

Oregon Food Infrastructure Gap Analysis

**Where Could Investment Catalyze Regional
Food System Growth and Development?**

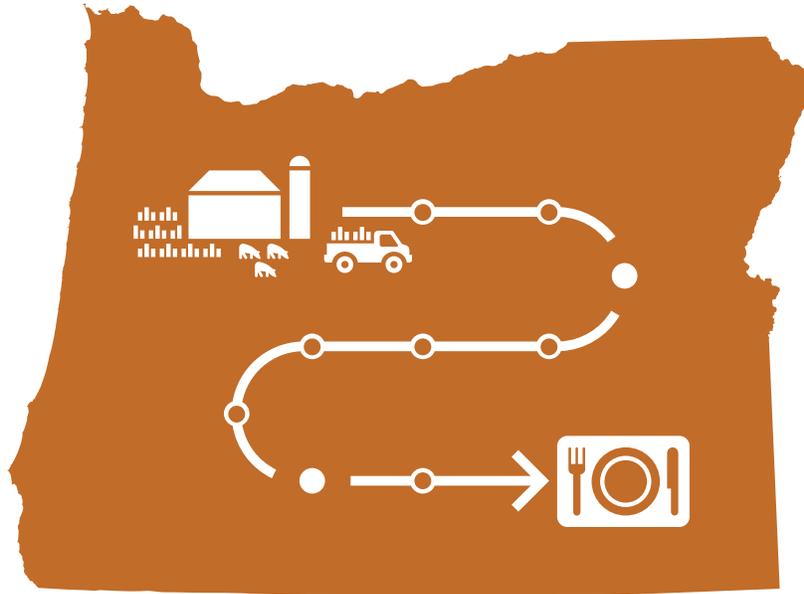
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Food System Growth and Development?**

By Ecotrust, with Matthew Buck
Funded by Meyer Memorial Trust

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11

Greens





Photo courtesy Carole Topalian

11.1 Introduction to Greens at the National Level

“Leafy greens” include a variety of plants eaten raw or cooked, such as arugula, cabbages, chard, cress, dandelion, endive, escarole, kale, lettuces, mache, mizuna, radicchio, spinach, tat soi, and winter purslane. The main types of lettuce are head lettuce (iceberg, butterhead, Boston, and Bibb), romaine, and various leaf varieties. Other “cooking greens” include collard greens, mustard greens, and turnip greens.

Total acreage of lettuce harvested in 2013 was 259,100 acres. The 7.9 billion pounds of lettuce harvested were valued at over \$2.4 billion at the farm level.

Acreage dedicated to other leafy vegetables is significantly smaller.

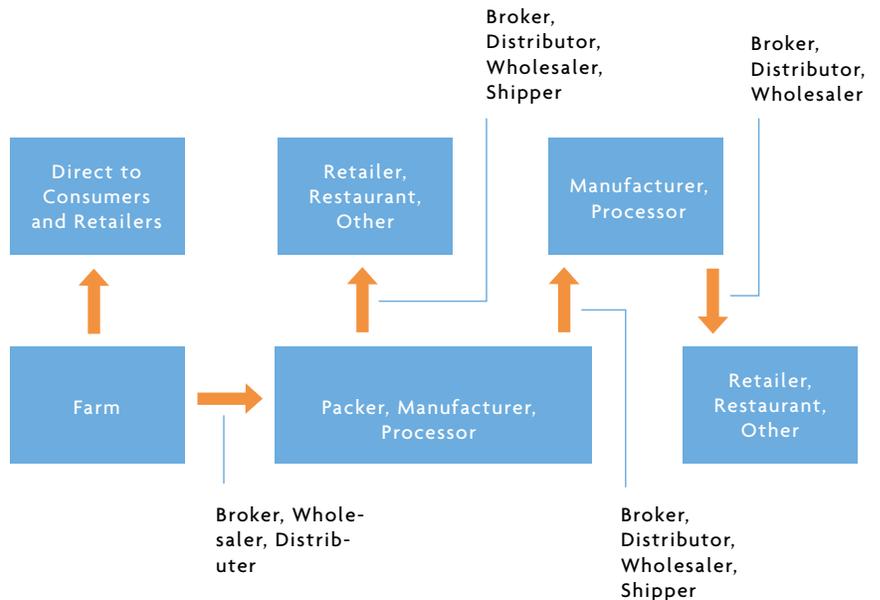
Table 11.1: Total production of greens by type.

