal requires that women's views, interests and needs shape the development agenda as much as men's, and that the development agenda support progress toward more equal relations between women and men. Gender needs should be part of the overall policy framework which can ensure that policies, programs and projects address the differences in experiences and situations between and among women and men. Equal participation in social and political issues involves women's equal right to articulate their needs and interests, as well as their vision of society, and to shape the decisions that affect their lives. Their ability to do this can be strengthened through community organizations and institutions, and building participatory capacity. The management of water resources is an important issue for societal health and well being. As world population continues to grow, a greater quantity and diversity of water needs will vex water resource managers. In order to address the changing state of water resource issues, managers must recognize they are dealing with problems with no clearly defined boundary, multiple stakeholders, and an absence of a single satisfactory solution. In order to adequately deal with such problems, water resource managers must consider the concepts of geographic scale, assess the impact of mismatched geographic scales, and understand the specific characteristics of places in their management plans. The management of water resources is an important issue.

Objectives of the study

This research was undertaken to develop a deeper understanding of community learning processes in water and forest resources management practices. The study drew on that knowledge and skills are learned and embedded in the contexts in which knowledge is obtained and applied in everyday situations. Although the researches have been done on water and forest resource management practices but very few researches have been conducted to explore researchable gaps and questions such as; what is the participation and level of participation in the communities being followed by hill women for management of water and forest resource; what is the nature of participation and extent of belongingness of hill women towards their communities engaged in water and forest

management; what is the attitude of women in communities towards participation in water and forest conservation programme with the following objectives:

1. To find out the type and level of participation by hill women for water and forest management.
2. To measure the attitude of participation and sense of belongingness in CoPs of hill women engaged in water and forest management.
3. To measure the nature of women in communities towards participation in water and forest conservation programmes.

Study area and Research Methodology

Universe of this study consists of the hilly areas of Uttarakhand State which is located between latitudes 29°5'-31°25'N and longitudes 77°45'-81°E covering a geographical area of 53,485 km of which 93 percent is mountainous. The region comprises of two administrative units viz., Garhwal (northwest portion) and Kumaon (southeast portion). Kumaon division includes six districts namely, Almora, Bageshwar, Champawat, Nainital, Pithoragarh and Udham Singh Nagar; while Garhwal division consists of seven districts, viz., Dehradun, Haridwar, Pauri, Rudraprayag, Tehri and Uttarkashi. The major source of livelihood of the population in the state is agriculture in which almost 70 percent of the population is engaged. The subsistence nature of agriculture in the hill districts provides nothing but a low and unstable annual income to the people, causing a sizeable out-migration of male members from the family, leaving behind a large number of female-headed households. Nainital district forms part of Kumaon Division of Uttarakhand State. It lies between $29^0$0' and $29^0$36'21" N latitudes and $78^0$50'53" and $80^0$0' E longitudes. The total population of the district is 7,62,909 as per 2011 census. The density of population is 225 persons per sq. km. The geographical area of the district is 4251 km^2

It is presumed hypothetically that the various developmental programmes meant particularly for the conservation of natural resources in hills and promotion of hilly areas to check the draining of youth have successfully carried out throughout the state and the local residents have successfully availed these facilities . How far these hypotheses presumption is correct and to what extent the national goal can be achieved by the government are some of the researchable questions are to be answered through the empirical study of eight villages in hilly area of Nainital district which are Selalekh, Majyuli, Jalananeel pahari, Mahtoliyagaon, Thali, Harinagar, Katna and Suni in Dhari and Okhalkanda blocks of Nainital district.

Tools and Techniques of data collection

Observation

An observation is the classic form of data collection in naturalistic or field research. Observational data is used to describe settings, activities, and people; and such data can present this description from the perspective of the participants. Because observation provides knowledge of the context in which events occur and the observations may enable the researcher to see things that participants themselves are not aware. A skilled observer can also monitor both verbal and nonverbal communication cues and can use concrete, unambiguous, descriptive language to describe what he or she has observed. In order to collect some other information secondary sources were used. During this investigation, the authors frequently visited the sampled villages and intensively observed the women through non-participatory observation method. The authors used to start the observation from early morning and continued till evening. Since the first author was staying in the village and belongs to same cultural background, the minute things of hills lifestyle were easy to observe from morning until night. An observation guide was prepared for focused observation along with that general observation of women was done like their daily routine, life style, housing conditions, wood storage etc. field dairy method was used to jot down all the observations. Their local terminology was also recorded and then used in the message. They were observed for the activities they were engaged in, both at home and outside and the way they conducted these activities. Observation facilitated comprehensive and effective interviewing, in turn supporting other modes of data collection.

