DISTRIBUTION OF SEABUCKTHORN AND ITS MARKET POTENTIAL IN NEPAL

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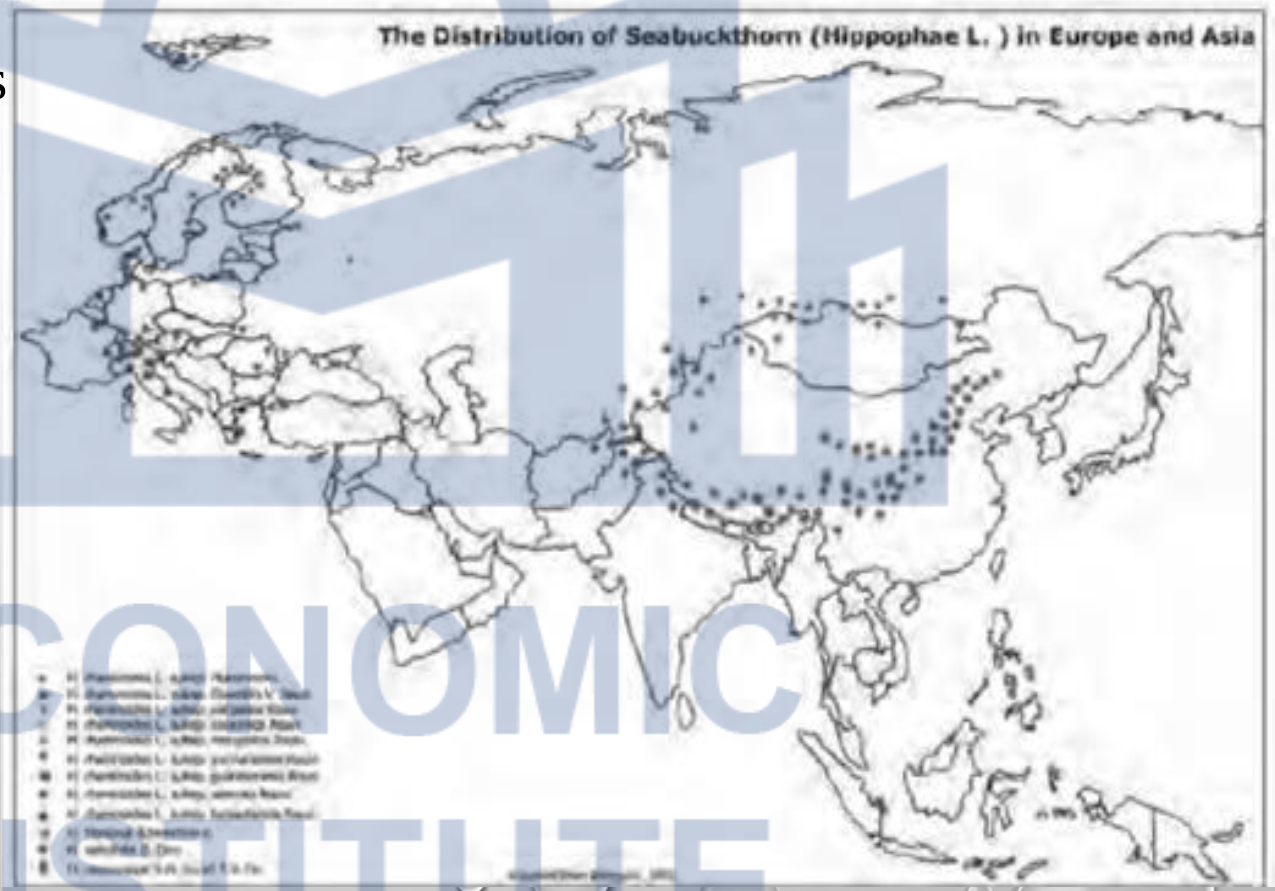
Introduction

- *Hippophae*, a species of Elaeagnaceae family commonly known as Seabuckthorn
- A dioecious xerophytic plant species
- Two species; *Hippophae salicifolia and Hippophae tibetana are* found naturally in Nepal Himalaya.
- Bears clusters of small golden yellow (*salicifolia*) and bigger golden berries (*tibetana*) that contain over 100 nutrients vital for human being.

Seabuckthorn Distribution: Global

- The global distribution in Europe and countries around Hindukush Himalaya Region.
- Nepal is one of the countries with rich Seabuckthorn population and its natural distribution in South Asia.



Seabuckthorn in Nepal

- Nepal has 2 species; *H salicifolia* and *H. tibetana*
- Known by more than 12 local, vernacular and ethnic names.
- Being used since 12th century in Northern Nepal as per Tibetan medical history.

- **Traditional**: Currently used for limited foodstuffs, fuel, fodder, and as traditional medicines (Ethnomedicinal uses)
- **Domestic uses:** for livelihood, food and household economy
- **Environmental uses** for soil erosion control
- **Economic uses**: Concentrate and final Juices, nectar, jam, green tea etc.

Hippophae salicifolia

- Generally, a small tree
- Bears clusters of small yellow berries
- Distributed mainly in Western and mid-Nepal, 2000 to 3700 masl
- Concentrated to sandy soils, river and stream banks and open landslide areas

H. salicifolia: Physiology

- Tap root, branched, 6-9 m in length
- Extensive rooting system with strong soil binding capacity
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- Useful for soil stabilization, riverbank control and water retention
- Excellent soil holding on fragile mountain slopes

Hippophae tibetana

- Short, bushy and thorny shrubs, around 10 to 50 cm high
- Distributed 3300 to 4500 (5100) m altitude in High Mountains of Nepal
- Grow basically in stony areas on hills and hillsides, in valleys and riverbanks
- Clonal variations in growth, hardiness, and height according to the geographic distribution i.e., higher the latitude, shorter the growth period

Rationale

- Despite its socio-economic importance, the natural habitats of *Hippophae* spp. are threatened by deforestation for agriculture, urbanization, and other activities
- Long-term management strategies necessitate a comprehensive approach, considering demographic, ecological, and socioeconomic aspects
- Addressing these issues requires an understanding of the species population, distribution, potential areas for its plantation, and its socio-ecological interactions.

Objectives

This study aims at studying the following traits of the seabuckthorn:

- Current status
- Present and future distribution
- Diversity and density
- Market potential, uses, conservation threats and challenges

Methods

Review of secondary literatures

- Publications of Tree improvement Unit/ Department of forests and other institutions; Published research articles, study reports and CFUG operation plans.