| 2013 NASS | Acres | Total Pounds | Farm Value |
|--------------------------------|---------|---------------|-----------------|
| Head Lettuce | 115,000 | 4,025,000,000 | \$1,081,920,000 |
| Leaf Lettuce | 53,000 | 1,219,000,000 | \$467,614,000 |
| Romaine Lettuce | 91,100 | 2,662,000,000 | \$880,373,000 |
| 2012 Ag Census/NASS/ERS | | | |
| Spinach (fresh) | 31,440 | 509,400,000 | \$221,006,000 |
| Collard Greens (fresh) | 10,005 | 301,763,000 | Unknown |
| Mustard Greens (fresh) | 5,705 | 140,038,000 | Unknown |
| Turnip Greens (fresh) | 5,033 | 125,373,000 | Unknown |
| Escarole/Endive | 2,030 | 89,364,000 | Unknown |
| Kale (fresh) | 5,535 | 114,300,000 | Unknown |

Greens grown for fresh market may be harvested either as single leaves or as whole plants. Harvesting is usually done by hand, making these crops quite labor intensive.

Greens are described as a “farm to fork” industry in which growers may market direct to consumers or to retailers, or send product through a chain of as many as three handlers as seen in the following graphic.

Figure 11.1: Greens market channels.

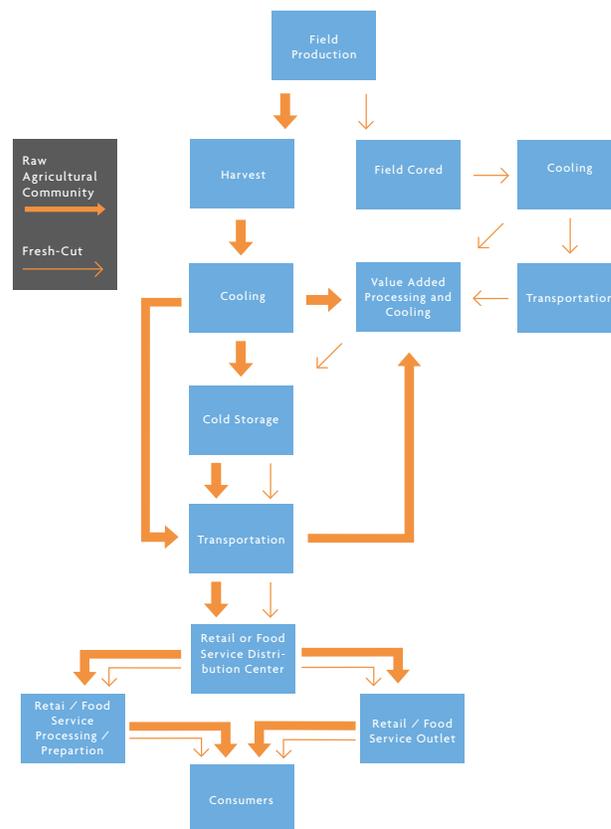


However, it is becoming less common for farms to ship whole plants. The Economic Research Service notes:

“The marketing of vegetables has undergone radical changes in the past 20 years with the introduction of packaged, prewashed vegetables sold in either bags or plastic containers. The convenience to consumers of prepackaged vegetables, particularly leafy greens, includes timesavings from not having to sort, wash, dry, or chop. These timesavings come at a price. Packaged vegetables typically cost more than their conventional counterparts. For example, in 2006, washed packaged leaf and baby spinach cost \$3.32 per pound, while loose or bunched random-weight spinach sold for \$1.05 per pound. Despite these higher prices, prepared and ready-to-eat bagged leafy green products, including salad mixes, accounted for more than half of all retail leafy green purchases in 2009.”²⁰²

In 2013 Nielsen Perishables Group estimated that 83 percent of households have purchased fresh-cut bagged salad mixes. The popularity of fresh-cut vegetables has put increasing emphasis on post-harvest cooling and handling of products to maintain quality and to ensure food safety.²⁰³

Figure 11.2: Greens industry process flow.



²⁰² “Consumers Cut Back on Convenience but not Necessarily Quantity, When Incomes Fall,” Fred Kuchler, USDA, ERS, 2011.

²⁰³ “Understanding Today’s Produce Consumers and Reaching Them in New Ways,” Nielsen Perishables Group, 2014.

11.2. Segmentation, Key Issues, and Trends

2012 US Census figures show that nationally there were 5,757 farmers reporting sales of lettuce. The large majority of those growers—about 76 percent—grew less than 1 acre of lettuce. The top 1.5 percent of those growers—each managing 1,000 acres or more—represented 75 percent of all sales.²⁰⁴

California and Arizona alone account for about 98 percent of commercial lettuce production.

