

South District Russet Burbank Commercial Potatoes: Fumigation and On-Farm Storage

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Background and Assumptions

Economic costs are used in the University of Idaho costs and returns estimates. All resources are valued based on market price or opportunity cost. Input prices are based on the U of I's annual survey of agricultural supply companies. Except for contract crops, the selling price is a 10-year average. The costs and returns estimate shown here is typical for growing irrigated Russet Burbank commercial potatoes in the higher yielding counties of eastern Idaho that fumigate. Production practices are based on producer surveys conducted in Bingham, Bannock, and Power counties. Although production practices may be similar for individual farms, each farm has a unique set of resources with different levels of productivity, different production problems, and therefore different costs. Farm size, crop rotation, age and type of equipment, and quality of management are all crucial factors that influence costs.

The Model Farm

This costs and returns estimate models a 1,500-acre farm with 500 acres in potatoes. The typical crop rotation is one year of potatoes followed by two years of grain. Corn may substitute for grain, while sugarbeets and alfalfa are grown in longer rotations. The farm uses a center pivot irrigation system and surface water delivered from an irrigation district. The irrigation district charges a flat fee per acre for water.

Tillage, Fertilization, Pest Control, and Irrigation

After the stubble from the preceding grain crop is chopped, the potato ground is irrigated, disked twice ripped and fumigated in the fall. The ground is chisel plowed and marked-out for planting in the spring. Potatoes are planted in May using a 6-row planter with 36-inch row spacing. The seeding rate is 20 hundredweight (cwt) with an additional 5 percent (1 cwt) to account for waste. Potatoes are cultivated and hilled in late May and cultivated in early June with a basin tillage tool. In September, vines are rolled and removed mechanically. Potato harvest begins three weeks later using a 2-row harvester, 4-row windrower, and five 10-wheeler trucks (300 cwt capacity). Potatoes are hauled directly to on-farm storage. Potatoes are stored 5 months in a modern, above ground storage facility with air and humidification. In addition to labor, electricity, and sprout inhibitor expenses, storage operating cost includes a charge for shrink and interest based on the value of the stored crop. Most fertilizer is custom applied in two preplant applications, fall and spring. A liquid phosphate starter fertilizer and micronutrients are applied at row mark-out. Additional nitrogen is applied post-plant through the sprinkler system. The weed control program uses cultural, mechanical (tillage and cultivation), and herbicidal control methods. A two-way herbicide tank mix is applied preemergence to control annual grasses and broadleaf weeds.

For insect control, a systemic insecticide is banded at planting and a contact insecticide is applied by air in July. Two fungicide applications are made for blight control, starting in July. The first application is made by custom ground application and the second is custom applied by air. Potatoes receive 20.5 inches of water during the growing season from approximately 47 irrigations (pivot revolutions), .5 inches in May, 6 inches in June, 8 inches in July, and 6 inches in August. One inch of water is applied pre-harvest in September, 1.5 inches are applied to the grain stubble before fall tillage and 2 inches are applied to apply/incorporate the fumigant for a total of 25 inches credited to the potato crop.

Resources: Machinery, Land, Labor, and Capital

Table 3 lists the tractors, trucks, and other equipment used to produce potatoes, along with their operating and ownership costs. Storage and handling equipment are not listed. All machinery except trucks is valued at 75 percent of replacement cost new prices shown in Table 3. This adjustment reduces the machinery repair operating cost and the depreciation and interest ownership costs on equipment by 25 percent. Each truck's price includes the cost of a used truck and the cost of a new self-unloading bed. The land charge is cash rent and covers the ownership costs (depreciation, interest, and insurance) on the irrigation system. A machine labor charge is made for all field operations except those performed on a custom basis. Custom operations are listed separately. The non-machine labor accounts for extra planting and harvest labor. Labor to operate machinery is valued at \$13.15 per hour, while irrigation and non-machine labor are valued at \$8.75 and \$7.70, respectively. Labor rates include a base wage plus a percentage for Social Security, Medicare, unemployment insurance, and other labor overhead expenses. Labor overhead amounts to 15 percent for non-machine labor, 25 percent for irrigation labor, and 30 percent for machinery labor. A management fee, 5 percent of gross returns, is included as an ownership cost. Interest on operating capital is charged from the time an input is applied until the month of harvest and calculated at a nominal rate of 7.5 percent. Interest on intermediate term capital is calculated using a rate of 7.75 percent. A general overhead charge of 2.5 percent of operating expenses is included to cover unallocated costs such as office expenses, legal and accounting fees, and utilities. Fees paid by the grower, listed under other operating costs, include: promotion fees paid to the Idaho Potato Commission and the National Potato Board, inspection fees paid to the Idaho Department of Agriculture, and membership fees paid to grower organizations. The consultant fee includes soil and petiole sampling and irrigation scheduling.