Distribution of Seabuckthorn species (collection of geocoordinates/georeferences by following methods)

- Review of Herbarium specimens (KATH, TUCH)
- Review of Published articles
- Online data base (www.floranepal.org, GBIF, RBGE, NHM, TI, iNaturalist)
- On site observation and community information

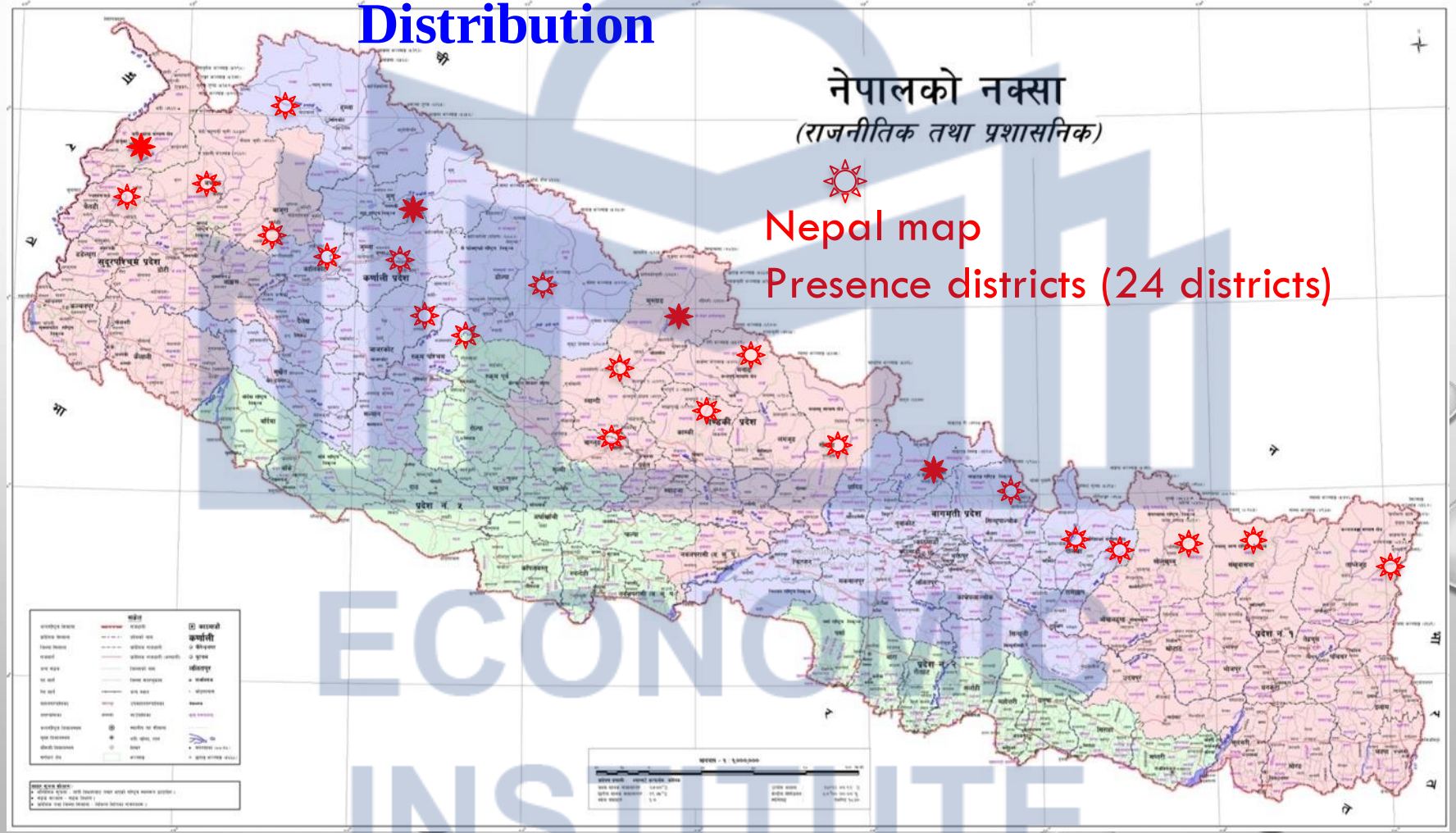
Meetings and interactions with concerned stakeholders

- DFOs, CFUGs, local communities

MaxEnt Species Distribution Modelling

- 19 Env variables from GCM and 5 other variables (aspect, elevation, slope, road network and landuse/land cover data) = tested through 24 variables
- Present and future (potential) distribution model under RCP 4.5 scenario (intermediate) for year 2030 and 2050.

