Progress Report on
Seabuckthorn (*Hippophae salicifolia*) Management for the
Upliftment of Local Livelihood in Mustang District

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Introduction

Seabuckthorn is a deciduous, nitrogen fixing, thorny willow-like plant. It is pioneering species and prefers to grow in low humid, alluvial gravel, wet landslips and riverside with brown rusty-scaly shoots (Lu, 1992; Banjade, 1999) and it belongs to family Elaeagnaceae. There are six species and ten subspecies of seabuckthorn (Jarsa, 1998) out of which two species (*Hippophae salicifolia* and *H. tibetana*) have been reported in Nepal at high altitude areas (Lu, 2003).

Seabuckthorn is serving as a measure of biodiversity conservation, soil conservation, medicines, food, fodder and fuel wood (Lu, 2003). It has an extraordinary capacity to grow and survive under adverse conditions (-40 to 40ºC) and has extensive subterranean rooting system with strong soil binding ability, soil stabilization, river bank control and water retention (TISC, 2001). Seabuckthorn berry is a very rich source of vitamins and possesses a number of unique medicinal properties, which have a great potential to provide health-foods and a variety of medicines (Ansari, 2003). The vitamin C content is 5 – 100 times higher than in common fruits and vegetables (Vidya, 1999).

### Comparison of the vitamin contents of seabuckthorn and other fruits and vegetables (mg/100g)

<table>
<thead>
<tr>
<th>Species</th>
<th>Vitamin A</th>
<th>Vitamin B1</th>
<th>Vitamin B2</th>
<th>Vitamin C</th>
<th>Vitamin K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seabuckthorn</td>
<td>11.00</td>
<td>0.04</td>
<td>0.56</td>
<td>300-1600</td>
<td>100-200</td>
</tr>
<tr>
<td><em>Cilicosa roxburghii</em></td>
<td>4.83</td>
<td>0.05</td>
<td>0.03</td>
<td>1000-3000</td>
<td>-</td>
</tr>
<tr>
<td>Kiwi Fruit (<em>Actinidia sinensis</em>)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>100-470</td>
<td>-</td>
</tr>
<tr>
<td>Hawthorn</td>
<td>0.82</td>
<td>0.02</td>
<td>0.05</td>
<td>100-150</td>
<td>-</td>
</tr>
<tr>
<td>Orange</td>
<td>0.55</td>
<td>0.08</td>
<td>0.03</td>
<td>50.0</td>
<td>-</td>
</tr>
<tr>
<td>Tomato</td>
<td>0.31</td>
<td>0.03</td>
<td>0.02</td>
<td>11.8</td>
<td>-</td>
</tr>
<tr>
<td>Carrot</td>
<td>4.00</td>
<td>0.02</td>
<td>0.05</td>
<td>8.0</td>
<td>-</td>
</tr>
</tbody>
</table>

*Source: Lu, 1992*

Also seabuckthorn has become an important source of income generation from fruit and oil extracts (from pulp and seeds) (Anon, 2006). Seabuckthorn fruit is called treasure of bio-activity substance because of its over 190 bio-activity substances containing with pharmacological effects on the cardiovascular and the immune system, strengthen the spleen and stomach and so on (Anon, 1999). Due to these reasons China and Russia has been producing seabuckthorn products since the early 19th century and this plant is called a wonderful plant (Lu, 1992).
Though seabuckthorn is a multipurpose and vital species for mountain-rural poor, it is one of the least known, unexplored and underutilized plant species in Nepal Himalayas (Gupta, 2000; TISC, 2001). The high mountain area in Nepal, where seabuckthorn natural stands are gregariously found, face severe development problems (Hilbert, 1997; Gupta, 2000). The regeneration of the plant was regarded poor by TISC (2001) due to various factors i.e. extreme cold, human interference, glacial flood effect, high velocity wind and improperly harvest of the plant. The seabuckthorn forest is also thought to be depleting due to fire and open access to grazing and cutting (Koirala, 2002). Many studies (Hilbert, 1997; TISC, 2001; Koirala, 2002; Ansari, 2003; Baral, 2006) reveal that the local people are underutilizing the plant products, harvesting the fruits traditionally and over cutting woods leading towards the destruction of resource. This species is one of the least studied medicinal plants in Nepal and an appropriate management option has not known so far (ACAP, 2002).

Despite rich but under exploited resource, Nepal is yet to harness the rich potential of seabuckthorn in producing foods, medicines, juices, and other cosmetic products (Ansari, 2003). There are ample opportunities to bring change in the livelihoods of high mountain people by utilizing this kind of hidden treasure of the Himalayas (Ansari, 2003). The local people of Mustang have been using the seabuckthorn wood for fuel wood purpose, fruits for manufacturing juice and concentrates and foliages for fodder, green manure and beddings of livestock (Koirala, 2002).

