Technology Intervention and Repercussion among High Altitude Community of Ladakh: A Case Study of Trench Greenhouse

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ABSTRACT

The present study endeavors to bring forth the socio-cultural local institutions and their repercussions on adoption of a technology (in this case, the trench greenhouse) among the high altitude community of Ladakh. Ladakh constitute the transhimalayan part of India where the prevailing harsh environment does not leave much scope for vegetable cultivation in time and space scale (especially during the winter months). With the effective utilization of greenhouse technology it has made possible to harness upon the available resources and grow vegetables round the year (in winter months also, when ambient temperature dips down upto -25°C). Among the various types of greenhouse technology developed by Defence Institute of High Altitude Research (DIHAR), the trench greenhouse is the most economical and easy to establish and grow vegetables in Ladakh area in which vegetables can be grown during winter months also when in the open field condition, cold weather does not allow for any vegetables to grow. Considering the utility and non expensiveness of this trench greenhouse, DIHAR, during the conception and dissemination process of this technology, perceived widespread adoption of this technology among the local community. But to their dismay, the rate of adoption among the local community is/was not upto the expected level. To understand this paradox, the present study was conducted and found the prevailing grassroots level local institution, governing the nature of property regime was the reason behind the low rate of adoption. The time period after harvesting (September) of field crops and sowing (March) in the next year, the institutional norms convert the private property in to a common pool resource (September to March), the winter months when greenhouses are of immense utility. Trench greenhouse (due to its openness, and devoid of any retention wall above the ground level) is not feasible where there is chances of trespassing by stray animals. It indicates that the trench technology does not fit well into the prevailing institutional framework and thus the adoption rate is hampered. This finding brings forth the role of socio-cultural factors in the technology adoption process and furthermore, the findings strengthens the concept of involving local people, and understanding the prevailing socio-cultural environment in the technology generation process.

Key words: Adoption; Greenhouse technology;DIHAR;

Ladakh constitutes the easternmost trans-Himalayan part of Jammu & Kashmir state of India, bordering Pakistan and China constituting of two districts viz. Leh and Kargil. Leh district is situated between 32°N to 36°N latitude and 75°E to 80°E longitude at an altitude ranging from 2900-5900 m asml. Area measuring 45,110 km having 116 villages is divided into 6 blocks1.

Truly described as high altitude cold arid desert, situated along the valleys of the Indus river, intensive sunlight, high evaporation rate, strong winds, and fluctuating temperature (30 to -40°C) characterize the general climate. It is generally said that a man sitting in the sun with his feet in the shade can have sunstroke and frostbite at the same time. With spare vegetation, there is little moisture in the atmosphere. Because of high mountains all round and heavy snowfall during winter, the area remains landlocked from the outside world for nearly six months in a year2.

The vegetable growing season (in open field condition) is only a few months long during summer times. Farming is small-scale; traditionally, each family owns a few acres of land, and their whitewashed mud houses are grouped together in villages whose size varies according to the availability of water. The principal crop is wheat and barley, the mainstay of traditional Ladakhi food. In the valleys there are orchards, and up on the
During winter months, the cold climate does not allow any vegetables to be grown in open field conditions. Therefore DIHAR, in the early 1980’s started R&D in the field of greenhouse technology, due to which now a days, locally grown vegetables are also available during the winter months also.

Greenhouse Technology: A greenhouse is a covered (by transparent cladding material) structure that protects the plants from high wind velocity, excess evaporation, unusual precipitation, and temperature extremes. It is the technique of growing crops by providing favorable environment/growing conditions to the plants.

In Ladakh region the greenhouse technology is of immense use to the farming community. This technology helps farmers grow fresh vegetables during winter months also when temperature dips down below freezing level. As per the diversified farming community of Ladakh, DIHAR has designed various types of passive solar greenhouses to cater to the needs of local farmers as per their resource availability e.g. polycarbonate and FRP greenhouses for Resource Rich Farmer (RRF), Polycen and trench greenhouses for Resource Poor Farmers (RPF).

Trench greenhouse: During the technology generation stage special attention was given to RPF of Ladakh, for which the institute has designed a low cost greenhouses called as trench greenhouse (Fig. 02), which is made of locally available material except the UV stabilized transparent polythene sheet. It is a very low cost greenhouse of 30 feet length x 10 feet width x 3 feet deep size, made below the ground level. The structure is covered with transparent UV stabilized 200 micron thick polythene during day time and extra cover of black polythene is laid out at night time. This greenhouse maintains an average of 7–8°C difference in temperature during winter. During day time the polythene sheet is covered/removed as per the prevailing ambient temperature. The production cost under trench greenhouse is Rs. 5.25/Kg of vegetable and cost benefit ratio is 1:3.55.

