
Oregon Truffle Market Analysis

A Business Planning Guide
for Small Woodland
Owners

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Introduction

This analysis provides guidance in assessing the potential market value of native Oregon edible culinary truffles produced in small-to-medium sized private temperate forests. The contents are oriented toward the small woodland owner entrepreneur seeking to develop a business plan for their forest system that includes management of Oregon truffle as a “wild” species; cultivation techniques are unknown at this time. This report describes all steps in the value chain, from truffle production to marketing (Figure 1). Although this report focuses on three species of Oregon native culinary truffle, much of the information is applicable to cultivated species of truffle and other commercially valuable nontimber forest products such as other wild forest foods, floral greenery, and native seeds and transplants.



Fig. 1. Flow chart outlining the contents of this report and steps in the value chain of a truffle enterprise.

Product – Oregon Truffles

The products that are the focus of this analysis are the three most commonly occurring species of Oregon native truffles sold to culinary markets: Oregon black truffle, and two species of Oregon white truffle (species specifics are described on p. 6). Truffles can be sold fresh, frozen, infused in oils, processed as purees or used as ingredients in pastas, sauces and other processed products. Fresh truffles have pungent aromas that can be imparted to other products, such as mild cheese or Arborio rice, by storing the products together for a period of time. The truffle can often still be used for other purposes afterwards.

In addition to the raw and processed food products other markets are emerging such as:

Agritourism/Ecotourism. Tourists engage in attractions and activities around farms or the environment. For example, a small forestland owner with truffles on their land can create u-picks or take people out on forays using truffle dogs to help locate ripe truffles.

Community Supported Forest Agriculture. A community supported forest farm is supported by members who pay a fee to receive some tangible benefit. The small woodland owner uses the membership fees to offset forest management costs and produce a reliable revenue stream. This is a new concept, much like the popular Community Supported Agriculture. See Appendix A.

A small forest-owner seeking to establish a profitable enterprise should consider whether and how the various secondary products can be leveraged to improve revenue.

Truffles are the fruiting bodies of truffle fungi, which grow on the tips of inoculated tree roots. The fungus forms a symbiotic relationship with the tree, absorbing water and converting inorganic nutrients (such as phosphorus and nitrogen) to organic forms that can

be utilized by the plant. In exchange, the fungus receives carbohydrates from the plant generated by photosynthesis (Pilz et al. 2009). When conditions are favorable, truffle fungi will “fruit” or form a truffle. As the truffle matures, it emits a strong odor that attracts animals that will feed on it. The spores pass through the digestive tracts of these animals unharmed and are dispersed through the feces. The spores then germinate, forming new fungal mycelia.

Pilz et al. (2009) describe the aroma of truffles:

Mammals are particularly fond of truffles and many humans find the aroma of truffles overwhelmingly seductive. The experience of truffle has been described as intoxicating, heady, provocative, rapturous, erotic, and addictive. There are many truffle species and each produces a distinctive, complex and evolving suite of aromas. Truffles are most often associated with the fifth sense of taste “umami,” or savoriness (p.5).

Of course, like all foods, truffles have their detractors with some people claiming they are akin to dirty socks or worse! Every truffle species tastes and smells quite distinct and many people who don't like one species may love another. Also, each truffle has a window of a week or so in which it is at perfect ripeness, beyond that it starts to rot with the odor getting stronger and eventually putrid, especially the blacks. If you have truffles that are starting to sweat and get soft, but don't smell unpleasant, you can freeze them for later use. Though a frozen truffle doesn't have some of the presentation qualities a chef might like, such as a texture conducive to thin shavings, freezing does have the advantage of breaking down the cellular structure. Some chefs feel that even more intense flavors are found in thawed frozen truffles than in fresh ones, and that thawed make the best sauces.

Chefs, home cooks, harvesters and other lovers of truffles are increasingly exploring the unique qualities of each truffle species and finding the right recipes to complement them. . As more people experiment with truffles and share their experiences, the more people overall will have success using them. Success in the kitchen will lead to greater consumer demand in the marketplace.

Oregon and Washington have vast areas of truffle habitat of which only a tiny fraction is ever managed for and/or harvested for truffles. The potential supply is enormous and could someday provide a major addition or alternative to other income generating activities, especially on private forestlands where the owner invests time and energy into creating optimal truffle habitat for production.

Because of their unique qualities of aroma and taste, and their being a wild food that can be somewhat elusive since they grow underground, truffles are one of the most expensive foods in the world. However, since one doesn't generally eat truffles like one eats a basket of strawberries, and a single truffle can flavor so much food, saying they are expensive is a bit misleading. In fact, truffles are not just for the wealthy. Anybody on any income can buy one and get a lot of mileage out of it in cooking if used wisely. Think of truffles as similar to a species like saffron--though a pound certainly can cost a lot, it only takes a pinch.

Truffles can be found throughout Europe, North African deserts, the Middle East, southern Himalayan forests, and the Pacific Northwest of North America (Pilz et al. 2009). Most truffles currently found in gourmet food stores and restaurants come from France and Italy where there is a long history and tradition of their use in gourmet food. The Italian white truffle (*Tuber magnatum*), and the French black truffle (*Tuber melanosporum*) command

the highest market prices from upwards of \$750 per pound for the Italian and \$500 per pound for the French. In contrast Oregon white truffles have sold from \$25 to \$75 per pound on average and blacks from \$50 to \$150. Mycologist Charlie Lefevre, owner of New World Truffieres, Inc., reports that he has worked with a truffle harvester that uses a dog to find perfectly ripened Oregon black truffles, harvests them, and sells them directly to local chefs for \$240 lb.

The European truffles are not necessarily better than other truffles, but rather there is an industry built around their long history and mystique. A similar industry has been developing in the Pacific Northwest for Oregon white and black truffles, and slowly but surely availability is expanding to more markets, quality control is improving, consumer awareness is growing, and demand and prices are rising. Each Oregon truffle species must develop around its unique qualities and not be marketed as interchangeable with European varieties as some marketers tried to do in the past. For example, if an Oregon black truffle is substituted in a recipe calling for French black truffle, the end result will be different than what the creator of the recipe had in mind. The dish may still taste good but it will be different. Rather than try to trick the consumer it is better to be honest and encourage consumer appreciation for the unique qualities of the Oregon truffle.

In addition to their aromatic qualities, most truffles also have value nutritionally, with a high concentration of minerals and microelements that are important to mammalian diets. These include phosphorus and micronutrients such as copper, manganese, selenium, and zinc (Trappe et al. 2009). They also contain important fats and fatty acids, and proteins and amino acids. Truffles are a good source of vitamins, including A, B-complex, C, D, and K (Trappe et al. 2009). Because truffles are generally not consumed in large quantities by people, their nutritional values may be minimal when used in food dishes.

Truffle Species

Over 350 species of truffle have been identified in the Pacific Northwest. Of these, three abundant edible species have the most commercial value in the culinary industry. This section provides a brief description of the taxonomy and ecology of these species.

In general, the two Oregon white culinary truffle species and the Oregon black culinary truffle species can be found in Douglas-fir forests in northwestern Oregon and southwestern Washington. They can be found in mixed conifer forests as well and the whites can sometimes be found in drier forests dominated by oak and other hardwoods but still having Douglas-fir present. All three species of truffles seem to thrive best in younger Douglas-fir forests, under age 30, but some harvesters feel that the age of the trees should be at least 15 years so harvest does not impede tree and truffle health. Truffles prefer and are easiest to sustainably harvest in the top soil of leaf litter, humus, sand, and silt that are found above the heavy mineral and clay subsoil, which doesn't drain as well.

Oregon Black Truffle (*Leucangium carthusianum*)

Leucangium carthusianum, formerly referred to in the scientific literature as *Pico carthusianum*, can be found in Douglas-fir forests throughout the Coast Range and the foothills of the Cascades, from northern California to British Columbia. Northwest Oregon and southwest Washington seem to have the greatest concentrations. The exterior (peridium) is black, resembling charcoal, and can be warty. The interior (gleba) is white to

grey, solid and firm, with grey pockets containing spores and surrounded by white veins. It looks marbled inside and slightly beige when ripe. Brown spots inside indicate decay. Black truffles are generally harvested sometime between September and February depending on the climatic conditions for that year. They are generally around the size of a golf ball, but can be as small as a dime and occasionally large ones as big as a baseball turn up.



Photo 1. Oregon black truffles

Oregon White Truffles (*Tuber gibbosum* and *Tuber oregonense*)

The western Pacific Northwest has several species of truffles that appear white or whitish-brown on the surface. Older literature will refer to all Oregon white culinary truffles as *Tuber gibbosum*, but these are now broken into several species. This guide primarily focuses on the two most common edible white species, *Tuber gibbosum* and *Tuber oregonense*. Both belong to the same genus (*Tuber*) as the culinary European truffles.



Photo 2. Fall Oregon white truffles (*Tuber oregonense*)

Both species are found in low-elevation, Douglas-fir forests, including forests that were formerly pasture or cropland. They occur from San Francisco to Victoria, B.C., west of the Cascades, from sea level to 2000 ft. in elevation. *Tuber gibbosum* (also known as the “spring Oregon white truffle”) has an olive to yellowish brown exterior (peridium) with some brown mottling, and external filaments (hyphae) having a bead-like wall. The interior (gleba) ranges from white when immature, to brown with white marbling when mature. It is generally harvested from January to June, depending on season conditions such as snow levels, moisture content in the soil, and average temperatures. *Tuber gibbosum* is typically about the size of a quarter, though smaller and much larger sizes can be found.

