The brochure is published within the project “Supporting Agricultural Cooperation in Georgia”, implemented by Rural Communities Development Agency (RCDA) in cooperation with OXFAM Consortia and supported by European Neighbourhood Program for Agriculture and Rural Development (ENPARD). The content of the publication is the sole responsibility of the author and can in no way be taken to reflect the views of European Union.

Foreword

For many rural areas, the path to sustainable economic development includes innovative approaches to natural resource conservation, management and utilization. This publication will support local communities to supplement their income through NTFPs. The types of products described in this publication include: wild pear, cornelian cherry, cherry plum, blackthorn, Caucasian persimmon, rosehip, dewberry, bilberry, raspberry, sea buckthorn, briquette and mulch. Each chapter describes botanical description and geographical distribution of the product, medicinal and culinary uses, products made from certain fruit as well as market and competition considerations.

Author: Lado Basilidze – Non-Timber Forest Products (NTFP) Specialist

Contact Information:

Rural Communities Development Agency (RCDA)

Village Misaktsieli, Mtskheta Municipality

Tel: +995 593 171 772

E-mail: rurcom@gmail.com

Web: www.rcda.ge
Income Opportunities in Non-Timber Forest Products
Table of Contents

Introduction .......................................................................................................................... 11
Steps for Starting a new NTFP business ............................................................................. Error! Bookmark not defined.
  Simple Inventory .................................................................................................................. 12
  Simple Market Research ....................................................................................................... 12
  Simple Capacity Estimation ............................................................................................... 12
  Preliminary Interest Evaluation .......................................................................................... 12
  Business Plan Development ............................................................................................... 12
Advice for New Entrepreneurs: Four Evaluations ............................................................... 13
NTFP Value Chain ............................................................................................................. 13
Chapter 1 - Bilberry ........................................................................................................... 15
  Description .......................................................................................................................... 15
  Distribution .......................................................................................................................... 15
  Usage .................................................................................................................................. 16
  Bilberry Products ............................................................................................................... 17
  Market Overview and Business Opportunities ................................................................. 19
  Equipment Needs ............................................................................................................... 20
Chapter 2 – Blackthorn (Sloe) .......................................................................................... 21
  Description .......................................................................................................................... 21
  Distribution .......................................................................................................................... 21
  Usage .................................................................................................................................. 22
  Blackthorn Products .......................................................................................................... 22
Chapter 3 – Caucasian Persimmon ..................................................................................... 24
  Description .......................................................................................................................... 24
  Distribution .......................................................................................................................... 24
  Usage .................................................................................................................................. 25
  Caucasian Persimmon Products ......................................................................................... 25
Chapter 4 – Cherry Plum ..................................................................................................... 27
  Description .......................................................................................................................... 27
  Distribution .......................................................................................................................... 27
  Usage .................................................................................................................................. 28
  Cherry Plum Products ........................................................................................................ 28
Chapter 5 – Cornelian Cherry .............................................................................................. 30
  Description .......................................................................................................................... 30
  Distribution .......................................................................................................................... 30
  Usage .................................................................................................................................. 30
  Cornelian Cherry Products ................................................................................................. 31
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Description</th>
<th>Distribution</th>
<th>Usage</th>
<th>NTFP Products</th>
<th>Market Overview and Business Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 6</td>
<td>Dewberry</td>
<td></td>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Distribution</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Usage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dewberry</td>
<td></td>
</tr>
<tr>
<td>Chapter 7</td>
<td>Raspberry</td>
<td></td>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Distribution</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Usage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Raspberry</td>
<td></td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Rosehip</td>
<td></td>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Distribution</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Usage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rosehip</td>
<td></td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Sea Buckthorn</td>
<td></td>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Distribution</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Usage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sea Buckthorn</td>
<td></td>
</tr>
<tr>
<td>Chapter 10</td>
<td>Wild Pear</td>
<td></td>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Distribution</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Usage</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Wild Pear</td>
<td></td>
</tr>
<tr>
<td>Chapter 11</td>
<td>Other NTFP's</td>
<td></td>
<td></td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Mulch, Briquettes)</td>
<td></td>
<td></td>
<td>Types of Mulch</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Briquettes</td>
<td></td>
</tr>
</tbody>
</table>
**Introduction**

NTFPs are defined as “goods of biological origin other than wood derived from forests, other wooded lands and trees outside the forests” (FAO, 1999).

Non-timber Forest Products (NTFPs) contribute to livelihoods of about 2 billion poorest of the rural and urban poor, and are among the most valuable plant resources for present and future food security. They provide food, medicine, fuel and incomes, and keep traditional knowledge alive. NTFPs have an important role in forests and – consequently – in their conservation.

Certain part of Georgia’s population derives a significant part of their livelihood from a vast range of non-timber products that they harvest from forests. In many cases NTFP gathering practices have their origins rooted deep in the past and are based upon a highly developed understanding of forest systems. A prominent feature of the recent concern for forest conservation has been the facts that many of the traditional uses of non-timber forest products are not only important to large numbers of people, they are also to a large extent consistent with the maintenance of the biodiversity and carbon sequestration values of the forest themselves. Many of the systems meet the criteria for “sustainability”, whereas there are countless examples of modern agricultural and forestry systems that have been imposed upon forest lands and are neither sustainable nor meet the needs of the people who depend on the forests.

Despite the abundance of the NTFP resources and rapidly growing international market for non-timber forest products (NTFPs) only insignificant amount of few products are currently being harvested and traded in Georgia. The extraction, processing, and trading of NTFPs is often the only employment and income generation available for the population in remote rural areas of Georgia. Mainly poor, women and children of school age are engaged in collection of NTFPs. There are no services for NTFP drying, collection and storage facilities needed to develop forest produce value chains, nor business support for organisational, technical and technological capacity building.

Local communities particularly women lack skills and capacities in sustainable collection and processing of NTFPs. Therefore, NTFPs can’t provide sufficient employment and income generation opportunities. On the other hand, unsustainable collecting/harvesting of NTFPs has adverse impacts on the forest and biodiversity.
**Simple Inventory** - Walk your land, visually observe, and make a simple list of the NTFP species you see. Roughly estimate by low, med, and high what the abundance, quality and accessibility is. If you can take digital waypoints take them where you take photos and then map them in a free program like Google Earth.

**Simple Market Research** - Get a feel for what NTFP products are being bought and sold. Observe products in the marketplace (e.g., grocery stores), and have a talk with businesses, extension agents, and others working with NTFPs.

**Simple Capacity Estimation** - Begin to gauge your capacity by writing down what you already have that might be of use in an NTFP business. For example, land ownership with nearby forests, cold or dry storage, and availability of equipment, labour or transportation.

**Preliminary Interest Evaluation** - Write down your wants and needs. For example, are you looking to make enough money to make a living wage or just offset your property taxes, how much time can you allocate, do you have potential partners, how many years are you willing to invest in building the business?

**Business Plan Development** - Business plans help structure your ideas and information and are often required for securing business loans and attracting investors. Writing a good business plan can be difficult and will take time, but if you get a template you can add in information gradually and it won’t be so overwhelming when you need one to raise capital. Don’t be discouraged by unfamiliar concepts and ignore items in your business planning template that don’t apply to your situation.
Advice for New Entrepreneurs: Four Evaluations

Planning and evaluating should be done up-front, before money is invested in the potential enterprise. Many small-scale NTFP ventures begin without adequate information and planning and, as a result, many of them fail. Small enterprises can enter markets selling NTFPs relatively easily, but only a small portion of these manage to adapt to the changing circumstances of supply, market demand, and competition to survive in the long-term. Prospective NTFP enterprises should complete four evaluations before investing in a new venture. These include personal evaluation, resource evaluation, market evaluation and project feasibility evaluation.

Personal Evaluation identifies and prioritizes the personal outcomes needed or wanted from the venture. These include the level of income necessary from the venture, acceptable levels of risk and an assessment of the personal, family and group resources available for the enterprise.

Resource Evaluation is the first step in developing any viable forest enterprise is to understand the capacity of the forest resource. It is impossible to manage the resource wisely or profitably without knowing about its natural growth and production and the human environment that affects it.

Market Evaluation is critical to the success of the business and one of the more difficult aspects of research into NTFP enterprises. It should identify the targeted markets and locate prospective buyers. The exact specifications required by the potential buyer must also be determined, including quality, quantity, price, timing of the harvest and other requirements. Some products have very exacting specifications. The NTFP enterprise must plan to meet these requirements, as well as those determined by government regulations.

The Project Feasibility Evaluation examines both the technical and financial workability of the potential enterprise. At a minimum, the financial evaluation includes a fully developed budget itemizing fixed and variable costs, and expected gross and net revenues. The amount of resources (time, money, labour, and land) needed for harvesting, handling, processing, transporting, and marketing the product must be accounted for. The expected yield, probable price at harvest and quality of the end product should be determined. On the technical end, the location of harvest sites, leases and permission if necessary, timing of operations, and methods of management must be addressed. For NTFPs from natural forests, special attention should be given to the sustainability of harvesting the resource, and how the NTFP enterprise will ensure managing in a responsible manner.

NTFP Value Chain

A value chain is a connected string of companies, groups and other players working together to satisfy market demands for a particular product or group of products. It includes research and development, input and suppliers and finance. Rural entrepreneur combine these resources with land, labor and capital to produce commodities. In a value chain marketing system, rural entrepreneurs are linked to consumers’ needs, working closely with NTFP suppliers and processors to produce the specific goods consumers demand. Similarly, through flows of information and products, consumers are linked to the needs of rural entrepreneurs.
Chapter 1 - Bilberry

Description
Bilberry (Vaccinium) is a deciduous plant which is between 20 and 60 cm in height. Stems light green, hairless, with four marked angles. Leaves up to 3 cm long, alternate, bright green, oval, with fine teeth, flowers of 4-6 mm in diameter lantern-shaped, pink or green-pink, single or in groups of two, that hang from the axils of the leaves. Berry fruit is about 5 mm, black and blue covered with purple hairs, rounded shape with a flat end. It blooms from April to June and fruits appear from July to August.

Distribution
There are approximately 450 species of Bilberry distributed especially in the northern hemisphere. It is also common throughout the boreal zone of Asia. In Europe it is especially abundant in Ireland, Scotland and Poland. In Iceland it is practically the only wild fruit to be found. Bilberry usually grows in heaths, meadows, moors and moist coniferous forests and its growth is favored by moderate shade and moderately humid ground conditions. The favorite type of soil for bilberries is an acid one, with a pH between 4 and 5.2. They do not like compacted soils, but rather fractured ones. They need highly oxygenated soil for proper plant growth. The best combination is the acid-gritty. Although they prefer soils high in organic matter, however, they can grow even in low productive land, where nutrients are scarce.