The Agricultural Marketing Service reports:

“A small number of firms are responsible for growing, processing, and transporting lettuce to retail outlets. In addition, the share of firms competing for bagged products has become more concentrated in recent years. The higher concentration is thought to be the result of barriers to market entry including high capital investments, difficulty in transporting bagged products while maintaining freshness, and brand recognition.”²⁰⁵

A 2014 Food Marketing Institute study listed the following reasons for Buying Locally Grown at Retail:

86% Freshness
 75% Support local economy
 61% Taste
 56% Like knowing source/how produced
 39% Nutritional value
 39% Price
 31% Enviro. impact of long distance transportation
 30% Appearance
 24% Long term personal health effects

Alternatives to conventional greens discussed in this report include:

- Organic
- Local products from small and midsized farms.

11.2.1. Organic

“Organic” is regulated by the USDA and requires a third-party audit. Consumers associate organic with the absence of chemical fertilizers or pesticides, although approved amendments and treatments may be used.

ERS figures show that acreage dedicated to organic lettuce production in the US increased 307 percent from 2000 to 2011 (from 11,410 acres to 34,967

²⁰⁴ “Farms by Concentration of Market Value of Agricultural Products Sold: 2012,” USDA, NASS, 2012.

²⁰⁵ “Commodity Profile: Lettuce,” Hayley Boriss, Henrich Brunke, Agricultural Issues Center, University of California, 2005.

acres). As a percent of all acreage dedicated to lettuce production, organic production increased from 3.69 percent to 11.56 percent of all production.²⁰⁶

ERS figures also show that farmers received a significant premium for organic greens:²⁰⁷

Table 11.2: Premium for organic greens by type.

| 2013 Organic Premium | Low | High |
|----------------------|-----|------|
| Greens (Chard) | - | 34% |
| Romaine Lettuce | 68% | 89% |
| Mesculin Mix | 23% | 101% |
| Leaf Lettuce | 55% | 105% |
| Spinach | 68% | 135% |

Organic bagged salads reportedly represent 23 percent of total sales of bagged salads as of 2014.²⁰⁸

11.2.2. Local and Regional

There are a growing number of independent farmers marketing direct to consumers or to commercial food buyers (retail grocery stores, restaurants, food service).

According to the 2012 USDA Census of Agriculture, a total of 6,680 Oregon farmers reported sales direct to consumers (18.8 percent of all farmers) and 1,898 Oregon farmers reported sales direct to a retailer (5.4 percent).²⁰⁹

11.3. Markets for Greens

Price differences for greens observed in Portland January 2015 include:

Table 11.3: Price differences for greens observed in Portland, January 2015.

| | Major Grocer | Major Grocer | New Seasons Market |
|-------------------------|---------------------------------|---|----------------------|
| Fresh | | | |
| Head Lettuce | \$0.99/head | | |
| Leaf Lettuce | \$0.99/head | \$2.29/head, Organic | \$1.99/head, Organic |
| Kale | \$1.29/bunch, Local | \$1.79/bunch, Organic | \$2.00/lb., Organic |
| Collard Greens | \$1.79/bunch | \$2.49/bunch, Organic | \$2.50/lb., Organic |
| Mustard Greens | \$1.79/bunch | | \$2.50/lb., Organic |
| Packaged | | | |
| Bagged Spinach | \$3.18/lb. (10oz. bag @ \$1.99) | \$9.00/lb., Organic (5oz. bag @ \$3.00) | \$5.99/lb., Organic |
| Spring Mix Bagged Salad | \$6.34/lb. (5oz. bag @ \$1.98) | \$4.99/lb., Organic | \$6.99/lb., Organic |

²⁰⁶ "Organic Production: Overview," USDA, ERS, 2013.

²⁰⁷ "Organic Prices, Overview," USDA, ERS, 2014.

²⁰⁸ "Trends in the Marketing of Fresh Produce and Fresh-cut/Value-added Produce," Dr. Roberta Cook, Department of Ag and Resource Economics, University of California, Davis, 2014.

²⁰⁹ USDA Census of Agriculture.



As with other products studied in this report, despite the potential to realize higher prices overall for differentiated products, midsized and smaller scale farmers pursuing niche markets must earn a margin that enables profitability in spite of typically higher per unit production, processing, and marketing costs.

11.4. Demand for Greens in Oregon

Understanding market demand is critical to evaluating potential investments to increase production and profitability of local greens.