The second species of Oregon white truffle, *Tuber oregonense*, is also known as the “fall Oregon white truffle.” The exterior (peridium) is white when immature, becoming yellow to olive mottled with brown to orange-brown or reddish brown blotches with age, and solid reddish brown when fully ripe. The interior (gleba) is white when immature, turning brown with white marbling with age. It is harvested from October to January. It is closely related to *T. gibbosum*, but can have a more intense fragrance. (Pilz et al. 2009). *Tuber oregonense* is generally smaller than *gibbosum*, from about a dime to a quarter in size.

In addition to the three described above, a few additional edible species may eventually have commercial potential. These include two additional species of Oregon white truffle (*Tuber castellanoi* and *T. bellisporum*), and the Oregon brown truffle (*Leucangium brunneum*), which belongs to the same genus as the Oregon black truffle. *Tuber castellanoi* occurs only in the central Sierra Nevada Mountains of California and *T. bellisporum* has been found only in southwestern Oregon. Both are rare. *L. brunneum* has a garlicky aroma, and

has been found with black truffles in western Oregon and northern California (Trappe et al. 2009).

Supply and Demand

It's unknown how many commercial truffles harvesters there are in the Pacific Northwest, but to give the reader a general sense for the size of the harvester population some rough estimates based on 20 years of ethnographic observations by Jones and others are as follows: As of 2012 fewer than 500 people make between \$100 and \$1,000 annually just from sales from truffles they have harvested, fewer than 50 make between \$1,000 and \$5,000 annually, and fewer than 10 make between \$5,000 and \$75,000 annually. Lefevre et al. (2001) believe that the vast majority of commercially productive truffle habitat is found on private lands, but that only a small portion of that habitat is harvested. Furthermore, where it is harvested, it is not usually by the owners of those lands, due to the owners' lack of awareness, knowledge or interest. Enough truffles exist to serve a much greater demand. For a reliable, predictable, sustainable, high quality supply more private landowners will need to develop either their capacity to harvest truffles themselves or a permitting, leasing or similar arrangement with commercial truffle harvesters or commercial buyers with company crews to harvest truffles from their land.

Pilz et al. (2009) estimate that less than 5,000 pounds of Oregon d truffles are harvested per year, with revenues from harvesting grossing about \$300,000 per year (based on prices in 2009). In comparison, Pilz et al. (2009) estimate that the annual market for all truffles (including European) is "expected to exceed \$6 billion within the next two decades." Oregon truffles are still in their market infancy, having only been shipped to chefs and other outlets since the early 1980s, and not in very significant quantities until the early 1990s. European and Asian truffles, on the other hand, have commercial histories dating back over 100 years. The potential for Oregon truffle market growth is enormous.

Truffle productivity of a given acre is highly dependent on environmental conditions and other unknown or un-researched reasons. Nevertheless, Pilz et al. (2009) estimate the potential production of Oregon native truffles to be 20 to 40 pounds per acre per year, if tree seedlings are inoculated and the land is actively managed for truffles. If 10,000 acres of Oregon forests were devoted to native truffle production (i.e., 10% of all young Douglas-fir stands), annual harvests could total over 200,000 pounds. Table 1 shows the potential demand for Oregon native truffles in 2030. In their conservative estimate, if a landowner had 9,000 acres actively managed for truffles he/she could harvest 23 tons per year values at \$4.5 million.

Table 1. Potential domestic market demand, value and acres for native Oregon truffles in 2030 (from Pilz et al. 2009).

Factor	Units	Low estimate	Medium estimate	High estimate	Optimistic estimate
Total demand for Oregon truffles	U.S. tons/year	23	91	312	833
# Acres needed	Acres	9,000	18,250	31,219	55,500
Value of U.S. demand for native truffles	\$ Millions	4.5	36.5	187.3	666

Perhaps the most important activity any potential business owner can engage in is the planning of all activities and required investments. Understanding the value chain of a product is important to the business planning process because it helps to identify the costs, equipment, resources and staff that will be required. It walks the small woodland owner through all steps, from production to sales.

The value chain of a product, such as truffles, is the path that a product follows from collecting the things needed to make it (production) through delivery to the final customer.

Insurance

Because there are inherent risks in any business, the small woodland owner is advised to secure business and liability insurance. The U.S. Small Business Administration provides an excellent overview of the various insurance types available to a small woodland owner on its website¹, including general liability, product liability, home-based business, internet business and worker's compensation insurances.

Security is a concern when one owns a small woodland property. Illegal harvesters likely have already trespassed and collected from the land if the owner has not prevented their presence in some way. These illegal harvesters often find their way onto private properties through public lands. Law enforcement officials will respond to a small woodland owner calling to report trespassing or theft. Once a small woodland owner decides to start a truffle business, they are strongly advised to discuss it only with those who can be trusted.

Production and Management

Getting Started

Small landowners are encouraged to take steps to survey their property for the presence of native culinary truffles if Douglas-fir forest conditions are present. Since truffles grow entirely underground they are more difficult to inventory than most other forest products, especially if you lack experience finding and harvesting them. One approach that some landowners use is to hire a commercial truffle harvester. More and more harvesters are beginning to offer inventorying services either for cash or in trade for the rights to harvest some truffles on the land. If you have land with what you think is ideal habitat, paying a harvester a couple hundred dollars to locate the patches could be a worthwhile approach to getting started. Be sure that they flag the truffle finds and/or provide you accurate GPS coordinates.

Another possibility is to establish a lease arrangement with a limited number of harvesters. Buyers may share the names of suppliers, who can then be contacted to determine their interest in an exclusive harvesting arrangement on private lands. This is an attractive proposition for a harvester, providing greater certainty about forest conditions (such as no pesticides), greater security and the ability to nurture an area according to their personal

¹ http://www.sba.gov/smallbusinessplanner/manage/getinsurance/SERV_INSURANCE.html

techniques. Many harvesters harvest on others' land illegally or under paid land-access agreements, the latter being preferred to the former.

If a landowner intends to plant new Douglas-fir trees, an emerging but yet unproven opportunity is to inoculate truffle mycorrhizae onto the roots of Douglas-fir seedlings. Though this technique is still in its infancy and suppliers may be difficult to locate, New World Truffieres is an example of a company that is developing trees inoculated with Oregon truffle spores to sell to landowners. Charles Lefevre hopes that truffle farmers will be able to harvest approximately 100 pounds of truffles per acre annually and sell them for around \$100 per pound (Maxwell 2005). Independent testing laboratories exist – such as Mycorrhiza Biotech or MycoRoots - that will certify that the presence of the desired fungi is present on purchased seedlings.²

A property that has neither truffles nor Douglas-fir trees may not see production for several years, as inoculated trees will have to be planted and the fungi given time to produce fruit. Estimates of the age at which trees begin to produce harvestable truffles range from 8 to 15 years.

Increasing Yield per Acre

Efforts at the cultivation and management of European – or “Old World” – truffle producing orchards has been described in *Oregon Culinary Truffles* (Pilz et al. 2009) and on the *New World Truffieres, Inc.* website.³ Management techniques for European varieties include lime applications, weed control with torches or by mowing, canopy pruning, pest control, fertilization, and irrigation in dry weather. One worker can manage up to 20 acres using this light management approach (Pilz et al. 2009).

It has not been researched whether these plantation management techniques would also benefit Oregon truffles. Part of the reason for the high price received for truffles is that it has been difficult for producers to increase their productivity using cultivation methods in non-plantation settings. If your property has Douglas-fir trees, but no truffles, production may not take long at all. Pilz and Bondi (2005) suggest that Christmas tree plantations could easily double as truffle plantations:

Not only are such forests and plantations abundant, privately owned, and easily accessed, but truffle patches might be easy to establish (if they are not already there). Some truffle harvesters and landowners claim that new truffle patches can be established by grinding mature truffles and spreading them (and thus their spores) in a water slurry. This claim has yet to be verified using scientific methods, but knowing if this is true would benefit the young Oregon truffle industry. Either the method could be used more widely or avoided as a waste of time (p 4).

This method of inoculating an existing forest was repeated in several versions – from a slurry injection to the roots directly, to a scattering of rotten truffle on the surface dirt – and reported as successful by several sources the authors encountered, but still no scientific evidence exists.

² <http://mycorrhizabiotech.com/> and www.mycoroots.com

³ www.truffletrees.com

In Europe, truffle plantations are commonly irrigated to enhance production (Trappe et al. 2009). Pilz et al. (2009) suggest that irrigation in the summer could improve native Oregon truffle yields. Again, however, no test trials have yet been conducted to quantify the effect of irrigation on native truffle production.

Chemical applications are understandably thought to have both positive and negative effects on truffle production. Trappe et al. (2009) reported that one landowner accidentally sprayed an excess of lime on his Christmas tree plantation, and subsequently found the largest Oregon white truffles on record (also in Pilz et al. 2009). Herbicides and pesticides, however, are thought to discourage truffle growth and should be avoided if possible.

