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Prospect of protected cultivation under cold arid region of Ladakh, India: Status and future prospect

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Abstract
The present study entitled "Present status and future prospectus of protected cultivation under the cold arid region of Ladakh" was carried out in districts Kargil and Leh. The cold arid zone of India is located in the rain shadow of the Himalayas and is one of the driest regions in the world. The area remains inaccessible to the outside world for nearly six months in a year due to heavy snowfall. This fragile ecosystem with limited availability of natural resources is a growing attraction for tourists. Multienterprise option needs to be strengthened to uplift the socio-economic status of the region. Organic farming, protected cultivation, off-season vegetable production, value addition, and development of better storability methods for vegetables and fruits will be remunerative to the farmers of the cold arid region. The currently protected cultivation structures at Kargil are 489 and 933 tunnel-type poly house by the agriculture and horticulture department. The prospect of protected cultivation in Kargil has envisaged a boost in vegetable production, particularly during the off-season (winter), by way of popuarising protected cultivation through women's self-help group (Ama Choskpa).

Keywords: Greenhouse, protected cultivation, Kargil, Leh.

1. Introduction
Ladakh (Land of high passes) comprises Kargil and Leh districts, covering a geographical area of 96,701 km2, accounting for 87.4% of the cold-arid region of India (Sharma J.P. and Mir A.A.1997) [2]. The cold arid part of Ladakh is characterized by substantial seasonal fluctuations in temperature ranging from + 30 °C to -30 °C with maximum sunshine days. The area is inaccessible to the outside world for six months yearly (Sodhana, M.S., 1998) [4]. Cropping techniques that employ protective cultivation involve controlling the microclimate around the plant body partly or wholly based on the plant species' requirements during their growth phase. The Ladakh region has a variety of agricultural practices adapted to the climate, such as greenhouses and poly houses, which greatly facilitate vegetable cultivation throughout the year. During the chilly winter months, when there is no vegetation outdoors, protected vegetable cultivation is a blessing for the rural areas of the cold desert. To grow several commercial vegetables and produce for sale during cold winter.
Due to their low cost, simplicity, and ease of operation, farmers in Ladakh have readily adopted trenches and poly houses (local designs). Trenches, which are necessary to deal with sudden and frequent weather changes, are easy to manipulate manually, which makes trenches ideally suited for this region of the world. In a cost-benefit analysis of greenhouse cultivation, local poly houses and trenches were found for vegetable production, given their low construction costs and high heat retention capabilities. The greenhouse effect has been used for a long time to grow various crops under controlled environmental conditions using electricity (Sodhana, M.S., 1998; McCartney, L., & Lefsrud, M. 2018) [4, 6]. However, in high altitudes of cold arid regions, the production of hydropower is not easy, especially during winter; due to sub-zero temperatures, most water source freeze, and the use of fossil fuels generated electricity is also not economical and environmentally friendly. Greenhouses are an increasingly valuable resource, significantly where food security and economic development are rising. Solar greenhouses can generate income in peri-urban areas, produce crops in winter, fulfil subsistence needs in remote areas, and make vegetables in winter. Farmer-led groups in Ladakh developed, designed, and improved a model to reduce the investment cost, facilitate construction, and extend the system's life with the help of the non-government organization (NGO) LEHO (Ladakh Health and Environment Organization). The current state of J&K, with an area of 2000 hectares and a production of 3444 MT1 compared to the total size of greenhouses in the world of 275,000 hectares as reported for the year 1999-2000, is quite significant when compared with the world concentration of greenhouses.

Thus, growing protected crops in India can be said to have enormous potential, particularly for Ladakh. Currently, more than 3000 greenhouses exist at Leh. These hostile climatic conditions allow the production of vegetables throughout the year. A large scale of brinjal, capsicum, tomato, and other cucurbits is produced during the summer, whereas the green vegetable crops are grown during the frozen winter months when temperatures reach -40 degrees Celsius. In the remote regions of Ladakh, soil trenches and underground greenhouses are also being used extensively (Sharma J.P. and Mir A.A.1997) [2]. The crop season is short, and the area is cut off from the rest of the country for 7 to 8 months. Therefore, self-sustenance is not only desired for this region but also a mandatory aspect of development. The acute power crisis in Ladakh has resulted in the development of solar greenhouses in the region. No single greenhouse exists in the region with a controlled climate device. But the region receives an abundance of sunshine, 300 sunny days per year (2150 KWh per year); even in December, the lowest radiation is 4.32 KWh per day (Sodhana, M.S., 1998) [4], which solar greenhouses can best utilize.