Bilberry is common in the western and partly in the Eastern part of Georgia. It usually grows as underbrush between 1700 and 2200 m above sea level. According to unofficial data the biological yield of Bilberry in Georgia is around 15000 tones. There are 4 species distributed in Georgia: Mountainous Bilberry (Vaccinium myrtillus), Blue Bilberry (Vaccinium uliginosum), Red Bilberry (Vaccinium vitis-idaea L.) and Caucasian Bilberry (Vaccinium arctostaphylos).
**Usage**

**Medicinal Uses** - A dried bilberry is markedly binding and has an antibacterial action. It can decrease intestinal inflammation and help protect the digestive tract lining. The berries are also said to be a refrigerant that lowers body heat. Bilberries are incorporated into European pharmaceuticals that are used to improve circulation. Berries and leaves are used to treat colitis, stomach problems and sugar diabetes. The fruit contains compounds known as anthocyanosides which contribute to visual acuity. A mixture of anthocyanosides from bilberry plus vitamin E halted the progression of lens clouding in 97% of people with early-stage cataracts. Regular use of the fruit results in quicker adjustment to darkness and glare and improved visual acuity both at night and in bright light during the day.

**Culinary Uses** - Bilberries are sold fresh or processed as individually quick frozen (IQF) fruit, purée, juice, dried or infused berries. The berries in turn may be used in a variety of consumer goods such as jellies, jams, pies, muffins, snack foods, and cereals. It is important when you bring them home, to wash them thoroughly so as to remove any parasites or organisms that they may have.

If you are going to buy them in the market, they can be found during the summer. It is important to buy those that are well turgid with no moisture or juice. If we press them a little and fingers “sink” in them soft, or you notice liquid coming from them, they are too mature and will rot very soon.

Fresh bilberries should be eaten quickly as they cannot stay fresh for too long. It is better to freeze the ones that are not going to be eaten immediately. They can last up to 20 days if frozen.
**Bilberry Products**

1. **Dried Bilberries**

   Spread the berries in a tray, lightly covered with greaseproof paper, in a warm airing cupboard for a week or more until dry, or for a shorter time in a very cool oven. Store in jars and use as currants. Try adding dried bilberries to muffins, for a unique and slightly tart take on bilberry muffins. Bilberries are also a great addition to cookies and pancakes.

2. **Bilberry Warmer**

   To each 500 g berries, add 50 g sugar and 120 ml water. Simmer until soft, and then strain off the juice. Add a little cinnamon to taste and drink hot.

3. **Bilberry Wine**

   ✓ Activated yeast;
   ✓ 1.5 kg bilberries;
   ✓ 9 l water;
   ✓ 1.5 kg sugar;
   ✓ 2 lemons;
   ✓ 2-3 Tablespoon cold tea or 1 teaspoon grape tannin;

   Wash the bilberries and remove any stalks. Put the berries in the plastic bucket and crush them with a wooden spoon, pour on the boiling water, then add the sugar and the thinly pared rind (no pith) and strained juice of the lemons, stir until the sugar has dissolved, cover the bucket with a clean cloth and allow to stand until cool, (about 21°). Stir in the cold tea, or grape tannin, and the activated yeast, cover the bucket with its lid and stand in a warm place for four days. Strain the liquid into the fermentation jar (dark glass for red wine), fit the bung and fermentation lock, and allow the wine to ferment in a reasonably warm place until sediment has settled at the bottom of the jar and the bubbles in the fermentation lock have ceased. This takes several weeks, after which the wine should begin to clear, maybe only a clear layer at the top of the jar, but the wine is now ready to be siphoned off through a length of plastic tubing into a second fermentation jar, which you have previously sterilized. Don’t let any sediment from the bottom of the jar get into the siphon tube and, to make up for the small amount of wine left behind with the sediment, top up the new jar with a little cooled, boiled water. This process is called ‘racking’ the wine, and it can now be left in a cool place for about three months, or until it has cleared completely. It is then siphoned into sterilized bottles and corked with new sterilized corks. If the wine has not completely cleared, you should rack it again into a sterilized fermentation jar, top up again, if necessary, with cool, boiled water, fit the bung and fermentation lock again and leave it for a few more weeks.
4. **Bilberry Jam**

- 500 g bilberries;
- 100 g quick-setting jam sugar with added citric acid and pectin;
- Juice 1 lemon;

Put the bilberries in a pan, bring to the boil and cook until the juice starts to run. Add the sugar and stir until dissolved, then boil for 4-5 minutes. Remove from the heat, stir in the lemon juice and leave to cool for 5 minutes before potting into small jars. Keep refrigerated.

5. **Wild Bilberry Syrup**

- Fresh Wild Bilberries;
- Water;
- Sugar;

Wash and drain the fruit. Place in a heavy-bottomed pot with just a little water in the bottom to moisten the berries until the juice begins to run from them. Bring quickly to boiling point and cook for one minute crushing the berries. Remove from heat. Strain through a jelly bag, allowing it to drip through overnight. You may give the bag a gentle squeeze at the end. Measure the juice and add 350 g of sugar to each 500 ml of juice. Put in a pot and heat gently, stirring until all the sugar is dissolved. Pour into sterilized, warm bottles and fill to within 3 cm of the top. Sterilize using the same method described for bottled whole fruit.
Market Overview and Business Opportunities

The largest producer of bilberries is the United States, which is both the largest importer and the largest consumer. Canada ranks second in production. Unlike the United States, where there is a large area of cultivated fields, the majority of Canadian production comes from the collection of wild fruits. Canada is also the leading exporter of the frozen bilberries. Chile is the third largest producer in the world and is followed by Argentina, New Zealand and Australia.

France is the largest producer in Europe, followed by Netherlands, Germany, Poland and Spain.

Besides USA, other countries where the fruit is consumed are Italy, England, Scotland, Ireland, Norway, Sweden, Finland and Japan.

The estimated annual growth of the bilberry production is 1% and its good food qualities are being increasingly recognized worldwide.

In 2014, “Vernik Agro Group” was the biggest bilberry producer in Georgia. They produced American breed of bilberry in Guria region. The company exported 12 tons of the bilberries to the UK market. The 26 tons of the same product was also exported to Russia.

According to the research by the USAID, the Western Georgia, especially Guria region has a very good potential for the bilberry production, because of its specific climate that is effective for the bilberry harvesting. In average 90% of the farmers in Adjara region, owns about 2000-2200 square meter of land that is very efficient for the small groups. The USAID reports that each farmer will be able to earn about 7000 GEL in average, by harvesting bilberries. In case of increase export to the EU market, it is necessary to harvest the maximal amount of berries, because of the high demand.

<table>
<thead>
<tr>
<th>Bilberry Price (1kg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Georgia</strong></td>
</tr>
<tr>
<td><strong>Europe</strong></td>
</tr>
<tr>
<td><strong>Russia</strong></td>
</tr>
</tbody>
</table>
**Equipment Needs**

The fruit harvesting is done when the fruits have reached their proper degree of sweetness. They must have bright color and proper ripening. They should not be too soft. Bilberry is ready to harvest when by a little pressure with the thumb and index finger they do not sink easily. The right consistency will allow transport and sail in fair condition. Too soft fruits are not suitable for the market and may only be used for private needs, especially for jams.

Picking the bilberries is an arduous process as they grow close to the ground and so a special rake, called a scrabbler, is required to separate the berries from the plants and the undergrowth. A good bilberry picker can pick about 70 kg of berries per day. The disadvantage of this technique is that it collects a lot of leaves and twigs, so the berries must be cleaned as well. Rolling across a wool blanket, picking out the leaves, or floating the leaves and twigs in water are all ways of cleaning.
Chapter 2 – Blackthorn (Sloe)

**Description**

Blackthorn (*Prunus spinosa*) is a large deciduous shrub or small tree growing to 5 m tall, with blackish bark and dense, stiff, spiny branches. The tree might be difficult to recognize without leaf, as it takes the vast variety of forms. Its highly irregular branching habit creates a range of shapes. It flowers from March to April, and the fruits ripen in July-August. Blackthorn fruits are small blue-black, sometimes deep purplish, round globular berries about 10–12 millimeters in diameter. The flowers are hermaphrodite (have both male and female organs) and are pollinated by Insects. Requires a well-drained moisture retentive soil. Succeeds in all soils except very acid peats. Succeeds in light shade but a sunny position is better. Thrives in a loamy soil, doing well on limestone. Plants are very resistant to maritime exposure. About 150 species of wildlife, including caterpillars, bees, butterflies, and moths, depend on the nectar of the flowers and nourishment from the leaves of the blackthorn. Plants are shallow-rooted and of a suckering habit, they can form dense impenetrable thickets which are ideal for nesting birds, especially nightingales. Flowers are often damaged by late frosts. Plants regenerate quickly after cutting or after fast moving forest fires, producing suckers from below ground level. This species is notably resistant to honey fungus.

**Distribution**

Blackthorn is widespread in Britain reaching altitudes of up to 415 m. This shrub is also found in Europe with the exceptions of the far north, north-east and extends as far east as Iran. It also occurs in south-west Siberia, north-west Africa, New Zealand and eastern North America. Blackthorn only grows in the eastern part of Georgia, where it reaches up to 1600 m.
Usage

Medicinal Uses - Sloe berries are very tonic bitters. They are astringent and stimulate the metabolism, clean the blood and are used as a laxative and diuretic. They help with indigestion, herpes, allergies, colds, neurosis, weak heart, kidney stones, skin, bladder, and prostrate problems. The fruit and leaves of Blackthorn contain tannins, organic acids, sugars and vitamin C. Steeped in boiling water, the flowers have a mild diuretic, tonic and laxative properties. The dried fruits are used to treat bladder, kidney and stomach disorders. The liquid from the boiled leaves can be used as a mouthwash for sore throat. It is also good for circulations, blood strengthening and nutrient absorption. Blackthorn is also used to treat constipation, nosebleeds, blood disorders, bowel problems, stomach problems, some eye problems, and the flu.

Culinary Uses - Blackthorn is exceedingly astringent, so it is normally cooked but once the fruit has been frosted it loses some of its astringency and some people enjoy it raw. The fruit is more usually used in jellies, syrups and as a flavoring for sloe gin and other liqueurs. Fruit should not be eaten if it is too bitter. The leaves are used as a tea substitute. The dried fruits can be added to herbal teas. The flowers are edible and can be crystallized or sugared.