Since the production of ectomycorrhizal fungi and truffles are closely tied to their host trees, clear cutting forests will have a negative effect of the diversity and abundance of these fungal species (Trappe et al. 2009). Property owners serious about truffle production should research other harvesting methods that do less damage to the truffle habitat.

Seasonal weather conditions will play a key role in truffle productivity. Dry summers reportedly affect the fall crop negatively, and a deep winter freeze will ruin truffles in the top layer of litter.

More research is needed with regard to the ideal soil conditions for growing native Oregon truffles. Some experts have found that sandier soils are better for Oregon black truffles, while soils with slightly higher clay content are better for producing white truffles.

Harvest

The harvest season for Oregon black truffle lasts from fall to spring, though in some seasons the harvest can extend into June. For white truffles, *Tuber oregonense* occurs from late fall to mid-winter and *Tuber gibbosum* occurs in spring to early summer, depending the year.

You can place harvested truffles in a paper sack or small food safe bucket with holes, a cooler with blue ice packs is the best way to maintain an optimal cool environment.

There are many opinions of how to properly harvest truffles. The methods commonly utilized have varying impacts on the forest and host trees, some are questionable and others clearly destructive.

Raking is one method of uncovering truffles. Using this method, the harvester will gently rake the duff and litter at the base of the tree. This technique involves dragging the dirt slowly, and beginning to lift the rake half way through the stroke. The objective is to turn the soil upside down and spread it out evenly, if possible. Black truffles look like lumps of coal, and can easily be passed over as clumps of dirt by the uninitiated harvester. Care should be taken around tree roots, and all the soil, duff and litter should be replaced after digging. Any exposed tree roots should be covered with soil. Root rot and disease can befall a tree with exposed roots, and it is in the best interests of the harvester that the tree



Photo 3. Raking for truffles

be healthy so it can harbor more truffles in the future. Gentle raking may also prevent damage to any truffles underneath, which may have an impact on their value.



Photo 4a and 4b. Exposed tree roots after raking for truffles can damage trees

Photos 4a and 4b show results of a practice commonly referred to as “ringing a tree”, in which the harvester digs around all sides of a tree. This technique is destructive, as the roots are left exposed and may cause the host tree disease or death. Such practices have led many to condemn the use of raking entirely, but most good commercial harvesters take care to avoid destructive practices.

One alternative or addition to the traditional raking approach is to use a truffle dog. While stories of using pigs to find truffles abound, it is not a common practice in Oregon as it is in some parts of Europe. One disadvantage of pigs is that they are inclined to eat truffles they find. Trained dogs are becoming more common in the Northwest as they can identify the buried, ripe truffles without raking, though digging will still be necessary. Dogs are now commonly used to hunt truffles in Europe, and some start-up truffle dog training businesses have emerged. One potential advantage of using truffle dogs is that it can reduce the need for random raking to find patches and avoid any potential erosion caused by excess digging. A good truffle dog is probably more likely to find ripe or over-ripe truffles, whereas with

raking you will inevitably dig up some immature truffles. Marketing very immature truffles can have a detrimental effect on the marketplace, since a chef without experience with Oregon truffles may have a suboptimal result when they unknowingly use an immature product. A chef or other end user not knowing what a mature Oregon truffle is supposed to feel, look, smell and taste like may think the immature truffle is as good as they get. Unlike many products where common sense might tell you that something is not yet ripe Oregon truffles can be more confusing, even to a professionally trained chef that has experience with European and Asian truffles. Thus, to help build a native Oregon truffle market, it is best to sell the highest quality (e.g., ripe or near-ripe) truffles to end users, especially those uninitiated.

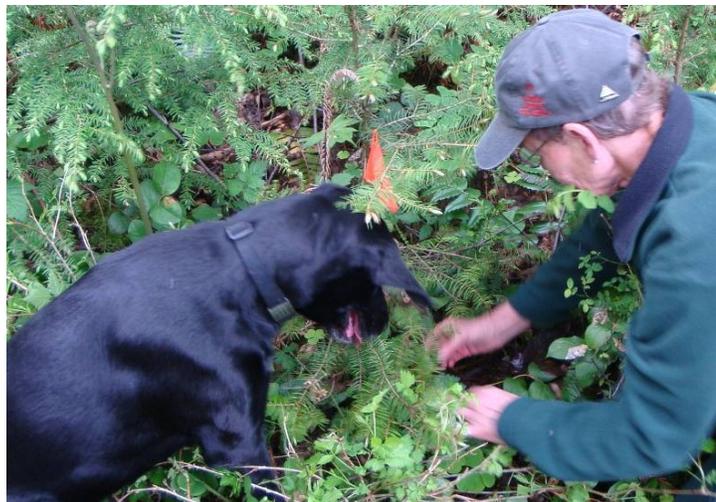


Photo 5. Dogs can be trained to help find truffles

Safety and Rules

Practice safety when you are in the woods. A good place to learn more about forest safety is on the U.S. Forest Service website, where you will find information on wildlife, tree safety, and even abandoned mines.⁴

While this document is provided as guidance for small woodland owners, it should be mentioned that harvesters on public lands and the property of others face additional rules. This may be relevant for the small woodland owner seeking to increase output to meet demand or to lease out land for harvesting by others. Harvesters should always take care to ensure that they have sufficient permission to harvest in the forest prior to entering. While public lands are generally open to all, boundaries between the public lands and adjacent private or otherwise protected lands are not usually marked. Oregon Revised Statute 164.813 “Unlawful cutting and transport of special forest products” provides some relevant information regarding the harvesting, transport and sale of products, including edible fungi huckleberry, collected from land other than your own.

As a final note from our journey into the woods, a seasoned harvester recited an old saying that he finds to be well suited for harvesters of any wild product: “Take what you need and leave the rest, and don’t ever take the very best.” He explained that it is never a good idea to take the last of anything, lest it be eliminated from an area entirely; and by leaving the best, you improve the reproducing stock overall.

Labor

An experienced harvester in optimal conditions could harvest up to 10 pounds of truffles per day. Most harvesters average far less over a season. The harvest rate depends on many factors such as the conditions of the forest on any given day, experience, truffle availability and more.

Most small woodland owners will probably be best off if they provide their own labor. However, small woodland owners seeking to hire paid labor to harvest wild forest goods, such as truffles, currently don’t have many options. The following presents three brief descriptions of hiring arrangements with estimated individual costs and benefits: contract labor, employees, and staffing agencies.

Contract Labor, also referred to as pay-per-piece or independent contractors, is paid for what they complete, rather than how much time they spend working. The IRS generally defines the relationship as follows:

The general rule is that an individual is an independent contractor if you, the person for whom the services are performed, have the *right to control or direct only the result of the work and not the means and methods of accomplishing the result.*

⁴ “Safety & Occupational Health”. <http://www.fs.fed.us/safety/>. Last modified April 13, 2010. Accessed November 28, 2010.

(<http://www.irs.gov/businesses/small/article/0,,id=179115,00.html>, accessed 5/18/10)

For truffle harvesting, contract workers may be paid per ounce or pound of truffle harvested. This form of labor allows the small woodland owner to closely tie labor to profitability, as each amount sold has a fixed harvesting cost. This labor arrangement protects the owner from paying too much for slow or unproductive workers.

Employees are harvesters paid per hour worked, regardless of productivity. Paying workers hourly allows a business owner to benefit from economies of scale, where workers whose harvesting skills improve with experience eventually harvest more ounces per hour, so the harvesting cost per ounce decreases over time. Employers are required to pay Social Security, Medicare, unemployment and federal taxes for their employees, and state taxes where applicable. This may also help retain employees who are seeking stable employment, in contrast to pay-per-piece work they could do on their own in public forests.

Staffing Agencies provide the simplest and safest solution, though it is also the most expensive. Temporary workers hired through a staffing agency are employees of the agency, which handles all of the employment-related paperwork, filings, taxes and insurance. The workers are typically paid minimum wage and the small forest owner pays a rate that is some percentage greater than the employee's rate.

The decision to use contract labor, employees or an agency will depend on the experience of the available harvesters, the expected number of ounces to harvest, the risk tolerance of the small woodland owner, the owner's tolerance for paperwork and other factors. Table 2 lists some of the requirements for each type of worker arrangement. Items listed as not applicable (n/a) are often included in staffing agency agreements.

Table 2. Some Requirements of Labor Type (incomplete list)	Contract	Employee	Agency
Form W-9, Request for Taxpayer Identification Number & Certification	Yes	Yes	No
Form 1099MISC – Miscellaneous Income	Yes	No	No
Family and Medical Leave Act ⁵	No	Yes	n/a
Migrant and Seasonal Agricultural Worker Protection Act ⁶	No	Yes	n/a
Hazardous Substances training (if used)	Yes	Yes	n/a
Employer Liability Insurance	Yes	Yes	n/a

*Due to the complexity of employment law, the small forest owner may be inclined to seek professional assistance. A copy of *The Employment Law Guide*, issued by the United States Department of Labor, can be found on the web⁷, and the IRS provides guidance online in the *Small Business and Self-Employment Tax Center*.⁸*

The United States' agriculture industry relies heavily on migrant and immigrant labor, and the small woodland owner might expect that many of the workers in their local labor pool will be from other countries. Migrant and immigrant laborers are often dedicated, hard workers who may not be fluent in English. The small woodland owner should consider language barriers in their hiring decisions, preferably by identifying a field lead that is bilingual. It is possible to specify the ability to communicate in English when posting the

⁵ Family and Medical Leave Act of 1993 (FMLA). (29 USC §2601 et seq.; 29 CFR Part 825).

