AGRICULTURAL RESEARCH FOR DEVELOPMENT IN UTTARANCHAL: COLLABRATION BETWEEN A RESEARCH INSTITUTE AND VILLAGERS

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In Uttaranchal, 80% area comes under mountainous terrain; a large proportion of the rural population lives in mid-hills and valleys of central Himalayas (at altitudes above 300m). The mountainous environment imposes a number of constrains such as unpredictable rainfall patterns, early and late frost, steep slopes and poor soils that limit crop yield. Coupled with lack of marketing infrastructure and problematic transportation. This condition is lead to endemic poverty in hill communities. On the other hand, the mountains of central Himalaya have a long and rich history of agricultural development. Centuries of hilly farming produced like tropical high land grains e.g. Ragi (Elusine coracana), Barnyard millet (Echinochloa frumentaceae), Proso millet (Panicum millaceum), Foxtail millet (Setaria etalica),Buckwheat (Fagopyrum) and in pulses; Amarenth (Amaranthus spp.), Horse gram (Macrotyloma uniflorum), Rice bean (Bigna umbellata), Edzukibean (Bigna angularis) still forms the basis of hilly livelihoods today . The complex hilly cropping system includes other useful edible and medicinal native plants such as Koot, Bajradanti (Potentella fulgens), Pasanbhed, Chirayata ,etc.

The "green revolution " falls short–Agricultural researches in Uttaranchal was formally established in early seventies with an aim of contributing to the countries development than overall economic growth by consolidating the necessary technological infrastructure to achieve greater agricultural productivity. In conjunction with the hill development as a separate ministry in U.P. government, which allocated funds for agricultural infrastructure development to hilly people. The green revolution paradigm was to increase production by applying scientific methods from research institution concentrating on staple crops vegetables and other crops and on technological aspects of production explored under laboratory conditions; soil fertility breeding chemical control of disease pests and weeds etc.

Over all agricultural production of Uttaranchal grew between 1970s and 1990s at a rate of more than 5% per year and constituted the basis of the state urban development. But despite the improved social and physical infrastructure, most rural areas remained poor; technology packages for high productivity were generated towards use by a minority of large commercial enterprises and could not be adopted by the majority of hilly farmers, further aggravating inequality and hindering development. Research simply did not perceived hilly farmers reality i.e. complex diversified and risk prone agriculture.

Research for sustainable development–Hilly form families consist of the majority of rural population (78%) many of whom lived in the mountainous areas of Uttaranchal , policy must be aimed to strengthen the hilly farmers economy as the foundation of the model of the sustainable agricultural development indeed, small holder hilly agriculture is the stable form of production since it is based on a diversity of crops, thus reducing the environmental risks, implicit in monoculture rural development programmes must considered non-conventional resources such as social awareness, creativity, solidarity traditional organizations, management abilities and cultural identity which can be important means of achieving change and development since they are a part of community cultural traditions.

In order to reorient agricultural research along these lines, new approaches that largely adhere to the principle of participatory rural research have been adopted. Participatory research approaches reversed the order of research goals and objectives; their main objective is to improve the livelihood of

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the people and not to increase production of infrastructure. Therefore, the research agenda priorities express by the farmers. Instead of the rigid framework, plural and flexible attitudes are needed to enable farmers and communities to respond to developmental challenges and scenarios moreover the new research approaches are underlying the importance of taking into account, environmental, social, economic and technological aspect of hilly agriculture as well as the interactions between these elements.

A successful participatory project–The Indian council of agricultural research (ICAR) is currently conducting a participatory research project on "Technology assessment and refinement through institution village linkage programme" through out country. Under this project G.B.P.University of Agriculture & Technology, Hill campus, Ranichauri is conducting activities in the hilly region. Activities are taking place in the villages of Tehri Garhwal district, at altitude between 1500 M to 1600 M in community block Chamba. Conditions for agriculture in the area are critical. The landscape is characterized by mountains, hill slope and intermountain valleys, with sub humid temperature climate subject to low temperatures from October to March, and a marked rainy season in summer (June to September, average annual rainfall about 1200mm), therefore limiting farming to just two crops per year. Agriculture takes place on slopes with calcareous soil of poor quality i.e. prone to erosion. Agricultural yields are low and peoples live in the conditions of poverty that are extreme in some families.