**Table 1. Costs And Returns Per Acre to Produce Potatoes
SEI South Russet Burbank with Fumigation and Storage**

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| | Quantity Per Acre | Unit | Price or Cost/Unit | Value or Cost/Acre | Your Cost |
|---|----------------------|------|-----------------------|-----------------------|--------------|
| Gross Returns | | | | | |
| Potatoes | 380.00 | cwt | 4.90 | 1862.00 | _____ |
| Total Gross Returns For Potatoes | | | | 1862.00 | _____ |
| Operating Costs | | | | | |
| Irrigation: | | | | | |
| Irrigation Power - cp | 25.00 | acin | 1.39 | 34.75 | _____ |
| Labor (irrigation) | 1.74 | hr | 8.75 | 15.23 | _____ |
| Water Assessment | 1.00 | acre | 21.00 | 21.00 | _____ |
| Irrigation Repairs - cp | 25.00 | acin | 0.55 | 13.75 | _____ |
| Custom: | | | | | |
| Custom Fertilize | 2.00 | acre | 4.95 | 9.90 | _____ |
| Consultant | 1.00 | acre | 15.00 | 15.00 | _____ |
| Custom Ground Spray | 1.00 | acre | 5.85 | 5.85 | _____ |
| Custom Air Spray-10g | 2.00 | acre | 7.65 | 15.30 | _____ |
| Fertilizer: | | | | | |
| Dry Nitrogen | 155.00 | lb | 0.39 | 60.45 | _____ |
| Dry P2O5 | 165.00 | lb | 0.24 | 39.60 | _____ |
| K2O | 185.00 | lb | 0.21 | 38.85 | _____ |
| Sulfur | 85.00 | lb | 0.12 | 10.20 | _____ |
| Liquid Nitrogen | 150.00 | lb | 0.43 | 64.50 | _____ |
| Liquid P2O5 | 60.00 | lb | 0.28 | 16.80 | _____ |
| Micronutrients | 1.00 | acre | 16.50 | 16.50 | _____ |
| Pesticide: | | | | | |
| Vapam 42% | 40.00 | gal | 3.65 | 146.00 | _____ |
| Thimet 20G | 15.00 | lb | 2.45 | 36.75 | _____ |
| Sencor 75DF | 0.75 | lb | 19.65 | 14.74 | _____ |
| Eptam 7E | 2.00 | qt | 8.85 | 17.70 | _____ |
| Bravo Ultrex WDG | 1.25 | lb | 6.95 | 8.69 | _____ |
| Dithane F45 Rainshield | 3.20 | qt | 3.65 | 11.68 | _____ |
| Monitor 4E | 0.75 | qt | 25.00 | 18.75 | _____ |
| Other: | | | | | |
| Crop Insurance | 1.00 | acre | 30.00 | 30.00 | _____ |
| Fees | 361.00 | cwt | 0.13 | 46.93 | _____ |
| Seed: | | | | | |
| G-3 Potato Seed | 21.00 | cwt | 6.75 | 141.75 | _____ |
| Seed Cut & Treat | 21.00 | cwt | 1.55 | 32.55 | _____ |
| Storage: | | | | | |
| Storage Operating Costs | 380.00 | cwt | 0.51 | 193.80 | _____ |
| Labor (machine) | 6.99 | hrs | 13.15 | 91.92 | _____ |
| Labor (non-machine) | 2.72 | hrs | 7.70 | 20.94 | _____ |
| Fuel - Gas | 0.20 | gal | 2.29 | 0.45 | _____ |
| Fuel - Diesel | 33.96 | gal | 2.08 | 70.64 | _____ |
| Lube | | | | 10.66 | _____ |
| Machinery Repair | | | | 39.63 | _____ |
| Interest on Operating Capital @ 7.50% | | | | 40.24 | _____ |
| Total Operating Costs per Acre | | | | 1351.50 | _____ |
| Net Returns Above Operating Costs | | | | 510.50 | _____ |
| Cash Ownership Costs | | | | | |
| General Overhead | | | | 34.00 | _____ |
| Land Rent | | | | 260.00 | _____ |
| Management Fee | | | | 93.00 | _____ |
| Property Taxes (machinery) | | | | 0.00 | _____ |
| Property Insurance | | | | 7.06 | _____ |
| Investment Repairs | | | | 11.57 | _____ |
| Total Cash Ownership Costs per Acre | | | | 405.63 | _____ |
| Non-Cash Ownership Costs (depreciation and interest) | | | | | |
| Commercial Storage Facility | | | | 59.71 | _____ |
| Commercial Storage Equipment | | | | 55.08 | _____ |
| Equipment | | | | 153.66 | _____ |
| Total Non-Cash Ownership Costs per Acre | | | | 268.44 | _____ |
| Total Costs per Acre | | | | 2025.57 | _____ |
| Returns to Risk | | | | -163.57 | _____ |