Participatory methods

Focus group discussion: Focused group discussion provides a deep understanding of attitude and feelings of community regarding particular issues. In this, people get enough chance to expose themselves in front of an acquainted group, which facilitate the process of generating information on discussed issue. The focused group discussion was conducted to provide understanding to the investigator about the process and issues related to the water and forest resource management. Focus group discussions, with women groups from selected villages, were organized to understand the perceptions and to get in-depth understanding of women regarding water availability, forest resources and their maintenance and traditional practices followed by them.

Mapping and diagramming**:** Participatory mapping is crucial to participatory rural appraisal and can be on different facets of rural life such as social issues, health, wealth, literacy, economic activities, social stratification, means of livelihood etc. in participatory mapping and modeling exercise villagers prepare a map of their village with chalks, colours, rangoli powder and locally available materials either on ground or on paper. For the present study, resource mapping was done to show different kinds of natural resources and micro environments. In a resource map, the villagers drew the resource profile of the village depicting different kinds of soils, ponds, trees, crops and microenvironments.

Transect walk: This participatory method involves systematic walking with the villagers through an area and discussing about different aspects of land use and agro-ecological zones in the village observed during the walk. The importance of transect walk lies not only in knowing the agro-ecological zones in rural areas but also in getting an in-depth account of the participating villagers of such zones in the village, their uses, problems and opportunities. As far as the rural agro-ecosystem of poor people is concerned, the physical variations in the village, the micro-environment and their use can be appreciated better through transect walks which provide visual explosion of the physical features of a village along with local people's interpretation. For the present study it was organized with the women of respective villages and the personnel of UDWDP project. The objectives of the transect walk was conducted to know whether women collect wood singly or in groups, how much head load do they have to carry? How much distance is needed to be covered? How much time they spent in fuelwood collection? Do they collect minor forest products such as wild fruits and leaves for fodder in the same visit or plan a separate visit for it? What were the water sources available? etc.

Daily routine diagram**:** It reflects the kind of activities which one does on a daily basis. It can not only show the time spent in different activities but also size of work involved. It is possible to identify general pattern from daily patterns. The general pattern of different groups can then be compared. Such daily routines can also be depicted on a seasonal basis in order to identify constraints and workload of different groups related to different activities. For the present study daily routine diagram of women was made to know their working pattern and work load. It was then compared with men folk of the village.

Type of documentation

Field diary**:** The field diary, as Cottle (1998) notes, is a vital data collection tool, generating a mass of details, information and general impressions that can be valuable for later analysis. It 'records and makes the invisible visible', by uncovering topics to explore what might otherwise have remained hidden. Sometimes what seems ordinary at the time takes on meaning later, so that there is a need for good descriptions of settings, scenes, people, events and interactions, including unexpected ones. The researcher used a field diary to write complete account of a particular day's activity.

Photographs: The pictures or photographs were captured to document buildings, places, process and setting over time to record specific behavior and describe the hill life in real situation. Photographs of socio-cultural life of the hills have been incorporated in this study at appropriate places. Photographs produced for research purpose included traditional practice of fodder preservation, water storage, village view, fodder collection, mulching, primary school, vegetation, forest tree management, fuelwood collection, water collection and its management etc. The researcher considered ethical implications of collecting documents with every method of data collection.

Operationalization of terms and concepts

Concept is abstraction of meaning by generalization. Operational definition is the standardization of definition for a particular research problem and that can be measured. It may also be conceptualized as the manipulated form of definition that is meant for measuring the things in research. In measurement we assign some numerical value to some variable, for further analysis of variable. It is empirical in nature.