Other Uses - The bark is a good source of tannin. It is used to make an ink. The juice of unripe fruits is used as a laundry mark, it is almost indelible. The pulped ripe fruit is used cosmetically in making astringent face-masks. A green dye can be obtained from the leaves. A dark grey to green dye can be obtained from the fruit. The bark, boiled in an alkali, produces a yellow dye. It can be used as a hedge in exposed maritime positions. The hedge is stock-proof if it is well-maintained, though it is rather bare in the winter and unless the hedge is rather wide, it is not a very good shelter at this time. Because of its suckering habit, the plant is a natural pioneer species, invading cultivated fields and creating conditions conducive to the regeneration of woodland.

Blackthorn Products

1. Blackthorn Hedge

Blackthorn is an excellent security hedging plant and is commonly found in hedgerows. The creamy white flowers of Blackthorn clothe the very prickly bare branches before the leaves in March and early April. Its long thorns have made it popular with farmers for centuries as the perfect barrier for keeping their livestock contained.

Blackthorn and Hawthorn make good bedfellows and they are often used in tandem to create a mixed hedge. Blackthorn blossoms in early spring (on bare branches, before the leaves appear) and Hawthorn flowers slightly later on (after leafing), so between them they offer an extended and impressive flowering period. In addition, both can be propagated from cuttings, making a low cost and wildlife-friendly hedging option.
It is best to plant **Bare Root** hedging in a double staggered row, and **Pot Grown / Root Balled** hedging in a single row.

2. **Wild Blackthorn Jelly**
   - 2 kg wild Sloes
   - 1 kg wild Crab Apples
   - Sugar sufficient to add 500 g to each 500 ml of the strained fruit juice

Wash and cut the crab apples into half. Put in preserving pan. Rinse sloes and add to the pot. Just cover with water and cook over a gentle heat until the sloes have burst and the crab apples are mushy. Strain though a jelly bag over night. Do not squeeze. Measure the juice and add the correct amount of sugar. Heat until the temperature reaches 105°. Boil for another two minutes. Test to see if it has reached setting point. A little on a cold plate should wrinkle after a minute. Skim and pour into warmed sterilized jars. Cool before covering tightly. Store in a cool dry place and in the fridge, after opening.

**Note:** Depending on how tart or sweet you want the finished jelly to be you may vary the proportion of sloes to crab apples. The more sloes the tarter the jelly will be.
Chapter 3 – Caucasian Persimmon

Description

Caucasian Persimmon (Diospyros Lotus L.) also known as Date-Plum is a tree height of 15–30 m usually with a rounded crown and sloughing of aging bark. The leaves are shiny, leathery, oval shape with pointed ends, 5–15 cm long and 3–6 cm in width. The upper leaf surface is glossy and leaf edge is smooth. The flowers are small and unobtrusive, greenish to reddish appearing in May to June. Fruits are berries with juicy flesh, yellow-orange or bluish-black in color at maturity period (September-October), 1–2 cm in diameter. Caucasian persimmons are adapted to a wide variety of soil types. Requires a good deep loamy soil in sun or light shade. When being grown for its fruit, the tree should be given a warm, sheltered, sunny position. It dislikes very acid or wet and poorly drained soils. Dormant plants are very cold-hardy, but the young growth in spring, even on mature plants, is frost-tender and so it is best to grow the plants in a position sheltered from the early morning sun. Plants have a long tap root and are difficult to transplant, it is best to plant them out in their permanent position as soon as possible and to give protection overwinter for the first year or two.

Distribution

The tree grows in the lower and middle mountain zones in the Caucasus. It is naturally grown in the western part of Georgia (Samegrelo-Upper Svaneti; Imereti) and in the eastern part (Kakheti) up to 1500 m. Diospyros lotus grows, either as a native or naturalized plant, in rocky, protected ravines, along mountain streams and on rocky slopes. They rarely grow in stands but often grow with the frame, ash, maple and other deciduous species.
**Usage**

**Medicinal Uses** - Caucasian Persimmons are delicious and exotic fruits that do more than serve as a sweet and tasty treat; they have a wealth of health benefits packed inside them, including their ability to improve eye health, reduce signs of aging, prevent various types of cancer, improve digestion, boost your immune system, lower cholesterol, increase your metabolism, strengthen your bones, boost cognitive function, lower blood pressure, and take care of your skin.

**Culinary Uses** - The fruit has an exquisitely rich flavor when it is fully ripe (almost at the point of going bad), but it is very harsh and astringent before then. These fruits can be eaten fresh, dried, raw, or cooked, which changes the flavor, but they are generally sweet and pulpy. When eaten fresh, they are usually eaten whole like an apple, cut into quarters, or sliced; though with some varieties it is best to peel the skin first. One way to consume very ripe persimmons, which can have a very soft texture, is to remove the top leaf with a paring knife and scoop out the flesh with a spoon. Riper persimmons can also be eaten by removing the top leaf, breaking the fruit in half, and eating from the inside out. The flesh ranges from firm to mushy, and the texture is unique. The flesh is very sweet and, when firm owing to being unripe, possesses an apple-like crunch. The fruit may not ripen properly in a cool summer, though if it is frosted it normally develops a very good flavor.

**Caucasian Persimmon Products**

1. **Dried Persimmon**

Preparation of dried persimmon starts in autumn, in October when fruit is hard. Cleaned, peeled, fresh persimmons are stringed on a thread by stem of fruit and dried in the sun during 3-4 weeks until they are fully dry and then stored in a dry, cool place. Gently massage them once a week to distribute the sugar in the fruit. If the persimmon has no branch attached, insert a small metal screw into the top of the persimmon, and attach the twine to that screw. At the end of the drying period, remove twine and metal screw (if using), and store them in a covered container or zipper-top plastic bag. The features of the dried persimmon are linked to the geographical area on the basis of customers/traditions, reputation, the drying process and practices of those involved in that process.
2. **Persimmon Jam**
- 1 cup persimmon puree (6 large persimmons, peeled)
- 200 g sugar
- Juice of one lemon
- 2 tablespoons water
- 1 tablespoon corn starch

Peel the persimmons, chop and place in a food processor. Pulse until you are left with a smooth puree. Transfer persimmon puree into a medium saucepan over medium-high heat and add the sugar. Boil for 15 minutes on medium heat, stirring occasionally. In a small bowl, mix water and corn starch until the corn starch is dissolved. Add the mixture to the persimmon puree followed by the lemon juice and boil on low - medium heat for another 15 minutes, (stirring occasionally), or until slightly thickened. Let the jam cool down to room temperature. Pour into sterilized jars and seal, store in the freezer. Or pour into mason jars, that can be closed airtight and store in the refrigerator for immediate consumption.
Chapter 4 – Cherry Plum

Description

Cherry plum (Prunus cerasifera) is a deciduous shrub or small tree reaching 8-10 m tall. It has an erect and bushy habit, with numerous intricate, fine and occasionally spiny branches. The flowers are hermaphrodite, appear in March-May slightly before the leaves, usually solitary, 2-2.5 cm wide, on about 1.5 cm long pedicels. The fruits are 2-3 cm wide, plum-like drupes, globose, ripening to red or yellow. Natural populations are characterized by high variability in respect of vigor, temperature tolerance, ripening time and disease resistance, which makes it easily adaptable to a variety of sites. The cherry plum is hardy about -25°C, with modest demands, except for light. This tough plant is also frost and drought tolerant and wind resistant. Requires a well-drained moisture retentive soil. Thrives in a loamy soil, doing well on limestone. Grows well in heavy clay soils. Most members of this genus are shallow-rooted and will produce suckers if the roots are damaged. Plants in this genus are notably susceptible to honey fungus.

Distribution

Cherry Plum is native to south-eastern Europe (Balkan Peninsula, Crimea), western and middle Asia (Caucasus, Iran, Iraq). More recently, it is present on all continents, naturalized widely outside its native range throughout temperate areas. In Australia and New Zealand, it is considered a weed species. Due to its high variability and easy hybridization with other Prunus species, different geographical subspecies have been described and its taxonomic subdivision is rather confusing and still under revision. Cherry plum is naturally grown throughout Georgia from 1600 to 1800 m. It can be found in open areas, such as forest margins, mountain slopes in woody or shrubby thickets, on stony slopes, ravine bottoms, near water and montane river valleys. According to unofficial data the biological yield of cherry plum in Georgia is around 40000 tones.
Usage
Medicinal Uses - Although no specific mention has been seen for this species, it belongs to a genus where most, if not all members of the genus produce hydrogen cyanide, a poison that gives almonds their characteristic flavor. This toxin is found mainly in the leaves and seed and is readily detected by its bitter taste. It is usually present in too small a quantity to do any harm but any very bitter seed or fruit should not be eaten. In small quantities, hydrogen cyanide has been shown to stimulate respiration and improve digestion.

Culinary Uses - Reddish-purple fruit ripens in the late summer and early fall. Fruit can be used raw or cooked. A very pleasant plum-like flavor when fully ripe with a mealy though juicy flesh. It is high in citric acid, containing about 4.7%.

Other Uses - A green dye can be obtained from the leaves. A dark grey to green dye can be obtained from the fruit. Often used as a rootstock for the cultivated plums, giving them a semi-dwarfing habit. Suited for soil protection, as well as avenue tree, bee pasture, bird pasture and as plant providing shelter for birds.

Cherry Plum Products
1. Cherry Plum Sauce (Tkemali)

Cherry plum sauce (Tkemali) is very healthy, as the main ingredient (plum) contains organic acids, pectin, vitamins C, E, B1, B2, P, minerals, tannins and carotene. Tkemali improves digestion and works as a metabolism booster. Tkemali is made from both red and green varieties of plum. The flavor of the sauce varies, but generally tends to be pungently tart. To lower the tartness level, occasionally sweeter types of plums are added during preparation.

