



## Costs and Returns of Producing Wild-Simulated Ginseng in Established Tree Plantations

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### Introduction

Forest farming in North America is becoming a popular practice that provides short-term income for owners of new forest plantations while their trees reach maturity. This income diversification is particularly relevant for many of the Indiana hardwood plantations planted in the last decade, but will not fulfill their economic potential until 60–70 years from establishment. This article is the second in a two-part series aimed at analyzing economic opportunities in forest farming for Indiana forest plantation owners. The first study explores growing hops along the tree line of newly established forest stands, while this second study investigates producing American ginseng in older (20- to 30-year-old) forest plantations.



**Figure 1.** Four-pronged ginseng.



There are four primary production methods for American ginseng (*Panax quinquefolius*) (Figure 1)—wild ginseng, wild-simulated ginseng, woods-grown ginseng, and cultivated ginseng—which offer varying market returns. The economic analysis presented in this article is developed for wild-simulated ginseng, based on lower levels of management and investment intensity as well as higher expected economic returns.

The following economic analysis is presented in two parts: a) estimates of the typical investment and operating costs of producing wild-simulated ginseng in established Indiana tree plantations; and b) profitability analysis using net present valuation methods across ranging yields and market prices.

This cost study can be used as a guide in preparing budgets and estimating market returns; however, actual results will vary from operation to operation, due to differences in management and cultural practices, soil, site, and weather conditions as well as input and output prices.

## Assumptions

The assumptions underlying the enterprise budget are explained below.

**Farm specification.** The representative farm is a hardwood tree plantation with trees that are at least 20–30 years old. It should be noted that although American ginseng is native to woodlands, the growing conditions and cultural practices of producing wild simulated ginseng in a tree plantation may differ from those in native woodlands. As such, site selection is very important for a successful stand.

The ideal site is moist but well-draining. North- and east-facing slopes tend to have adequate shade and moisture levels, however, flat landscapes that are well drained can also be suitable. The tree canopy should be dense enough to provide 70%–80% shade in the summer and produce leaf litter in the fall that decomposes rapidly (typical of yellow-poplar, tulip-tree, sugar maple, American beech, American basswood, and black walnut trees, among others) to provide a proper balance of nutrition and moisture-retention. Understory plants, such as jack-in-the-pulpit, bloodroot, wild ginger, and blue and black cohosh, among others, are good indicators of suitable ginseng sites. Careful evaluation should be given to plantations with a relatively recent history of agricultural use, particularly regarding issues related to such things as drainage, compaction, weed competition, and lack of organic matter, among others, which may adversely affect the success of producing wild simulated ginseng.

The cost estimates listed in the following sections are based on a quarter-acre planting, of which only 6,500 square feet are planted due to tree obstacles and recommended plot layout.

**Land preparation.** Typical land preparation for wild-simulated ginseng requires few inputs. Soil testing is necessary to determine if the planting site has sufficient pH, calcium, and phosphorus levels for growing ginseng. It is best to work with soil conditions that require only marginal soil adjustments, as supplemental nutrients can predispose ginseng to disease. One soil test (\$15) is sufficient for up to a half-acre field. If needed, calcium adjustments are best made with pelletized gypsum, as gypsum will raise calcium without buffering the pH (unlike lime). Soil adjustment costs were not included in this analysis as they are heavily site dependent.

Depending on the under-canopy density of the planting site, heavy vegetation may need to be thinned with a mower (\$36 for a four-hour mower rental) and/or herbicide (\$90 to purchase a backpack sprayer and \$9 for 72 oz. of herbicide). Approximately 3 hours of labor are needed for a quarter-acre field at an hourly rate of \$11.40. However, we recommend minimizing site disturbance to replicate the growing conditions of wild ginseng as closely as possible. Less intense land preparation practices include the use of handheld tools, such as an ax, loppers, pruners, and rakes. A grower could also thin slightly and work with the natural vegetation, such as briars and shrubs, to increase browse protection and make theft more difficult.

Land preparation materials, machinery, and labor costs amount to approximately \$179 per quarter acre.

**Stratified seed.** Viable ginseng seeds (Figure 2) are one of the most significant investments in establishing a successful ginseng operation. One pound of stratified seed contains an estimated 6,400–8,000 seeds. Current stratified seed prices range from \$150–\$200 per pound. As improperly stratified seeds germinate poorly, we highly recommend that seeds be purchased from a reputable source. Depending on the planting method, a quarter of an acre may require 2 to 4 lbs. of seed, for a total cost of approximately \$305–\$609.