Mustang, one of the most inaccessible districts of the country, is a geographically fragile mountain area. This species is vital species especially for mountain-rural poor because it provides nutritional needs of the people without any cost and possesses unique characteristics in environment conservation (ACAP, 2002). Moreover, it can uplift the livelihood through income generation from various products like juice, jam, tea, medicines and cosmetics like in China (Lu, 2003). The role and contribution of such plants are crucial and more so amongst the rural communities of developing countries. Some 80% of the population of developing countries depends on non timber forest products for their primary health, nutritional needs and income generation (FAO, 1995). This is particularly true to a country like Nepal, where alternative economic opportunities are limited. However, contribution of the species in the income generation of the local people has not yet been assessed and because of this, better management of seabuckthorn has not been possible for their livelihood upliftment. So, the local people in Mustang district have so far reaped a small fraction of its benefit despite the great potential of this species. Moreover, in order to manage the seabuckthorn in scientific and sustainable manner, quantitative information of the present stocking, potential production and their sustainable management are essential.

Until and unless the local people are aware of the resource and able to generate income from it, research work alone cannot contribute in the conservation and cannot uplift of the local people. This project aims at conducting biophysical and socio-economic surveys to quantify the resource of seabuckthorn, identify its contributions in livelihood and analyze current management systems. Appropriate management options will be recommended from the proposed study made. During this project nurseries will be developed and plantations will be performed, seabuckthorn management committees will be formed and ten year operation plan will be developed. There will be clear provision in the five years operation plan to harvest the resource properly, produce the commercial products, trade them efficiently in markets and share the benefits in equitable manner. Training will also be organized to aware and empower the local people for sustainable seabuckthorn forest
management. It is expected that the local people will be able to manage seabuckthorn forest themselves to get high economic return without deteriorating the resource base. So, the project outcomes will help to uplift the livelihood of the local people and maintain the mountain ecosystem. Moreover, this will be a milestone for formulating policies regarding seabuckthorn management. Thus this will create an independent resource mobilizer and thereby a model community.

**Study Area**

The present project has been conducted in Lete and Kunjo VDCs (Village Development Committees) of Mustang district. Mustang is a semi-desert, trans-Himalayan, rain shadow area covering 3673 sq. km. It lies in the Dhawalagiri zone of western development region, which is surrounded by Tibet in the North, Manang in East, Myagdi in South and Dolpa in the West. The total population of the district is 14981 and number of household is 3243 (NPC, 2001). These VDCs lie in lower Mustang which is a transition between trans-Himalaya and inner Himalaya. Annual rainfall in the area is 1500 mm supporting a very rich vegetation of conifer and broadleaf. In these VDCs, *H. salicifolia* has been reported along the river banks, booklet bank, flood plains and in the sloppy areas of Kunjo and Lete VDCs. Total households in Lete and Kunjo VDCs are 174 and 162 respectively and there are altogether 5 forest users groups in Lete and Kunjo VDCs.
Objectives

This project had specifically set four objectives.

1. To estimate the standing biomasses of wood, fruits and foliages of seabuckthorn (*Hippophae salicifolia*)
2. To identify the contributions of seabuckthorn to the livelihood of the local people in the study area
3. To assess the current management systems regarding their techniques of propagation, harvesting, extraction and utilization of seabuckthorn
4. To form a seabuckthorn management committee, prepare five years' operation plan, train the local people to the sustainable seabuckthorn management and disseminate the findings

Methods

To fulfill the objectives, this project has completed the following tasks. Analysis of the data is going on.

Preparation for Field Visit

**Discussion with Annapurna Conservation Officials and Preparation of Permission Letter:** As Mustang lies in the Annapurna Conservation Area Project (ACAP) and this project has included destructive sampling of the trees, permission letter was necessary. So after discussion with the officials, permission letter was prepared to study in this protected area and cut the trees.

**Discussion with the Forest User Committees:** It was necessary to get support of the local people to cut the seabuckthorn trees and to conduct other activities. Several discussions have been carried out with the forest user committees of the VDCs to aware the importance of seabuckthorn tree and need of this study for the improvement of their livelihoods and the resources.

**Reconnaissance Survey:** To get general overview of the study area and the distribution of seabuckthorn forest, reconnaissance survey has been carried out with the help of a local people.

**Sampling Design:** With the help of reconnaissance survey and aerial photographs, stratified systematic line plot sampling has been chosen with plot size 10mX10m. Altogether 100 plots (between plot distance 100m) have been set in the map for resource inventory that would comprise approximately 2% sampling intensity.

**Direct Field Observation**

For the first objective, following biophysical data have been collected.

**GPS Locations:** GPS locations of all the boundary of seabuckthorn patches have been recorded. These locations are being analyzed to find the distribution area of the seabuckthorn and to show the spatial distribution in the study area through GIS software. Arial photographs have been made available from ComForM (Community based Forest Management in the Himalaya) project, Institute of Forestry, Pokhara, Nepal.