11.5. Consumer Spending on Greens

According to the Bureau of Labor Statistics, the average household (2.6 persons) in the western US spent \$7,180 in 2013 on food at home (59 percent) and away (41 percent) in 2013. This includes \$283 spent on fresh vegetables of all types for at home consumption.²¹⁰

Spending on lettuces and leafy vegetables is not called out in BLS reports. However, the ERS does estimate per capita consumption²¹¹ and average retail prices²¹² of lettuce and other leafy vegetables as follows:

Table 11.4: Estimated household spending on greens.

| Crop | Pounds (2012) | Avg/lb. (2008) | Per Capita Spending | Est. Household Spending |
|------------------------|---------------|----------------|---------------------|-------------------------|
| Head lettuce | 14.23 | \$0.99 | \$14.09 | |
| Leaf & Romaine Lettuce | 11.28 | \$1.95 | \$22.00 | |
| Spinach | 1.4 | \$3.92 | \$5.49 | |
| Collard Greens | 0.8 | \$2.36 | \$1.89 | |
| Mustard Greens | 0.4 | \$2.19 | \$0.88 | |
| Turnip Greens | 0.4 | \$2.11 | \$0.84 | |
| Escarole/Endive | 0.3 | \$2.55 | \$0.77 | |
| Kale | 0.3 | \$2.19 | \$0.66 | |
| Total | 29.11 | | \$45.74 | \$118.92 |

The Packer offers another estimate of retail sales for 2012 with more up to date pricing:²¹³

Table 11.5: Estimated retail sales of greens.

| 2012 | Pounds | Sales | Avg. per lb. |
|-----------|---------------|-----------------|--------------|
| Salad Mix | 1,216,156,495 | \$3,022,681,827 | \$2.47 |
| Lettuces | 975,898,702 | \$1,381,067,303 | \$1.42 |
| Spinach | 124,539,494 | \$535,764,092 | \$4.30 |
| Greens | 114,450,819 | \$172,604,702 | \$1.51 |

²¹⁰ “Region of residence: Annual expenditure means, shares, standard errors, and coefficient of variation,” Consumer Expenditure Survey, US Bureau of Labor Statistics, 2014.

²¹¹ “Region of residence: Annual expenditure means, shares, standard errors, and coefficient of variation,” Consumer Expenditure Survey, US Bureau of Labor Statistics, 2014.

²¹² “How Much Do Fruits and Vegetables Cost?” USDA, ERS, 2011.

²¹³ “Lettuce,” The Packer’s Produce Universe, (n.d).



Using population data and the figures above, it is possible to form estimates for total consumption of fresh greens in Oregon, at the county level or for municipalities.

| POUNDS | Head Lettuce | Leaf Lettuce | Spinach | Collard Greens | Mustard Greens | Turnip Greens | Escarole Endive | Kale |
|---------------|--------------|--------------|---------|----------------|----------------|---------------|-----------------|------|
| Oregon | 51.7M | 41.9M | 5.5M | 3.1M | 1.6M | 1.6M | 1.2M | 1.2M |
| Multnomah Co. | 10M | 8.1M | 1.1M | 605K | 303K | 303K | 227K | 227K |
| Jackson Co. | 2.7M | 2.2M | 289K | 165K | 83K | 83K | 62K | 62K |
| Bend | 1M | 847K | 111K | 63K | 32K | 32K | 24K | 24K |
| La Grande | 172K | 140K | 18K | 10K | 5.2K | 5.2K | 3.9K | 3.9K |

Table 11.6: Estimated consumption of fresh greens in Oregon.

A 2007–2010 National Health and Nutrition Examination Survey (NHANES) suggests that about one-third of vegetables are consumed outside the home (12.7 percent in full service restaurants, 12 percent in fast food restaurants, and 8.4 percent through other channels such as school food service.)

This suggests that consumer spending at retail for greens in Oregon may be as follows:

| CONSUMER SPENDING | Head Lettuce | Leaf Lettuce | Spinach | Collard Greens | Mustard Greens | Turnip Greens | Escarole Endive | Kale |
|-------------------|--------------|--------------|---------|----------------|----------------|---------------|-----------------|--------|
| Oregon | \$33.8 | \$54M | \$14.2M | \$4.9M | \$2.3M | \$2.2M | \$2M | \$1.7M |
| Multnomah Co. | \$6.5M | \$10.4M | \$2.7M | \$943K | \$437K | \$421K | \$382K | \$328K |
| Jackson Co. | \$1.8M | \$2.8M | \$747K | \$257K | \$119K | \$115K | \$104K | \$89K |
| Bend | \$682K | \$1.1M | \$287K | \$99K | \$46K | \$44K | \$40K | \$34K |
| La Grande | \$113K | \$180K | \$47K | \$16K | \$7K | \$7K | \$6.5K | \$5.6K |

Table 11.7: Estimated consumer spending on greens in Oregon.

