

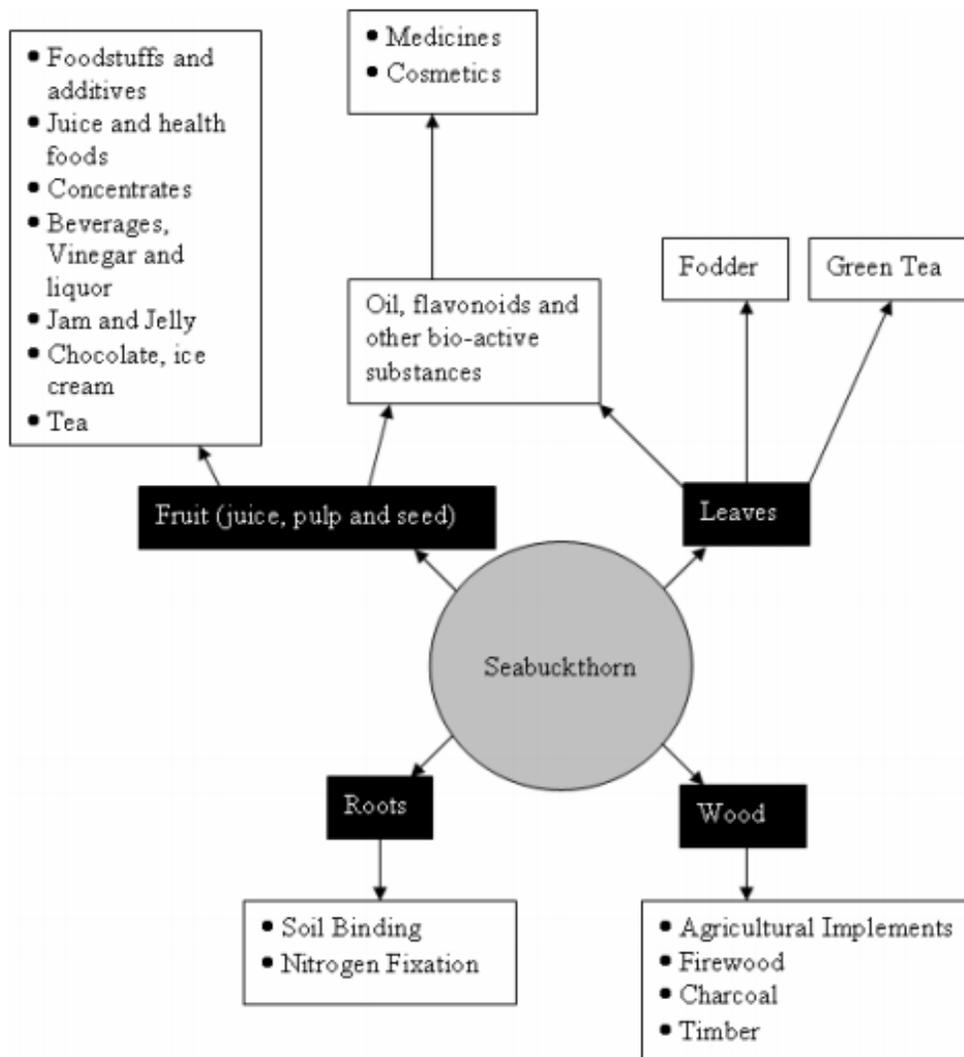
## Nepalese Sea Buckthorn

### Description and Information

Sea buckthorn is a native wild bush of the Nepalese hillside region (1). It is a perennial, deciduous shrub that produces orange-red berries (2). Currently there are over 9 species of sea buckthorn known in the world, the two most common found in Nepal are *Hippophae tibetana* and *Hippophae salicifolia* (2). Sea buckthorn berries are very high vitamins A, C, and E, fatty acids, antioxidants, phytosterols and tocopherols, which make the berries valuable for consumption in poor rural areas (2). There are many medicinal uses for sea buckthorn berries and leaves as well, in fact there is literature dating back to the 8<sup>th</sup> century which details over 30 medicinal uses for sea buckthorn including the treatment of ulcers and topical use in treating burns and skin diseases which are still used today (2;3).

Sea buckthorn shrubs are distinctly male and female (2). Only female plants are able to produce berries, but both male and female plants must be present in the field for pollination and in turn for berries to grow (2). There are two ways in which sea buckthorn may be propagated, by seed or through cuttings (3). Shrubs propagated by seed take 5-6 years to mature and those propagated by cuttings mature in 3-5 years (3). Once the plant has matured it can produce berries for 70+ years (2). It is estimated that one hectare of cultivated sea buckthorn can produce between 750 and 1500 kg of berries, depending on age and environmental conditions; which is attributed to the high density of berries per branch (1).

Berries are not the only valuable part of sea buckthorn. The leaves are also high in vitamins and can be used or sold for teas or as fodder for livestock (2). Sea buckthorn is also a source of fuel wood for many rural farmers. One hectare of sea buckthorn is able to produce up to 18 tons of fuel wood (2).