<http://www.dol.gov/compliance/guide/fmla.htm>

⁶ <http://www.dol.gov/compliance/laws/comp-msawpa.htm>

⁷ <http://www.dol.gov/compliance/guide/index.htm>

⁸ <http://www.irs.gov/businesses/small/index.html>

position or working with an agency, but this may drastically restrict the number of applicants.

Processing

After harvesting, truffles must be thoroughly cleaned. The cleaning process enhances produce safety and quality, and includes cutting off any rotten spots or holes created by insects, brushing off the dirt, lightly rinsing and blotting dry. This simple process may also extend the shelf life. Truffles should then be refrigerated as soon as possible in a plastic or glass container. Covering the truffles in a dry paper towel will help blot any excess moisture that accumulates.

Appendix B describes a few of the many value-added products that can be made with Oregon truffles.

Grading Quality

Truffles have little to no aroma until they are ripe or rotten, and you will know the difference, especially with blacks as they smell very bad when rotting or rotten.

Truffles should be sorted based on where they are in the ripening process, as this will determine how quickly they need to be used and how long they can be stored. In addition to aroma, an excellent visual guide of truffle ripeness is the photography found on page 36 of *Oregon Culinary Truffles* (Pilz et al. 2009).⁹ Fully ripe truffles generally have a dark marbling color when sliced in half. For example, Oregon black truffles will be dark marbled grey when ripe, and white inside when unripe. Oregon white truffles will have a brown marbled color (similar to chocolate milk) inside when ripe. Very immature truffles with no marbling may never ripen, so it is best to harvest only ones that are ripe or will ripen properly. Experience will guide you.



Photo 6. Cross section of Oregon white truffle

Truffles that were harvested before reaching maturity may have to be ripened in storage, as described by Czarnecki (1995).¹⁰

After several hours to several days in proper storage conditions the aroma of mature or nearly mature truffles intensifies. At peak ripeness the truffles soften slightly and within a day or two begin to exude visible surface moisture. The appearance of surface moisture is an indication that they are about to spoil and they must be used within a day. The period of time during which truffles may be ripened and used is roughly around a week though can be much shorter if the truffle is harvested near the peak of ripeness.

Black truffles that are sweating may have already begun to rot. Truffles that are very spongy or soft are likely rotten, though whites tend to last a bit longer in this state than blacks. Ripe truffles should be firm but not rock hard and not too spongy. Damaged truffles have a shorter shelf-life.

⁹ This document can be found at www.oregontruffles.org.

¹⁰ Referenced in LeFevre et al. 2001

Most chefs like to see truffles whole and arriving at their restaurant a couple of days before they are ripe. They should not have any bruises, brown spots or large holes, though it may be acceptable to have some roughness or small chips.

Certifications

While France, Italy and Spain have certification processes to verify the quality of truffles sold in those countries, no certification process has yet been established for Oregon truffles. Currently some truffle buyers require that harvesters have a permit, lease or permission slip from a landowner, indicating that they were legally harvested.

Existing certification programs include the USDA Agricultural Marketing Service's Fresh Products Grading and Quality Certification, as well as an Organic Wild Crop Certification for wild harvested products. These certifications can be useful for ensuring that transactions with large or distant buyers go smoothly. To qualify for USDA Organic Wild Crop Certification, the landowner must provide evidence of sustainable harvest of the crop in an area that has been free of prohibited materials (e.g., pesticides/herbicides) for at least 3 years. There are over 50 domestic certifying agents in the US including Oregon Tilth (www.tilth.org), and California Certified Organic Farmers (CCOF) (www.ccof.org). For a complete listing of certifying agencies go to the USDA National Organic program website¹¹. For products exported overseas, the landowner should verify that the certifying entity meets the standards of international organic certification agencies, such as JAS (in Japan), EC (in the European Union), and CAN/CGSB (in Canada).



The decision by the small woodland owner to pursue Organic Wild Crop certification will depend on many factors, including the cost of certification¹² and expected additional revenues, as well as the decision to manage the land without the use of chemical herbicides and other prohibited materials. Once a property is certified, all products derived from the land (including other edible and medicinal plants and fungi) can be marketed as certified organic. It is important to check with the buyer or processor that you want to work with to see if they will pay more for organic certification.



FairWild© certification is offered by the FairWild Foundation – a non-profit organization based in Switzerland. It is very new to the United States but has the potential to take off and work in tandem with organic certification. Unlike organic certification, FairWild also provides guarantees for social sustainability. Products receiving this certification have been determined to be harvested legally and ethically, including social equity for harvesters, and in an environmentally sustainable way. Certifications are available for wild collected

¹¹ <http://www.ams.usda.gov/>

¹² As of 2010, the initial first year cost of Organic Wild certification by Oregon Tilth is \$624 (if located in Oregon), and an annual fee thereafter starting at \$469 (and increasing depending on revenues amounts from the sale of the organic product(s) from the previous year). More information on the fee structure and certification requirements can be found at <http://tilth.org/files/certification/OTCOPProgramBundle.pdf>. <http://www.ams.usda.gov/>

products, raw materials for finished products and products containing FairWild ingredients. The cost for FairWild certification is estimated at around \$5,000 but this can vary depending on support for the program and other factors. This cost will prevent most small woodland owners from participating during their start-up phase, but the potential added value in the marketplace of certification may make it attractive for those small woodland owners that are able to produce hundreds of pounds of native truffles from their lands annually. It is also possible to partner with other landowners or through a co-op like the Oregon Woodland Cooperative to offset the cost of certification for any one individual.

Some sellers also offer a certificate of origin, though such certificates are normally used for international sales between free trade agreement countries.

Other local certification programs include “Salmon Safe” (www.salmonsafe.org), and the “Food Alliance Certification” (www.foodalliance.org).

Packaging and Storage

Understanding the packaging and storage process is important because it affects how much a small woodland owner can expect to spend on packaging materials, refrigeration and equipment. The packaging you select, based in part on the form of truffle you are shipping, the target customer and the distance it must travel, will affect the way it can be shipped. Ecologically responsible packaging – such as biodegradable cellulose, cardboard cartons and glass jars – provide visibility while addressing environmental concerns.

Fresh

Fresh truffles must be kept cool. If you are shipping truffles over long distances, it is important to package them in containers that breathe or wick moisture. Moisture can be managed with air circulation or with absorbent packaging such as paper or rice. Humidity controlled refrigerators are effective, though expensive. Depending on where they are in the ripening process, truffles can keep in a regular refrigerator for up to two weeks; however, everything else in the refrigerator will probably taste like the truffle. Truffles can be used to aromatize other foods like cheese, eggs, arborio rice, or cream.

At room temperature a truffle that is a few days from peak will ripen within 12 hours. If it is 75 degrees or warmer the speed accelerates quickly and there is more likelihood of rotting. If it cannot be refrigerated, a truffle packed in dirt could last up to a week, with some weight loss.

Truffles may be taken to the final customer without special packaging, if they are intended for immediate use. A cardboard box or the collection cooler will work for this purpose. The U.S. Food and Drug Administration does not require labeling for unprocessed raw foods, such as truffles (USH&HS FDA Labeling 2009). The processor should seek assistance from the local county health department in complying with all local, state and federal food regulations.

Frozen

Truffles that have been frozen will degrade when thawed so only truffles that are perfectly ripe should be frozen, then used immediately when thawed. It's a good idea to refrigerate the truffle for a few hours before freezing; this wicks the surface moisture away and prevents them from sticking together when frozen. They freezer burn easily so if possible vacuum pack the truffles. Flash freezing is expensive but works well if that is an option.

Packing truffles in rice (e.g., Arborio) just prior to freezing will help reduce freezer burn, especially in frost free units. If properly vacuum packed, frozen truffles can last for months.

Packaging should be done to the specification provided by the buyer. The U.S. Food and Drug Administration has specific labeling requirements for most processed foods, including frozen truffles (USDH&HS FDA Labeling 2009). Not only must certain products bear a Nutrition Facts label, but there are guidelines for the claims that can be made about the characteristics of a product, such as claims about medicinal value.

Dried

Approximately 90% of a truffle's weight is lost during drying, depending on size and the conditions where it was harvested. A standard food dehydrator can be used to dry truffles. Packaging should be done to the specification provided by the buyer.

U.S. Food and Drug Administration labeling requirements also pertain to dried truffles (USDH&HS FDA Labeling 2009). As with frozen truffles, these include a Nutrition Facts label, and guidelines for the claims that can be made about the characteristics of a product.

Other Value-Added Products

Processing, packaging and storage of these products is beyond the scope of this analysis, but the equipment and materials required should be included in the planning for a potential entrepreneur. Some sample images of value-added truffle products are included in Appendix B.