In present study the various concepts were identified by review of relevant literature and discussion with scientists. The selected concepts (Table 1) were conceptualized, operationally defined and measured as presented here under:

Table 1 Concepts and their measurement

Sl No.	**Concepts**	**Measurement**
a.	Formal social participation	Gangwar (1998)
b.	Informal social participation	Gangwar (1998)
c.	Nature of participation	Chindgren-Wagner (2009)
d.	Sense of belongingness	Chavis et al. (2008)
e.	People's Participation Index	Bagdi (2004)

The study problem

The natural resources are under increasing stress and causing concern about environmental sustainability through efficient use of forest and water resources. Continuous increase in population and the pressures of economic development call for careful monitoring of natural resources and take the necessary actions to maintain them. Farmers must learn to use more water-efficient technologies and/or grow more water-efficient crops. The predominant causes of dwindling forest wealth have been identified as over-exploitation, overgrazing, illegal encroachments, unsustainable agricultural practices, forest fires, and environment unfriendly development projects in the forest areas. The collection of forest products including fuel wood, timber, etc. is much beyond the regenerative capacity of forests (Gulati and Sharma, 2000). Reduction in dense forest cover before the ban on green felling, hastened soil erosion and siltation of water bodies (Valdiya, 1985), drying up of springs (Negi and Joshi, 2002), replacement and loss of species (Singh et al., 1984), increased ratio of energy spent in fodder, fuel collection, and agricultural bustle that enhance labor of the women folk (Pandey et al., 1983) are some of the revealing indicators of the environmental ill-health (Anonymous, 2010).

The inhabitants of Uttarakhand state depend on natural springs (*naula*, *dhara*, *gadhera* etc.) for drinking water supply, household activities and irrigation, but in recent times most of the springs have either become seasonal or extinct due to ecological imbalances. Rainfall is the only source for the overland flow and roof-top runoff, but the spring discharge (*dhara*) is dependent on snow fall as well. Against the requirement of 18 ha of forests land including 5-12 ha of well-stocked forests, per hectare of cultivated land, the ratio of forest to agriculture is only 1.33:1 and the ratio of well-stocked forests to agricultural land is only 0.84:1. To reverse the order of deterioration of natural resources and support livelihood activities for the inhabitants, watershed management has been taken up as the functional and planning tool for conservation of natural resources and sustainable development by the Government of India through its Common Guidelines for Watershed Development Projects 2008. Fresh water is expected to become the most limiting resource in many parts of the world in the near future. This has led to a surge in funding for watershed management programs (Shah, 1998; UNCED, 1992). Projects to develop ecology start with traditional knowledge as they are proven technology for natural resources management. In a real sense, every culture of a social system, traditionally, is the result of people's action to survive and their attempts to optimize the use of available resources, i.e., soil, water and forest. In the study area, World Bank aided Uttarakhand Decentralized Watershed Development Project (GRAMYA) implemented by Watershed Development Directorate of Uttarakhand Government. It is operating since 2005 with the aim to mitigate water problem in the area, subsequently addressing issues of other natural resources in a participatory mode, with emphasis on women participation. Rural women's active participation in forest protection and water conservation schemes is imperative as resources in women's hands are more likely to be used for the family's well-being than resources in men's hands. Everyday learning has not always been recognized or valued as legitimate or worthwhile knowing by the learners or educational researchers. Accordingly, a large proportion of 'informal learning' is not well-researched or documented e.g. women's learning in the home (Eichler, 2005). This is an important issue to address because traditional water sources and forests have declined over the years due to decline in the social values attached to them and inefficiency of the government in utilizing traditional knowledge (Raju et al., 2004). In order to effectively use the vast store of village communities traditional knowledge for water and forest resource management, a multiuser-friendly knowledge management system must be set up to collect, classify, test and disseminate this essential data to those who need it (Paimpillil, 2013). In this context the study problem of the present work has been formulated so that forest and water management programmes through Communities of Practice in hilly areas of Uttarakhand can be understood and the relevance of the various connecting policies and programmes can be enumerated.

Message Designing for Communities of Practice

Van Wyk, (2005) described it as a network of people emerging spontaneously, and held together by informal relationships and common purpose, that shares common knowledge of a specific domain and learn from one another. Communities of Practice is group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis (Wenger et al., 2002).

Level of Participation

It was conceptualized as participation of women in the community at different amounts or levels (Chindgren-Wagner, 2009). A review of the literature indicated that there were typically three categories (i.e., core, active, or peripheral) and, therefore, women were asked to select the category that described their typical amount or level of participation in their community. The semi structured interview schedule was prepared to obtain the responses of the women to measure the level of their participation. For measuring the level of participation of the women, it was classified into three (Core participation, Active participation and Peripheral participation) categories.