Table 2. Monthly Summary of Cash Expenses per Acre

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| | Sep 04 | Oct 04 | Nov 04 | Dec 04 | Jan 05 | Feb 05 | Mar 05 | Apr 05 | May 05 | Jun 05 | Jul 05 | Aug 05 | Sep 05 | Oct 05 | Total |
|----------------------------------|---------------|---------------|--------------|--------------|--------------|--------------|---------------|---------------|---------------|--------------|---------------|--------------|--------------|---------------|----------------|
| Preharvest: | | | | | | | | | | | | | | | |
| Chop Straw | 7.56 | | | | | | | | | | | | | | 7.56 |
| Disk | 10.24 | | | | | | | | | | | | | | 10.24 |
| Irrigate | 2.87 | | | | | | | | 1.22 | 39.70 | 44.06 | 11.75 | 1.91 | | 101.52 |
| Rip/subsoil | 9.59 | | | | | | | | | | | | | | 9.59 |
| Fertilize | 91.50 | | | | | | | 67.50 | | | | | | | 159.00 |
| Fumigate | | 150.35 | | | | | | | | | | | | | 150.35 |
| Crop Insurance | | | | | | | | 30.00 | | | | | | | 30.00 |
| Assessments | | | | | | | | 21.00 | | | | | | | 21.00 |
| Repairs | | | | | | | | 13.75 | | | | | | | 13.75 |
| Plow | | | | | | | | 6.34 | | | | | | | 6.34 |
| Mark Out | | | | | | | | | 49.24 | | | | | | 49.24 |
| Seed Hauling | | | | | | | | | 4.05 | | | | | | 4.05 |
| Plant | | | | | | | | | 231.92 | | | | | | 231.92 |
| Ground Spray | | | | | | | | | 34.90 | | | | | | 34.90 |
| Cultivate | | | | | | | | | | 12.90 | | | | | 12.90 |
| Consultant | | | | | | | | | | | 15.00 | | | | 15.00 |
| Aerial Application | | | | | | | | | | | 32.24 | 13.49 | | | 45.73 |
| General Pickup Use | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | | | 28.91 |
| Total Preharvest Costs | 124.17 | 152.76 | 2.41 | 2.41 | 2.41 | 2.41 | 2.41 | 141.00 | 323.74 | 55.01 | 108.24 | 27.65 | 1.91 | | 946.55 |
| Harvest: | | | | | | | | | | | | | | | |
| Vine Roll | | | | | | | | | | | | | 4.60 | | 4.60 |
| Vine Kill | | | | | | | | | | | | | 9.92 | | 9.92 |
| Dig | | | | | | | | | | | | | 52.70 | | 52.70 |
| Crop Hauling | | | | | | | | | | | | | 22.71 | 34.06 | 56.77 |
| Assessments | | | | | | | | | | | | | | 46.93 | 46.93 |
| Total Harvest Costs | | | | | | | | | | | | | 89.92 | 80.99 | 170.92 |
| Storage: | | | | | | | | | | | | | | | |
| Storage | | | | | | | | | | | | | | | 193.80 |
| Total Storage Costs | | | | | | | | | | | | | | | 193.80 |
| Interest on Operating Capital | 0.78 | 1.73 | 1.75 | 1.76 | 1.78 | 1.79 | 1.81 | 2.69 | 4.71 | 5.05 | 5.73 | 5.90 | 6.48 | -1.72 | 40.24 |
| Operating Costs per Acre | 124.95 | 154.50 | 4.16 | 4.17 | 4.19 | 4.20 | 4.22 | 143.69 | 328.46 | 60.06 | 113.98 | 33.56 | 98.32 | 273.07 | 1351.50 |
| Cash Ownership | | | | | | | | | | | | | | | |
| General Overhead | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | 2.83 | | | 34.00 |
| Land Rent | | | | | | | 260.00 | | | | | | | | 260.00 |
| Management Fee | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | 7.75 | | | 93.00 |
| Property Insurance | | | | | | | | 7.06 | | | | | | | 7.06 |
| Investment Repairs | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | | | 11.57 |
| Cash Ownership Costs | 11.55 | 11.55 | 11.55 | 11.55 | 11.55 | 11.55 | 271.55 | 18.61 | 11.55 | 11.55 | 11.55 | 11.55 | | | 405.63 |
| Total Cash Costs per Acre | 136.49 | 166.04 | 15.70 | 15.72 | 15.73 | 15.75 | 275.76 | 162.30 | 340.00 | 71.61 | 125.52 | 45.10 | 98.32 | 273.07 | 1757.13 |