Sales

The small woodland owner may seek to enter sales agreements with their buyers, though most small sales have only a transaction receipt. A sales agreement is a document written prior to the transaction that details the product being sold and how it is being paid for. A sales agreement is not necessary for small transactions, but large, long-distance, international or recurring sales should have one for the protection of both parties.

Terms and Conditions of Sale. The sales agreement should detail the terms and conditions of the sale that must be met to satisfy each party. These include unit of measure (pounds, flats or other), price per unit, payment terms, how to grade quality, delivery timing, mode of transportation, transportation charges or fees and any other conditions, as applicable.

Payment terms should be arranged in advance, and the small woodland owner should only extend credit if they are confident of the buyer's ability to pay. Payment terms include the currency of payment (for international transactions), acceptable payment form (credit card, cash, money order, personal check, etc.) and payment due date.

For a fee, the USDA Agriculture Marketing Service can provide pre- and post-shipment inspections. According to the *Schedule of Fresh Products Branch Programs User Fees*, fees as of October 1, 2008 ranged from \$69 to \$151 per batch of 50 or 51 packages, plus inspector hourly rates and mileage. (USDA Agricultural Marketing Service 2008)

In addition to tax purposes, the small woodland owner should keep a record of truffle transactions for legal purposes. University extension offices or local USDA Forest Service should be aware of applicable truffle laws; while the federal and state departments of

revenue should know any income tax rules. Small woodland owners should also check with the local chamber of commerce.

Target Markets

Restaurants and Resorts

Gourmet chefs working in restaurants and resorts that source their ingredients locally are good potential customers for wild forest goods such as truffles. When talking with them it is important to emphasize the things about your product that will appeal to them, such as flavor, consistent quality and on-time delivery. Restaurants don't want to spend too much time sourcing their ingredients because they have a lot of other things to do. Providing a modest sized sample for them to taste or providing delivery and quality assurances that you can deliver on may help earn their business.

Of course, reaching the decision-maker is often difficult and may take additional networking skills, but a small woodland owner who is confident of their product's quality should be willing to try a few times. Restaurants and resorts may have seasonal specials that include, or even focus on, regional foods. Ask the wait staff about their specials and look at the menu. When talking with the potential buyer, emphasize that the truffles were harvested from the wild locally if that appears to be important.

Specialty Grocers

Grocery stores and cooperatives that cater to a gourmet customer base are a growing market and an excellent prospect for potential sales of fresh truffle and value-added products. Seasonal sales of value-added products like oils, particularly for holiday gift-giving, are also an opportunity through this channel.

Store management in specialty grocers usually have the autonomy to make sourcing decisions and so are the best first contact to make. Of primary concern to these grocers is offering high quality product, so reliable delivery of flawless truffles is paramount. Like restaurants and resorts, reaching the decision-maker and getting them to buy may be difficult and take a few visits. A small woodland owner who is confident and persistent will have better luck than one who makes just one phone call.

An excellent guide to marketing and selling special forest products to retailers can be found in the publication "Marketing Special Forest Products in New York State" (Ochterski et al. 2005). Though its title says New York state, the talking points, customer considerations, selling strategies, promotion ideas and other content are relevant for all markets nationally.

Farmers' Market Shoppers

Open farmers markets provide a forum for directly educating consumers in assessing truffle ripeness and how to use a truffle without losing its flavor. Attending a farmers market is, for most, an enjoyable outing. Customers are relaxed and open to learning about the sustainable nature of small woodland owner truffle operations and the recipes that the

owner has to offer. This opportunity is unique in that customers who may have never heard of, let alone tasted, truffles, can be presented with samples of foods that incorporate them.

Many consumers at a farmers market are motivated by LOHAS, an acronym for "lifestyle of health and sustainability". LOHAS consumers may even be interested in paying for the experience of harvesting their own truffles on the small woodland owner's property. These same customers are also good candidates for membership in a Community Supported Forest Agriculture enterprise.



Gourmet food enthusiasts often scour farmers markets looking for fresh and local ingredients. These consumers will certainly be attracted to tables providing samples of foods made with truffle, or with brochures emphasizing the variety of foods and wines they might go with.

Most farmers markets charge a table fee, and that fee should be balanced against the expected volume per day. The small woodland owner can consider sharing a table with other harvesters to reduce costs, if necessary to maintain profitability.

The small woodland owner should have educational and informational materials to hand out to potential customers. The materials should have the owner's contact information and information about the products available, as well as anything else that may be of interest, such as the history of the small forest where the truffles were harvested or recipes for cooking with them.

Direct Web Sales to Domestic Buyers

One of the most prolific marketplaces for truffles and truffle-derived products is the Internet. It is an opportunity to connect directly with the customer. The small woodland owner's website could be an opportunity to secure members for a Community Supported Forest Agriculture project or just a way to promote value-added products and raw truffles.

Online customers can be savvy and may arrive at the small woodland owner's website already educated about what products are available from other businesses and how much they should cost. For this reason, the producer should research online prices to be sure their own prices are competitive. Truffles are often available for sale in forums like Craigslist, Etsy and eBay, making these good places both to do pricing research and to sell product at no additional cost. Amazon is also a venue for sales of value-added products.¹³

There are a number of places to get help creating a website. If you have limited experience with websites, you may do best seeking assistance in identifying a professional from a local extension office. A small woodland owner with more Internet experience could use a free service from Google or Yahoo! or pay for one from any number of online providers.

Consolidation Buyers

¹³ http://www.amazon.com/s/?ie=UTF8&keywords=dried+truffles&tag=googhydr-20&index=aps&hvadid=4306558487&ref=pd_sl_2733xbe8rl_b Accessed 29 November 2010.

These buyers consolidate purchases from numerous producers to fill large orders from corporate buyers, or maintain regular purchasing agreements with buyers they have established a trusting relationship with. This is the simplest of arrangements for a harvester. The buyer sets commodity pricing and the small woodland owner brings in the goods. Consolidators purchase from many harvesters to fill large orders that individual harvesters are not capable of filling alone. Some consolidators are cooperatives, owned and managed by the members, and some are simply for-profit enterprises. While prices are not as high and the small woodland owner has no ability to influence that price; the revenue is more predictable, there are no expenses associated with marketing, and less overall time is involved.

Examples of such buyers include Mycological Natural Products in Eugene, Oregon, Alpine Mushrooms in Estacada, Oregon, and Smith's Forest Fresh Products in Portland, Oregon. Mushrooms and other gourmet forest products are often sold through the same channels. Other places to check are the Yellow Pages and Craigslist.

International Sales

Sales to the foreign equivalent of any of the above target markets can be great additional sources of sales for your business, but there will be some extra hurdles to navigate. In addition to the language, cultural differences, currency exchange and time differences, each international market operates under its own import and produce regulations. Even the smallest shipments of produce are usually subject to rules intended to prevent the spread of disease and pests.

The Oregon State Department of Agriculture, Agricultural Development and Marketing Division works with Oregon producers to make marketing connections, and may be a source of assistance for small woodland owners interested in marketing native Oregon truffles internationally. Similar programs may exist in other states. Nationally, the USDA Agricultural Marketing Service also provides assistance with international exports.

Distribution

Shipping

Regardless of the method you choose to ship, it is essential to ensure that truffles are kept in a cool, climate controlled environment. Truffles should be packaged in a way that assumes delays in delivery, such as cancelled flights or highway accidents.

The seller should become familiar with all available modes of transport, as any number of events could make one or more either unavailable or cost-prohibitive. Any of these modes can be found with a search online or in the phone book.

Overnight Carriers

Most Oregon truffles are shipped overnight, but they frequently spoil en-route or shortly after arriving. Thus, perishability may be the single greatest difficulty in selling Oregon truffles. This problem grows greater near the end of a season, as a greater proportion of harvested truffles are at or near maturity. Leaving some dirt on the truffle extends the shelf life a bit.

FedEx now offers same day shipping, taking product door to door in just hours. This service is expensive; www.fedexsameday.com provided a “quick quote” of \$191.70 for shipment from Portland, OR, to Boston, MA. More realistic are overnight services ranged from \$49.79 to \$87.70 for the same package size and route. Packages that emit an odor of any kind are prohibited, and are only guaranteed to arrive unspoiled if several terms and conditions are met.

UPS offers “UPS Express Critical” services, ranging from next-flight-out air courier to hand carry, which provides a dedicated courier from door to door, even on international shipments.

For almost every mode of transportation for perishable goods, taking advantage of shipping insurance is highly recommended. This is especially true for truffles, which require specific conditions to prevent a very expensive loss.

Personal Motor Vehicle

Harvesters delivering in small volume may find it most economical to deliver product using their own vehicle and deducting the mileage as a business expense. Quantities shipped will likely fit in any model of car, so the best choice of personal vehicle is one that can manage the terrain at the expected harvesting location and which is fuel efficient for daily deliveries of harvested product. Greater fuel efficiency will lead to greater profit margins, though a vehicle that is expected to travel off-road but is not equipped for it will have higher maintenance costs.

Passenger Ground Transport

Amtrak passenger rail and Greyhound bus lines are a couple examples of passenger ground transportation services that also carry small shipments. Though Amtrak does not ship perishable goods, other goods may be shipped through “Amtrak Express Shipping”.¹⁴ Greyhound’s service is called “Package Express” and online quotes are available. For other services, contact the local train or bus station for details on shipping rules, restrictions and costs.