- 3 glass jars 220 ml, sterilized
- 1 kg ripe red/green plums
- 100 ml water
- 3-4 large cloves garlic
- 1 small red pepper
- 5 tablespoons chopped fresh cilantro (or 5 teaspoons dry)
- 3 tablespoons chopped fresh dill (or 3 teaspoons dry)
- 1 tablespoon tarragon
- 2 teaspoons chopped fresh peppermint (or 2/3 teaspoon dry)
- 2 teaspoons coriander
- 2 teaspoons dried spices
- 2 teaspoons salt
- 1 tablespoon sugar
- 2/3 teaspoon ground black pepper
- 2 teaspoons lemon juice
- 3 tablespoons pomegranate juice
- olive oil

- Cut plums in quarters, remove stones and place in a pot with a little water, about 100 ml. bring it to a boil over medium heat and simmer for 15 minutes, stirring occasionally. Finely chop garlic and red pepper
• When plums are soft, drain them using a sieve and keep the juice (it's delicious and healthy). With a spoon or spatula rub plums through the sieve in the same pot. Add the rest of the ingredients and mix well together. Simmer for 5 more minutes
• Let cool and transfer to jars. Cover with 1-2 teaspoons of olive oil to preserve. Seal and store in the fridge or in a cool place for 2-3 months

2. Cherry Plum Jam

✓ 2 kg Whole Cherry Plums
✓ 1.5 kg Sugar
✓ 60 ml Freshly Squeezed Lemon Juice
✓ 60 ml Water

• Put all the ingredients in a large flat-bottomed pan
• Stir and bring to the boil. Boil until the skins start coming off and the fruit comes away from the stones
• At this point, pour the cherry plum jam mixture into a large piece of muslin and squeeze out fruit pulp and back in to the pan
• Continue boiling the jam mixture until ‘setting point’ is reached. This can take as long as 30 minutes
• Setting Point: Put a couple of saucers into a fridge to chill. It is best to do this a bit before you start making the cherry plum jam. Using a teaspoon let a few drops of the jam mixture drip on to a chilled saucer and allows it to cool for a short while. Now push your finger sideways against the jam. When it is at the right setting point, the jam should crinkle, and be nice and tacky
• Pour into sterilized jam jars and screw the lid on
Chapter 5 – Cornelian Cherry

**Description**

*Cornelian cherry* (*Cornus mas* L.) is a deciduous shrub or small tree growing 2-6 m tall, exceptionally reaching 8-9 m. The crown is regular, bushy, hemispherical and may expand more horizontally up to 5 m. The trunk is straight, sometimes with sinuous or multiple stems, the branches ends often drooping. The leaves are opposite with a short stalk, oval, 3-5 cm wide and 6-8 cm long. They turn to mahogany red in autumn. The flowers are small, 5-10 mm in diameter, hermaphrodite, with four yellow petals. They bloom in late winter before the leaves sprout. The fruit is a fleshy, bright red cherry-like drupe, which ripens in mid-late summer. It is olive-shaped, 12-15 mm long, with a smooth and shiny rind and containing two seeds. The fruit is edible when it falls and is dispersed by animals. It is a light-demanding and slow-growing species, which thrives in open areas or in semi-shade vegetation, such as forest hedges, steppe shrubs and light woodlands. It prefers moist, alkaline soils rich in nutrients, although it is principally found in warm and dry conditions. Wind and frost are also well tolerated and it can survive up to -30°C, while it is sensitive to salt and marine exposures. It also a long living tree, surviving up to 300 years. The cornelian cherry has been apparently free of disease and pest problems, a highly appreciated characteristic which gained its use as an ornamental and orchard species.

**Distribution**

Cornelian cherry is native of the temperate zones of Eurasia, with a Pontic and Mediterranean distribution. It occurs from central and southern Europe (Pyrenees, France, Italy and Balkan Peninsula) to Asia Minor (Turkey, Caucasus). Throughout Georgia, Cornelian cherry is naturally grown as underbrush in broadleaved forests up to 1500 m. According to unofficial data the biological yield of cornelian cherry in Georgia is around 17 000 - 20 000 tones.

**Usage**

**Medicinal Use** - The bark and the fruit are astringent, febrifuge and nutritive. The astringent fruit is a good treatment for bowel complaints and fevers, whilst it is also used in the treatment of cholera. The flowers are used in the treatment of diarrhea. It is a good source of anthocyanin. Depending on the variety produced and the growing conditions, it can be a good source of vitamin C, various minerals and calcium pectate fiber, which can reduce levels of cholesterol.
**Culinary Uses** - The fruits are edible and have a similar taste to sour cherries. The cornelian cherry is a species of economic interest for fruit production. Plants are cultivated in orchards in many countries of Eastern Europe, Caucasus and Central Asia, as its sweet-acid fruits are very valuable for fresh consumption and for processing to produce syrups, juices, jams and other traditional products. For this purpose several cultivars have been selected, bearing fruits with different sizes, taste (acidity and sweet) and colors (from creamy white, yellow, orange, red, violet to black);

**Cornelian Cherry Products**

1. **Cornelian Cherry Compote**

   - 1 kg Cornelian Cherry
   - 600 ml water
   - 100 g white sugar

   - Wash and dry the cherries. Combine with 500 ml water in a large sauce pan and bring mixture to a boil, stirring occasionally. Cover and reduce to a simmer. Simmer for about 15 minutes, or until cherries are tender. Remove from heat and let cool
   - Mash the cherry mixture in the pot and remove pits. Add remaining water and sugar and return mixture to a boil. Reduce to a simmer and cover. Simmer for an additional 5 minutes before removing from heat. Let cool completely before storing in sterilized jam jars

2. **Cornelian Cherry Marmalade**

   - 1.5 kg cornelian cherry
   - 2 kg sugar
   - 500 ml water
   - 125 ml citric acid

   - Wash cornelian cherries and boil them in a big pot with 500 ml of water for 15-20 minutes or until they are soft
   - Once they cool down, smash them in a colander in small patches. You will have cornelian cherry puree in the end
   - Mix 1.6 kg of white sugar and the puree in a big pot and cook on medium heat. Once it starts boiling, check the time
   - Cornelian cherry marmalade will be ready in 6 to 7 minutes. Do not let it boil more than 7 minutes
   - When it starts boiling, there will be pink foam on top. Remove the foam with a spoon
   - A minute before you turn it off, put 125 ml citric acid (it preserves that magnificent color and prevents crystallizing)
Chapter 6 – Dewberry

Description

Dewberry (Rubus fruticosus) is a well-known shrub belonging to Rosaceae family. Its height reaches from 0.5 to 2 meters. The leaf consists of three leaflets, slightly and bilaterally hairy. The inflorescences are composed of two to five flowers. Large flowers have long pedicels with five sepals. The sepals are grey-green. Dewberry flowers from June to July. Fruit ripen period – August-September. The fruit consists of not more than 20 drupelets. Each drupelet has one hard seed inside. The aggregate is approximately 1 cm in diameter and nearly round. Suitable soil types for dewberry are light (sandy), medium (loamy) and heavy (clay). It prefers well-drained and moist soils. Suitable pH for the plant is neutral and basic (alkaline) soils and it can also grow in very alkaline soils (rich in nitrogen). Dewberry has large lateral growing root systems that spread and interconnect, creating a perennial thicket. Before planting dewberries one should consider the amount of space one needs and the plants potential invasiveness. It reproduces vegetatively by rooting at the tips. The plant can also be propagated by root and softwood cuttings.

Distribution

Dewberry is widely distributed across much of Europe and Asia. It has also become sparingly naturalized in scattered locations in Argentina, Canada and the United States. Rubus fruticosus can grow at altitudes up to 2000 m above sea level. The species are found in open areas such as roadsides, wood margins, mid-successional dunes, riverbanks, valleys and ravines. It prefers full sun to partial shade. There are 37 species of Rubus naturally grown in Georgia (27 species are endemic). It is naturally distributed throughout the country. According to unofficial data, the biological yield of dewberry in Georgia is 25 000 tones.
Usage

Medicinal Uses - The leaves and roots can be made into tea, extracts, or an infusion to treat stomach problems such as ulcers and gastritis and kidney stones. The decoction obtained from the leaves, stems and fruits, in addition to the ailments already mentioned, can promote women’s reproductive health and to treat cystitis, diabetes, bacterial infections such as pyeritis, skin fungal infections and hair loss. Honey produced from Rubus caesius nectar is not only tasty, but also healthy. It is very effective in healing gastric disorders. Moreover, it has an anti-inflammatory effect and protects mucous membrane of throat and oral cavity.

Culinary Uses - Dewberry is cultivated for its edible berries, as an ornamental plant and for honey production. The fruit can be consumed raw, or made into jam or jelly; it can also be used to make a purple or dull blue dye. The leaves can be used to make tea.

Other Uses - The fruits are consumed and dispersed by birds and other animals. Like many other species of Rubus, dewberry is pollinated by bees, flies, and beetles. It is also capable of self-pollination and apomixes.

Dewberry Products

1. Frozen Dewberry
   ✓ Colander
   ✓ Wax paper
   ✓ Baking sheet
   ✓ Granulated sugar (optional)
   ✓ Freezer containers
   ✓ Marker

   - Keep the dewberries in the refrigerator until you are ready to prepare them; then wash only a few berries at a time to prevent crushing
   - Place the berries in a colander and rinse them with cool water. Don't submerge the berries
   - Discard soft, blemished or overripe berries or green, under-ripe berries. The best berries for freezing are ripe but still firm
   - Drain the berries thoroughly and remove the stems and caps by pinching them off with your fingernails
   - Line a baking sheet with waxed paper. Spread the berries on the sheet in a single layer
   - Sprinkle the dewberries lightly with granulated sugar if you prefer sweeter berries. Allow the berries to sit at room temperature until the sugar dissolves
   - Place the baking sheet in the freezer until the berries freeze solid; then transfer them to plastic freezer containers. Label and date the container
   - Use frozen dewberries within 18 months
2. **Dewberry Wine**

- 3 kg Dewberries
- 1 kg Granulated Sugar
- 1/2 tsp. pectic enzyme
- 1/2 tsp. acid blend
- 1 crushed Camden tablet
- 4 l water
- Wine yeast and nutrient

- The fruit should be picked when ripe. Wash well. Place the fruit in primary fermenter and crush. Pour 4 liter hot water over fruit and add the dissolved Camden tablet and sugar. Stir well and cover.
- Allow to cool to room temperature (about 22°C). Add pectic enzyme and stir. Cover. Stir well every 8 to 10 hours.
- At the end of this first day, dissolve the yeast in a small quantity of lukewarm water for 10 minutes and pour this "starter" on to the must. Cover the fermenter. Cover securely with plastic sheet and allow fermenting 4 - 5 days. Stir twice daily.
- When the foaming has ceased, strain out the fruit pulp. Syphon into 4 liter secondary fermenter and attach air lock. Be sure jug is filled to neck and lock is tight.
- Allow to ferment to completion (specific gravity of 1.000 or less). Rack off sediment into another secondary or, if unavailable, rack into primary fermenter, clean out and sanitize secondary, then immediately rack back into secondary. Allow to age about 1 month or until perfectly clear. If clear and stable at this time, the wine may be bottled. If not, rack once more and allow to clear another month.
- Stabilize the wine with 1/2 tsp. potassium sorbit and 1/2 Camden tablet per 4 liter. If a sweeter wine is desired, sweeten to taste with either fructose or with sugar syrup (200 g sugar to 120 ml boiling water). Bottle and cork the wine then stand upright for 2 - 3 days to allow corks to expand. Then lay wine on its side to age for 4 - 6 months.