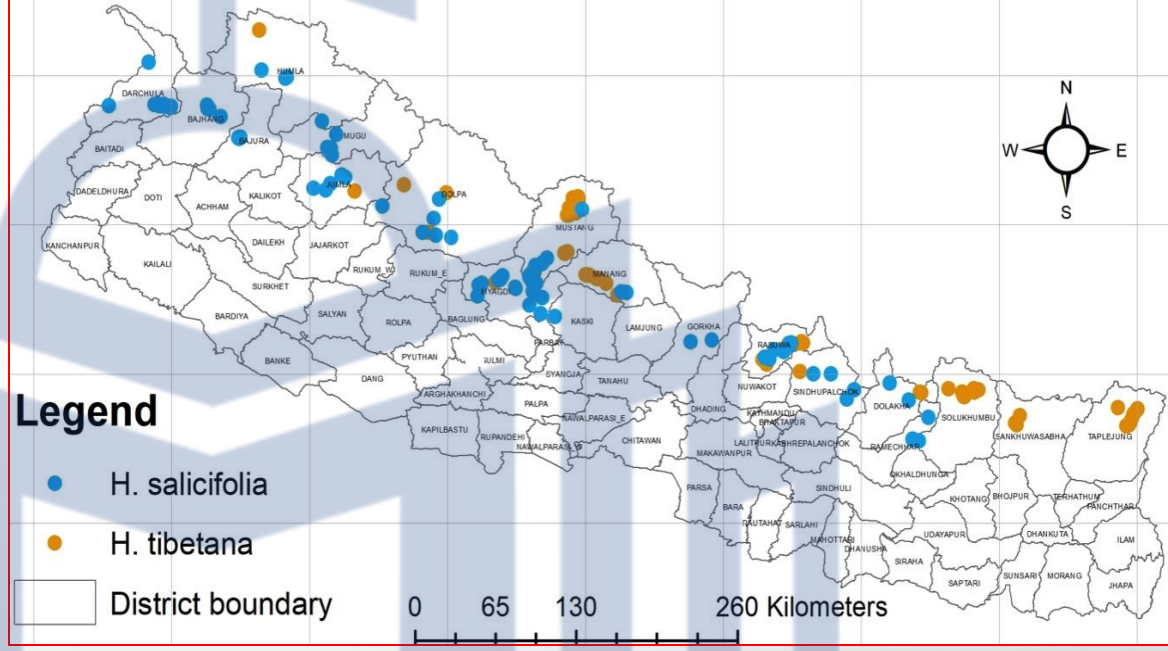
FindingsM Present Distribution

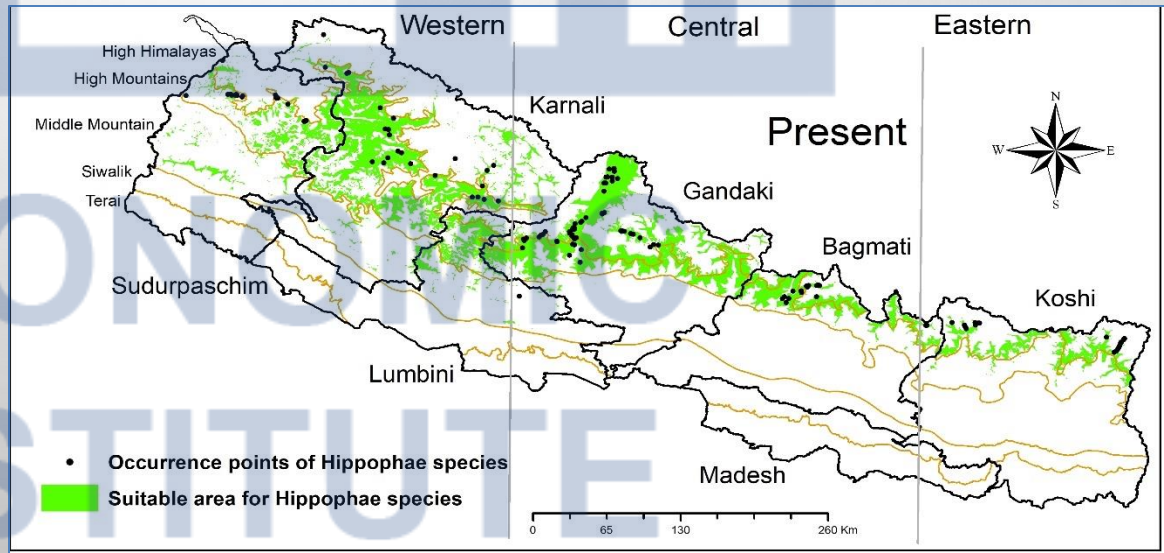


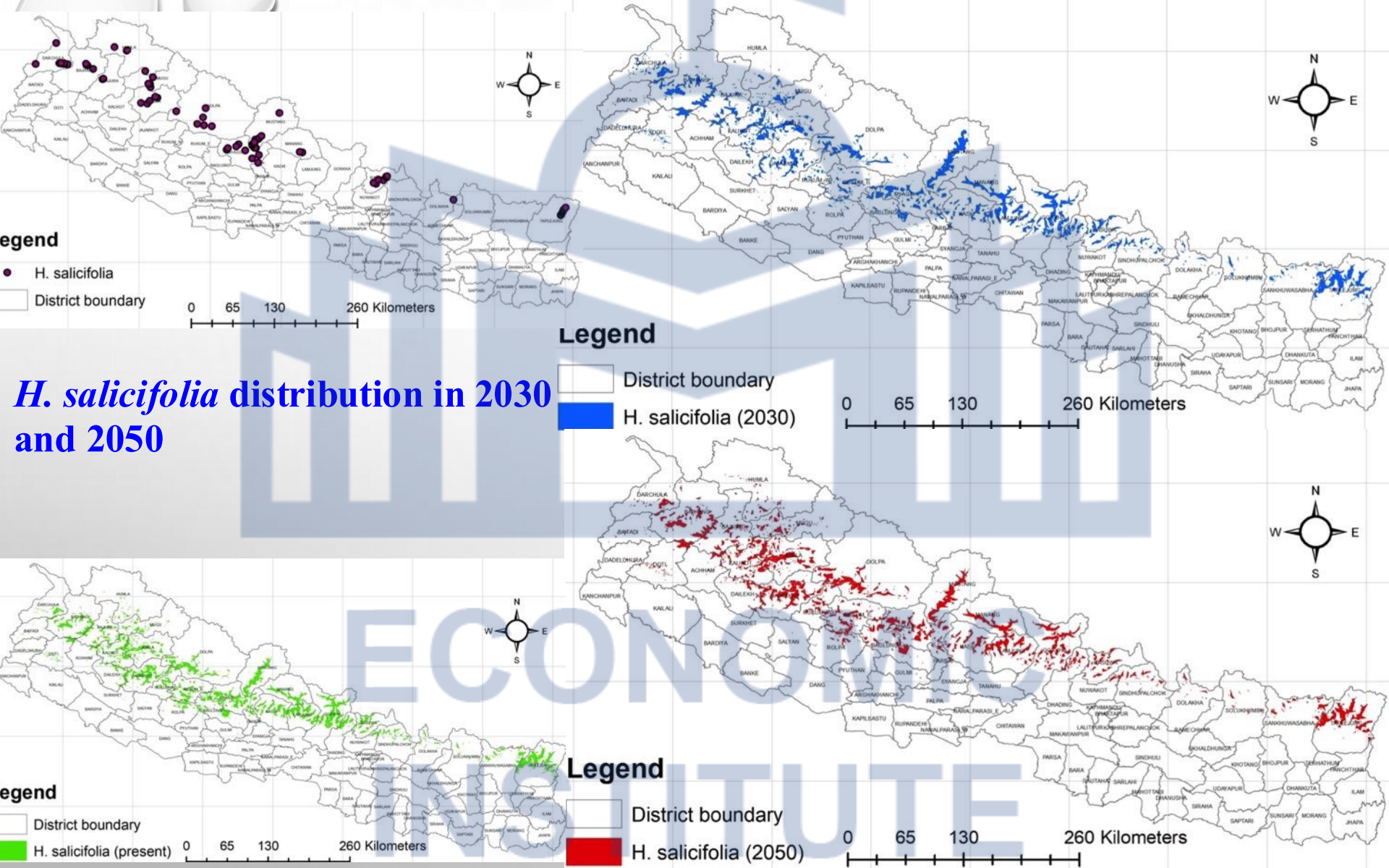
Present distribution

Natural distribution in more than 24 districts of high mountain from East to West