Dissemination and adoption of trench greenhouse: Considering the utility of greenhouses in Ladakh region for vegetable production during winter months accompanied by the low cost incurred to establish a trench greenhouse, it was perceived that there will be mass level adoption of this simple technology, and accordingly extensive awareness programme were conducted through various channels like, local radio and television, brochures, field days, training camps, field demonstration etc. But, to the dismay of the institute, this technology was not adopted by the local farmers as per the preconceived hope. Therefore DIHAR through its extension wing conducted a study to understand the reasons behind the low rate of adoption.

Socio-cultural factors of technology adoption: One intriguing features of HAC is high level of social security, even though with limited resources. It is even more
intriguing to find sustainable agriculture in a region where the individuals household are not self sufficient in itself in terms of resources required to practice agriculture. The answer lies in local institutions, observed high among HACs.

A single household, or a village may not be self sufficient (self possession of resource) of its own in terms of the resources required to make a living by subsistence type of farming, but the household enjoy assurances (both vertical and horizontal) that the deficient resources will be available, as and when required. For example, a HAC household does not possess his own irrigation source (unlike the individual tube wells in LLC). In HA there are glaciers, whose melted water is carried through *khuls* (channels) into the villages for distribution in a village (somewhere distributed among more than one village) and further among different householders. Though the system of distribution is complex, but exploitation is rare. The equitable distribution of this scarce resource to every stakeholder (those who contribute in community work) is ensured by the strong institutional network. The institutions allow (within a limited scope) to contribute in a way where a household (household is the social unit in HA institutional system) is capable of, e.g. I help you in sowing and you help me in harvesting.

In terms of technology adoption, institutions play a major role in regions of high social networking, like Ladakh. Adoption of a technology takes place within the institutional framework. Before a technology is adopted, it has to fit within the institutional framework of the community. In other words, technology is like the ‘word’ and institutions the ‘grammer’. An efficient technology if it does not fit into the institutional framework, is not adopted by the community. E.g. in the present case, trench greenhouse being one of the most economical and affordable greenhouse technology, is not adopted by the farmers of Ladakh at large scale. The reason being, local institutional norms leading to conversion (temporal) of private property into a common property during winter (after harvest of crops the whole village land is open for animals to graze upon irrespective of any private ownership) due to which these greenhouses are not feasible where there is risk of encroachment of free roaming grazing animals. These greenhouses are only feasible where a household has its own boundary walled compound, thus limiting the adoption of this technology by household who are devoid of such facility.

For overall development of the region, research output has to reach at the grassroots level, but adoption of a technology (apart from appropriateness of the technology) is dependent on many other factors like the sociology of HAC, their economic status, resource and infrastructure available, and also on the psychological make up of the individuals.

In HA areas with low population density, it has been found that the communication pattern is dominated by the lateral networking accompanied by more of personal interaction. This network act as a platform for sharing information and acknowledging the various creative and innovative endeavours made over time and space by various individuals.

The property regime in HAC in respect to natural resources is such that many of the resources are held in common (common property/pool resource - CPR) and even private property held by an individual household are spread over different altitudes and consolidated holdings are rare to find. Today, the development policies generally recommend consolidation of holdings which overlooks the advantage of this property regime.

Due to single cropping season in HA it has been found that the consequences of perceived risk takes a major factor in decision making process, especially when it comes to adoption of a new technology. Therefore except for a very few innovative farmer, a new technology is adopted by majority of the farmers only after they have personally identified and experienced the positive outcome of the new technology. In extension terminology, the proportion of late majority occupies the major share among HACs.

**RECOMMENDATIONS**

It is a common practice among extension functionaries to create new institutions for their extension activities. It is recommended that, instead of creating new institutions the existing institutions (in context of HAC of Ladakh) e.g. the *goba* system (village administrative system), *chhurpon* (water supervisor), *Kutual* (messenger) etc. (for detail about this functionaries see angchok, 2006) should be effectively used and involved in various extension programmes. It will not only help in reducing the exante and ex-postfacto cost, but will also helps in obtaining credibility (a major factor for success of an intervention) among the local community.

Increased importance of the role of local and grass
root level institutions can not be overruled. Therefore when formulating and implementing plans, priority should be given to relevant institutions on a continuing basis. In context of the above discussed factors and situation, it is argued that extension personnel should be aware of the prevailing socio-cultural environment so that during the technology development and dissemination phase those factors could be taken into consideration and thus avoid undesirable repercussions in the process of transfer of technology.

**REFERENCE**