3. **Dewberry Jelly**

- 2 kg Dewberries
- Enough water to cover
- 1 kg sugar

Boil until berries are real soft. Out through a colander the juice will be thick. Measure 1.5 liter juice, 1 kg sugar and stir well. Let them to a good boil that cannot be stirred down. Cook until juice is thick. Test by putting a tablespoon of the syrup in a saucer. Let cool. If it congeals it is ready to put into jars. If it doesn't, cook longer and test it.
Chapter 7 – Raspberry

**Description**

**Raspberry (Rubus idaeus)** is a deciduous shrub that grows up to 1.5 meters high with biennial stems. The leaves are pinnate compound, with three to five leaflets. The flowers are hermaphrodite, white to greenish white, drooping, single or in small grapelike clusters, appearing in June and July. The fruit is a red raspberry, rounded, 2 cm long and broad, maturing between July through September. Raspberries need ample sun and water for optimal development. Raspberries thrive in well-drained soil with a pH between 6 and 7 with ample organic matter to assist in retaining water. While moisture is essential, wet and heavy soils or excess irrigation can bring on *Phytophthora root rot*, which is one of the most serious pest problems facing the raspberry.

**Distribution**

Raspberry is native to Europe, including Britain, from Iceland south and east to Spain and temperate Asia. It occurs throughout Georgia in the lower and middle mountain zones up to 2500 m. As a wild plant it grows on rocky hills, rock outcrops, forest clearings, margins of roads, fields and waterside thickets. Raspberry typically increases dramatically after fire or timber harvest. In many areas this shrub can compete vigorously with conifer seedlings for light, moisture, nutrients and space.

![Average regional raspberry output (kg/ha)](image)

**Usage**

**Medicinal Uses** - A raspberry tea was made from the leaves and used in the treatment of diarrhea and as an aid in childbirth. Externally, the leaves and roots are used as a gargle to treat tonsillitis and mouth inflammations, sores, minor wounds, burns and varicose ulcers. The leaves are harvested in the summer and dried for later use. The fruit is antiscorbutic and diuretic.
Culinary Uses - Raspberries are grown for the fresh fruit market and for commercial processing into individually quick frozen (IQF) fruit, purée, juice, or as dried fruit used in a variety of grocery products. Traditionally, raspberries were a mid-summer crop, but with new technology, cultivars, and transportation, they can now be obtained year-round. An individual raspberry weighs 3–5 g and is made up of around 100 drupelets, each of which consists of a juicy pulp and a single central seed. A raspberry bush can yield several hundred berries a year. Raspberries are eaten fresh or in jams and jellies, or added to pies and other baked goods, candies and dairy products to add flavor.

Other Uses - Raspberries provide food and cover for a wide range of wildlife species. Dense raspberry thickets serve as favorable nesting habitat for many small birds. Small mammals such as rabbits and squirrels also find shelter in raspberry thickets. A purple to dull blue dye is obtained from the fruit. A fiber obtained from the stems is used in making paper.

Raspberry Products

1. Raspberry Leaf Tea

Raspberry leaves are among the most pleasant-tasting of all the herbal remedies, with a taste much like black tea, without the caffeine. Raspberry leaves gathered in spring before the plant flowers have the highest antioxidant content.

To make raspberry leaf tea, pour 240 ml of boiling water over 3-5 grams of dried leaf. Close the teapot and allow standing for 10 minutes and then sweeten to taste.

2. Raspberry Jam

- 1 l granulated sugar
- 1 l raspberries
- Place sugar in an ovenproof shallow pan and warm in a 120°C oven for 15 minutes. (Warm sugar dissolves better)
- Place berries in a large stainless steel or enamel saucepan. Bring to a full boil over high heat, mashing berries with a potato masher as they heat. Boil hard for 1 minute, stirring constantly
- Add warm sugar, return to a boil and boil until mixture will form a gel for about 5 minutes
- Ladle into sterilized jars
3. **Dried Raspberries**

- Start with raspberries that are not over ripe. If they are mushy they will not dehydrate well (they might fall apart). The fruit should be firm and red, not dark burgundy (the color raspberries turn when they are super ripe).
- Wash and dry your raspberries. Arrange them in a single layer on your trays, with the hold down to allow water to drain.
- It's hard to get them completely dry. They seem to absorb twice their weight in water. Plus they have the small hole (left from the hull after being pulled from the branch) in the center that holds water too.
- Fill up your dehydrator trays. Give each berry plenty of room and made sure it is placed upside down so the water caught in the hole drained out.
- Spray with just a bit of lemon juice to keep them from turning brown.
- Place your tray inside your dehydrator at about 135°C.
- On the fruit setting they will take about 15-18 hours.
Chapter 8 - Rosehip

Description
Rosehip (Rosa canina) is a shrub that grows up to 5 m and has multiple arching stems. Stems are covered with thorns that are stout, flattened, downward-curving and unequal in size. Leaves are alternate and pinnate divided into 5 to 7 leaflets with serrated margins. Both sides of the leaves are glandless and smooth. Flowers are solitary or in small clusters at the ends of branches and bloom in June to July. Flowers have five white to pink petals 2 to 3 cm long, hermaphrodites (have both male and female organs) and are pollinated by bees, flies, beetles and Lepidoptera. Fruits ripen in September to October, are smooth, bright red and 1 to 2 cm long. Fruits persist on the plant for several months and become black. The plants show strong resistance to harsh environmental conditions (poor soil, rocky places, strong winds and limiting water, etc.). It prefers well-drained soil and can grow in heavy clay soil. Acid, neutral and basic (alkaline) soils are suitable for the plant.

Distribution
Rosehip grows wildly in Europe (including Britain), northwest Africa and western Asia. In Georgia, 25 species of rosehip (5 endemic) grow throughout country. It particularly develops beside forest watercourses, scrub in the plains, in pastures, riversides and well-watered semi-arid parts of the mountains. It is common in hedges and at the edges of woods. Rosehip can be found up to 1200 m altitude.
Usage

Medicinal Uses – Rosehip is important due to its traditional pharmaceutical, nutraceutical and commercial significance. They are beneficial for health due to their appreciable levels of high-value nutrients, vitamins, minerals and bioactives. The fruits, boiled in water, can be used as a diuretic as well as remedy for common cold. Rosehips are traditionally employed to treat influenza, inflammation and chronic pain. Moreover, they are useful for the treatment of skin disorders and ulcer. Another healthy benefit of rosehips is their essential fatty acids (EFA’s), which humans cannot synthesize and must be supplied through diet. Rosehip powder, which is marketed as a food supplement in several European countries due to its anti-inflammatory properties, has been shown to reduce knee or hip osteoarthritis in clinical trials.

Culinary Uses – Rosehips can be used as fresh or in dried form. As a rich source of minerals (potassium, phosphorous), vitamin C, carotenoids and flavoring components. Rosehips have several culinary and food applications. The demand for rosehips as a natural and useful material is increasing as new products are emerging in the market, including health supplements, food additives, functional foods, specialty oils and exfoliates. The high content of added-value bioactive compounds in rosehips allows for the extraction, isolation and potential applications of several of health-promoting components. Rosehips are a potential fruit commodity to be used for functional food and cosmo-nutraceutical preparations.

Rosehip Products

1. Rosehip Jelly

- 500 g of rose hips
- 900 g of apples
- 600 ml of water
- 1 lemon
- 1 kg of jelly sugar

- Remove the stems and the sepals
- Boil rosehips in water and force them through a vegetable mincer in order to remove the seeds
- Cut the apples into pieces, with peel and core
- Put the rosehip pulp and the apples together in a cooking pot, add water until the whole is covered with water and boil for 30 minutes
- After boiling, cool down and pour everything through muslin and squeeze out all the juice in a large cooking pot
- Add lemon juice and 850 g of jelly sugar per liter of juice
- Boil juice for another four minutes
2. Rosehip Wine

- 2 kg of fresh rose hips
- 1.5 kg of sugar
- 4 l boiling water
- 1 tsp. black tea
- 1 tsp. baker’s or wine yeast

- Rinse and drain the hips. Place them in a primary fermenting vessel such as a clean food-grade plastic bucket that has a tight-fitting lid. Pour in 4 liters of boiling water. Add the teaspoon of tea and all the sugar, stirring to dissolve the sugar. Let the mixture sit tightly covered for 24 hours. Add one teaspoon of baker’s or wine yeast and let the mixture ferment for seven days, covered, stirring once per day with a clean spoon.

- Strain off the rose hips and pour the liquid into a 4-liter glass jug (an old wine jug works great) and fit with a fermentation lock or balloon. If you use a balloon, be sure to release the gases occasionally or it will burst. Place the jug in a warm spot until fermentation ceases. Siphon (rack) the liquid off of the yeast solids into a clean glass jug and refit with the fermentation lock or balloon.

- Racking will usually reactivate fermentation for a short time. When fermentation ceases completely for several weeks, siphon the wine into clean wine bottles. Cork the bottles securely or use wine bottles with screw-on tops and store in a cool spot for six months or longer. There will usually be a glass or two of wine left after bottling.

3. Rosehip Tea

- 75 g rose hips
- 1 l water
- 2 tbsp. golden raisins or currants
- 1 tsp. sugar
- 1 tsp. fresh lemon juice

- Rinse the rosehips. Chop the fruit into very small pieces. Place in a saucepan and cover with water. Wait for 10 minutes. Slowly bring to a boil and continue to cook at a slow boil for 5 minutes.

- Add golden raisins or currants for aroma and fresh lemon juice and sugar to taste. Strain and pour into teacups.
4. Dried Rosehip

- Collect rosehip quantities to be dried or made into teas, jellies, juice, pickles, etc., for winter use
- Sort out the imperfect ones and rinse the batch. Carefully pat dry
- Line a cookie sheet with a screen or a sheet of cardboard, or parchment or wax paper and spread them across in a single layer
- Leave in a dark, well-ventilated area for a few weeks, they’ll be ready when they are hard, wrinkly and darker in color
- You can also do this in the oven on the lowest setting or use a dehydrator
- You can dry them whole or you can cut and seed first (directions below). If mainly using for teas, leaving whole is fine

**Storage:** Seal in airtight containers or glass jars, store away from direct light

5. Rosehip Oil

- 300 g Rosehips
- 500 ml of your chosen carrier oil

- Rinse the rosehips thoroughly and chop off the hairy heads and the tails
- Put the rosehips in a slow cooker and add the carrier oil. Almond oil can be used as it is soft, light and nice on the skin – but you can use any oil such as olive oil or cooking oil
- Let the mixture bubble away, occasionally taking the lid off to give it a quick stir and make sure it all looks fine. Simmer for about four hours if rosehips are squishy – for harder rosehips you may want to leave it cooking for up to eight hours
- Take the oil and hip mixture and strain it – jelly strainer can be used
- Once the mixture is strained and all traces of the rosehips removed you can decant the oil into jars
**Market Overview and Business Opportunities**

For the past 30 years, Chile has been the main producer of Rosehips, accounting for 85% of world supply. All thanks to the cold rainy climate found in the Andes mountain range. Today, however, it is known that rosehips possess magnificent cosmetic properties and uses that Chilean companies have known how to put to good use and have turned the country into its main producer worldwide. Chile also produced a new export item: rosehip seed. The seed is a waste product from the dehydration process and is now in high demand all over the world for its active medicinal principles and tissue-regenerating properties.