ERS price-spread figures suggest that in 2012 the farm price for head lettuce is about 21 percent of the final retail price. The average across a “market basket” of fresh vegetables was 23 percent of the final retail price. This has bearing on evaluating the real scope of opportunity in markets referenced above.²¹⁴

11.6. Market Channels

Salad and cooking greens make their way from farm to market through a number of channels both direct and wholesale.

11.6.1. Direct Market

Oregon farmers reported a total of \$44.1 million in sales direct to consumers in 2012—an average of just over \$6,600 for each farm reporting direct sales. It can be assumed that at least two-thirds of sales through farmers’ markets, farm stands, CSAs, and other direct market channels are of fresh produce—representing about \$29 million. BLS consumer spending figures suggest that 46 percent of fresh produce sales will be for vegetables. ERS figures suggest that at least 42 percent of that subtotal will be for salad and cooking greens.

²¹⁴ “Price Spreads from Farm to Consumer: Overview,” USDA, ERS, 2015.



This implies about \$5.6 million spent on direct market greens, much of which will be organic or marketed as “grown with organic practices,” which could translate to about 1.7 million pounds of lettuce and 250,000 of other mixed greens. If true, this would be 1.8 percent of lettuce and 1.7 percent of other greens consumed in the state.

11.6.2. Processing/Manufacturing

The 2012 USDA Agricultural Census does show small numbers of Oregon farmers raising collard greens, kale, mustard greens, and spinach for processing. About half of Oregon’s spinach crop goes to processing. USDA does not disclose dedicated acreage for other crops in order to preserve confidentiality.

11.6.3 Retail

US Census County Business Patterns data indicate there were 763 grocery stores.

Many grocery stores are outlets of major chains, like Safeway and Kroger, which do carry conventional and organic produce from local farm suppliers. Both Safeway and Fred Meyer stores in Portland identify local lettuce and cooking greens with shelf tags, which in some cases name the farm. Cal Farms (Oregon City) and others have also been featured on billboards as part of a Fred Meyer advertising campaign.

There are also about 80 independent or natural food stores, like New Seasons Market (12 stores), Market of Choice (9 stores), Whole Foods Market (8 stores in Oregon), Zupan’s (4 stores), and about a dozen cooperative grocery stores (like People’s Food or Oceana Natural Food), that may be most dedicated to relationships with local suppliers.

Grocery Headquarters reported in 2011 that sales of cooking greens averaged \$337 per store per week.

The Nielsen Perishables Group reported that 2013 sales of lettuce averaged \$1,334 per store per week, and that sales of bagged salad mixes averaged \$3,286 per store per week.

Private labels now represent the largest segment of the bagged salad market, with 29.7 percent of sales.

If the 80 independent stores in Oregon had local/regional fresh greens representing half of total sales, the resulting need would be 3.9 million pounds of lettuce and 928,000 pounds of other greens annually. Those figures represent about 4.2 percent of Oregon lettuce consumption and about 6.5 percent of Oregon greens consumption.

If the remaining 683 chain grocery stores in Oregon had local/regional fresh greens representing 10 percent of total sales for 6 months out of the year, the

resulting need would be 3.3 million pounds of lettuce and 793,000 pounds of other greens annually. Those figures represent about 3.5 percent of Oregon lettuce consumption and about 5.6 percent of Oregon greens consumption.

11.6.4. Restaurants

US Census County Business Patterns data indicate there were 3,974 full-service restaurants (not including limited service “fast food”) and 123 catering companies in Oregon in 2012. The top 10 percent may be considered “fine dining” and more likely to be engaged in procurement of local products (though primarily through wholesalers).

The NHANES study referenced above suggests that 12.7 percent of vegetables are consumed in full-service restaurants. (A separate breakout for “dark green vegetables” is even higher at 18.2 percent.) That in turn implies that 397 Oregon restaurants (10 percent) represent a market for at least 1.2 million pounds of lettuce and about 180,000 pounds of other greens—or about 1.3 percent of lettuce consumption and 1.3 percent of other greens consumption.

11.6.5. Farm to Hospital

Health Care Without Harm (HCWH) is an international environmental health organization that supports sustainable food procurement at hospitals and healthcare facilities. A 2007 survey by Oregon Center for Environmental Health resulted in detailed reports of lettuce purchases from six regional hospitals. Combined, the six institutions represented 1,726 hospital beds and reported purchasing:

Table 11.8: Greens purchasing by six Oregon hospitals, 2007.

| Product | Pounds/Yr. |
|-------------------------------|------------|
| Head Lettuces (whole) | 6,360 |
| Leaf Lettuces (whole & dices) | 69,984 |
| Salad Mixes | 26,544 |

Extrapolating from those six institutions to Oregon’s thirty-three private hospitals and 6,008 total hospital beds, this suggests hospitals could represent an annual market for:

Table 11.9: Estimated purchasing of greens by Oregon hospitals.

| Product | Pounds/Yr. | Percent OR Consumption |
|-------------------------------|------------|------------------------|
| Head Lettuces (whole) | 22,138 | |
| Leaf Lettuces (whole & dices) | 243,606 | |
| Salad Mixes | 92,396 | |
| Total | 358,140 | 0.4 percent |

Other greens were not included in the survey. But if hospital purchases of other greens were proportionate with consumption, it would imply a need for 49,000pounds of greens—about 0.3 percent of Oregon consumption.