Table 3. Machinery and Equipment Costs per Hour

| Description | Purchase Price | Years to Trade | Salvage Value | Hours Used | <-Non-Cash-> | | <-----Cash-----> | | <-----Operating-----> | | | Total Costs/Hr. |
|--------------------|----------------|----------------|---------------|------------|---------------------|--------|------------------|---------|-----------------------|-------------|-------|-----------------|
| | | | | | Ownership Cap. Rec. | Insur. | Taxes | Repairs | Fuel & Lube | Total Oper. | | |
| 4-wheeler | 6500 | 10 | 1920 | 225 | 2.75 | 0.07 | 0.00 | 0.07 | 3.45 | 3.52 | 6.34 | |
| Basin Tillage Tool | 25000 | 15 | 2400 | 65 | 32.40 | 0.80 | 0.00 | 2.47 | 0.00 | 2.47 | 35.66 | |
| Chisel Plow 1 -20' | 15600 | 15 | 1498 | 55 | 23.71 | 0.58 | 0.00 | 2.74 | 0.00 | 2.74 | 27.04 | |
| Pickup - used 3/4t | 11000 | 8 | 2500 | 200 | 6.22 | 0.13 | 0.00 | 0.91 | 5.98 | 6.89 | 13.23 | |
| Pickup 1 - 3/4 ton | 37000 | 8 | 5000 | 300 | 14.78 | 0.26 | 0.00 | 3.59 | 9.57 | 13.16 | 28.21 | |
| Pickup 2 - 3/4 ton | 37000 | 8 | 5000 | 300 | 14.78 | 0.26 | 0.00 | 3.59 | 9.57 | 13.16 | 28.21 | |
| Planter - 6R PO | 38000 | 12 | 5263 | 120 | 29.47 | 0.68 | 0.00 | 11.50 | 0.00 | 11.50 | 41.66 | |
| Potato Harvester | 57000 | 10 | 10080 | 155 | 37.23 | 0.81 | 0.00 | 9.08 | 0.00 | 9.08 | 47.12 | |
| Potato Windrow -4R | 47000 | 10 | 8312 | 155 | 30.70 | 0.67 | 0.00 | 7.49 | 0.00 | 7.49 | 38.86 | |
| R Cultivator-6R PO | 6600 | 15 | 634 | 75 | 7.40 | 0.18 | 0.00 | 0.77 | 0.00 | 0.77 | 8.36 | |
| Ripper - 15' | 9900 | 12 | 1371 | 245 | 3.75 | 0.09 | 0.00 | 3.17 | 0.00 | 3.17 | 7.00 | |
| Seed loader-tube | 10500 | 15 | 1008 | 120 | 7.34 | 0.18 | 0.00 | 1.49 | 0.00 | 1.49 | 9.01 | |
| Sprayer - 50' | 7500 | 15 | 720 | 30 | 20.90 | 0.51 | 0.00 | 1.68 | 0.00 | 1.68 | 23.09 | |
| Straw Chopper | 17000 | 12 | 2355 | 85 | 18.54 | 0.43 | 0.00 | 2.74 | 0.00 | 2.74 | 21.70 | |
| Tandem Disk - 18' | 22000 | 12 | 3047 | 95 | 21.46 | 0.49 | 0.00 | 3.29 | 0.00 | 3.29 | 25.25 | |
| Tank/injector -18' | 2700 | 15 | 259 | 75 | 3.03 | 0.07 | 0.00 | 0.54 | 0.00 | 0.54 | 3.64 | |
| Tool Bar w/Shovels | 1800 | 15 | 173 | 75 | 2.02 | 0.05 | 0.00 | 0.21 | 0.00 | 0.21 | 2.28 | |
| Tractor - 160hp | 113000 | 15 | 21999 | 261 | 34.95 | 0.97 | 0.00 | 1.89 | 22.21 | 24.10 | 60.02 | |
| Tractor - 200hp | 134000 | 15 | 26087 | 450 | 24.06 | 0.67 | 0.00 | 3.89 | 27.76 | 31.65 | 56.37 | |
| Tractor - 250hp | 134000 | 15 | 26087 | 500 | 21.66 | 0.60 | 0.00 | 1.85 | 34.71 | 36.56 | 58.83 | |
| Tractor 2 - 200hp | 134000 | 15 | 26087 | 450 | 24.04 | 0.67 | 0.00 | 3.89 | 27.76 | 31.65 | 56.35 | |
| Truck 1 - 5 ton | 55000 | 15 | 10708 | 400 | 11.11 | 0.31 | 0.00 | 7.35 | 1.20 | 8.55 | 19.97 | |
| Truck 2 - 5 ton | 55000 | 15 | 10708 | 400 | 11.11 | 0.31 | 0.00 | 7.35 | 1.20 | 8.55 | 19.97 | |
| Truck 3 - 5 ton | 55000 | 15 | 10708 | 400 | 11.10 | 0.31 | 0.00 | 7.35 | 1.20 | 8.55 | 19.96 | |
| Truck 4 - 5 ton | 55000 | 15 | 10708 | 400 | 11.10 | 0.31 | 0.00 | 7.35 | 1.20 | 8.55 | 19.96 | |
| Truck 5 - 5 ton | 55000 | 15 | 10708 | 400 | 11.10 | 0.31 | 0.00 | 7.35 | 1.20 | 8.55 | 19.96 | |
| Vine Chopper | 16800 | 8 | 3793 | 95 | 20.13 | 0.41 | 0.00 | 2.47 | 0.00 | 2.47 | 23.00 | |
| Vine Roller | 2500 | 15 | 240 | 55 | 3.80 | 0.09 | 0.00 | 0.26 | 0.00 | 0.26 | 4.16 | |