The dynamic of the Rosehip export from Georgia is increasing. According to the Statistic Department (GeoStat), in 2013 the 77.1 tons of Rosehip was exported from the country, two times more than in 2012 with 33.7 tons. The total value of exports in 2013 was 127 thousand dollars, as compared to the 2012 value of 55 thousand dollars. The main target country in 2013 was Bulgaria - with 44 tons (77.8$ thousand), and Germany in 2012, with 13.4 tons (21.6$ thousand) of exported products. In 2013, the 15.1 tons of Rosehip was also exported to the Russian market (14.5$ thousand).

Currently, Rosehip is produced, processed and preserved by several leading companies (Georgian Herbs LTD, Campa LTD, Kula LTD and Bio Products LTD) which are the main players in the market and are willing to cooperate with agricultural cooperatives.

**The Georgian Herbs LLC** is already producing bio products from NTFP and mostly they use Rosehip and Bilberry. The company purchases the mentioned products once per year. The Georgian Herbs LLC needs to buy Dried Rosehip and Bilberry, and is accessible to purchase products instantly from the agricultural cooperatives. The company also points out that existence of Bio Certification would be an advantageous for the producers, processors and consumers.

**Campa LTD** - a producer of natural juices is not producing bio products from NTFP at this moment. However, they are interested in starting such production again, and therefore are willing to buy bio certified NTFP resources from the small farmers and agricultural cooperatives. The products they usually use for bio production are Rosehip and Sea-Buckthorn, and the company is willing to purchase a Bulk and Dried forms of the product.

**Kula LTD** - a producer of ecologically clean juices and natural juices from fruit and vegetables for children is also interested in producing bio products from NTFP. The list of their main products includes Wild Pear, Crab Apple, Rosehip, and Bilberry. Kula LTD is also willing to buy all the mentioned products from the agricultural cooperatives. The desired form of the products for the company is Bulk, Dried, and Sodden.

**Bio Products LTD** was launched in the beginning of 2010 and yet the only product it produces is a wild Rosehip Juice. Company employs local inhabitants in different regions of Georgia to collect wild forest products.

<table>
<thead>
<tr>
<th>Price List of Rosehip Per Kg.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosehip (Sodden, Damp)</td>
<td>0.6 GEL</td>
</tr>
<tr>
<td>Rosehip (Dried)</td>
<td>2.5 GEL</td>
</tr>
</tbody>
</table>
Chapter 9 – Sea Buckthorn

Description

Sea buckthorn (*Hippophae rhamnoides*) is a dioecious multi-branched, thorny shrub, reaching 2 to 4 m in height with stout branches forming a round, often symmetrical head. It has brown or black rough bark and a thick grayish-green crown. Staminate and pollinate flowers are inconspicuous appearing before the leaves. Leaves are alternate, narrow 4 to 6 cm long, and lanceolate with a silver-grey color on the upper side. Flower buds are formed mostly on 2-year-old wood, differentiated during the previous growing season. Pollination of the female flowers occurs in mid-May, and is entirely dependent on wind. Fruit ripening occurs about 100 days after pollination (September-October). Sea buckthorn fruit can vary in both shape and color, but are typically globose to egg-shaped berries ranging from yellow to bright orange in color. The combination of fruit shape and size, together with the contrast between the color of the fruit and leaves, contributes to the ornamental value of this plant. It can withstand extreme temperatures from –43° to 40°C and is considered to be drought resistant. However, irrigation is needed in regions receiving less than 400 mm of rainfall annually. They typically grow in dry, sandy areas, but demand full sunlight for good growth and do not tolerate shady conditions near larger trees.

Sea buckthorn develops an extensive root system rapidly, and is therefore an ideal plant for soil erosion control, land reclamation because of its ability to fix nitrogen and conserve other essential nutrients, wildlife habitat enhancement, and farm stand protection. Sea buckthorn needs a period of 4-5 years from the appearance of the first shoots from the seeds to the beginning of fruit and peaks at the 7-8th year of plant life, remaining productive for 30 years with intermittent pruning. An orchard planting can yield 10 tons of berries per hectare.
**Distribution**
Sea buckthorn occurs as a native plant distributed widely throughout temperate zones including China, Mongolia, Russia, Great Britain, France, Denmark, Netherlands, Germany, Poland, Finland, Sweden, and Norway. In Georgia, sea buckthorn is grown throughout the country up to 2500 m. It is typically found on slopes, riverbanks, and seashores.

**Usage**

**Medicinal Uses** - In natural medicine, there are many uses and indications for the Sea Buckthorn. Leaves and flowers are utilized for arthritis, gout and skin rashes and irritations. Tea made from the leaves contains vitamins (C, A, B1, B2, B6, B9, E, K, P, F) and minerals, antioxidants, amino acids, and fatty acids. The tea is typically used for lowering blood pressure and serum cholesterol, prevention and treatment of diseases of the blood vessel, and for increasing immunity. Sea buckthorn berries are used for preventing skin infections, improving sight, and slowing the aging process. The tea is commonly applied to sunburns to reduce swelling and irritation while promoting healing.

**Culinary Uses** - Interest in utilization of sea buckthorn products has been increasing recently in the area of human nutrition. Thanks to the functional properties and unique taste of the berries they can be used for production of juice, bonbons, jelly, jam, alcoholic and non-alcoholic beverages or dairy product flavors. Oils from the seeds and pulp may be used as ingredients in food supplements such as jelly, plant capsules, or oral fluids. They are also used in cosmetic products such as shampoo. Leaves are used for production of extracts, teas or cosmetics.
Other Uses - Sea buckthorn has long been used in animal nutrition as an additive to feed mixtures for its favorable effects on animal health. Sea buckthorn leaves, seed and berry residues are suitable feed for farm animals and poultry, mainly in dry and cold regions. In poultry, sea buckthorn positively affected the egg production and body weight of laying hens. It can be used as a shelter hedge. It dislikes much trimming. A very thorny plant, it quickly makes an impenetrable barrier. It can be used as a pioneer species to help the re-establishment of woodland in difficult areas. Because the plant is very light-demanding it will eventually be out-competed by the woodland trees and so will not out-stay its welcome.

Sea Buckthorn Products

1. Sea Buckthorn Jam

✓ 500 g Sugar
✓ 2.3 kg fresh or thawed sea-buckthorn fruit
✓ 3 apples
✓ 500 ml Water
✓ 1 tbsp. Butter

- Wash berries and cut apples into small 2 cm cubes
- Place fruit in a large pot then bring to a boil, reduce to a simmer and cook for 30 minutes, mashing the berries against the side of the pan with a wooden spoon until the fruit is tender
- Take off the heat and mash the remainder of the fruit with a potato masher
- Add the sugar to the saucepan, heat through, stirring until completely dissolved then add the butter.
- Bring to a boil and cook rapidly for about 15 minutes
- Test for setting by placing a plate in the fridge. Spoon a little of the jam onto the plate, allow to cool then move it with your fingernail
- If a crinkly skin forms then the jam is ready
- If not continue boiling for 5 minutes more and test again
- Skim the surface then ladle into sterilized jars that have been warmed in an oven set to 100°C for 20 minutes
- Allow 1 cm of head space then secure the lid, allow to cool and store
2. **Sea Buckthorn Oil**

Sea buckthorn oil contains a wide range of vitamins, like vitamins A, B2, B1, B6 and vitamin C.

- Carefully wash the sea buckthorn fruits, making sure you do not crush them
- Smash the berries in a bowl, using a fork or use the blender. When you have obtained a thick paste, put the composition in a frying pan and let it heat
- After 5 minutes, add a small amount of sunflower oil and stir until the oil blended in and turn the heat off
- Let the composition cool down and afterwards strain it as well as you can
- Put the resulting oil in a glass jar or a jar bottle and keep it in the fridge

3. **Sea Buckthorn Tea**

- Picked by hand, sea buckthorn leaves are then air dried, producing a tea with a delicate, green tea flavor. An excellent and nutritional resources, sea buckthorn leaves contain most of the biologically active compounds in the fruit with even greater concentrations of flavonols and sterols
- Sea buckthorn leaves are crushed, producing package tea directly; or adding into flavoring and producing tea. This way is either convenient or hygienic
- Processed tea beverages: it is the first to distill sea buckthorn tea through hot water, secondly preparing distilled liquid with sugaricid and acidicid; finally sea buckthorn tea beverage is produced by sterilization and canned
Market Overview and Business Opportunities

Sea Buckthorn Oil

Sea buckthorn oil is distributed across the globe, mainly in China, Mongolia, Tibet, India, Nepal, Russia, Ukraine, UK, Sweden and Norway. As one of the super fruits, sea buckthorn possesses a content of vitamin C between 200 and 2500 mg/100g, with content of palmitoleic acid averaging 40 % in the sea buckthorn oil. Also there are nearly 40 kinds of sea buckthorn flavones in sea buckthorn. It is dubbed as the most promising health-care and medical plant in 21st century. According to Herbridge media, both supply and demand markets for sea buckthorn remained stable before 2012. Then from 2013 to 2014, the market demand of sea buckthorn clearly increased to leave a shortage in supply for two reasons: the limited resource amount of sea buckthorn fruit, the seasonal picking, and short stock to meet demand of the increased market share; and the supply of sea buckthorn seed oil volume for international market share is absolutely in short due to the backward technologies of domestic suppliers and inadequate number of suppliers. Due to lack of raw materials of sea buckthorn fruits in recent years, the price has constantly been on the rise along the price of the sea buckthorn fruit oil and the sea buckthorn seed oil. From 2013 to present, the market price of sea buckthorn has increased by around 30 to 50 %. In 2014, the demand of sea buckthorn oil witnessed an apparent increase.