Figure 2. Stratified ginseng seed.



Figure 3. Casting seed on ground (Method 2)

**Sowing.** Ginseng seed is always planted in the fall before the ground freezes. There are several methods for planting ginseng. In this study, two methods were used. Method 1 involves planting the stratified ginseng seed directly into the ground, while Method 2 involves casting the seed on the ground. The tradeoffs between the two methods are seed costs, labor costs, and germination rates, as described below. For both methods, it is ideal to sow within a few days after a rain so that the soil is moist and easy to work.

Under Method 1, seeds are planted individually seven to nine inches apart and  $\frac{1}{2}$ – $\frac{3}{4}$  inch below the surface using a dibble stick (\$16 for two dibble sticks). It is estimated that two to three seeds\* are planted per square foot, resulting in 1 oz. of seed per 200 square feet or 2 lbs. (\$305) of seed for a quarter acre, assuming 6,500 square feet are planted. Approximately 47 hours of labor (\$535 for unskilled labor) are needed for a quarter acre using this planting method. This method is more labor intensive, but will maximize the germination rate of seeds and minimize seed costs. Total planting costs under this method are \$855 per quarter acre.

Method 2 is not as labor-intensive, but results in higher seed costs and lower germination rates (Figure 3). First, measure out plots, leaving room for walkways. The dimensions will vary according to access or equipment considerations related to the width between tree rows in the plantation. This study uses 200-square-foot plots (5 x 40 feet) separated by 3-foot walkways (see Figure 4), which for a quarter-acre plot results in approximately 6,500 planted square feet.

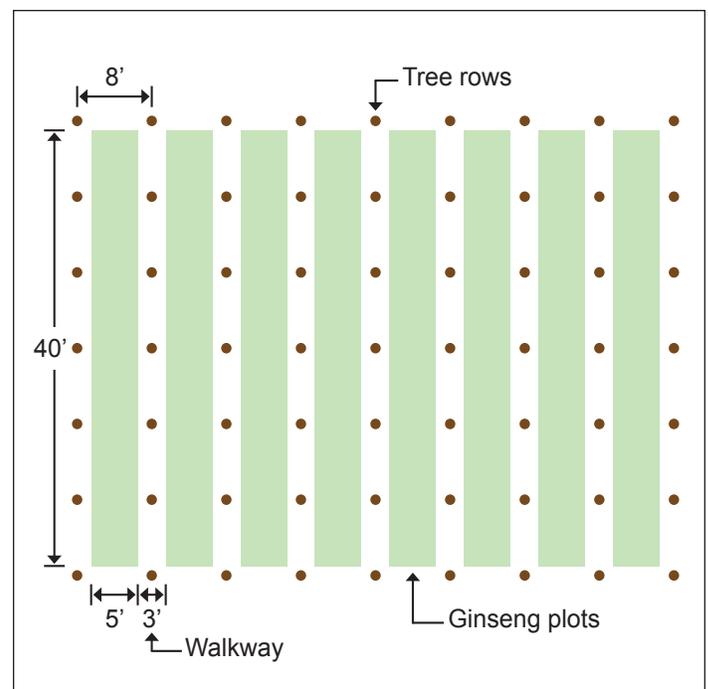


Figure 4. Diagram of plot layout for wild-simulated ginseng planting under Method 2 (not to scale)

\*It is also possible to plant 4 to 5 seeds per square foot under Method 1, which can help to increase the probability of producing ideal yields (see following discussion on yield). Plants will thin due to natural mortality; crowded plants can be transplanted elsewhere.

Working one plot at a time, rake off the leaf litter to one side using a rugged leaf rake (\$30 for rake and miscellaneous hand tools). Next, take a garden rake or hand cultivator to quickly scratch the top of the soil, creating a rough surface, which will help the seeds make contact with the soil. Measure out 2 oz. of seed and evenly distribute it across the plot (approximately four to five seeds per square foot).

For a quarter acre, this results in approximately 4.1 lbs. of seed (\$609) and 33 hours of labor (\$371). After casting the seed, use the garden rake or hand cultivator to incorporate the seed into the soil and walk up and down the plot to help press the seed about ½ to ¾ an inch into the ground. Finally, rake the leaf litter that was brushed aside back over the plot. Total planting costs under this method are \$1,010 per quarter acre.