**Use of Seabuckthorn Parts in Various Purposes**

### **Growing Conditions and Environmental Sustainability**

Wild sea buckthorn is grown mostly in the hillside regions of Nepal (3). It is a perennial plant that can withstand temperatures from -40 to +40 °C, though germination and the rapid growth period, are most efficient at 20 °C(2). Its high range of temperature makes sea buckthorn a good crop for hillside areas which frequently see very warm days, but cold nights (2). It is relatively drought resistant, needing a minimum 250 mm of moisture per year, but its growth and berry production is most efficient receiving 400 mm of moisture per year (2). Since sea buckthorn shrubs are distinctly male and female, both are needed in the same field to produce berries. It has been found that a male to female ratio of 1:6 results in the highest yields (2). Sea buckthorn shrubs flower in the late summer to early autumn and it takes 12-15 weeks after flowering for the berries to mature (2). Sea buckthorn is naturally resistant to most pests, and therefore does not need additional pesticides (2). Research has shown that fertilizers high in phosphorus increase fruit yield, but it is suggested that soil is tested for deficiencies before adding fertilizers (2).

Sea buckthorn plants have quite the extensive root system (1). Roots can grow up to 5 m deep and 10 m across, with 80% of the roots located in the topsoil (1;2). It has been found that because of the root system, sea buckthorn plantations are able to reduce soil run off by 99% and top soil loss by 96% (2). Another way in which sea buckthorn plants reduce erosion is by providing good ground coverage and reducing the need to till every year (4).

Sea buckthorn is known to improve soil fertility in two ways. Sea buckthorn is able to fix nitrogen in the soil due to nodules on the roots and symbiotic nitrogen fixing bacteria (2). In fact a hectare of sea buckthorn shrubs is able to fix 180 kg of nitrogen a year, which is double the amount of

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nitrogen fixed by soy (2). And lastly sea buckthorn shrubs are able to solubilize minerals and organic matter which makes it easier for plants to absorb (2).

### **What this means for Nepal**

The introduction of domesticated sea buckthorn has many potential benefits to Nepal. For example because sea buckthorn is shown to do well in the hillside environment with relatively low inputs, it would increase the livelihoods of hillside farmers that are working on marginalized lands. In turn, sea buckthorn increases nutrients in the soil, and therefore would be good to intercrop with as it not only increases soil fertility, but also protects against erosion and can be used to increase income as well. Because the entirety of the plant is being used, the farming of sea buckthorn also has the potential to refocus spending within a family, as they do not have to buy fuel wood or fodder for livestock. This income can now be refocused into areas such as medical care and education.

The farming of sea buckthorn also provides employment outside of traditional agriculture, specifically for women and those who do not own land (4). For example jobs are created in the postharvest processing of berries and leaves in the realm of cleaning, and extracting juices and oils. There may also be a need for nurseries which grow sea buckthorn seedlings in the optimal conditions for germination and the rapid growth period, creating strong seedlings before being transplanted into the harsher climates of the hillsides (1).

### **Limitations**

One limitation in developing sea buckthorn for export is the time it would take to propagate the shrub on a large scale as it can take up to 6 years for the shrub to produce berries. One would think that propagating fields by cuttings would help reduce this time, but there are some trade-offs between the two types of propagation. Though propagation by seed will increase biodiversity, there is no guarantee

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that the seedling will be female and able to produce berries (1). On the other hand propagating by cuttings preserves desirable traits, all shrubs will be female and they will mature faster, but this is at the cost of biodiversity (1). If a harmful variable is introduced to the crop, all of the plants would be affected and yields would suffer. It is important to weigh the trade-off between time and biodiversity when deciding how to domesticate sea buckthorn.

### **Export Potential**

With the gaining popularity of natural and ecofriendly cosmetics, there is a niche market emerging for environmentally sustainable oils and pigments. Sea buckthorn has been used as a skin treatment in Nepal for years (3). We now know that sea buckthorn oil, extracted from berries, seeds and leaves contain high levels of vitamins A and E, antioxidants and fatty acids which have all been linked to fighting inflammation, aiding in cellular repair and slowing the maturation of the skin, as well as fading scars and acne (2). Specifically palmitoleic acid and oleic acid are thought to be the most potent of these acids (2). Natural cosmetics companies, like Lush Cosmetics, The Body Shop, and Physicians Formula have committed to creating partnerships with farmers in developing countries that practice sustainable agriculture to expand free trade and increase the livelihoods of these farmers, and they may be interested in utilizing this ingredient to enhance their products or as a substitute for other environmentally unsustainable oils.

Before emerging into the market, more research needs to be done on the need certifications, such as organic certification or non GMO certification, as many natural cosmetics companies have made a commitment to use only organic ingredients. Do the growing practices have to meet organic regulations of Nepal, or those of the country being exported to?

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