Chapter 10 – Wild Pear

Description

Wild Pear (Pyrus Caucasia) is a tree, 20-25 (30) m tall, with a broadly pyramidal or oval crown having numerous prickles when young. Young offshoots are greenish or dark brown with a few small, light lenticels. Leaves are 3-5 cm long and 2.5-4.5 cm wide, orbicular ovate, ovate or oval, the leaves on young plants are sharply serrated on all edges and non-pubescent; those on adult plants are smooth-edged and pubescent only near the edges. Flowers are 2.5-3.5 cm in diameter, assembled in inflorescence of 5-8 flowers. Petals are white or pinkish. Fruits are 1.5-3 cm in diameter, for the most part round or sometimes pyriform, yellow or green-yellow, non-rusty, with residual sepals. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils, requires well-drained soil and can grow in heavy clay soil. It can grow in semi-shade (light woodland) or no shade. Dislikes very exposed positions. Established plants are drought tolerant. A very hardy plant tolerates to temperatures down to below -15°C. There are three types of wild pear according to maturity period: Early (August), Middle (September) and Late (October-November).
**Distribution**

*Pyrus caucasia* is a relict and endemic species to the Caucasus. It is determined as relict tree and ancestor of fruit pear landraces of Georgia. In total, eleven species of wild pear occur in Georgia, but *P. caucasia* is endemic species of the Caucasus and most widespread among the wild pears of Georgia and it is considered as main progenitor species of local pear cultivars. It occurs everywhere in the woodlands of the Caucasus, in mountainous and flat areas with sufficient moisture, often along river valleys. Caucasian pear grows up to elevations of 1,500-1,600 (1,900) m above sea level. It is the most widespread wild fruit tree in Georgia. According to unofficial information the biological yield of wild pear estimates 80 000 – 90 000 tones.

![World Map](image)

**Usage**

**Medicinal Uses** - Pears fruit is packed with health benefiting nutrients such as dietary fiber, anti-oxidants, minerals and vitamins, which are necessary for optimum health. In addition, pear fruit is one of the very low calorie fruits and contain good quantities of vitamin C. The fruit is a good source of minerals such as copper, iron, potassium, manganese and magnesium as well as B-complex vitamins such as folates, riboflavin and pyridoxine (vitamin B-6). Pears have been suggested in various traditional medicines in the treatment of colitis, chronic gallbladder disorders, arthritis, and gout.

**Culinary Uses** - Wild Caucasian pears are eaten as a food and consumed in a variety of ways - fresh, as a juice, canned and dried. They are also used to make jams, jellies and even fermented to produce pear cider. Some varieties of pear are cultivated for cooking purposes.
**Wild Pear Products**

1. **Wild Pear Jam**

- 2 kg of wild pears, peeled, cored and chopped
- 3 medium lemons
- 1 kg of granulated sugar
- 1 l of water

- Prepare the pears and place in a large covered bowl, to stop them browning
- Remove the zest from the lemons carefully to avoid adding the bitter pith. Set zest aside. Squeeze the lemon juice and strain
- Add the water, chopped pears, lemon zest and juice to a large heavy bottomed saucepan
- Simmer very gently until the pears are just soft
- Pour in the sugar and stir, over a medium/low heat until the sugar is dissolved
- Bring the heat up to a rolling boil. Allow to boil hard for ten minutes before testing for a set. If it has not reached setting point. Continue to boil rapidly, checking for a set every couple of minutes
- Allow the jam to stand for a few minutes and pour into warmed sterilized jars
- Cover with screw top lids or wax disks and cellophane tops. Label when cold. Store in a cool dry place

2. **Dried Wild Pear**

- Wild pears (Choose ripe but not overripe fruit)
- Lemon juice (optional, you only need this if you want your pears not to turn a tan-brown color. Use about a 300 ml of juice per 4 liter of water

- Wash your pears, and cut out any bruised or bad spots.
- Slice your pears. You can use an apple corer to cut out the core and then slice the pears in rings, or you can slice them lengthwise into slices without cutting out the core. The slices should be 6 to 13 mm thick, thinner slices will dry to a more crunchy texture and thicker slices will be chewier.
- If you do not want your pears to brown while drying, soak them for 10 minutes in lemon water.
- Arrange the pear slices on the trays of your food dehydrator. If you are dehydrating them in your oven, line a cookie sheet with parchment paper and arrange the pears on the paper, or place the slices on drying racks and stack them on the cookie sheet.
- Set the oven for 160 degrees (or, if your oven does not allow you to set it for that temperature, use the "warm" setting). Place the pears in the oven and dry for 3 hours, then check them. If you like the texture, take them out, otherwise, leave them in the oven and check every half-hour until the pear slices reach the desired texture. It can take from 3 to 6 hours (roughly) to dehydrate pears, depending on the moisture content of the fruit, the humidity, and particular oven. If you're using a dehydrator, follow the directions that came with the machine, if they do not mention how long to dry pears, follow the directions for dried apples.
• When your pears are dry, remove them from the oven and allow them to cool. Put them in airtight containers and store. If you've dehydrated more pears than you will eat in a month or so, put some of them in the freezer. They will stay fresh longer and you will not have to worry about them going stale.

3. **Wild Pear Juice**

- 6 fully ripped wild pears, peeled and cored
- 30 ml freshly squeezed lemon juice
- 1.2 l water
- desired sweetener such as powdered sugar, honey, maple syrup

• Chop the pears coarsely. Transfer them in a heavy bottom saucepan and cover them with water.
• Simmer the pears, on medium-low heat, for 15 minutes, until tender
• Working in batches, puree the pears with the liquid in which they were boiled
• Press the pear puree through a fine sieve with a wooden spoon, to remove any pieces of core or skin
• If needed, thin the puree with water until a drinkable consistency is reached
• Taste and adjust the sweetness. If the nectar is too tart, add powdered sugar or alternative sweeteners

---

**Chapter 11 – Other NTFP’s (Mulch, Briquettes)**

**Description**

**Mulches** are materials placed over the soil surface to maintain moisture and improve soil conditions. Mulching is one of the most beneficial acts a homeowner can do for the health of a tree. Trees growing in a natural forest environment have their roots anchored in a rich, well-aerated soil full of essential nutrients and soil microorganisms. The soil is blanketed by leaves, organic materials, and living organisms that replenish and recycle nutrients. This environment is optimal for root growth and mineral uptake. Urban landscapes and new developments, however, are typically harsher environments with poor quality soils, reduced organic matter, and large fluctuations in soil temperature and moisture. Applying a 5 to 10-cm layer of organic mulch can mimic a more natural environment and improve plant health.

**Types of Mulch**

Mulches are available in many forms. The two major types of mulch are **inorganic** and **organic**.

**Inorganic mulches** include various types of stone, lava rock, pulverized rubber, geotextile fabrics, and other materials. Inorganic mulches do not decompose and do not need to be replenished often. On the other hand, they do not improve soil structure, add organic materials, or provide nutrients. For these reasons, most horticulturists and arborists prefer organic mulches.
Organic mulches include wood chips, pine needles, hardwood and softwood bark, cocoa hulls, leaves, compost mixes, and a variety of other products usually derived from plants. Organic mulches decompose in the landscape at different rates depending on the material, climate, and soil microorganisms present. Those that decompose faster must be replenished more often. Because the decomposition process improves soil quality and fertility, many arborists and other landscape professionals consider that characteristic a positive one, despite the added maintenance.

**Benefits of Proper Mulching**

- Helps reduce soil moisture loss through evaporation
- Helps control weed germination and growth
- Insulates soil, protecting roots from extreme summer and winter temperatures
- Reduces soil erosion by reducing the impact of raindrops and water runoff
- Improves soil biology, aeration, structure (aggregation of soil particles), and drainage over time
- Improves soil fertility as certain mulch types decompose
- Inhibits certain plant diseases
- Gives planting bed a uniform, well-cared-for look

**Usage**

Most types of mulch are available by the bag. It is best to apply organic mulch shortly after purchase or delivery. If it is not convenient to do so, cover the mulch with a tarp or plastic to keep the material dry. Before selecting mulch consider how it will be used. Consider availability, cost, appearance, quality, and durability. Understanding the characteristics of different mulches and their appropriate uses will help you select the right mulch for your needs.

**Uses of Organic Mulch**

1. **Composted Animal Manure**
   Well composted animal manure can be used as a mulch or soil amendment. Composted animal manure is an excellent choice for new planting beds as it improves soil quality and adds nutrients. Fresh manure should not be used in garden beds because it can burn plant roots. Caution should be used when using animal manure in vegetable gardens. Manure should be well composted prior to using as mulch for at least one week and to eliminate most potential disease organisms. Dog, cat, and pig manure should never be added to vegetable gardens.
2. Grass Clippings
Allow lawn clippings to dry before applying to gardens. Fresh, green material may settle and form a dense mat or produce an unpleasant odor. If the lawn has been treated with a broadleaf herbicide, do not use the clippings until the lawn has been mowed two or three times after the application. The best source of lawn clippings is a well-maintained lawn. Grass clippings from a weed-infested lawn will undoubtedly contain a large amount of weed seed. Grass clippings do not last long and are best used in vegetable gardens or annual flower beds.

3. Leaf Mulch
Leaves should be shredded or composted before applied as mulch. Shredded or composted leaves do not mat down as readily as whole leaves, are less likely to blow away in the wind, and decompose more quickly. Shredded or composted leaves are excellent mulch for vegetable gardens, annual flower beds, raspberry plantings, and around trees and shrubs. Leaves are poor winter mulch for strawberries and herbaceous perennials.

4. Newspapers
Shredded newspapers or whole sheets may be used in the vegetable garden. Most newspapers use organic inks so gardeners need not to worry about lead contamination. When using newspaper sheets place a layer of 2 or 3 sheets between plant rows and cover with an organic material such as leaf mulch or grass clippings to hold it in place. Water the sheets so they stick to one another and to the soil surface, then weigh them down with soil to prevent them from blowing away in the wind.

5. Pine needles
Pine needles are light, airy, decompose slowly and make attractive mulch. They may last several years and may be easily removed if necessary. Pine needles are acid in reaction and are excellent mulches for acid-loving plants. However, they also can be safely used in the vegetable garden and elsewhere in the home landscape. The best source of pine needles is a large, established windbreak.
6. Sawdust

Sawdust is easy to apply, weed free, and decomposes slowly. Generally, sawdust should be allowed to age or weather for a year before being applied. If fresh sawdust is used, apply only a 3 cm layer and make sure the sawdust does not crust over, reducing water infiltration. Do not use sawdust from treated lumber in the yard and garden.

7. Straw

Straw that is free from crop and weed seed is excellent mulch for the vegetable garden and strawberry bed. Suitable materials include wheat, oat, and soybean straw. Straw may provide a winter habitat for mice and other rodents, so avoid using straw around trees and shrubs.

8. Wood chips

Wood chips are an excellent mulching material that may be available from local arborists, or municipal or private yard waste sites. Wood chips are best used in landscape plantings, such as around trees, shrubs, and roses, and in perennial beds.

Improper Mulching

As beneficial as mulch is, too much can be harmful. The generally recommended mulching depth is 5 to 10 cm. Unfortunately many landscapes are falling victim to a plague of over mulching. “Mulch volcanoes” are excessive piles of mulch materials applied around the base of trees. Deep mulch can be effective in suppressing weeds and reducing maintenance, but it often causes additional problems.