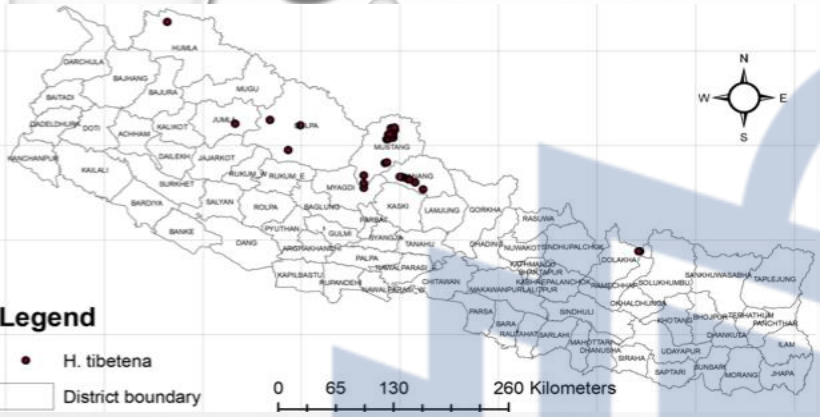
Modeling shows the present distribution as follows: ➔

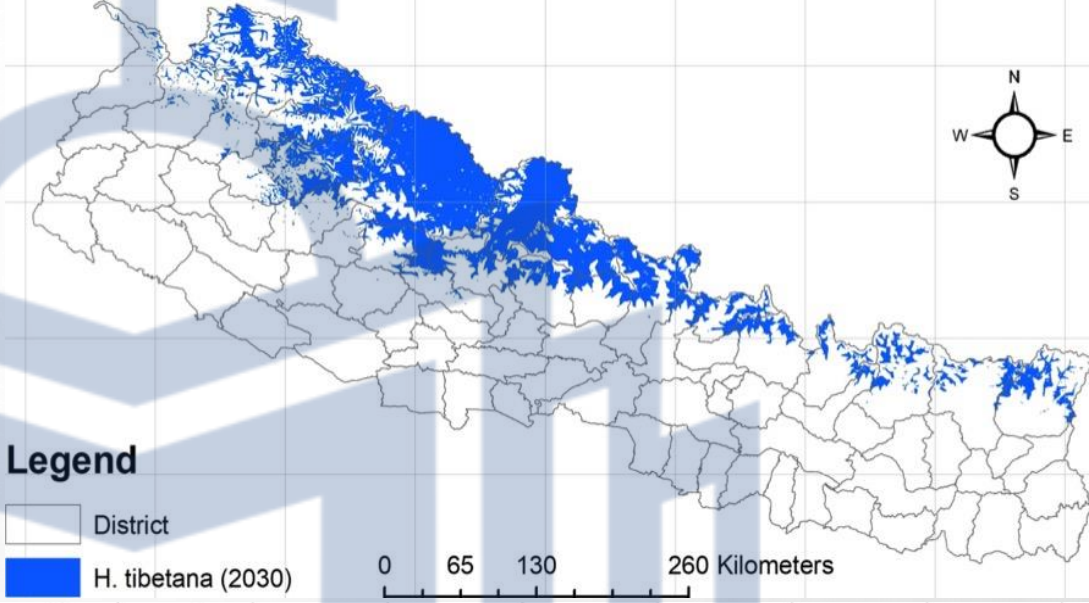




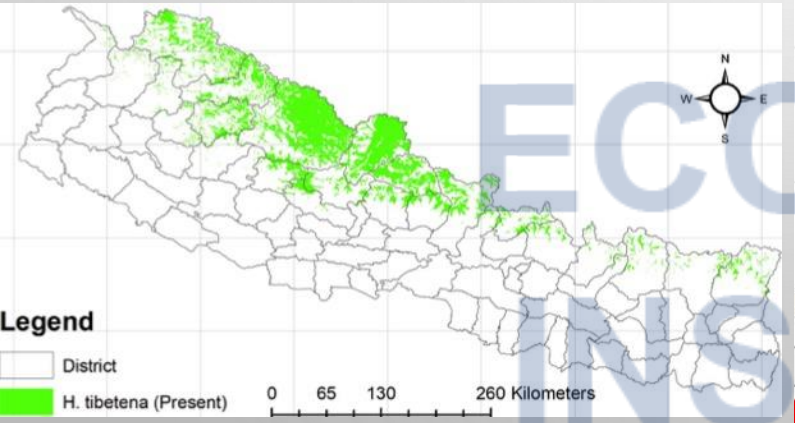


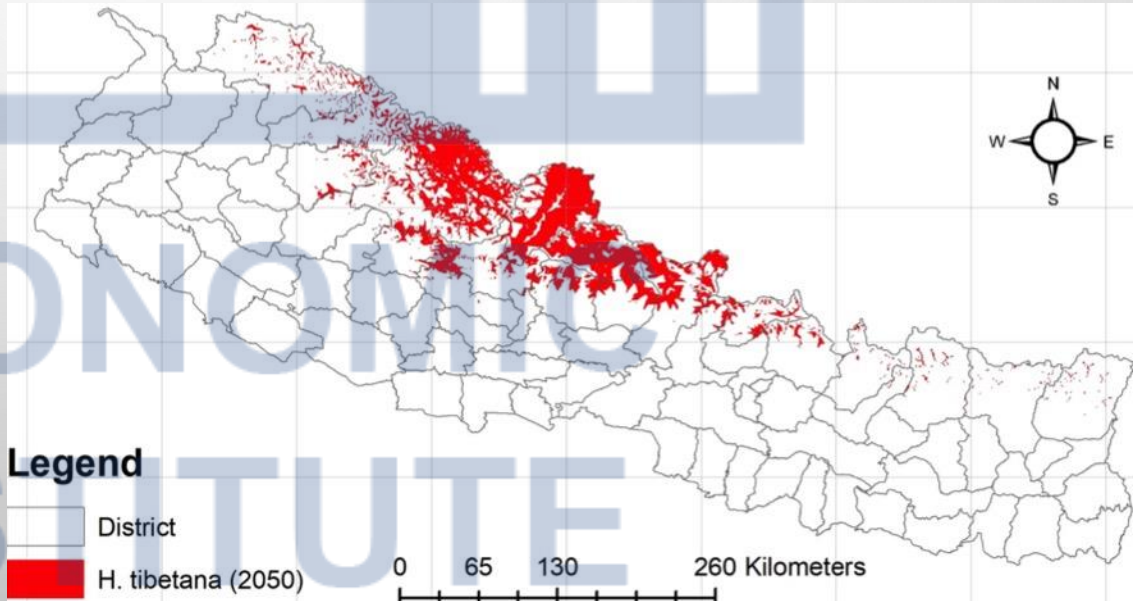
H. salicifolia distribution in 2030 and 2050