In majority, the hilly farm families belong to the higher caste of Hindu. Families have a limited endowment of productive resources with an average farm size of less than two hectares. Owing to increasingly different economic conditions, the farmers have expressed a great interest in farming system that enable them to ensure food security, reduced cost and provide the supplementary sources of income. One of the main objectives of the project has been the resolution of the traditional agricultural practices and associated cropping systems.

Table 1. Rennunculus weed control by using herbicides (no. of farmers –188)

Treatment	Yield (g/ha)						Return(Rs/ha)		
	Grain(Q/ha)			Stover					
	1st year	2nd year	3rd year	1st year	2nd year	3rd year	1st year	2nd year	3rd year
T_1 farmers practices (no weeding)	15.35	14.0	13.0	19.2	20.2	20.0	-220.00	-280.00	-335.00
T_2 farmers practices (2,4-d spray@0.5 kg/ha)	23.00	24.0	23.0	27.6	28.0	27.3	-400.50	4600.00	4000.00

From green revolution technology to CDR technology–The identified problems of technological interventions were mainly comprising of, low yield of crops like wheat, paddy, millet-crops, Soya-been, gram etc. on irrigated as well as un irrigated farming locations. However, low productivity of miltch animals is due to poor health and nutrition. It becomes major confining factor along with poor economic status. To cope up with these problems 28 scientific information generated by different agricultural research institutes were collected for further verification and refinement. So there appropriateness could be established for the future extrapolation as per farmers perspective.

Table 2. Effect of different fertilizer levels on Wheat grain and straw Yield

Treatment Fertilizer (Kg/h)	Year wise Yield (Q/h)						Year wise Cost (Rs/h) of intervention			Year wise additional income (Rs)		
	Ist Year		IInd Year		IIIrd Year							
	Grain	Straw	Grain	Straw	Grain	Straw	I	II	III	I	II	III
T-1 12(N_2)+12 (P_2O_5)	15.6	19.2	14.2	17.4	21.20	23.0	-	-	-	-	-	-
T-2 25 (N_2)	16.6	20.8	15.6	19.2	21.8	24.6	250.0	250.0	250.0	640	1060.0	182.0
T-3 25(N_2)+25 (P_2O_5)	18.4	23.0	16.6	20.4	24.4	30.0	500.0	500.0	500.0	1690	1538.0	958.0
T-4 25(N_2)+25 (P_2O_5)+10(K_2O)	21.0	26.2	17.8	23.2	29.0	24.2	580.0	580.0	580.0	3210	2537.0	48.76

To active this major objective of the project, different modes of operation was planned e.g. OFT, OFR and demonstrations. During project implementation different skill were imparted to the farmers through training. As per impact analysis observation for the following conclusions were drawn.

The willingness of hilly farmers to experiment with the restoration of their abandoned agricultural practices and with new crops associations they had not previously managed shows that they have a great capacity to adopt agricultural technologies and adjust them to their particular circumstances. The qualitative and non qualifiedly impacts mentioned above (self esteem, ownership, trust between hilly farmers and researchers, development of mutual support network, revalorization of traditional knowledge, strengthening of hilly farmer's own investigative skills) are further invaluable benefits of the project.

CONCLUSION

The achievements of the project is applying this approach can be explained in terms of what is researched and how research is conducted. The project meet farmers priorities, there was an excellent relationship with the community, work plan where flexible and locally pertinent and the participation of hilly farmers in the project gave them a sense of ownership, of belonging and being able to count on commitment of research team. Therefore, the innovation proposed produced positive quantitative changes in production and in community also benefited from gaining insight into different ideas, practices, ways of thinking and life style at same time as families shared their own ideas, knowledge and worries. The strengthening of these types of experiences and values are fundamental in understanding and explaining the progress and achievement of this project.

The need of the day is to generate technologies according to the production system and location specific. The mountains are having diversity in the vegetation simultaneously diverse in micro ecosystems. Therefore, it requires a serious thinking on the use of green revolution technology in the CDR production system and development of new technology for the newly born state.

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