Core participation defines the activities of a small group of members who reliably and enthusiastically participate in discussions in the community forum. Members, who serve as core participants take on community projects, identify topics for the community to address, and move the community along its learning agenda and, as a result are the heart of the community (Wenger et al, 2002).

Active participation is the next level of participation within communities of practice. The members do not exhibit the regularity or passion of the core members but periodically participate in the community forums and is also quite small, consisting of 15 to 20 percent of the community (Wenger et al., 2002).

Peripheral participation where most members are located and these members rarely participate, but they keep to the sidelines, watching the interaction of the core and active members.

Results

Nature of Participation

It refers to the way of using knowledge in the social community practices by the women and constructing identities in relations to these communities. For many communities, the need to generate new and better knowledge is a reason for its members to participate. In the present study, participation in community was measured with the scale developed by Chindgren-Wagner (2009) with slight modifications suited to the study. A five-point continuum scale ranging from unimportant, important, fairly important, very important and most important was used and scores were assigned as Most important (5), Very important (4) and Fairly important (3). Weighted score mean score was calculated to indicate level of importance of participation and ranks were assigned. Based on range, class intervals under different categories were made. The score thus obtained were categorized under five groups (Most important-4.36 to 4.57, Very important-4.15 to 4.36, Fairly important-3.73 to 4.15, Important-3.52 to 3.73 and Unimportant-3.31 to 3.52) to indicate extent of importance.

Sense of belongingness

It was conceptualized as the connectivity among the members in a community of practice. It entails the level of interaction between members and possession of feelings of belongingness (Andriessen, 2005). In this study, the value obtained after analysis of the data was indicative of level of sense of belongingness in the community. The Sense of Community Index designed by Chavis et al. (2008) was used with a slight modification to measure the level of sense of belongingness. The degree of agreement/ disagreement was recorded on five-point scale. For positive statements, the scoring was as Strongly agree (5), Agree (4), Undecided (3), Disagree (2) and Strongly disagree (1). The scoring procedure was reversed for negative statements. The aggregate score for each respondent was calculated by summing up the scores obtained from the above scale. The women were than categorized as Least sense of belongingness (Less than 57), Moderate sense of belongingness (57 to 67) and High sense of belongingness (More than 69) based on their level of belongingness. For making categories of the women mean value (63.45) and standard deviation (5.64) was used.

People's Participation

It was operationalized as the degree to which an individual had participated in the water and forest conservation programme**.** Ilango (1991) operationalized the concept of people's participation as the involvement of the programme's target group in decision-making, planning, implementing, contribution in the form of money, labour or land, offering suggestion for improvement of programme implementation, taking initiative, mobilizing people and resources and assuming leadership and ownership of projects. In this study, People's Participation Index (PPI) was calculated to measure the extent of attitude of the women towards participation in water and forest conservation programmes; scale developed by Bagdi (2004) was used with a slight modification. The scale consisted of thirteen statements and the degree of agreement/ disagreement was recorded on five-point scale. For positive statements, the scoring was as Strongly agree (5), Agree (4), Undecided (3), Disagree (2) and Strongly disagree (1).

The scoring procedure was reversed for negative statements. The scores were computed with the help of People's Participation Index (PPI) and were obtained in percentage that indicated the percent attitude of people towards participation in water and forest conservation programme as a whole and separately during different stages of planning, implementation and maintenance of the programme. The value calculated by PPI was categorized as Highly favorable (84-100%), Favorable (68-83.9%), Neutral (52-67.9%), Unfavorable (36-51.9%) and Highly unfavorable (20-35.9%).

Discussion

Participation in communities of practices

Participation in the village communities

Participation in village communities is of two types; formal and informal. The present study revealed that in water and forest management practices in a watershed project operative in Nainital district, the women participated in both formal and informal communities. In formal participation majority of the respondents were having no membership (56%). The participation in informal communities was highest (100%) on the occasion of marriages followed by religious ceremonies (94%), Comparatively higher percentage of participation in informal communities might be due to more number of peripheral members (Table 2). Lave and Wenger (1991) opined that legitimate peripheral participation reflects a high level of belongingness among the members of informal communities.