Problems Associated with Improper Mulching

- On wet soils, deep mulch can lead to excess moisture in the root zone, which can stress the plant and cause root rot
- Piling mulch against the trunk or stems of plants can stress stem tissues and may lead to the development of insect and disease problems
- Some mulch, especially that contains fresh grass clippings, can affect soil pH and may eventually lead to nutrient deficiencies or toxic buildups
- Mulch piled high against the trunks of young trees may create habitats for rodents that chew the bark and can girdle the trees
- Thick blankets of fine mulch can become matted and may reduce the penetration of water and air
Proper Mulching

- Determine whether soil drainage is adequate and if there are plants that may be affected by the choice of mulch. Most commonly available mulches work well in most landscapes. Some plants may benefit from the use of slightly acidifying mulch, such as pine bark.
- For well-drained sites, apply a 5 to 10-cm layer of mulch (less if poorly drained). Coarse mulches can be applied slightly deeper without harm. Place mulch out to the edge of a tree’s crown or beyond. Remember, if a tree had a say in the matter, its entire root system (which usually extends well beyond the drip line) would be mulched.
- If mulch is already present, check the depth. If sufficient mulch is present, break up any matted layers and refresh the appearance with a rake. Some landscape maintenance companies spray mulch with a water-soluble, vegetable-based dye to add color to faded material.

Growing season
Apply mulch to planting beds and around the root zone of plants in mid-spring after garden soil has warmed. Mulching around newly installed plants is particularly beneficial, especially for fall plantings as it protects roots over the winter. It is not necessary to replace all mulches each year. New mulch should be added only as needed to the original depth of the first application to avoid over-mulching. Aged mulch can be plowed into the garden later to amend the soil.

Winter protection
A common misconception is that a layer of mulch prevents soil from freezing. It actually lessens the possibility of plants being heaved out of the ground by freeze/thaw cycles. Mulch allows soil to warm up gradually in spring, preventing damage to plants that emerge early before temperatures are warm enough to sustain them. Roses and tender perennials in particular benefit from an application of winter mulch. Winter mulch should be removed from the base of protected plants in the spring when new growth is observed.

Trees and shrubs
Apply no more than a 5-7 cm layer of mulch around the base of trees and shrubs to avoid soil compaction and root suffocation leading to early decline. Avoid piling mulch against trunks and stems. Constantly moist conditions created by over-mulching may also promote the growth of pathogens and provide a habitat for unwanted insect and animal pests.

Perennials
Apply no more than 5-8 cm of mulch around established plants during the growing season. Avoid burying the crowns or heavy mounding around stems. In the fall after the ground freezes, apply 10 – 16 cm of finely shredded leaves over the crowns of recently transplanted or marginally hardy perennials to provide winter protection.

Annuals
Use ground or shredded hardwood or cocoa hulls to suppress weeds in annual beds and to add a finished look. Larger wood chips can be used to create pathways.
**Vegetables**
Mulching the vegetable garden reduces competition from weeds, conserves moisture, and protects fruits and vegetables from being splashed by soil. It also lessens the spread of disease pathogens. Apply mulch after planting when the soil has warmed. Small to medium texture or composted material works best. Mulch can also be used in the vegetable garden to create pathways between rows for easy cultivating and harvesting.

**Briquettes**

**Description**

**Briquettes** are made from raw materials that are compacted into a mould. Briquette could be made of different shapes and sizes depending on the mould. The appearance, burning characteristics of briquettes depends on the type of feedstock and the level of compactness and the mould used.

**Briquetting** is a way to convert loose biomass residues, such as sawdust, straw or rice husk, into high density solid blocks that can be used as a fuel. Biomass briquettes (including pellets, which are very small briquettes) replace fossil fuels or wood for cooking and industrial processes. They are cleaner and easier to handle, and cut greenhouse gas emissions. There are two approaches to briquetting. Both require the loose biomass to be ground to a coarse powder like sawdust.

**High Pressure Briquetting**

High pressure briquetting uses a power-driven press to raise the pressure of dry, powdered biomass to about 1500 bar (150 MPa). This compression heats the biomass to a temperature of about 120°C, which melts the lignin in the woody material. The press forces the hot material through a die at a controlled rate. As the pressure decreases, the lignin cools.
Low Pressure Briquetting

Low pressure briquetting can be used for materials with a low amount of lignin, such as paper and charcoal dust. In this process, the powdered biomass is mixed into a paste with a binder such as starch or clay, and water. A briquetting press is used to push the paste into a mould or through an extruder, or it can simply be shaped by hand. The briquettes thus produced are left to dry, so that the binder sets and holds the biomass powder together. Low pressure briquetting machines are often hand operated, using a lever that drives a piston to compress the paste.

Benefits of Briquetting

Briquetting is a way to make use of biomass residues that would otherwise go to waste, and replace the use of wood and charcoal (often produced unsustainably) and fossil fuels, thus cutting greenhouse gas emissions. Briquettes are easier to store and use for cooking than wood, because they are uniform in size and composition. They are much cleaner to handle than charcoal or coal, and produce less local air pollution. There are some concerns about using field waste for briquettes, because it is sometimes also valuable as a soil improver. However, residues like sawdust and rice husk have limited agricultural use and can be a fire hazard, as can pine needles. High-pressure briquetting requires electricity or mechanical power. The energy input depends on the biomass used and the quality of the briquette produced, but is typically between 40 and 60 kWh/tons, or only 3 to 9% of the heat produced by the briquettes. Extra heat may also be needed to dry the biomass, but this can usually be provided by burning below-specification briquettes.

Numbers

Briquettes have been used as fuel for many years in Europe and the USA, mainly on remote farms. Since 2000, there has been a rapid increase in the production and use of wood pellets, particularly in Sweden, Germany and Austria, because they can be used in automated boilers for space heating. An estimated five million tons of biomass pellets were used in Europe in 2010, some of which had to be imported from North America.

Even in the UK, the demand and supply of wood pellets is increasing. Since the 1990s, briquetting plants have been manufactured in both India and China. A 2007 estimate suggested about 250 operating plants in India, producing approximately 750,000 tons of briquettes per year. The demand for briquettes from industry is increasing, especially in South India. In 2002, there were about 600 briquetting plants in China and the number was increasing. There is a huge resource of biomass residues that could be made into briquettes, but the availability of cheap coal means that they are not cost competitive. However, the
Chinese government has a program to increase the production and use of biomass briquettes, with a target of one million tons in 2010. In many countries there are significant resources of biomass residues, which are not needed for agriculture. Thus as the cost of conventional fuels increases, the use of biomass briquettes and pellets is likely to grow.

**Sources of Raw Materials**

Briquetting and/or carbonization plants – especially when run on a large scale basis – require a stable supply of raw material which could only be granted by e.g. large farms and frequent harvesting campaigns. Success also depends on good access to the customer, whether it is supplying to a few large scale consumers or to a great number of small consumers. From the technical point of view, the alternative fuel produced must be competitive in its combustion properties, in its transport and storage requirements, and of course in its price. People are only willing to change to a new fuel if it is reliable, convenient and cheap. Small scale production and application of fuel from agricultural, forestry and urban organic waste seem to have a comparative advantage, because they require less investment, are flexible in respect to fluctuation in raw material supply, type and quality, and even more important, are often poverty driven, which lowers the acceptance barrier against the new fuel. A thorough investigation into the availability of raw material, the consumer habits, the access to technology and the limiting cost factors is compulsory before starting briquetting and carbonization projects.

**Main Raw Material Sources:**

- **Field Residues**
  - Maize, wheat, rice, millet, sorghum straw
  - Cotton residues
  - Banana leaves
  - Forestry residues like dead trees, leaves and branches, reed and sedge, weeds, etc.
• **Process Residues**
  - Sugar-cane bagasse
  - Coffee and rice husks
  - Coconut and groundnut shells
  - Coir dust
  - Tree barks; saw dust and shavings, charcoal dust etc.

• **Domestic and Industrial Organic Waste,**
  - Waste paper and cardboard
  - Furniture waste

**Briquetting Technologies**

Biomass densification represents a set of technologies for the conversion of biomass residues into a convenient fuel. The technology is also known as briquetting or agglomeration. Depending on the types of equipment used, it could be categorized into three main types:

1. **Screw Press** - In a screw press or screw extruder, the rotating screw takes the material from the feed port, through the barrel and compacts it against a die which assists the build-up of a pressure gradient along the screw. Thus, the extruder features three distinct zones: feed, transport, and extrusion zones. The important forces that influence the compaction of the feed material play their role mostly in the compression zone near to the extrusion die. The frictional forces between feed material and barrel/screw, the internal friction in the material and external heating device (of the extrusion zone) cause an increase in temperature (up to 300°C), which softens the feed material. Lignin
from the biomass is set free and acts as gliding and binding agent. The speed of densification, the energy consumption of the press and the quality of the briquettes produced depend on:

- Flow ability and cohesion of the feed material
- Particle size and distribution
- Surface forces
- Adhesiveness

2. **Piston Press** - There are two types of piston press 1) the die and punch technology; and 2) hydraulic press. In the die and punch technology, which is also known as ram and die technology, biomass is punched into a die by a reciprocating ram with a very high pressure thereby compressing the mass to obtain a compacted product. The standard size of the briquette produced using this machine is 60 mm, diameter. The power required by a machine of capacity 700 kg/hr. is 25 kW. The hydraulic press process consists of first compacting the biomass in the vertical direction and then again in the horizontal direction. The standard briquette weight is 5 kg and its dimensions are: 450 mm x 160 mm x 80 mm. The power required is 37 kW for 1800 kg/h of briquetting. This technology can accept raw material with moisture content up to 22%. The process of oil hydraulics allows a speed of 7 cycles/minute (cpm) against 270 cpm for the die and punch process. The slowness of operation helps to reduce the wear rate of the parts. The ram moves approximately 270 times per minute in this process.

3. **The Pellet Mill** - Pelletizing is closely related to briquetting except that it uses smaller dies (approximately 30 mm) so that the smaller products are called pellets. The pelletizer has a number of dies arranged as holes bored on a thick steel disk or ring and the material is forced into the dies by means of two or three rollers. The two main types of pellet presses are: flat/disk and ring types. Other types of pelletizing machines include the Punch press and the Cog-Wheel pelletizer. Pelletizers produce cylindrical briquettes between 5mm and 30mm in diameter and of variable length. They have good mechanical strength and combustion characteristics. Pellets are suitable as a fuel for industrial applications where automatic feeding is required. Typically pelletizers can produce up to 1000 kg of pellets per hour but initially require high capital investment and have high energy input requirements.