H. tibetana distribution in 2030 and 2050





Distribution modelling data

H. salicifolia

Scenario 4.5	Area (sq km)
Present	15666.572
2030	26253.717
2050	12442.258
Review record	2000-3700 m
Present record	2000-4100 m

Distribution modelling data

H. tibetana

Scenario 4.5	Area (sq km)
Present	8649.164
2030	7162.133
2050	7127.244

Review record	3300-4500 m
Present record	3200-5100 m

Variables determining distribution of Seabuckthorn in Nepal

Present study

Category	Variable	% contribution	Permutation importance
Temperature	bio9	48.8	55.3
Precipitation	bio18	45.2	29.9
Physiography	slope	5.6	13.5
Precipitation	Bio14	0.3	1

Bhandari et al 2024

?

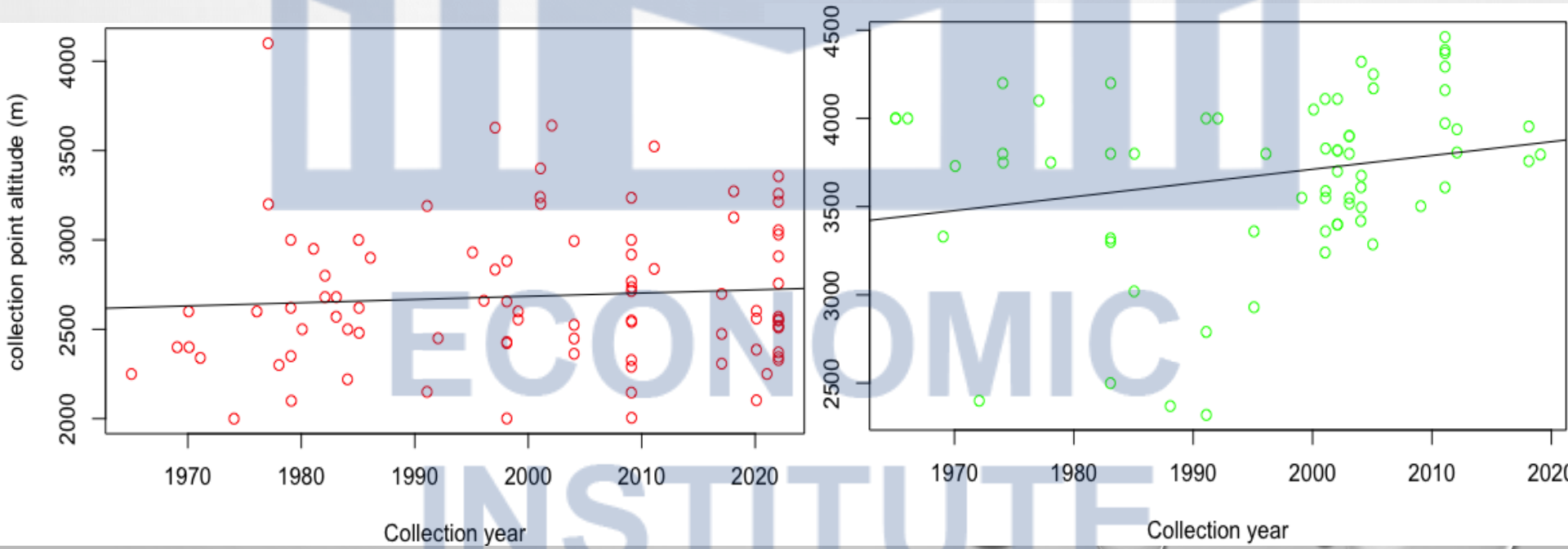
Category	Topography (6%)		Temperature (72%)			Precipitation (22%)		
Variable	Slope	Aspect	Bio2	Bio3	Bio9	Bio14	Bio17	Bio18
Contribution(%)	5	1	6	2	64	1	4	17

Based on results, Slope, Bio9 (Mean temperature of driest quarter), Bio14 (Precipitation in driest months) and Bio18 (Precipitation of warmest quarter) contributed the most.