The most common greenhouse is a polyhouse constructed using locally available materials like mudbricks, wood, and polyethylene. U.V. stabilized cladding film is used for these Ladakhi ploy houses (Wani, K.P., 2011) [5]. State Government (J&K) provides subsidies through various agencies like the agriculture/horticulture department to farmers to construct Ladakhi polyhouse. Several other agencies, like NGOs (LEHO and LEDeG), also promote greenhouse construction in the region. NGOs have resulted in a greenhouse revolution in Ladakh. Approx. 15,000 greenhouses are available in the Leh district, which is perhaps the largest in the country. 'Nang,' the remote village of Ladakh, has 55 greenhouses, each with all 55 families.

2. Materials and Methods

The Kargil district falls in the cold arid zone with slopes ranging from 10 to 80%. Geographically located between 34°33′27″ N latitude and 76 °07′34″ E longitude while Leh district is geographically located between 32°N to 36°N latitude and 75 °E to 80 °E longitude at an altitude ranging from 2900 to 5900 m above mean sea level (Tamchos, T *et al*., 2011) [1].

2.1 Site location

The first selected area, the TSG block of Kargil district, lies 22 km away from Kargil district headquarter. The total geographical location of the TSG block is 3091 hectares, including 5villages, namely Treaspone, saliskote, G.M. Pore, Kanoor, Tambis plain lands, and high altitude mountains. The cultivated areas are tiny as compared to the plains. The selected regions are Poyen, Soth, Manjee, Sankoo Lancharchay Faruna, and Pashkum, with an average elevation of 3314 m above mean sea level (MSL). The climate of the study area is cold and arid, with a mean annual average rainfall of 185.42 mm. The environment of the site, in general, is arid type. On the Himalayan side of the rain shadow, Leh combines both arctic and desert climate conditions, as the monsoon winds get dried out after passing through the plains and the mountains in the region. Therefore, Ladakh is often called "Cold Desert".

2.2 Natural vegetation and land use

Poplar (*Populus* spp.), Willow (*Salix* spp.), apple, and apricots are the predominant trees in the study area. Sea buckthorn (*Hippophae rhamnoides*), famous for its rich vitamin C in fruits, is also found there. Besides this, other shrubs like a wild rose, Artemesia spp., *Capparis* spp. etc., are also observed. Agriculture and horticulture dominate the economy of the area. The crop selection is based on the farmer's choice and market demand. Farmers commonly grow barley, wheat, buckwheat as a cereal crop, alfalfa, and sometimes oat as fodder. In addition, mustard, potato, and other vegetables are also grown.

Table1: Sowing and harvesting seasons of crop on the region.

Crop	Period of	
	Sowing	Harvesting
Wheat	1ST Fortnight of April	1st week of august
Barley	1ST week of April to 20th April	15th July to1st week of August
vegetable	15th April to 1st week of may	1st week of August to 15th August

***Sources*:** Agriculture department Ladakh

Table 2: Poly house established by Agriculture Departments

Sr. No	Block	No of Poly hose constructed by Agriculture Dept. (size 30'x14')
1	Kargil	47
2	Drass	48
3	Chiktan	27
4	Shargole	53
5	TSG	146
6	Sankoo	105
7	Taisuru	33
8	Zanskar	30
	Total	489

***Source*:** Agriculture department 2014-2015

Table 3: Poly houses established by Horticulture Department Kargil

Sr. No.	Block	No of Poly houses constructed by Horticulture Depth. (size 6 mt x 9 mt)
1	Kargil zone	495
2	Batalik zone	176
3	Chiktan zone	262
	Total	933

3. Result and Discussion

To find the present status of protected cultivation in Ladakh. A detailed survey of farm families from a selected village in Kargil and Leh district of Jammu and Kashmir compressing different land holding sizes was conducted. Moreover, the cultivation of vegetables like sweet pepper, cucumber, brinjal, and chilies in summer under ploy houses is picking up. During the early spring season, when day length increases considerably but fields are not workable due to snow and freezing temperatures outside, the crops like coriander, Swiss chard, Radish, Spinach, and Lettuce for green leaves are becoming available. The total number of poly houses constructed during 2014-15 by the Agriculture and Horticulture Department was 489 (Table 2) and 933 (Table 3), and KREDA built 3000 domestic and 250 commercial greenhouses during the year 2010-15.

3.1 On field and of field production

From the survey, it's found that the production of vegetables increased inside the polyhouse from (2.15 to 6.40) the production of different vegetables inside and outside the polyhouse are cabbage at 2.15 and 9.7, beetroot at 1.2 and 5.0,

cucumber lettuce 0.75 and 4.88, cauliflower 2.5 and 7.5, Spanish 2.5 and 6.5 tomato 2.5 and 10.5 carrot 2.5 and 6.0 onion 2.5 and 6.5 leafy vegetable 1.75 and 3.83. During the survey, it was observed that the yield increase inside the polyhouse was 2.15 times for cabbage, 4.167 for beetroot, 5.313 for lettuce, 3.0 for cauliflower, 2.4 for spinach, 4.0 for tomato, 2.4 for carrot, 2.6 for onion 2.189 for leafy vegetable (Table 4).