Commercial Airlines

This mode can be an economically fast option for transport of truffles over long distances if you have enough product to offset minimum poundage. A 2006 study found that flights up to 8 hours had no effect on strawberries, while a 14 hour flight induced a stress response in cucumbers and strawberries, reducing quality (Laurin 2006). Many carriers post their rates online, with US Airways charging from \$0.30 to \$0.56 per pound for minimum size food shipments (often 100 lbs., but sometimes less), depending on distance and care given (US Airways). A disadvantage of this shipping option in contrast to an overnight carrier is that you have to arrange shipment to the airline cargo counter as well as pickup once the product has arrived.

For those seeking to export truffles or other agricultural products, the USDA Agricultural Marketing Service publishes the *Agricultural Export Transportation Handbook* (Welby and McGregor 2004), which provides useful information on numerous considerations that are specific to international sales. Some considerations include taking special care with harvesting, processing, packaging for long-distance travel, and rapid delivery to ensure the best quality (Pilz et al. 2009). Having a trusted point person (which could be the buyer) at

¹⁴ Emails from Amtrak customer service. April 17, 2010 and April 20, 2010.

the destination to help clear international customs and ensure payment of tariffs¹⁵ or taxes is also critical.

Promotion

While truffles as a gourmet product are well established in the culinary industry, Oregon varieties are not as well known or regarded with professionals. Additionally, there are many home chefs who know little of truffles beyond chocolates. For the truffle market to grow beyond the small niche group of customers who currently purchase them, promotion will be essential.

Building interest and credibility through a familiar media source is an excellent way to facilitate market growth. A savvy individual could get the local **television** network to use truffles in one of their cooking specials.

Customers also appreciate **educational materials** when they consider new products, especially when they are not familiar with the product's proper use. A pamphlet or brochure should be created to tell customers about the product, its uses and benefits, and even where and how it is harvested. This brochure could serve multiple target markets, from culinary professionals to home chefs, and could easily be created with commonly available computer software templates. Materials that make customers feel like they are closer to their food source and harvester, perhaps even talking about the small woodland owner, will have great impact. Because LOHAS customers are one group of target market end-users, promotional materials should emphasize terms like *local* and *sustainable*, in addition to the characteristics of the product itself such as aroma and mystique.

Other recommendations from "Marketing Special Forest Products in New York State" (Ochterski et al. 2005) include the following:

- Show images of your product being used
- Include a teaser recipe or some way your product can be used
- Make sure your contact information is included in several places
- While three-fold brochures are standard, customers may appreciate variety
- Use one main font style, and try to use original photos and graphics, rather than clip art
- Use "available for pre-order" rather than "sold out" on price lists to show you are ready to meet buyer expectations

Personal selling will be a key promotion vehicle for the target market of chefs, and the small woodland owner should identify talking points and practice their sales technique prior to reaching out.

Word of Mouth advertising is personal selling done for you by new or loyal customers. Keeping customers happy with good product and service is a marketing strategy in its own right. You can move the process along by providing free samples to friends and neighbors (Ochterski et al. 2005) or just asking customers to tell their friends about your product.

¹⁵ One example of tariffs on imported truffles is from the U.S. In 1999, the U.S. imposed 100% tariffs on many goods imported from Europe, including truffles, in retaliation for the European ban on hormone-treated U.S. beef (Pilz et al. 2009, BBC News 1999).

Classifieds are a proven way to move excess product. Harvesters have had success both in local newspapers and on websites, such as Craigslist. There is little expertise required to promote in this way, and it is a low-cost option.

Websites are a valuable tool for reaching out to potential buyers of value-added products. Websites are an opportunity to provide richer content that engages the target market. Examples are cooking demonstration videos and greater detail than will fit on a brochure. This channel also provides a method of accepting credit cards through online merchant services.

Websites do require technical ability that not all small woodland owners possess, but there is no shortage of professional *web developers* who can be contracted to do this work. An Internet search should provide a list of local professionals, but the small woodland owner should also check with their local extension office for information on other resources.

Events like the Oregon Truffle Festival, in Eugene, Oregon, provide an opportunity to showcase product to a large audience. In addition to having product available to sample and buy, the seller should bring promotional materials to lead potential customers to the farm's website. A booth at this venue type will be more expensive than at a farmers market and so may be a better forum for selling value-added products unless the small woodland owner has a large supply of fresh truffles. The Oregon Department of Agriculture, and likely many others nation-wide, offers an email listserv (newsletter) to notify members of upcoming events.¹⁶ They also provide connections to resources that can help pay for event fees, reducing the cost of attending, and network businesses to share booth space.



National events include the Fancy Food Show, North America's largest specialty food and beverage tradeshow, which takes place twice a year, on the west coast in winter and the east coast in summer. It is another opportunity to showcase gourmet food items, including fresh, frozen and processed truffles. The event is hosted by the National Association for the Specialty Food Trade.¹⁷ Another example of a major national food event is the Natural Products Expo West and Expo East.

Community Newsletters are a good way to reach out to potential customers with a predisposition for local products. Many neighborhood newsletters rely on local advertisers to support their publications, and the readers tend to be aware of the need to support the advertisers.

Pricing

Specific prices are provided – without guarantee of accuracy – to assist the business plan developer in identifying all relevant and possible costs and revenues associated with a for-profit non-timber forest product enterprise. Individuals should conduct their own pricing research, particularly for the purposes of forecasting.

¹⁶ <http://listsmart.osl.state.or.us/mailman/listinfo/agmarketing> Oregon Department of Agriculture Development and Marketing Division; 1207 Naito Parkway, Ste 104; Portland, OR 97209

¹⁷ More information available at <http://www.specialtyfood.com/fancy-food-show/>

What Affects Pricing?

A number of factors affect the price that a small woodland owner can command. Working with a buyer in advance will help to identify some of these variables so they can be planned for.

Scarcity of supply is one of the biggest factors influencing the price of fresh truffles. Weather conditions that lead to low forest productivity create market conditions where a harvester can command high prices, while optimal conditions can have the opposite effect.

Truffle quality also affects the price. As mentioned earlier, factors such as size, ripeness, freshness, lack of physical damage, and documentation of legal harvest will influence price.

Because this is a product that is customarily sold by weight, it is important to note that truffles lose weight from evaporation after harvest. So in addition to the premium for being a fresher product, local truffles may also be more valuable than those brought from greater distances due to differences in weight from water loss (Pilz et al. 2009).

Superficial damage to the truffle from harvesting may or may not affect pricing. If truffles are sold quickly to restaurants, then slight nicks may be acceptable since they are shaved into thin slices. On the other hand, a buyer who may be selling to a market on the east coast may demand undamaged truffles. As with any product, it is always best to check with the buyer about the criteria and specifications that he/she has.

Timeliness and consistency of deliveries will affect pricing when selling to restaurants. When menus are planned around a specific food, it is critical that that product be available at the moment it is needed at the level of quality that is required.

As will be noted in the next section discussing historical pricing, a factor that has been known to affect pricing of truffles is distinctiveness, such as size.

Historical Pricing through Existing Channels

Part of the business planning process is to do research that will identify historical pricing of the product or products intended for sale. Commodity markets exist for common raw materials such as oil, wheat and metals, but such an open market does not exist for most nontimber forest products. This is especially true of truffles, as these transactions usually take place quickly and quietly.

Sources of truffle pricing include the Internet, events, specialty grocers and other places where truffles can currently be found. Harvesters, consolidators and other buyers may be willing to share this historical data for the chance at building up additional local supply.

In some areas there will be no apparent source of a specific product, in which case the small woodland owner may be inclined look to *substitute products* for pricing guidance. A substitute product is one that has the same form and function as the product being discussed. Oregon native truffles **should not** be considered substitutes for European or Asian truffles, or any other kind of product. Every species is distinct and - though some may work well as substitutes in limited cases - generally they should have their own recipes.

Table 3 lists prices for fresh, frozen, and processed truffles. Some of these prices are readily available on the Internet, or in publications. Prices from consolidators will generally require a phone call. It is important to note that prices can fluctuate greatly between years, depending on supply. For example, in 2009, an early winter freeze reduced truffle production and buyers were paying \$90 to \$100 per pound for Oregon black truffles, while in 2011, production was high and the price went down to \$30 to \$40.

Table 3. *Sample Truffle Product Prices, March 2011*

Form	Price/unit	Source
Oregon black, fresh	\$30 to \$40 / lb. (can be up to \$80-\$90/lb. in other years)	Consolidation buyer
Fresh	\$110 / lb	Craigslist, Portland Oregon ¹⁸
Oregon white or black, fresh	\$60 / 3oz	Earthy Delights ^{19, 20}
Oregon black, frozen	\$40 / 3oz	Foodoro ²¹
Oregon white, frozen	\$40 / 3oz	Foodoro ²²
Oregon black, fresh	\$75 / .5 lbs	eBay ²³

Industry Support

Cooperatives

For small woodland owners seeking access to larger markets and customers, but lacking in business expertise or substantial volumes demanded by large buyers, cooperatives are an attractive option. Cooperatives are organizations formed by their members – in this case small woodland owners – who pool their resources, equipment and skills. This collaboration allows for individuals to contribute what they have, from marketing expertise to sorting equipment or cold-storage, and benefit from shared resources. Usually these cooperatives achieve non-profit or corporation status for tax benefits and offer other legal protections that individuals would not otherwise have.