With an additional 12,403 beds in Oregon’s licensed nursing care facilities, there is potential for the health care sector’s demand to be even greater.



Conclusions should be tempered with the knowledge that price remains a major consideration for foodservice in healthcare. The added value of local products from smaller farm suppliers may not be enough to justify paying a price premium.

11.6.6.66 Farm to School

School Food FOCUS is a national collaborative that is working with fifteen large school districts across the US (including Portland Public Schools and the Beaverton School District) to make school meals nationwide healthier, regionally sourced, and sustainably produced.

In Oregon, approximately 24 percent of school food budgets are spent on local food—the highest percentage in the nation. (USDA, 2014) Schools, with limited budgets and limited ability to prepare fresh foods, offer an interesting procurement challenge. Portland Public Schools (PPS) has enrollment of about 46,000 students, serves 11,000 breakfasts (24 percent participation) and 21,000 lunches daily (46 percent participation).

Portland Public Schools follows guidelines that call for serving at least one-half cup of dark green vegetables per week. The district also lists a number of local farmer suppliers on its website.²¹⁵

Portland Public Schools offers a fruit and veggie bar allowing students unlimited access to two types of vegetables and two types of fruit and fresh salad greens. One-half cup of fresh, raw, chopped leafy greens is considered equivalent to one-quarter cup of dark green vegetables for purpose of compliance with school lunch program requirements. USDA purchasing guidelines state that 4.8 pounds of Romaine lettuce or 6.9 pounds of leaf lettuce will yield one hundred quarter-cup servings after being trimmed and chopped.

The school district also features locally grown kale in its Harvest of the Month promotion for February 2015. USDA purchasing guidelines state that 8.5 pounds of fresh, raw kale will yield one hundred quarter-cup servings after being trimmed, cooked, and drained.

One-eighth cup is the smallest recognized serving size for vegetables.

If local lettuce were featured in salad bars on a daily basis for at least half the school year (90 days) and half of participating students (10,500) consumed a minimum a quarter-cup of fresh, chopped lettuce, PPS would require 945,000 million total servings, which would in turn require 65,205 pounds of leaf lettuce.

If cooked local greens were featured in meals four times during the school year, and students receive the minimum one-eighth-cup serving, PPS would

²¹⁵ “Real Food with Local Flavors,” Portland Public Schools, (n.d.).

require 84,000 servings, which would require 3,570 pounds of fresh kale or similar quantities of other greens.

Extrapolating to the 567,000 students enrolled in districts across Oregon suggests a need for 803,700 pounds of leaf lettuce and 44,000 pounds of other greens.

Extending that scenario to the approximately 190,000 students enrolled in Oregon universities and colleges suggests a need for another 270,000 pounds of lettuce and 15,000 pounds of other greens.

11.7. Demand Summary

Combining the estimates provided for retail, restaurants, hospitals, and educational institutions suggests there is potential demand in Oregon for at least 9.8 million pound of local lettuces, and about 2 million pounds of other local greens. Those totals represent about 10.5 percent of all lettuces and about 14 percent of other greens consumed in Oregon—but, as seen below, more than 150 percent of all lettuce currently produced in Oregon, with the greatest shortfall in head lettuces.

The breakdown by channel for lettuces is as follows:

- Retail: 73% ~7.2 million lbs.
- Restaurants: 12% ~1.2 million lbs.
- Education: 11% ~1.1 million lbs.
- Hospitals: 4% ~358,000 lbs.

On the surface, it appears Oregon lettuce farmers have at least a 1.6-times opportunity to expand local markets.

The breakdown by channel for other greens is as follows:

- Retail: 85% ~1.7 million lbs.
- Restaurants: 9% ~180,000 lbs.
- Education: 3% ~59,000 lbs.
- Hospitals: 3% ~49,000 lbs.

Production figures in the next section suggest that Oregon farmers are likely meeting close to 100 percent of local demand for fresh kale and turnip greens in season, about 70 percent of demand for fresh spinach, and a significant percentage of demand for mustard greens. However, these products are not consistently being identified as local, which may be limiting opportunities for value-add.