Table 4: Vegetable production inside and outside poly house

Crop	Open field production	Inside poly house kg/m2	Increase in yield
Cabbage	4.5	9.7	2.15
Beetroot	1.2	5	4.167
Cucumber	.8	4.25	5.313
Lettuce	.75	4.88	6.4
Cauliflower	2.5	7.5	3
Spanish	2.5	6.5	2.4
Tomato	5.5	10.5	4
Carrot	2.5	6	2.4
Onion	2.5	6.5	2.6
Leafy vegetable	1.75	3.83	2.189

3.2 Adoption of protected cultivation

During the survey, we found that Chinese-type polyhouse, mud-walled poly houses, and low plastic tunnels are the cheap protected cultivation technologies in operation in the cold arid region for raising nurseries. The tunnel type and polyhouse (local design) have been primarily adopted by farmers due to their low fabrication cost and easy operation. The demand for vegetables in the local market is increasing. Therefore, protected cultivation is one of the viable options for improving the economy of the region's farming communities. The most common greenhouse in Ladakh is the Ladakh polyhouse. Unlike usual, it is surrounded by mud brick walls instead of polyethylene sheets, which not only cut down the installation costs but also reduce the adverse effects of strong winds, increasing the temperature retention and, thus, increasing net profits. Jammu and Kashmir State Department of Agriculture/Horticulture provide cash assistance of Rs. 3000 besides a 32x16 ft. free polyethylene sheet. Lean houses generally have three sides made of mud bricks, and the side walls descend towards the front. As a result, the greenhouse revolution in Ladakh has been accelerated. Trench-type greenhouses are simple, inexpensive, and incredibly useful for Ladakh. The potential for this structure in the region is vast. It consists of a pit structure composed of wooden poles to hold polyethylene film that is U.V. stabilized–covered by polyethylene sheets or woollen or cotton sheets during the night to reduce heat loss in extreme cold. Even though it is an underground structure, it has the lowest cost among all greenhouses and the lowest wind damage. Its construction and maintenance do not require much skill. Being an underground structure, it loses little heat and retains most of its temperature (Singh B., 1998) [3]. The system is thus most suitable for the region. But the farmer is not adopting this type due to a lack of knowledge about trench technology.

4. Conclusion

Technology that is protected is crucial for meeting the targets. Greenhouse technology is an invaluable tool for the sustainable development of a hilly region. The widespread use of greenhouses could provide a sign of relief in a harsh winter that might otherwise threaten human survival in these rural hilly regions. In the off-season, a ploy house is an option for growing vegetables because it traps most solar radiation for photosynthesis. By its very nature, polyhouse technology creates a microclimate that allows vegetables to be produced in the season when the open land is too cold to grow them. A survey was conducted to know the present and future status of protected cultivation in the cold arid region of Jammu and Kashmir State. The primary cropping season is Kharif. This technology will help people have green vegetables in the off-season, which was impossible without the help of government and non-government departments. It should be possible for poor farmers to adopt these technologies with financial assistance, such as low-interest loans.

5. References

1. Tamchos T, Hussain A, Dawa S. Vegetable Production in Ladakh (Cold Arid Region of Jammu and Kashmir): Achievements and Future Strategies. Indian Horticulture Journal. 2011;1(1):50-52.
2. Sharma JP, Mir AA. Crop improvement perspective in cold arid zone-Ladakh. Regional Agricultural Research Station, Sher-e-Kashmir University of Agricultural Sciences & Technology-Kashmir, Leh (Ladakh), India; c1997.
3. Singh B, Dwivedi SK, Paljor E. Studies on suitability of various structures for winter vegetable production at sub zero temperatures. In XXV International Horticultural Congress, Part 7: Quality of Horticultural Products. 1998;517:309-314.
4. Sodhana MS, Prakash S, Goval LC, Sawhney RL, Goval A. Design of solar passive house in Ladakh, Part III; c1998.
5. Wani KP, Singh PK, Narayan N, Khan SH, Amin A. Prospects of vegetable production in cold arid region of Ladakh, Achievement and future strategies. International Journal of Current Research. 2011;33(6):10-17.
6. McCartney L, Lefsrud M. Protected agriculture in extreme environments: a review of controlled environment agriculture in tropical, arid, polar, and urban locations. Applied Engineering in Agriculture. 2018;34(2):455-473.