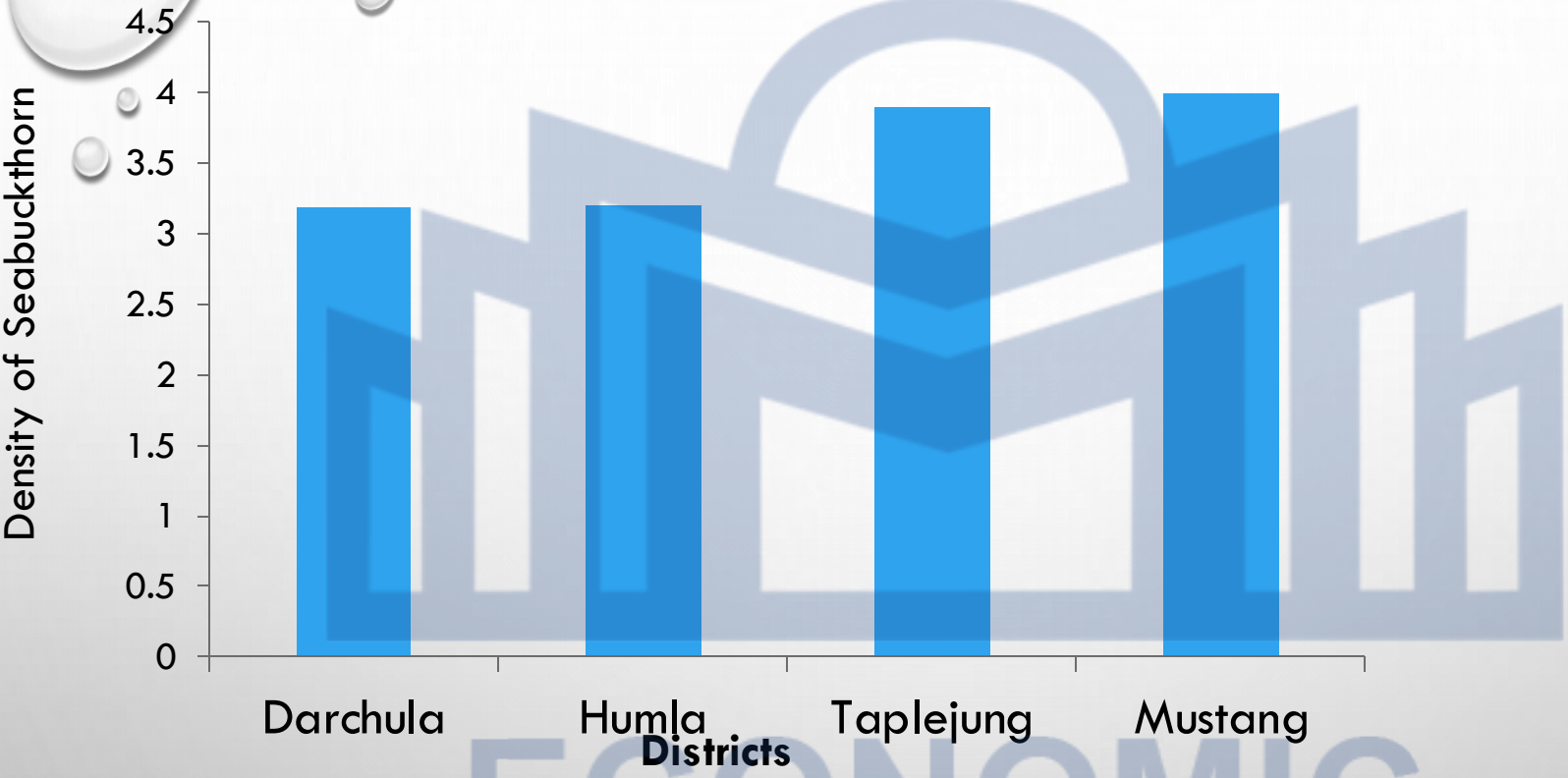
Distribution change (plant upshift) overtime (1970-2022) (could be a reason of climate change)

H. salicifolia (Red)
P = 0.08

H. tibetana (Green)
P = 0.06 (pronounced upshift)



Diversity and density in selected districts



Density of Seabuckthorn per ha in the four districts

Frequency of Seven Associated species

85 associated species in total

- *Juniperus horizontalis 35%*
- *Rumex nepalensis 28%*
- *Artemisia indica 22%*
- *Anemone rivularis 22%*
- *Coniogramme affinis 21%*
- *Potentilla fruticosa 17%*
- *Calanthe tricarinata 5%*

Calanthe tricarinata

Uses

- Believe to be origin in the Himalayas
- Ethnomedicinal uses
- Domestic uses for livelihood, food and household economy
- Handicraft and veterinary uses
- Environmental uses for soil erosion control
- Economic uses: Juices
- Others

Traditional uses

Fig. 6 *Hippophae tibetana* (Eleagnaceae), uprooted bushes used as fence material, Upper Mustang, Nepal. (Photo Youba Raj Pokharel)

Table 2: Traditional use of Sea Buckthorn in Nepal

Uses	Remarks
Fuelwood	It has been observed, not estimated though, that Sea Buckthorn is a major source of fuelwood in Mustang and Manang districts. Along with *Juniper* and *Caragana*, its fuelwood are seen piled-up on rooftop of almost every household. Blacksmiths prefer its charcoal for making golden ornaments.
Fruits	Despite occasional consumption of ripe fruits especially by the cattle grazers, and making pickle, there is a customary practice of making *chuck*-a highly concentrated fruit juice, which is sold at a good price of NRs 80/litre (Baral and Karki, 2002).
Fodder	Goats, horses and donkeys are often seen browsing its leaf, but owing to its thorns, it is not used as fodder as such.
Fencing	Used as live fence around the agriculture fields
Fertilizer	Leaves and humus are sprayed or applied as mulch in agriculture fields to increase potato yield.
Beverage	Ripe fruits are sometimes brewed to make local beer (*Chhyang*).
Medicine	Its use in medicine is yet to be recorded in Nepal, however a number of preparations are in use in Tibet, China and elsewhere.