**Direct Sites Observation:** The nursery, plantation sites, degraded areas and local juice and concentrate making homes (industries) have been visited to observe their progress, production system and products.
Data Collection for Regression Equations: For this, destructive sampling has been carried out taking at least three representative sample trees from each 5 cm diameter class (0-5cm, 5-10 cm, 10-15 cm, and so on). Trees were randomly selected from the desired size (dbh) and felling direction was fixed. Then the ground was cleared for shrub and other obstacles and a sheet of 20X10 m² size was laid along the direction of the desired felling direction. Then the tree was felled. Their heights, diameter at 30 cm, crown diameter, bark width at 30 cm and growth ring at 30 cm were recorded. Altogether 30 trees of different diameter classes were cut and their weights of fruits, wood and foliage were taken in situ. Their oven dry weight is being taken in lab that will be incorporated during the formation of regression equations between biomasses (wood, fruit and foliage) and tree height and diameter at breast height. For ease of utilization by local people, biomass tables of all three dependent variables (fruit, foliage and wood) will also be prepared.

Inventory: To quantify the present stocking of wood, fruit and foliage, 50 plots of size 100m² were taken along the river bank at a distance of 100 m between plots and 50 plots of the same size were taken in the sloppy/degraded patches in a stratified systematic line plot manner. Within the plot, number of trees, diameter at breast height, height, number of regenerations, number of stumps and erosion and grazing status were recorded.
**Socio-economic Survey**

For the socio-economic data collection, following PRA and RRA tools were used by means of which the information regarding seabuckthorn like management, roles in income generation, poverty reduction, roles of different organizations, institutional arrangements, problems, prospects and other important factors have been collected. Through direct field observation during the time of harvesting, extraction and utilization, their techniques of fruit harvesting were identified.

**Household Survey:** Household survey was carried out covering all the classes of people (including poor and rich). Respondents in each VDCs were 20% of the total households.

**Focus Group Discussion:** It was carried out with all the five forest users group members of Lete and Kunjo VDCs, women groups and other groups (poor and Dalits).

**Semi-Structured Interview and Discussion with Key Informants:** Some of the project officials collectors, traders, Amchi and other knowledgeable personnel have been consulted for taking data and this are still going on. Officials from ACAP, ICIMOD, CARE, DSCO, TISC etc are being consulted for taking the socio-economic data.

**Project Participants and beneficiaries**

The participants and beneficiaries are hopefully the local poor people inhabiting the rural area of the Mustang district. They will at least get sufficient important nutrients (vitamin A, B, C, E and K) for their health and will learn to manage the seabuckthorn forest sustainably for sound environment and economy. From this project, people of other remote mountainous people will also get benefits from the lesson learnt from this study. The consumers of the products will also ultimately be benefited from the nutritious juice, jam, tea and other products.
<table>
<thead>
<tr>
<th>Activities</th>
<th>Tangible Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource inventory to quantify the standing biomasses of wood, fruits and</td>
<td>• Regression equations</td>
</tr>
<tr>
<td>leaves</td>
<td>• Biomass tables</td>
</tr>
<tr>
<td></td>
<td>• Present biomasses of wood, fruits and leaves</td>
</tr>
<tr>
<td></td>
<td>• Identify harvestable quantities</td>
</tr>
<tr>
<td>Household survey, focus group discussion, semi structured interview and</td>
<td>• Identify the contributions of seabuckthorn to the livelihood of the local people</td>
</tr>
<tr>
<td>discussion with key informants for socioeconomic information</td>
<td>• Identify roles and responsibilities of different stakeholders</td>
</tr>
<tr>
<td></td>
<td>• Identify market channels</td>
</tr>
<tr>
<td></td>
<td>• Aware the local people, help in seabuckthorn management committee formation</td>
</tr>
<tr>
<td>Direct field observation, group discussion, discussion with key informants</td>
<td>• Assess the existing management systems regarding the techniques of propagation, harvesting,</td>
</tr>
<tr>
<td>, research paper reviews</td>
<td>extraction and utilization</td>
</tr>
<tr>
<td></td>
<td>• Recommend the appropriate management systems for sustainable management</td>
</tr>
<tr>
<td>Seabuckthorn Management Committee formation and participatory operation</td>
<td>• Sustainable management of seabuckthorn by local people</td>
</tr>
<tr>
<td>plan preparation</td>
<td>• Continuity of the work</td>
</tr>
<tr>
<td>Training</td>
<td>• Aware and empower local people</td>
</tr>
<tr>
<td></td>
<td>• Local people will be able to manage the seabuckthorn forest with sound environment and economy</td>
</tr>
<tr>
<td></td>
<td>• Local people will know the techniques of making various products especially juice, jam and tea.</td>
</tr>
<tr>
<td></td>
<td>• Produce commercial products</td>
</tr>
<tr>
<td></td>
<td>• Local people will be able to sell their products in markets.</td>
</tr>
<tr>
<td>Brochure preparation</td>
<td>• Aware the local people</td>
</tr>
<tr>
<td></td>
<td>• Provides guideline (reference) to manage the forest</td>
</tr>
<tr>
<td></td>
<td>• Disseminate the findings</td>
</tr>
</tbody>
</table>

**NOTE:** This project is ongoing and detail report is being preparing. For more information, please contact me at rrajchal@yahoo.com or +9779803210032.
References


Some Photographs

Seabuckthorn Leaf

Seabuckthorn Berries

Two Varieties of Berries being observed in Mustang
Seabuckthorn Seed

Seabuckthorn Colonizing in Landslide Area

Seabuckthorn Pulp without Seed