Level of Participation

Highest number of the respondents (55.33%) was peripheral members (Table 2) compared to core or active members. This distribution for active and core members reinforces earlier findings suggesting that this is always a smaller group who serve as the heart of the community (Wenger et al., 2002). In a community of practice members participate at different levels viz core, active, and peripheral. Core participation defines the activities of a small group of members n who reliably and enthusiastically participate in discussions in the community forum. Members, who serve as core participants take on community projects, identify topics for the community to address, and move the community along its learning agenda and, as result is the heart of the community (Wenger and Snyder, 2002). The active members are at next level of participation within communities of practices. They do not exhibit the regularity or passion of the core members but periodically participate in the community forums and is also quite small, consisting of 15 to 20 percent of the community (Wenger et al., 2002). The third level of participation where most members are located is at the periphery. These members rarely participate but they keep to the sidelines, watching the interaction of the core and active members. Some remain peripheral because they feel that their observations are not appropriate for the whole or carry no authority and some do not have the time to contribute more actively. The knowledgeable people from different communities may help all communities stay connected.

Sense of Belongingness

In this study most of the respondents (68%) had a medium sense of belongingness to the water and forest management activities of the community (Table 2). The sense of belongingness indicates the connectivity among the members in a community of practice. It entails the level of interaction between members and possession of feelings of belongingness (Andriessen, 2005). Within organizations, sense of belongingness may be illustrated as a dimension ranging from low i.e. simple/loose to high i.e. complex/tight (Chindgren & Wiswell, 2006). According to Andriessen (2005), members having limited interaction and identity have a low level of belongingness. Dongol et al. (2002) were of the view that understanding benefits of community forest leads change in attitude, vision and behavior of community members and increase interest in and awareness of community forestry and stimulate thinking about its sustainability.

Attitude of women in community towards participation

For participation in water and forest conservation programme, the overall attitude of respondents was highly favorable as is indicated by high percentage attitude of people towards participation in the water and forest management programme. The women in the study area considered participation in programme planning and programme maintenance as highly important which is evident by highly favorable attitude as indicated by people's participation index (PPI) of 94.53and 86.14 percent respectively (Table 2). The high percentage attitude of respondents indicates that in the study area people participation was excellent. The least Peoples Participation Index also indicated that the respondents' attitude was favorable for programme implementation. It is a true fact that the majority of residents of rainfed hill areas were resource poor. They could not go for expensive works. In programme implementation generally investment is required. If any government agency take part in the activity, the local residents will be ready to give their input in terms of manpower that too if the programme is beneficial for them in long run. These factors might have led to least PPI in the present study. When a programme is implemented and it starts giving benefit to the local residents, certainly they become active for its maintenance as it becomes an income generating venture and this change in attitude increase interest and stimulate thinking (Dongol et al., 2002). This factor might have contributed to highly favorable attitude of respondents towards programme maintenance. Highly favorable attitude of respondents towards programme planning might also be due to their high sense to belongingness in community work (Table 2).

Activities related to knowledge work (Nature of participation)

The nature of participation within communities was examined though knowledge works. Since today, knowledge work has been defined as a profession, a characteristic of individuals, and as an individual activity (Kelloway and Barling, 2000). For the purposes of this study, knowledge work is a discretionary behavior focused on the use of knowledge in the workplace. In the present study respondents reported that their nature of participation most often entailed "Having informal meetings, fun and non-work-related activities" with "Interacting and communicating with fellow community members" following close behind "Hearing about new knowledge and sharing experiences from

other community members" and "Making useful contacts /networking". The least important nature of participation was "The judicious management of water and forest resources." and "Improving the level of expertise of the members" (Table 3). In order to do this, it may be necessary for members to organize and package knowledge for others or embed it in a useful form such as processes, products, and services (Kelloway and Barling, 2000). Thus it indicated that camaraderie and togetherness were components of communities of practice; however, it appears that for these respondents, these aspects of community participation were of lesser importance. The respondents placed "Advising or helping other members" at fifth rank. This knowledge work activity is also of much relevance to the community. For many communities the need to generate new ideas and better knowledge was a reason for its members to participate. In order to do so, an appropriate culture, or sense of community, recognizes the need to provide time for members to dialogue and interact (Adams and Freeman, 2000). Furthermore, the process that communities go through in order to generate knowledge is itself often knowledge that should be captured.