Oregon Woodland Cooperative (OWC) is one example of such an arrangement, with over 75 member properties totally over 35,000 acres. OWC plays a significant role in helping small woodland owners with all phases of non-timber forest product management and production.



Their website, <http://www.orwoodlandco-op.com/>, provides numerous examples of members benefiting from the organization of sales for firewood and boughs, grant support and industry events.

Government and Non-Governmental Organizations

¹⁸ <http://portland.craigslist.org/clc/grd/2238448158.html> 2 March 2011.

¹⁹ [http://www.earthy.com/Fresh White Oregon Truffles 3 oz Season Over P368.cfm](http://www.earthy.com/Fresh%20White%20Oregon%20Truffles%203%20oz%20Season%20Over%20P368.cfm). 8 March 2011.

²⁰ [http://www.earthy.com/Fresh Black Oregon Truffles 3 oz P366.cfm](http://www.earthy.com/Fresh%20Black%20Oregon%20Truffles%203%20oz%20P366.cfm). 8 March 2011.

²¹ <http://oregonmushrooms.foodoro.com/products/FrozenOregonBlackTruffles3oz>. 8 March 2011

²² <http://oregonmushrooms.foodoro.com/products/FrozenOregonWhiteTruffles3oz>. 8 March 2011

²³ <http://www.ebay.com>. 8 March 2011

University Extension Offices, the US Department of Agriculture and individual State Agriculture Offices all have departments dedicated to the support of emerging entrepreneurs. These offices provide research, product development support, marketing support and business development services for the agriculture sector and are enthusiastic in their services. The small woodland owner is highly encouraged to engage their services at each stage of their participation in non-timber forest product markets. One such example is Oregon State University's forestry and natural resources extension program.²⁴

Several national and regional nonprofit organizations, such as the North American Truffling Society²⁵, have also dedicated efforts to support a growing local food movement and many provide assistance to individual harvesters.

Online communities also facilitate connections between buyers, sellers and service providers. The Oregon Forest Industry directory (www.orforestdirectory.com), maintained by Oregon State University, is a free, on-line business-to-business directory for small woodland owners and businesses for a wide variety of forest products, including wild mushrooms and truffles. FoodHub (www.foodhub.org) is fee-based on-line directory that connects professional food buyers and sellers in the Northwest.



S.W.O.T. Analysis

S.W.O.T. is an acronym representing the four parts of an analysis that reviews the **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats of a given business. It is used here to look at the strengths and weaknesses of Oregon culinary truffles as a product, and how those might be affected by the opportunities and threats posed by the produce marketplace. The analysis will help a small woodland owner decide if the balance of risks and rewards is acceptable. By reviewing these strengths, weaknesses, opportunities and threats in this format, the small woodland owner can brainstorm ways to mitigate threats and take advantage of opportunities.

Strengths of Oregon Truffles

- Believed by many to be as good as any other truffle species around the world, different from others and unique.
- Can be managed alongside other nontimber and timber species.
- Doesn't require pesticides or herbicides.
- Grows wild in Pacific Northwest forests, many on privately held lands in northwest Oregon and southwest Washington.
- Does well on Douglas-fir tree farms, including Christmas tree plantations.
- 30-40 acres of productive truffle land is enough to make a living, according to successful harvesters

²⁴ <http://extensionweb.forestry.oregonstate.edu/>

²⁵ www.natruffling.org

- While inventorying truffles you can include other potentially harvestable nontimber species with economic value.
- Can be part of a comprehensive portfolio that includes a different product for every time of year.
- High profitability per acre, as compared to other agricultural crops, may improve likelihood of obtaining financing.

Weaknesses of Oregon Truffles

- Established preference among gourmet chefs for European varieties.
- Misconceptions about the aroma and flavor, resulting from purchases of immature truffles.
- Negatively affected by clear cutting and other high disturbance timberland management activities.
- Requires a high level of quality control.
- Perishability negatively impacts feasible shipping distances.
- Production highly reliant on environmental conditions.
- Can be elusive and difficult to find.
- Methods to artificially increase production not currently well understood.
- Wait time of 10 to 15 years required in newly planted Douglas-fir plantations.

Opportunities in the Marketplace

- Lower price point, as compared to French varieties, opens up a market of entirely new potential customers.
- Plenty of opportunity exists to reach new customers.
- Consumers are increasingly concerned with sustainability, prefer responsible products like local Oregon truffles.
- Domestic market presents ample opportunities for growth, with proper marketing and awareness.
- Growing industry support organizations including university extension, state trade agencies, NGOs and business associations.
- Oregon's wine country reputation and fine cuisine industry can be leveraged in marketing collateral.
- The global truffle industry is well established and growing in Oregon.
- Only a tiny fraction of available wild truffles are harvested in the Pacific Northwest so supply is not expected to meet demand for many decades.
- Access to truffles on federal lands is difficult, creating an opportunity for small woodland owners to meet stable supply needs.

Threats in the Marketplace

- Illegal harvesters on small woodland owners' land may be occurring that the small landowner may need to stop before developing their own harvest.
- Poor quality product delivered by competitors may damage the reputation of all local truffles (though this does create an opportunity to leverage Customer Relationship Management with quality guarantees).
- Competition is high for local market, particularly with restaurants.
- Increasing the number of truffle harvesters and producers may lower prices.

Barriers to Entry

Some factors that the small woodland owner should consider to determine whether a truffle enterprise will be feasible include the following:

- Presence of truffle on one's land. If there are currently truffles on one's land the up-front costs will be lower than if the landowner needs to invest time into creating optimal habitat or invest resources in unproven approaches like buying inoculated Douglas-fir seedlings and waiting until trees reach the age in which truffles might start to be found (10 to 15 years).
- Competitive local marketplace. Many truffle harvesters in the area sell directly to restaurants, so finding local buyers may take some work.

Cost Analysis

A thorough analysis of expected costs will be required for any business plan that will represent a significant source of expenses or income for the small woodland owner, particularly if the plan will be presented to a bank to obtain credit. Each potential cost category is listed here with details, but the small woodland owner should conduct research to determine actual pricing. See Appendix C for a sample cost worksheet.

Labor – Truffles can be a labor-intensive crop when extensive scouting is required or when production in patches requires extensive hours of raking. The small woodland owner should calculate the number of annual hours needed per labor type (crop planters, crop maintenance, harvesting, sorting and processing, packaging), and the cost per hour of each laborer.

Shipping – Shipping costs will vary by sales type. Internet sales may have a higher shipping cost overall because of the smaller volumes, but those costs may be charged back to the customer. If a shipping company is used that does not provide the shipping containers, those should be factored in as well. For purposes of the cost analysis in the appendix of this document, it is assumed that the small woodland owner will hand deliver shipments to their customers or their suppliers.

Packaging – Whether the product is fresh, dried or frozen, it will need to be packaged for shipping. The small woodland owner should consider how many truffles will be harvested per year, and how they will be processed, to determine the annual packaging costs. Examples of packaging include plastic bags and cardboard boxes.

Refrigeration – If the small woodland owner plans to hold raw product for any period of time beyond delivery direct from the field, there should be a plan for refrigeration. Commercial volumes of truffles may not fit neatly into a kitchen refrigerator and will certainly flavor everything in the refrigerator. The cost-effectiveness of options will depend in part on expected volumes. A small refrigerator dedicated to the harvest should suffice.

Equipment – How much equipment will be required depends in large part on how much processing will be done prior to sale. Harvest equipment consists of a rake and a cooler. For transportation, almost any vehicle will do, but the terrain and distances that will be travelled should be considered for their impacts on maintenance and fuel costs.

A computer with Internet access is recommended. It is much easier to start a website, find buyers and manage shipping, among other business tasks, if it can be done in the privacy of a home or office. The local library often has computers for public use, if needed.

Supplies – Supplies are items purchased for use that will have to be replaced completely. These include pens, paper, stamps, and envelopes.

On the topic of credit

"The five C's of credit are cash flow, collateral, credit worthiness/character, capital (personal financial stake), and conditions."

Jeff Deiss, USDA

The above note comes directly from the U.S. Department of Agriculture and was specifically mentioned at a meeting of nontimber forest product professionals seeking to expand the market. We include it here to call attention to cash flow. While a truffling operation may be small and transactions handled in cash, keeping good records of those transactions and reporting them to the IRS to pay taxes on them will help the small woodland owner to obtain financing in the future. These transactions and taxes paid are the proof for the bank of a landowner's claim that truffles exist on their lands and that they provide a positive cash flow.

If a small woodland owner cannot meet all the bank's requirements, but cannot begin without financing for some component of the operation, peer-to-peer lending sites may be an option. Such websites, like KIVA (www.kiva.org), provide entrepreneurs the opportunity to explain their circumstances in hopes that an individual or group of individuals may be interested in supporting the endeavor.