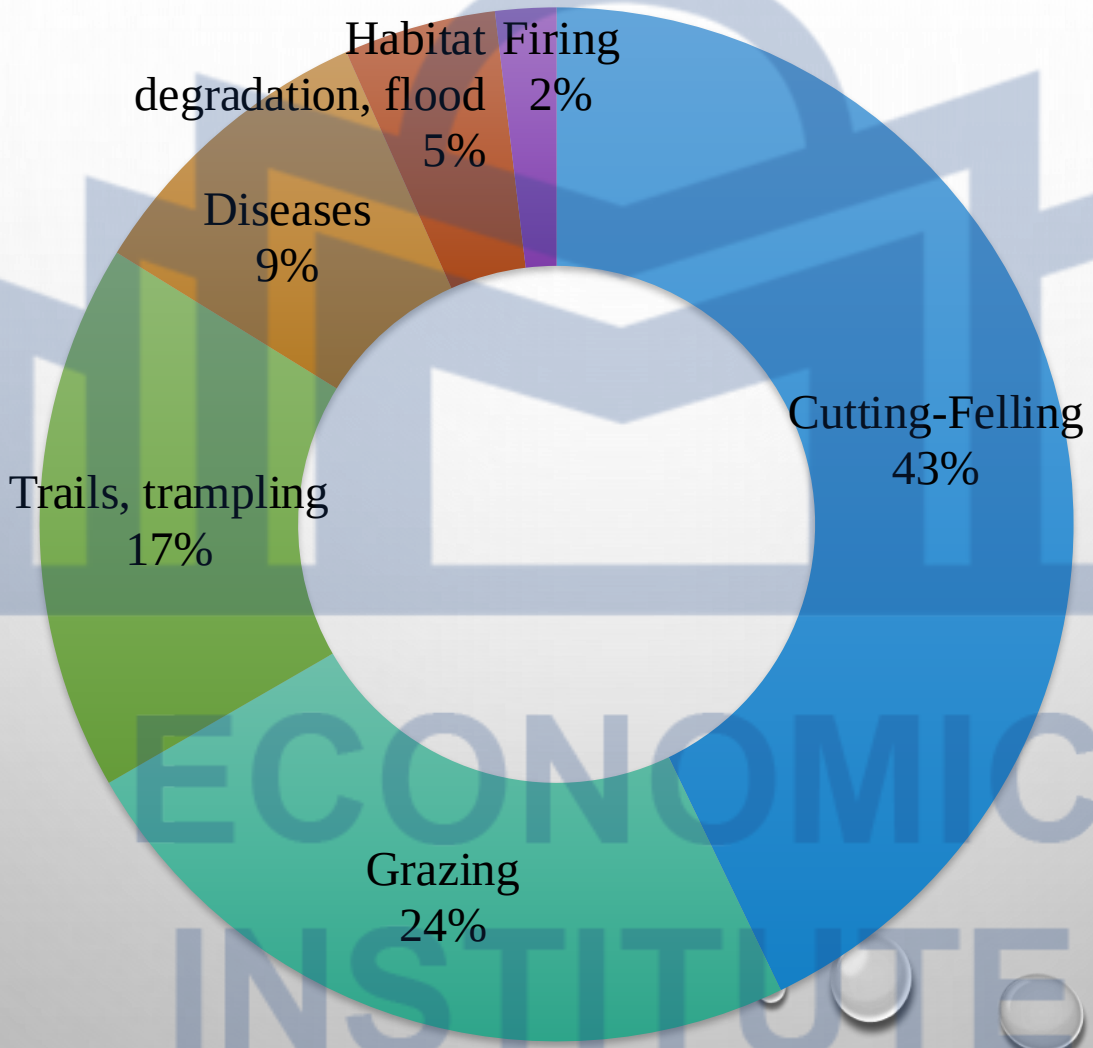
Ethnomedicinal uses

Ethnomedicinal use records in the present study	Earlier reports of ethnomedicine with references
Used as source of vitamin C.	Used as source of ascorbic acid (Rosch 2004).
Used as source of flavonoids and the oils.	Used as different sources of flavonoids and the oils (Li & Schroeder 1996).
Effective against skin problems, cardiovascular diseases, and immune system support.	Effective against, cardiovascular diseases, mucosa injuries, skin problems, cancer, and immune system support (Graham *et al.* 2000; Wali *et al.* 2019).
Used in burns, bedsores, eczema, etc.	Externally used to treating a wide variety of skin damage, burns, bedsores, eczema and radiation injury, antioxidant, cancer, cardiovascular, immune system, skin, and other treatments including cosmetic uses (Anon 2005; Pokharel *et al.* 2021).
Used as anticancerous.	It has been estimated that 30-40% of all cancers can be prevented by lifestyle and dietary measures alone (WCRF/AICR 1997).
Used as drugs.	Drug metabolizing, detoxifying and antioxidant enzymes are important cellular defenses against carcinogenic (Goel *et al.* 2003; Kumar *et al.* 2002).
Used as healing of wounds and dermatitis.	The oil from the pulp/peel of berries is rich in palmitoleic acid and oleic acid helpful for treating burns, healing wounds and skin diseases, such as atopic dermatitis (Kumar *et al.* 2002).
Used as oxidative processes.	Used to free radical-mediated oxidative processes contribute to atherogenesis (Eccleston *et al.* 2002; Ivanov & Nikitina 1973).
Juice of fruits used against gastritis.	Juice of fruits used against intestinal disorder (Pokharel *et al.* 2021).
Used against foul smell from the mouth.	Used as remedy vomiting, and also chewed to remove foul smell from the mouth (Maity *et al.* 2004).
Used against vomiting.	To remedy vomiting and as appetizer (Gairola *et al.* 2014)

Marketing

- Due to inherent limitations, not much work has been done in its efficient utilization in Nepal
- Seabuckthorn juice, Jam,Tea, are some of the products being marketed in nominal capacity
- Both raw juice and concentrate juice is being sold in household level, local and national markets

Threats and Challenges



Conclusions

- Geocoordinates collected from 18 districts but the present distribution ranges up to 24 hilly and mountainous districts.
- Study was done on present status of both species, and it was found decreasing natural distribution of both species
- Scinario 4.5 of the distribution modelling shows *H. salicifolia* will be increased by 2030 but decrease in 2050 wherease, *H. tibetana* will be decreased slightly in 2030 and almost constant by 2050.

Recommendations

- Details distribution study is needed and its updated distribution map is required for policy planning.
- Distribution modeling utilizing the latest IPCC report and climate data is required for precise modeling that support for future planning.
- Sustainable use and management of prevailing threats and challenges are immediate.
- Market aspect is still traditional and yet to be commoditized.
- In-situ and commercial cultivation both supports controlling soil erosion and landslides and it ultimately gives yield for local household economy.

Ecology and Ethnobotany in and around Api Nampa Conservation Area (ANCA), Darchula, Nepal

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CHAPTER
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Sea Buckthorn, Dry Eye, and Vision

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INTRODUCTION

Sea buckthorn (*Hippophaë*) berries are widely used traditional medicine in Asia. In Central Nepal sea ckthorn is among the medicinal plants with the wid- range of uses. It is recommended for gastrointestinal sorders, coughs, and colds, as well as for menstrual sorders.[1] Sea buckthorn berries are listed in the *Chinese armacopeia* as an ingredient for the treatment of cough d for improving blood circulation and digestion.[2] In ssia, sea buckthorn oil was tested as a treatment for

the seed oil is triacylglycerols, but the fatty acid composition of the oils differs (Table 48.1). Sea buckthorn pulp oil is characterized by its content of approximately 30% palmitoleic acid (16:1n-7), rare in such amounts in food sources. Consumption of high-palmitoleic acid oils has been shown to affect circulating total and low-density lipoprotein (LDL)-cholesterol beneficially.[20] Recent animal studies suggest lipokine effects and modulation of insulin resistance and hepatic lipid accumulation by palmitoleic acid.[21,22] The relevance of these findings for humans, however, remains unclear.[23]

The main fatty acids of sea buckthorn seed oil are the

Hippophae rhamnoides L. ssp. *turkestanica* Rousi
Hippophae rhamnoides L.
Hippophae salicifolia D. Don
Hippophae tibetana Schltdl.
ELAEAGNACEAE

Youba Raj Pokharel, Ripu M. Kunwar, Rainer W. Bussmann, Narel Y. Paniagua-Zambrana, and Arshad Mehmood Abbasi

Synonyms

***Hippophae rhamnoides* L.:** *Elaeagnus rhamnoides* (L.) A. Nelson
***Hippophae salicifolia* D. Don:** *Elaeagnus salicifolia* (D. Don) A. Nelson; *Hippophae conferta* Wall.; and *Hippophae rhamnoides* subsp. *salicifolia* (D. Don) Servettaz; *Hippophae tibetana* Schltdl.