Conclusion

To offer an avenue towards the theoretical development of CoP, this paper has described the emergence of a successful CoP for water and forest management in lesser Himalaya (Nainital). The paper reinforces that CoP can be a sustainable alternative to natural resource management as a survival strategy for hill population where farmers have small land holdings. Hill women can also significantly contribute to the mitigation of environmental degradation. In short, CoP can be effectively executed with the people's participation on community basis. This paper asserts that CoP is a critical element for successful management of natural resources especially in fragile eco-system, lesser Himalaya example. There is synergy between CoP and peoples participation in natural resource management prograsmmes and therefore they should be integrated to maximum advantage towards rural sustainability. Hill women's tacit knowledge plays a pivotal role in rebuilding the rural communities shattered by mass wasting and erosion caused by depletion of forest cover, unscientific agronomic practices, hydrologic imbalances and natural calamities, as evidenced in the hilly regions of Uttarakhand. As a side note, this study underlines that the growth of CoP can be expedited by establishing some constructive policy measures. Although hill farmers are not gripped with profit maximization as other regional conventional farmers, the gravity of economic incentives associated with natural resource management systems should be well understood. This paper has conceptualized the CoP approach to practicing in water and forest management programmes with a case study of lesser Himalayan region of Nainital district. It has been argued that CoP in the capitalist economy is an economically viable option and a credible pathway to social and environmental sustainability in the rural context. The lesser Himalayan CoP model for water and forest management is of great relevance to developing countries, especially hilly areas in mapping a strategy of how to achieve the triple goals of economic efficiency, sustainability of natural resources and mountain agriculture. Communities of Practice coupled with watershed development programmes can be a pathway to achieving the economic, social and ecological dimensions of sustainability in hilly rural areas where the agricultural landscape in terms of land ownership is small-scale farming and prone to natural calamities. The paper does not claim that the lesser Himalayan region CoP model for water and forest management should be universal guidelines for collective action. In fact, this CoP model can be implemented in any type of property rights regime. Institutional and cultural framework behind the natural resource sector varies across countries because of their different histories and livelihoods. Therefore, diverse institutional pathways to CoP can be explored. In this context, country /region specific CoP need to be established. This can be based on household demography, sizes of farm holdings, and property rights characteristics of holdings, farming systems, livelihood systems, motivations, and satisfaction level. It is becoming increasingly important for policy makers to be informed of a type of environment according to their motivations for and constraints to natural resource management. Thus CoP can be used to design appropriate policy measures to promote natural resource management and to assist smallholder farmers. Moreover, in-depth research on village development movements through CoP and check on rural youth migration occurring particularly in hilly areas can produce a useful future reference for hill economies. The concept of CoP although has been used in corporate organizations, but its analysis in informal groups by identifying characteristics of CoP can enable the policymakers to strengthen the activities to expedite the process of water and forest conservation.

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Table 2 Participation in management practices

Sl.No.	**Participation extent/activity**	**Percentage** (majority of women)
1.	Medium extent of participation	73.33(in 4 to 7 water management activities)
2.	High extent of participation	65.33(above 9 forest management activities)
3.	Participation in water conservation activities	92-96(in tank construction and animal husbandry)
4.	Participation in forest conservation activities	93.33(Plantation/ afforestation activity)
5.	Formal participation	56(have no membership)
6.	Informal participation	94-100(in Religious /marriages ceremonies)
7.	Level of participation	55.33(as peripheral member)
8.	Sense of belongingness	68 (medium)
9.	Peoples' participation in programmes (overall, planning/maintenance)	84-94 (have highly favorable attitude)

Table 3 Nature of participation in community.

S.No.	Statements	Weighted mean score	Rank	Level
1.	Hearing about new knowledge and sharing experiences from other community members	4.08	III	Fairly important
2.	Developing together new ideas for the community	3.89	VI	Fairly important
3.	Having informal meetings, fun and non-work-related activities	4.27	I	Very important
4.	Making useful contacts /networking	4.06	IV	Fairly important
5.	Improving the level of expertise of the members	3.71	VIII	Important
6.	Helping newcomers in the community	3.77	VII	Fairly important
7.	Advising or helping other members	3.93	V	Fairly important
8.	Interacting and communicating with fellow community members.	4.14	II	Fairly important
9.	The judicious management of water and forest resources.	3.65	IX	Important