As can be seen from Table 1, the estimated costs under Method 1 and Method 2 differ by \$155. Actual costs vary based on seed costs, labor rates, as well as labor efficiency. In practice, the preferred planting method may be determined by labor availability and efficiency. This study uses Method 1 as the base scenario for the remainder of the analysis.

**Table 1.** Comparison of planting method costs. *Source:* Based on author's estimates

Planting Method	Unit	Qty	\$/Unit	Total
<b>Method 1</b>				
Stratified seed	lb	2.0	150	\$305
Tools	tool	2	8	16
Labor	hour	46.9	11	535
Total				<b>855</b>
<b>Method 2</b>				
Stratified seed	lb	4.1	150	\$609
Tools	tool	2	15	30
Labor	hour	32.5	11	371
Total				<b>1,010</b>

**Security.** Often referred to as “green” gold, wild ginseng and wild-simulated ginseng are subject to theft. Ginseng farmers follow various security measures, such as planting ginseng in areas with low foot traffic, informing neighbors to help keep a watchful eye, fencing off mature plots, installing security cameras, keeping guard dogs, and embedding microchips, among other tactics. For the purposes of this budget, it was estimated that one security camera (\$200) would be sufficient for a quarter acre.

#### **Theft: From a Strictly Financial Perspective, How Much Theft Makes Ginseng Unprofitable?**

Given the baseline scenario in this analysis, in which a quarter acre yields 25 pounds of dried ginseng with market price of \$480 per pound, a thief must steal 54 pounds of fresh ginseng (approximately 18 pounds of dried ginseng) before a grower experiences financial loss. Assuming that it takes more than three hours to dig up one pound of dried ginseng, it would take an estimated 63 hours to harvest this quantity of ginseng. A group of 15–20 thieves could steal this amount in half a day and go unnoticed. The extent to which such organized poaching exists and is likely to go uninterrupted varies by location and must be determined on a case-by-case basis.

**Maintenance.** Wild-simulated ginseng requires very little maintenance. Fertilizer should not be applied as it tends to predispose ginseng to disease. Inspection should be limited to once every few weeks to minimize damage, such as spread of disease, etc. Approximately 40 minutes per month is estimated for inspecting and maintaining a quarter-acre field (8 hours per year for an annual labor cost of \$92).

If the growing area is subject to mole or vole predation, growers can use bait or bucket traps to limit damage from these pests. In addition, on sites with poor drainage and compacted soil, fungal diseases may be more of an issue and fungicide treatment may be necessary. These additional maintenance costs are not included in this study.

**Yield.** Regardless of the planting method, subsequent germination and attrition rates should result in 1 or 2 roots per square foot (approximately 9,750 roots for a quarter-acre field of which 6,500 square feet are planted). Approximately three pounds of wet or “green” ginseng result in one pound of dried ginseng. The number of roots in a pound of dried ginseng varies according to the size of the roots. Historical data from the Indiana Department of Natural Resources (DNR) indicates that the number of

roots per pound ranged from 298–528 roots per pound over the past 10 years. This study uses the 10-year average of 388 roots per pound, or approximately 25 pounds per quarter-acre, as the baseline scenario.

**Harvesting, washing and drying.** Wild-simulated ginseng is generally harvested after seven to eleven years of growth; this budget assumes that harvest occurs in the tenth year. Harvest and sale of ginseng are regulated to protect plant populations. In Indiana, the legal harvest season is September 1 to December 31. In general, the best time to harvest roots is in the fall after the leaves have started dying, particularly a day after rain when the soil is moist and loose. Roots are dug by hand using a sharp, needle-nosed spade; shovel; spade fork; flathead screwdriver; or mattock (\$40 for hand tools). Great care should be taken to minimize damage to the roots. It is estimated that it takes more than three hours of labor to harvest one dry pound of ginseng. At that rate, 6,500 square feet of ginseng plantings will take approximately 90 hours to harvest. It is best to harvest and wash roots in the same day. Rinse the roots with running water and avoid using high pressure water as well as scrubbing the roots. Over-washing the roots reduces their value.



Figure 5. Freshly harvested ginseng roots

Ginseng must begin drying immediately after washing to prevent rotting. A room or shed can be converted into a drying room by adding insulation, drying racks, a heat source, and a means of circulating air and controlling humidity (estimated at \$400). The temperature should not exceed 90 to 95 degrees. Drying time will vary depending on the size of the roots, and may range from a few days for small roots to six weeks for large roots. Three pounds of fresh roots yield approximately one pound dried. Energy costs are estimated at about \$0.50 per dry pound. Once dried, roots should be stored in paper bags or boxes. Harvesting and drying costs total \$1,479.

