



Himalayan Institute of Alternatives, Ladakh
(An Alternative Institute For Mountain Development)

Desert Greening Project

2022-2023



**Funded by
Make My Trip Foundation**

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1. INTRODUCTION

Himalayan Institute of Alternatives, Ladakh (HIAL) is undertaking a massive Desert Greening initiative at its campus, situated on a desert area of 135 acres in a valley of Ladakh, approximately 20 kilometers from the region's main city of Leh. HIAL's vision is to create an alternative and sustainable development model for the Hindu Kush Himalayas and mountain regions beyond. HIAL is focused on creating new paradigms of 'learning by doing' while creating a platform for the rejuvenation and incorporation of indigenous knowledge and contextual-based learning.

With the support of the MMT foundation, the greening of HIAL's campus serves as a robust platform for the advancement of desert greening techniques and methodologies. The initiative aims to inspire and educate high altitude mountain regions within the Himalayas and beyond. Simultaneously, HIAL's plantation team is working on greening 70% of the campus using perennial and native plant species, employing various principles of desert greening. In the 2023-24 period, MMT funded HIAL to plant 12,500 plants on the institute's premises. The lists below provide details of the plant species.

Table 1: Lists of plant species and their survivability are listed below.

S.no	Name of plant species	Total planted
1)	Russian Olive (<i>Elaeagnus angustifolia</i>)	5,000
2)	Kikar (<i>Robinia pseudoacacia</i>)	5,000
3)	Wild rose (<i>Rosa webbiana</i>)	2,500
4)	<i>Ephedra gerardiana</i>	20
	Total planted	12,000

2. BRIEF METHODOLOGY

The plantation work involved several stages, including land preparation, collection of planting material, and actual plantation. Land preparation involved soil excavation, the removal of stones, and soil conditioning. Planting material, including seedlings and cuttings, was collected from nearby villages and places. Plantations were carried out in mixed patterns, mimicking natural habitats.

➤ Land preparation/ Initial works

In order to carry out the plantation work, initial land preparation was undertaken, which included digging the soil with a JCB, machine and manual eliminating big stones, and finally making appropriate soil by mixing clay, sand, and manure. The purpose of land preparation is to provide the necessary soil conditions that will enhance the successful establishment of the young offshoots

or seed sown plants. Similarly, procurement of consumables and non-consumables like agricultural tools and equipment, different materials (dry leaves, clay, and farmyard manure) has been done.



Fig. 1: Land development with the help of JCB.



Fig. 2: Mixing manure



Fig. 3: Compost preparation



Fig. 4: Soil improvement in a greenhouse to propagate tree saplings

➤ **Planting material collection**

In order to complete the target of planting 12,500 saplings, various excursions were made by the team. Saplings of the native species were collected from nearby villages and places in order to use them for plantations. Similarly, a small number of uprooted saplings were also collected from Phyang and Tia villages. Since the native plant species are very few in nature, cuttings were preferred as compared to uprooting.



Fig 5: Interaction with people having knowledge on native plants



Fig 6: Collection of Russian Olive



Fig 7: Collection of wild rose A



Fig 8: Collection of wild rose B

➤ **Plantation:**

The plantations were done in three plantation seasons, i.e. spring and autumn 2022 and spring 2023. 10,000 saplings were planted in the spring & autumn 2022, and 2500 plants were planted in spring 2023. The native plant species were raised in a greenhouse and transplanted in an open field for spring plantation, and for autumn plantation, cuttings were directly planted in the field. All the different species were planted in a mixed pattern in order to mimic the plants that are growing in their natural habitat. Plantation operations were carried out with the help of different consultants, staff, interns, *malis*, laborers and volunteers. The resulting patch of vegetation will grow thick and dense, functioning as an effective barrier once the plants establish themselves and the growth forms mature.



Fig 9: Nursery raising in greenhouse



Fig 10: Nursery raising in trench



Fig 11: Plantation in spring



Fig 12: Spring plantation



Fig 13: Autumn plantation

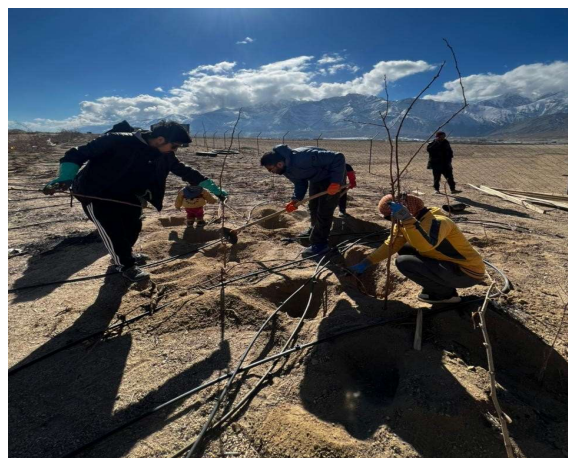


Fig 14: Autumn plantation



Fig 15: Autumn plantation



Fig 16: Autumn plantation

➤ **Irrigation:**

Following the daily targets of planting saplings, they were irrigated based on their water requirement, which is generally three times a week during the summer and less in the winter. The saplings were covered by stones in order to minimize evaporation losses. Further, the research focus is to monitor the optimal amount of water needed for the saplings and thus manage the water sustainably. It is interesting to note that plantations need less watering in the fall as compared to the spring. Summer irrigation was done using drip irrigation, and autumn irrigation was done using pipe watering. Pipe watering was also used when drip irrigation was not working during the summer. In general, the irrigation ends by the end of October; however, at HIAL due to high soil porosity and the fact that water does not retain in the winter, we have to water the whole season, although less in the winter.



