Organic *Asparagus Racemosus*:
A Nepalese Agrifood Export

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Product Description

Asparagus officinalis crop culture began in 200 BC where it originated close to the Mediterranean Sea [1]. *Asparagus officinalis* is the common garden species that is a perennial crop harvested for its tall shoots [1]. Since it is perennial it can be productive for more than 15 years if planted with proper site selection [4]. The females produce larger spears and the males produce a greater number of smaller spears [4]. The crop is planted during spring time as one-year old crowns or by transplanting seedlings [4]. *Asparagus officinalis,* being a mainstream species of Asparagus, presents vital information on characteristics, growth, inputs, diseases, nutrients, global trends etc. that can be used as a base of crop knowledge in order to make the wild asparagus species of Nepal successful.

The wild species of asparagus in Nepal is called *Asparagus racemosus,* also known as Kurilo [3]. *Asparagus racemosus* is a native plant to mid-Asia, Northern Europe, and Russia but can be found in other countries around the world such as Australia and India [3]. In Nepal this variety can be found in community forests and conservation areas, tropical to temperate regions, as well as the mid-hills and the Terai [3]. This non-timber forest product (NTFP) is one of many used for medicinal purposes and is collected by small and medium forest enterprises to maintain income [3]. Nepal's wild asparagus has potential to be domesticated, and organically grown as a Nepalese agrifood export.

Cultivating *Asparagus Racemosus*

Rural people of Nepal often depend on the collection of medicinal non-timber forest products as a source of income, especially those who live in hill areas [3]. *Asparagus racemosus* is one of these NTFPs that people collect, but less than 5% of farming households in Nepal have used medicinal plants as a crop [9]. Cultivation of *Asparagus racemosus* can be practiced

through seed propagation or by nurturing and transplanting roots [3]. *Asparagus racemosus* is among the preferred species to grow by NTFP farmers because of its production cycle, high profit, and suitability to upper and lower elevation [9]. In order to cultivate *Asparagus racemosus* and build organic farming businesses for this product, more farmers in Nepal need to improve their knowledge and skills on NTFP domestication [9]. Training must be provided at a local level, including for women, to grow successful and profitable NTFP products [9].

Growing Asparagus

Asparagus can tolerate different ranges of temperatures from 115 degrees to -40 degrees Fahrenheit [4]. In Nepal, temperatures rise to 46 degrees Celsius and in the winter they can drop to -26 degrees [8]. Asparagus grows best in moist temperate areas with well-drained, medium-textured loam soils [4]. Nepal has several different types of soils. Lower Siwalik ranges have sandy soils while hills have shallow, stony, and rocky soils [8]. In the Terai there are well-drained clay and silty loam soils, but are they are acidic [8].

Acidic soils that are low in calcium and magnesium can be treated with liming methods before planting the crop [4]. An input needed when planting asparagus is Nitrogen fertilizer for which the amount depends on the organic matter level of the soil [4]. Prior to planting, half of this fertilizer should be broadcast and half should be side-dressed during cultivation; once the crop is established the fertilizer should be top-dressed after harvesting [4]. Watering is especially needed during the early stages of fern development with the plants taking up soil water of about 0.10 to 0.20 inches daily, however, over-watering can cause leaching of the nitrogen nutrients and should be prevented [4]. In Nepal irrigation systems may be a challenge in some areas however precipitation varies across the country. The average yearly rainfall is 1,600 mm and 80% of this occurs in the months of June, July, August, and September [8]. In the

Tibetan plateau area there is low rainfall below 200 mm per year, and in the Annapurna mountain slopes there is up to 4,600 mm of annual rainfall [8].

Diseases and Weeds

Diseases that commonly affect the asparagus crop are asparagus rust, botrytis blight, and purple spot [1]. Asparagus rust can cause premature defoliation and reduce yields especially in conditions of dew, fog, and rainfall [1]. Non-chemical controls for organic farming include increased width between crop rows [4], and removing debris using light discing methods [1]. Botrytis blight is a fungus that attacks weakened plants and can be minimized by protecting against other diseases and disposing of residue [1]. Purple spot is often caused by sand blasting and develops spores on the windward side of the stocks [1]. Cultural controls can include removing residue and planting "cover crops" to protect against infection [1]. There are several different weeds that affect this perennial crop. Perennial broadleaf weeds and perennial grasses will compete with asparagus and can survive for many years growing in numbers [1]. Although perennial broadleaf weeds can be removed by tillage, grasses require chemical controls [1]. Annual broadleaf weeds and annual grasses can be eliminated using rye seed that is applied and "burned" using glyphosate resulting in decreased germination of weed seeds, or careful tillage and hoeing can also be practiced [1].

These diseases and weeds present challenges for organic asparagus farming in Nepal. Non-chemical methods require extensive labouring, and the cost to initially establish an asparagus site can be expensive, however, this vegetable is a high value product and is the first vegetable to be produced in the spring [4].

Health Benefits

Asparagus is a rich source of many different nutrients as a raw vegetable. Per 100 grams of raw asparagus it contains 756 IU or 38 RAE µg of vitamin A [11]. It also contains 1.13 mg of vitamin E, 5.6 mg of vitamin C, and 52 µg of folate per 100 grams [11]. It is high in certain minerals such as 24 mg of calcium, 202 mg of potassium, 2.14 mg of iron and 14 mg of magnesium [11]. Asparagus is also a source of fiber and protein [11]. This source of nutrients is beneficial not only to market consumers but also to the people of Nepal. *Asparagus racemosus* offers medical uses. The tubers can be purposed for treating tuberculosis, night blindness, and stomach or kidney problems [3]. The seeds can be used to purify blood, and rhizome powder is given to breastfeeding mothers to benefit both the mother and her child [3]. Medical uses could benefit the people of Nepal in local communities and vulnerable groups such as pregnant women and children.

Export Potential

Global sales of organic foods are around $20 billion per year and in North American and European countries the sales have increased by 20% yearly [10]. The organic market has expanded resulting in a greater variety of products demanded and imported such as tropical foods and local commodities [10]. *Asparagus racemosus* can be singled out as a Nepalese organic vegetable to export with Canada as a trade partner. In 2013 the total value of fresh asparagus imports to Canada was over $86 million with 21 major importer companies including Loblaws, Metro, and Sobeys [6]. Asparagus imports have increased over time; in 2005 Canada imported $65,683,000 of this product and in 2014 this rose to $93,952,000 [5]. A New Zealand study shows that fresh asparagus can be stored and transported using precooling methods and unperforated polyethylene bags [7]. Precooling is the immersion of the product in chilled water for a certain time period which is then transferred into polyethylene-lined cartons to be stored at four degrees Celsius [7]. It can be stored up to four weeks and this method can reduce

deterioration [7]. There are some challenges to be faced by organic asparagus producers. A product is only considered organic if producers have official certification, which can create barriers to entry [10]. This certification process is difficult and expensive such as in South America where costs can take up 5% of farm sales [10]. Canada's food inspection agency also has requirements for asparagus as a fresh import and grade standards are only met when defects, failed diameter and length, and unpermitted length variations do not separately exceed 10% of the total product [2].

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