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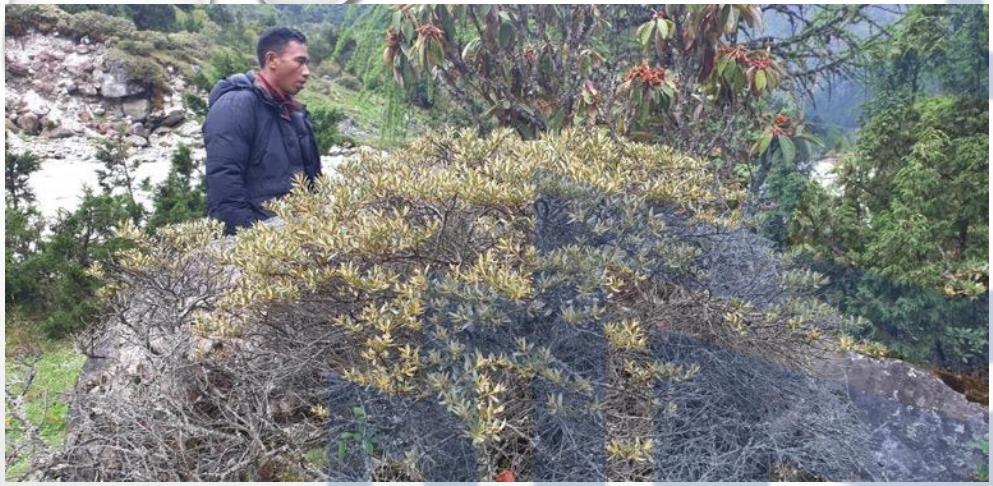
Publications

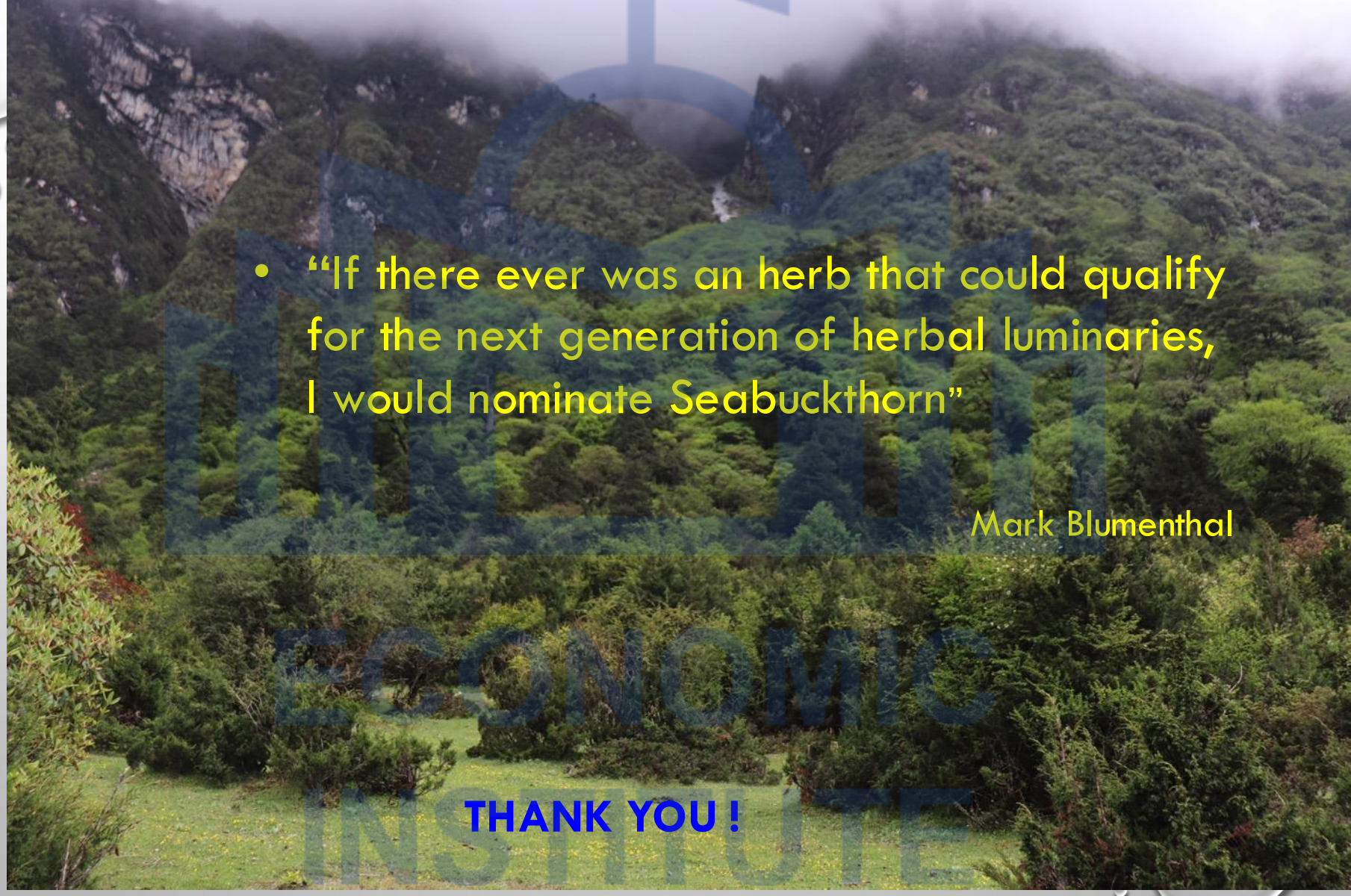
Present status and opportunity of developing Sea Buckthorn (*Hippophae* Linn. sps.) resource in Nepal: a review

Sushim R. Baral[1]



Few Field photos


ECONOMIC
INSTITUTE


• “If there ever was an herb that could qualify for the next generation of herbal luminaries, I would nominate Seabuckthorn”
Mark Blumenthal
THANK YOU !