Key success factors

- Having a plan.
- Having a buyer or multiple buyers ready to take your harvest quickly.
- Keeping good records. Having sales receipts that document business income, and the expenses incurred to earn that income, will make tax time much easier. Keeping good records also means creating records, such as purchasing agreements, to ensure prompt payment by customers. Small woodland owners who hire employees must also plan for filing human resources related paperwork and for tracking wages paid.
- Understanding the customer. What is done to the product affects who will want to buy it and why.
- Understanding applicable laws. Laws govern all areas of business including health and safety of employees, harvesting and transport of special forest goods, food safety and income.
- Knowing the business's revenue needs and planning to meet them.
- Knowing the time and resources required for the value chain and being prepared with these prior to the first harvest.

Appendices

Appendix A: Community Supported Forest Agriculture

Community Supported Forest Agriculture (CSFA) enterprises offer an opportunity to bundle truffles with other non-timber forest products. In this model, customers purchase a share of the farm or forest and receive a monthly harvest. Customers buy it to support “lifestyle agro-forestry” and other benefits such as sustainability. The harvest may be just truffles, or may include any variety of non-timber forest products available in the small forest, from wild berries and mushrooms to medicinals to firewood. Products follow the seasons and connect the consumer to their local natural areas and their bounty. Often included is some form of newsletter that builds the customer’s relationship with the small woodland owner. Some CSFA models include member harvesting days, though coordinating large group trips would require more planning than harvesting on a conventional farm.

Another potential benefit of establishing such an enterprise may be tax benefits of considering your forest to be “farm” land. Some states tax properties that are primarily maintained to produce foods at a lower rate than managed forests. In Oregon, for example, a 6.5 acre or smaller property may be considered farmland if it meets several requirements and generates a net income of only \$650 per year.²⁶ A tax professional should be consulted to confirm if such a tax benefit exists in your state and how to properly take advantage of it.

²⁶ “Department of Revenue: Property Tax”. Oregon Department of Revenue. 5 May 2010.
http://www.oregon.gov/DOR/PTD/IC_303_645.shtml accessed: 2 March 2011.

Appendix B: Some Examples of Value-Added Truffle Products

Frozen truffle

Truffles can be frozen like most other foods. To prevent freezer burn and preserve flavor, it is best to place them in a vacuum-sealed bag individually. Nothing is as tasty as a fresh truffle, but there is a market for frozen truffles and freezing is a good way to avert losing an oversupply of fresh truffles that can be sold. Frozen truffles can be grated onto food without defrosting and must be used quickly to avoid spoiling.

Truffle Infused Cooking Oil

It takes a substantial amount of Oregon truffles to make a good oil but it can be done. Soak cut up truffles in an oil, filter, then seal the jar. The processor will have to experiment with different oil varieties and truffle species to develop their own recipe. Be wary of high mold counts that can spoil the oil. Mold counts can be tested by a food laboratory and sometimes your university agricultural extension service.



Dried truffle

Though they lose a substantial amount of their flavor and aromatic qualities, truffles can be dried in a food dehydrator or in an open paper bag in the fridge. Much like onions, everything in your fridge will have the smell of truffle after a while. Accounts vary on how much flavor is retained through this process. Dried truffles can be grated by hand for use as a garnish, or placed in a pepper grinder.

Appendix C: Sample Cost Worksheet

This worksheet is for demonstration purposes only and should not be used for business planning purposes. It will provide the small forestland owner a starting place for thinking about the range of costs that can affect revenue. Most users will see places where they can reduce costs listed here. Overnight shipping charges are assumed to be paid by the customer and labor is calculated at an hourly rate.

COST ANALYSIS (see notes)	Unit	Price per	Qty	Year 1	Year 2+
Assumptions	acres		25		
Pounds per acre	lbs			20	35
Pounds per year	lbs			500	875
Production					
Site Assessment	each	\$ 1,500	1	\$ 1,500	
Innoculation: existing young trees	lbs	\$ 50	3	\$ 150	
Harvest					
Vehicle (purchase, maintenance)	each	\$ 6,000	1	\$ 6,000	\$ 600
Fuel - Harvest	gallon	\$ 3	1000	\$ 3,000	\$ 3,000
Picking rake	each	\$ 25	3	\$ 75	
Collection Buckets (cooler)	each	\$ 15	3	\$ 45	
Sales					
Shipping (hand delivery)	trip	\$ 50	100	\$ 5,000	\$ 5,000
Marketing (web and flyers)	total	\$ 250	0	\$ -	\$ -
Labor					
Labor - Harvest	hours	\$ -	2667	\$ -	\$ -
Labor - Process, Package, Ship	hour	\$ -		\$ -	\$ -
Federal Payroll taxes	percent	15%		\$ -	\$ -
State Payroll taxes	percent	10%		\$ -	\$ -
Management					
Internet, Phone	month	\$ 50	12	\$ 600	\$ 600
Insurance	month	\$ 30	12	\$ 360	\$ 360
Computer	each	\$ 1,000	1	\$ 1,000	
Printer	each	\$ 300	1	\$ 100	
Professional Tax Services	return	\$ 200	1	\$ 200	\$ 200
Cost of Goods Sold (CGS)					
Year 1 (includes start up costs)	Annual	\$ 18,030		\$ 18,030	\$ 9,760
Years 2 and beyond	Annual	\$ 9,760			
Revenue (sales)					
Truffle sales	pound	\$ 80		\$ 40,000	\$ 70,000
Profit					
Revenue less CGS	Year 1	\$ 21,970	profit		
Revenue less CGS	Year 2+	\$ 60,240	profit		
Breakeven	(years)	0.82			

Sources

- Czarnecki, J. 1995. A cook's book of mushrooms. New York: Artisan.
- Laurin, Emilie. 2006. Post-harvest response of fresh produce to low-pressure stress occurring during air cargo transportation conditions: A simulation. Quebec: Laval University. <http://www.tiaca.org>
- Lefevre, Charles K, David Pilz, James M Trappe, Randy Molina. 2001. *Tuber Gibbosum and Leucangium Carthusianum*: Ecology, Harvesting and Marketing. In Proceedings of the Vth International Congress on the Science and Cultivation of Truffles and other Edible Hypogeous Mushrooms. Aix-en-Provence, France. March 4-6, 1999. Paris, France: Federation Francaise de Trufficulteurs: 4.214-4.217
- Maxwell, Jessica. 2005. "The Fungus Among Us". Green Gourmet, National Audubon Society, January-February 2005.
- Ochterski, Jim, Robert Breyfuss, and Monika Roth. 2005. Marketing Special Forest Products in New York State. Cornell University Cooperative Extension.
- Pilz, David and Mike Bondi,. 2005. An Oregon Garden guide to Truffles. Oregon State University, Department of Forest Sciences. Silverton, OR: Oregon Garden Rediscovery Forest.
- Pilz, David, Charles Lefevre, Leslie Scott, and James Julian. 2009. Oregon culinary truffles: An emergent industry for forestry, agriculture, and culinary tourism. A feasibility study. http://www.oregontruffles.org/truffles_feasibility_final.pdf (accessed May 13, 2010).
- Produce Marketing Association. 2009. Issues: Transportation <http://www.pma.com/issues/transportation.cfm>. Accessed 11/20/09.
- Rice, Owen. 2011. Personal Communication. 3/29/11/
- Schlosser, William E., Cindy Talbott Roche, Keith Blatner, and David M. Baumgartner. 1997. A guide to floral greens. Washington State University Extension. <http://cru84.cahe.wsu.edu/ItemDetail.aspx?ProductID=13710>. Accessed 3/20/2010.
- USDA Agricultural Marketing Service. "Schedule of Fresh Products Branch Programs User Fees Inspection." United States Department of Agriculture Agricultural Marketing Service. 3 1, 2008. <http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5065795> (accessed 11 20, 2009).
- U.S. Department of Health & Human Services, Food and Drug Administration (USDH&HS FDA Labeling). 2009. Labeling and Nutrition. <http://www.fda.gov/Food/LabelingNutrition/default.htm>. Last updated 10/21/2009. Accessed 12/30/2009
- US Airways. "Domestic food SCR 2000". http://www.usairways.com/en-US/Resources/downloads/traveltools/Domestic_food_DSCR2000.pdf
- Welby, Ellen M. and Brian McGregor. Agricultural Export Transportation Handbook. 2004. United States Department of Agriculture – Agricultural Marketing Service (USDA AMS). http://www.fas.usda.gov/agx/ship_doc_req/amsfile.pdf 9 (Accessed 11/21/12)

Additional Useful References

- Cocksedge, Wendy and Michelle Schroeder. 2006. A Harvester's Handbook: A guide to commercial non-timber forest products in British Columbia. Royal Roads University, Center for Non-Timber Resources. Victoria, BC: Royal Roads University.
- Cocksedge, Wendy. 2006. Incorporating non-timber forest products into sustainable forest management: An overview for forest managers. Victoria, B.C: Royal Roads University.
- Oregon Department of Agriculture – Agricultural Development and Marketing Division.
<http://www.oregon.gov/ODA/ADMD/index.shtml>. Accessed 04/15/2010.
- Vance, Nan C, David Pilz, Melissa Borsting, and Jim Freed. 2001. Special Forest Products: Species Information Guide for the Pacific Northwest. Gen. Tech. Rep. PNW-GTR-513, US Department of Agriculture, Forest Service, Portland, OR: Pacific Northwest Research Station, 169