The critical shortages across both categories are likely for certified organic crops.

11.8 Oregon Greens Production

The 2012 USDA Census of Agriculture shows a total of 163 farms in Oregon reported sales of lettuces raised on 255 total acres. Lettuces and other greens are minor crops in Oregon and breakdowns are not provided by size of operation or by production.

The production estimates that follow are based on crop budgets published by Oregon State University, using a midrange figure for yield per acre that might be expected.

Table 11.10: Estimates of Oregon production of greens.

| | Farms | Acres | Production | | % of Oregon Consumption |
|-------------------------|-------|-------|------------|-------------------|-------------------------|
| | | | Heads | Pounds | |
| Head Lettuce | 39 | 13 | 218,400 | 409,500 | 0.8% |
| Romaine & Leaf Lettuce | 134 | 241 | 5,775,600 | 5,594,800 | 13.3% |
| Total Lettuces | | | | 6,004,300 | 6.4% |
| Collard Greens | 9 | 11 | | 165,000 | 5.3% |
| Escarole/Endive | - | - | - | - | - |
| Kale | 119 | 100 | | 3,800,000 | 323.2% |
| Mustard Greens | 14 | 42 | | 630,000 | 40.2% |
| Spinach | 45 | 407 | | 7,163,200 | 130.6% |
| Turnip Greens | 15 | 300 | | 4,500,000 | 287.1% |
| Total Leafy Veg. | | | | 16,258,200 | 115.2% |

Meeting a great percentage of Oregon's consumption of lettuces will require increasing production—by enrolling additional acres, by implementing season extension strategies to enable harvests over a greater portion of the year, and by developing post-harvest handling capacity to improve product quality and limit losses due to wilting and spoilage.

11.9. Oregon Greens Infrastructure

11.9.1. Season Extension—High Tunnel Hoop Houses

Lettuce and spinach in the Willamette Valley typically yield two crops per year. Some hardier greens, such as kale and chards, can be grown year-round, but may fair poorly in hot summer sun. High tunnel hoop houses offer a means to extend the production season and control environmental conditions. One study suggests that high tunnels can lengthen the growing season from 1 to 4 weeks in the spring, and 2 to 8 weeks in the autumn (Wells and Loy, 1993)—but there are also examples of farmers growing greens year round using tunnels.

Iowa State University’s Ag Decision Maker notes:

High tunnels enable growers to increase their profitability in several ways:

- They extend the growing season in the spring and fall allowing earlier and later production of cool and warm-season crops.
- Crop quality and yields can be improved through better climate, water, and nutrient management, and a reduced incidence of plant diseases.
- They allow for better labor efficiency because planting, maintenance, and harvest can be performed without being affected by weather.
- Growers often receive higher prices for out-of-season crops.

The estimated cost to construct a 2,160-square-foot-high tunnel (30 feet by 72 feet—84 percent usable space) is \$7,000.

Production and gross receipts with such a tunnel were estimated as follows:

| | Yield per Sq. Ft. | \$ per lb. | Gross per Sq. Ft. | Yield per Crop | Gross per Crop |
|---------|-------------------|------------|-------------------|----------------|----------------|
| Greens | 0.46 lbs. | \$7.00 | \$3.22 | 835 lbs. | \$5,842.37 |
| Lettuce | 1.15 lbs. | \$7.00 | \$8.05 | 2,087 lbs. | \$14,605.92 |

Table 11.11: Production and gross receipts for greens grown in high tunnels.

A study of high tunnel production in Washington found that tunnel-grown lettuce had three times greater marketable yield compared with field-grown.²¹⁶ However, tunnels are not a panacea. The study also found that labor costs were six times higher in a high tunnel than in the open field. While still profitable to grow lettuce in a tunnel, it was 43 percent more profitable to grow in an open field—suggesting that use of tunnels will be less competitive during the peak-growing season.

The authors did note, however, that their sample was small, there is a learning curve associated with maximizing production and minimizing costs, and that economies of scale may be possible with more tunnels in operation. Tunnels can also significantly reduce stress on plants affecting crop quality and risk of crop loss (due to frost, hail, etc.)

Barriers to more widespread adoption of high tunnels were also noted as follows:

“high cost of tunnel production in terms of capital investment, time, and effort; lack of experience with tunnel set up and management; lack of horticultural experience with crops requiring high labor input; low knowledge base to manage tunnel operation, maintenance, and repairs;

²¹⁶ “Economic Profitability of Growing Lettuce and Tomato in Western Washington under High Tunnel and Open-field Production Systems,” Suzette P. Galinato and Carol A. Miles, HortTechnology, 2013.



and lack of understanding of the optimal planting dates and varieties for production.”²¹⁷

Other opportunities to consider may be repurposing of under-utilized greenhouses and development of hydroponic or aquaponic production. Some informants have suggested that with the recent recession, a number of nurseries have greenhouses that have been taken out of production. There are also a small but growing number of start-up businesses raising lettuce hydroponically (Next Season, Bend) or in combination with on-land fish farming (The Farming Fish, Rogue River).