### Harvesting Ginseng Seeds

After 4 to 5 years, ginseng plants mature and begin producing red berries that contain ginseng seeds. A mature plant will produce 6 to 8 seeds. These seeds fall to the ground after ripening in August and September and remain dormant for 18 to 20 months until germinating the second spring after ripening.

The seeds can be left behind to self-generate new ginseng populations or collected for replanting. Indiana law prohibits the commercial sale of collected seed for all production methods of ginseng; however, for the cost of a few hours of labor, growers looking to expand their growing area can collect the berries, separate the seeds (if double-seeded), and plant on-site  $\frac{1}{2}$ – $\frac{3}{4}$  inch deep. This practice dramatically reduces seed-related establishment costs for subsequent ginseng stands. In the event of high seed volume or rodent pressure, growers can collect and stratify seeds in a secure container at home. However, since Indiana law prohibits the removal of seeds from the vicinity in which they were collected, farmers may want to consult their local Conservation Officers about stratifying seeds at home for the purpose of later replanting in the original vicinity. Seed harvesting costs are not included in this study.

**Labor rates.** Unskilled labor rates are estimated at \$11.40 per hour, based on the 2014 Bureau of Labor Statistics' occupational employment statistics for farm laborers in Indiana.

**Salvage value of equipment.** Salvage value is the estimated resale value of an asset at the end of the investment horizon, which in this case is when the ginseng roots are harvested and marketed. To determine salvage value, a percentage of cost was estimated, based on approximate age and usage at the end of the investment period (see Table 2). Salvage values were calculated for assets that offered a potential resale value.

**Returns.** Wild ginseng is very easy to sell; however, prices are purely a function of the quality of the roots as determined by the buyer. As required by Indiana law, all ginseng must be sold through a licensed dealer. There are currently 27 registered dealers in Indiana. Despite being highly marketable, prices can be extremely volatile due to the fact that the dried ginseng market is controlled by a few buyers in Hong Kong, the main export destination for American ginseng. As a result, the price for wild ginseng can vary 30%–40% within a given season, week, or even day.

**Table 2.** Estimation of salvage values

	Cost	Year purchased	Salvage value	
			% of cost	Value
<b>Backpack sprayer</b>	\$90	0	13%	\$12
<b>Trail Cameras</b>	200	7	25%	50
<b>Drying equipment*</b>	150	10	50%	75

\*Includes equipment used for heat source, air circulation, and humidity control. Insulation and drying racks are not included as they likely do not have resale value.

If market prices are expected to be low, it is best to postpone harvest and allow the roots to grow for an additional year. Alternatively, dried roots can be stored for another year while waiting for prices to increase; however, doing so requires a dealer license (\$100 annually) and training in certification and recording of ginseng harvests. DNR records indicate that over the last 10 years, annual wild ginseng prices have ranged from \$250 to \$880 per pound, with an average annual price of \$483 per pound. The baseline price used for this analysis is \$480.

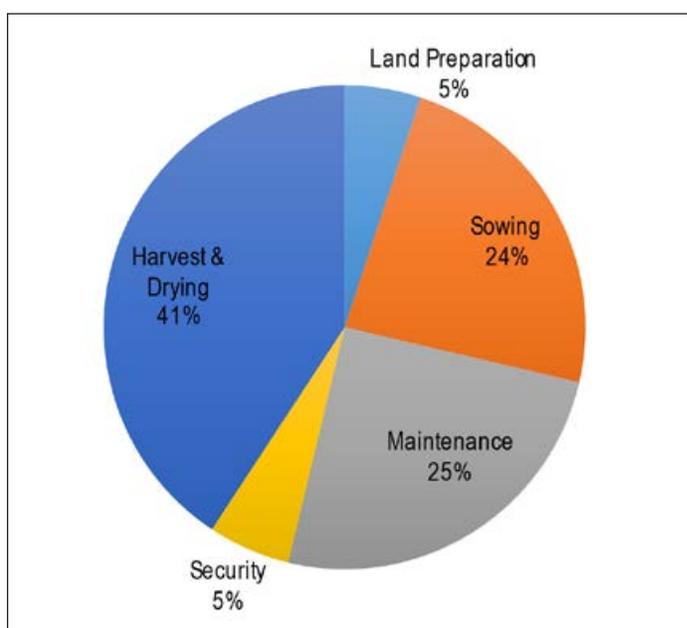
**Other costs.** Land rent is not included in this analysis, because the target audience is assumed to already own land with established tree plantations; thus, any associated land rents for the added ginseng operation are a sunk cost of their forest operation. Insurance is not included, as wild-simulated ginseng is not covered under USDA's Noninsured Crop Disaster Assistance Program.