Fig 17: Drip system



Fig 18: Irrigation through pipe in fall



Fig 19: Watering during peak winter with flooding irrigation

3. SURVIVABILITY



Fig 20 : Plant status June 2023



Fig 21: Plant status June 2023



Fig 22: Wild rose



Fig 23: Russian olive

Table 2: Survivability of various plant species after one year.

S.no	Name of plant species	Total planted	Total survived	Survival %
1)	Russian Olive (<i>Elaeagnus angustifolia</i>)	5000	3910	78.2
2)	Kikar (<i>Robinia pseudoacacia</i>)	5000	2905	58.1
3)	Wild rose (<i>Rosa webbiana</i>)	2500	1053	42.5
4)	<i>Ephedra gerardiana</i>	20	15	75
	Total planted	12000	7883	63%

We witnessed a 63% survivability of the plants. This is considered good survivability in Ladakh's desert, considering the plantation was away from any stream or natural spring and river. Our observations on survivability of each species is presented below:

Russian olive (*Elaeagnus angustifolia*):

Russian olive demonstrates the highest survivability rate among the four species, with 78.2% of the planted specimens still alive after one year. This could be attributed to several factors, such as the plant's resilience and adaptability to various environmental conditions. However, it is crucial to note that Russian olive, like the other species mentioned, has experienced significant damage to its bark, which may have affected its overall health and survival.

Robinia (*Robinia pseudoacacia*):

Robinia, also known as black locust, displays a survivability rate of 58.1% after one year. The lower survival rate compared to Russian olive suggests that Robinia may be more susceptible to adverse conditions or pests. Furthermore, the damage caused by wild rabbits and lizards to the bark might have played a significant role in reducing the survival rate of Robinia plants. The bark provides essential protection and nutrients to the tree, and when damaged, it can negatively impact growth and survival.

Wild rose (*Rosa spp.*):

Wild rose plants exhibit a survivability rate of 42.5% after one year. The lower survival rate compared to both Russian olive and Robinia indicates that wild rose may be more sensitive to environmental conditions or face additional challenges. Again, the damage inflicted by wild rabbits and lizards on the bark could be a crucial factor contributing to the decreased survivability rate.

Ephedra (*Ephedra spp.*):

Ephedra, a genus of shrubs, has shown a relatively high survivability rate of 75% after one year. This suggests that Ephedra species possess inherent traits that promote

survival and adaptability, potentially making them more resilient to environmental stressors, including damage caused by pests.

In the upcoming years, this greening will have a wide range of regional advantages, such as carbon sequestration, improved living conditions for staff and student inhabitants, and the creation of new biological habitats for numerous life forms.

4. CHALLENGES

In Ladakh, greenery exists next to natural water bodies or areas irrigated through artificial canals. This is the reason that less than 10% of the total area is green.

HIAL faced and tackled several challenges, as presented below:

Scarcity of water:

- a. Last year we experienced a severe scarcity of water due to its arid climate. Water needs to be purchased and transported via tanker from distant sources, leading to increased costs and logistical challenges.

Soil Conditions:

- a. Porous soil structure: The soil in HIAL is generally porous, with low organic matter content and a coarse texture. This type of soil hampers water retention and nutrient availability, posing a significant challenge for tree growth and establishment.
- b. Nutrient Deficiency: The porous soil lacks essential nutrients required for healthy tree growth. To overcome that problem, we added organic matter, such as compost or manure. This helps increase the water holding capacity of the soil and improves nutrient availability for tree growth.

Extreme temperature and climate:

Ladakh experiences extreme temperatures, with cold winters and hot summers. The temperature fluctuations and harsh climatic conditions further impeded the survival and growth of trees. Frost damage during the winter and heat stress during the summer adversely affect the health and vitality of young trees.

Our studies show that survivability increases if we plant mature saplings. This can either be done by raising greenhouse nurseries of our own or by purchasing fully matured plants that generally cost 4-5 times more.

5. BENEFICIARIES

The plantation project at HIAL had several positive impacts, including reducing the carbon footprint through the planting of 12,500 saplings with a survival rate of 63.4%. The project also supported the local economy by providing employment opportunities to 20 individuals directly and around 300 indirectly through tours and field visits. Additionally, the project contributed to gender inclusion and empowerment by benefiting 12 women who were involved in plantation and project related activities.

Table 4: List of Beneficiaries from MMT project

S No	Parameters	MMT Projects to Local Beneficiaries
1	Sapling planted	12500 plants
2	Survival Rate at End of Year	63.40%
3	Directly employed salaries	20 individuals directly
4	Indirectly Employed (Tours/ Field Visits)	5000 individuals indirectly
5	Total Women Beneficiaries	3000 women

6. FUTURE PLANS

HIAL experimented this spring with planting of matured trees following the principles of permaculture. We transplanted 160 matured plants and witnessed a survival rate of around 93%. After several years of experimentation, we finally have the process to green the desert land of HIAL. These trees require irrigation twice a week, which after a few years will reduce drastically and survive only through drip irrigation systems or greywater systems near the buildings. This process will be replicated in the green HIAL's desert land.





Fig 24: Successfully Transplanted Matured Trees

7. CONCLUSION

The plantation work at HIAL aimed to green the barren desert ecosystem of Ladakh by employing region specific afforestation techniques. Despite the challenges faced, a significant success rate of 63.4% was achieved, contributing to the greening of HIAL's campus. The latest experiment with transplantation of matured trees following the permaculture principles yielded very high survivability. Thus, providing us with a methodology for greening desert successfully. This provided valuable insights into desert greening and highlighted the importance of adapting techniques to the specific climatic and geographical conditions of the regions. Further, HIAL will become a knowledge hub for young generations who are interested in nature.