11.9.2. Labor

Labor is clearly a factor for greens production. The Washington study found that labor represented 58 percent of total cost for both field-grown and tunnel-grown lettuce.²¹⁸ A 2011 University of Kentucky study estimated that high tunnel greens production in a 1,920-square-foot tunnel could require between 70 and 150 hours of labor depending on the crop mix (less with greens and head lettuce, more with leaf lettuce or herbs).

Given the small number and smaller size of farms raising lettuces and greens in Oregon (limiting implementation of technologies employed in California and Arizona), access to labor (ten dollars/hour for field work, twelve dollars/hour for equipment operators) may actually be the single most limiting factor for increasing production.

11.9.3. Post-Harvest Cooling and Handling

As important—or more important—than total production of lettuces and greens is the capacity to deliver products to distributors, food service, and consumers in marketable condition. A number of informants remarked that investments in post-harvest handling by farmers in California ensure that their products can arrive in Oregon markets two to three days after harvest in better condition than Oregon products harvested the same or prior day.

In summer heat, lettuces cut and allowed to sit in fields wilt quickly. The scale of agriculture in California allows almost immediate transfer of cut produce by truck to cold rinse to quickly reduce temperature and contaminants that may promote spoilage. This will be less of a concern in high-tunnel production, with better ability to moderate extremes of temperature, but growers may still benefit from investments in owned or shared facilities to quickly wash and cool greens to increase the marketable quantity, quality, and shelf-life of produce. Combining quality with local origin, even at a higher price, seems a path to success.

²¹⁷ “Economic Profitability of Growing Lettuce and Tomato in Western Washington under High Tunnel and Open-field Production Systems,” Suzette P. Galinato and Carol A. Miles, HortTechnology, 2013.

²¹⁸ “Economic Profitability of Growing Lettuce and Tomato in Western Washington under High Tunnel and Open-field Production Systems,” Suzette P. Galinato and Carol A. Miles, HortTechnology, 2013.

11.9.4. Aggregation and Distribution

With the small number and smaller size of farms raising lettuces and greens in Oregon, it seems unreasonable to expect that any single grower-shipper could emerge in the near term capable of satisfying a meaningful percentage of identified demand. More likely is that growers will aggregate product under a single brand, either as contracted suppliers or as member-owners. Given the proximity of Portland/Vancouver, Salem, Corvallis, and Eugene as markets and the need to take advantage of existing labor pools, it may be advantageous for the brand or cooperative to be based in the Willamette Valley. One or more strategically placed growers may be host to post-harvest handling and aggregation sites—facilitating transfer of full truckloads of washed and cooled greens to distribution centers. Lower land costs and reduced competition may also make smaller-scaled production profitable outside population centers in southern, eastern, and coastal Oregon.

11.10. Conclusions

Oregon farmers are likely already meeting a significant percentage of in-state demand for kale, a crop that is attaining status for nutritive benefits and use in the trending “healthy” snack food, kale chips.

Oregon farmers are capable of meeting demand for turnips greens and spinach, but it is unclear what percent of production is actually consumed in state. Both products are increasingly marketed in packaged form (washed and bagged)—capacity for which Oregon lacks at any meaningful scale. Lettuces of all types are also increasingly consumed in washed and bagged form or as prepared salads.

Meeting a great percentage of Oregon’s consumption of lettuces will require increasing production—by enrolling additional acres, by implementing season extension strategies to enable harvests over a greater portion of the year, and by developing post-handling capacity to improve product quality and limit losses due to wilting and spoilage.

Combining the estimates provided for retail, restaurants, hospitals, and educational institutions suggests there is potential demand in Oregon for at least 9.8 million pound of local lettuces—about 150 percent of current production.

Producing an additional 3.8 million pounds of lettuces would require construction of some 440 to 585 2,160-square-foot high tunnels (assuming 3 to 4 instead of 2 crops per year) at a total cost of \$3.1 to \$4.1 million. A cost-share program available to farmers from the Natural Resources Conservation Service could reduce that cost by half—from \$1.55 to \$2.05 million.

University of Kentucky figures suggest that the labor required to operate that number of high tunnels could be between 66 and 143 full-time employees, with combined annual wages between \$1.4 and \$3 million.