**Summary of costs.** The total cost of wild-simulated ginseng production is estimated at \$3,631 for a quarter-acre field (6,500 square feet planted). These costs and their respective timing are delineated in Table 3. Figure 6 represents the breakdown of total costs across the various production stages. As can be seen, 41% of the total cost is related to harvest. Thus, the financial risks of producing wild-simulated ginseng are relatively low.

**Table 3.** Costs and timing of costs to produce a quarter-acre of wild-simulated ginseng

	Unit	Quantity	\$/Unit	Year		
				0	1-9	10
<b>Investment Costs</b>						
Land Preparation						
Soil test	test	1	\$15	\$15		
Mower rental	4-hr rental	1	36	36		
Backpack sprayer	backpack	1	90	90		
Herbicide	oz	72	0	10		
Labor	hour	3.0	11	34		
Sowing						
Stratified seed	lb	2.0	150	305		
Tools	tool	2	8	16		
Labor	hour	46.9	11	535		
<b>Operating Costs</b>						
Maintenance	hour	8.0	11		91	
Security camera*	camera	1	200		200	
Harvest						
Hand tools	tool	2	20			40
Labor	hour	90.0	11			1,026
Drying						
Conversion of drying room	room	1	400			400
Heating cost	per lb of ginseng	25	1			13
Salvage value			137			137

\*This is a one-time cost in year 4. Ginseng roots are susceptible to poaching as early as year 4. Thus, security measures are not needed until year 4. All other costs are annual for the indicated time period.



**Figure 6.** Proportion of wild-simulated ginseng costs

## Profitability Analysis

Given that a ginseng operation spans several years, the subsequent profitability analysis was conducted using a discounted cash flow valuation method to reflect the time value of money. Time value of money is the economic principle that money available today is worth more than the same amount tomorrow due to its potential earning capacity. As such, the annual cash flows delineated in this study were discounted at an annual rate of 4% to estimate their present value.

The break-even price for a planting space of 6,500 square feet and baseline yield of 25 pounds per quarter acre is \$169 per dried pound of ginseng. This break-even price is \$81 (or 32%) less than the lowest average annual price for Indiana-grown American ginseng, according to DNR historical data (see section on Returns). However, ginseng yields and prices can vary significantly from operation to operation, based on numerous site, agronomic, and market factors. Table 4 provides analysis, including total costs, break-even price, and net returns, at various yield and price combinations so that growers can approximate their ginseng operation's profitability using the price and yield combination that most closely reflects their own.

**Table 4.** Present value of costs and returns per quarter-acre across various yield and price combinations.

Pounds per quarter acre*	Yield			
	20	25	30	35
Roots per pound	488	390	325	279
<b>Present value of cash flows at varying yields</b>				
Land preparation	\$185	\$185	\$185	\$185
Sowing	855	855	855	855
Maintenance	740	740	740	740
Security	171	171	171	171
Harvest	582	720	859	997
Drying	277	279	280	282
Salvage value	-92	-92	-92	-92
Total	2,718	2,858	2,998	3,139
Break-even price	201	169	148	133
<b>Present value of net returns</b>				
<b>\$/pound</b>				
280	\$1,065	\$1,871	\$2,676	\$3,482
380	2,417	3,560	4,703	5,846
480	3,768	5,249	6,730	8,211
580	5,119	6,938	8,756	10,575
680	6,470	8,627	10,783	12,940

\*Assumes a quarter-acre forest plot is equivalent to 6,500 planted square feet

## Acknowledgements

We would like to acknowledge Dave Apsley, Ohio State University Extension; Jeanine Davis, North Carolina State University; Tanner Filyaw, Rural Action Sustainable Forestry Program; and Cary Floyd, Indiana Department of Natural Resources, for reviewing this publication.

This work was funded by Agricultural Science and Extension for Economic Development (AgSEED) funding from the Purdue College of Agriculture.

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Mar 2017

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