Net Returns Per Acre Above Operating Costs For Potatoes
Yield (cwt/acre)

| | 266.00 | 304.00 | 342.00 | 380.00 | 418.00 | 456.00 | 494.00 |
|------|--------|--------|--------|--------|--------|--------|--------|
| 3.43 | -392 | -278 | -163 | -48 | 67 | 181 | 296 |
| 3.92 | -262 | -129 | 5 | 138 | 271 | 405 | 538 |
| 4.41 | -132 | 20 | 172 | 324 | 476 | 628 | 780 |
| 4.90 | -1 | 169 | 340 | 511 | 681 | 852 | 1022 |
| 5.39 | 129 | 318 | 507 | 697 | 886 | 1075 | 1264 |
| 5.88 | 259 | 467 | 675 | 883 | 1091 | 1299 | 1506 |
| 6.37 | 390 | 616 | 843 | 1069 | 1296 | 1522 | 1749 |

Net Returns Per Acre Above Cash Costs For Potatoes
Yield (cwt/acre)

| | 266.00 | 304.00 | 342.00 | 380.00 | 418.00 | 456.00 | 494.00 |
|------|--------|--------|--------|--------|--------|--------|--------|
| 3.43 | -798 | -683 | -568 | -454 | -339 | -224 | -110 |
| 3.92 | -668 | -534 | -401 | -268 | -134 | -1 | 132 |
| 4.41 | -537 | -385 | -233 | -81 | 71 | 223 | 375 |
| 4.90 | -407 | -236 | -66 | 105 | 275 | 446 | 617 |
| 5.39 | -276 | -87 | 102 | 291 | 480 | 669 | 859 |
| 5.88 | -146 | 62 | 269 | 477 | 685 | 893 | 1101 |
| 6.37 | -16 | 211 | 437 | 663 | 890 | 1116 | 1343 |

Net Returns Per Acre Above Total Costs For Potatoes
Yield (cwt/acre)

| | 266.00 | 304.00 | 342.00 | 380.00 | 418.00 | 456.00 | 494.00 |
|------|--------|--------|--------|--------|--------|--------|--------|
| 3.43 | -1061 | -948 | -835 | -722 | -609 | -496 | -382 |
| 3.92 | -930 | -799 | -668 | -536 | -404 | -272 | -140 |
| 4.41 | -800 | -650 | -500 | -350 | -199 | -49 | 102 |
| 4.90 | -670 | -501 | -332 | -164 | 5 | 175 | 344 |
| 5.39 | -539 | -352 | -165 | 23 | 210 | 398 | 586 |
| 5.88 | -409 | -203 | 3 | 209 | 415 | 622 | 828 |
| 6.37 | -279 | -54 | 170 | 395 | 620 | 845 | 1070 |

The practices and chemicals specified here are based on survey information representative of typical operations. They are not recommendations. Because of constantly changing labels, laws, and regulations, the University of Idaho can assume no liability for the consequences of use of chemicals specified here. In all cases, read and follow the directions and precautionary statements on the specific pesticide product label. To simplify information, trade names have been used. No endorsement of named products is intended nor is criticism implied of similar products not mentioned.

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