



Supply Chain Development for Vermont-grown Organic Mesclun

Project Summary

The Intervale Center completed the following feasibility study for an aggregated product line of Vermont-grown, organic mesclun product for sale through local and regional market channels. We documented current Best Management Practices, conducted a market analysis to assess potential demand and developed financial models to evaluate cost of production and market pricing. Through this research, we concluded that:

- While market opportunity exists in both local and regional markets, price is the most limiting factor to increasing demand for local product.
- Harvest and post-harvest labor are the two biggest expenses in small-scale production of organic mesclun. Creating efficiencies in these areas is essential to lowering production costs and increasing profitability.
- Post-harvest processing practices require a high level of management and oversight to ensure an end product that meets both quality standards and consistent supply in the marketplace.
- Regional market channels may require increased product liability coverage and food safety certifications. Producers at any scale should be aware of and follow current FSMA regulations.
- An aggregator model for mesclun would be beneficial to manage end-product quality, increase supply, build efficiencies in scale, and meet increased food safety requirements in the marketplace. That being said, current market demand is not large enough to warrant a separate aggregator to increase supply and build efficiencies in scale. Greater production and market analysis needs to be conducted to determine the appropriate scale and point in the supply chain for aggregation.

What follows is a summary of best practices, market analysis and financial models that we have developed to assist farmers, processors, distributors, service providers, and others interested in food system development to better understand the feasibility of aggregated mesclun for Vermont farmers.

Best Management Practices

Organic Mesclun Production

Mesclun, also known as salad mix or spring mix, is a mixture of tender, bite-size salad greens. There are two main crops that are grown to produce mesclun in Vermont, baby lettuce and mustard greens, including many varieties of each crop. Until recently, the majority of mesclun crops have been grown by planting seeds densely in bare soil and harvesting individual leaves when young. With the introduction of Salanova, a new lettuce variety that maintains small leaves when grown to a mature head, production has transformed to include field transplanting of greenhouse-grown plugs and in some cases use of plastic mulch.

Mesclun production requires a high level of management with attention to detail. It is a fast growing crop, and proper handling practices are key, given that it is delicate and highly perishable. While there are many challenges, mesclun production can provide great rewards because of the small window from planting to market, providing short-term income and eliminating much of the risk associated with investing in long-season crops.

The following Best Management Practices are based on information provided 5 Vermont farmers who produce certified organic, field-grown mesclun at a small scale (equal or less than 1/8 acre plantings). It is an average representation of the current production systems being utilized. Overall, farms in this group have very similar practices with slight variation based on a specific farm's soil, equipment, markets, labor capacity and management preferences.

Production Cycle

In Northwest Vermont, the growing season for mesclun is approximately seven months, from mid-April through October, depending on the date of first and last frosts. Growers have been able to extend the season using row covers and low tunnels, and it is common to harvest 22-26 weeks of the year.

First planting begins in mid-April with first harvest in mid-May. Time from planting to harvest ranges from four to six weeks, depending on variety planted and ambient temperature. Final planting occurs in early to mid-September. As temperature decreases in the fall, growers over-plant or "stockpile" crops at the end of the season to accommodate for slower plant growth and extended harvests.

Soil Preparation

It is very important to prepare soil properly when producing mesclun to ensure a clean, residue-free seed bed for direct seeding crops. For spring seeding, having bare-fallow ground or a winter-killed cover crop with quick incorporation enables an early start to the season. Most growers use disc harrows for primary tillage followed by a rototiller or a bed-size field cultivator for secondary tillage and bed formation. Bed sizes range from 30-48 inches on top. Preparing beds three to four weeks in advance and using stale seed bed techniques helps to reduce weed pressure, which can become a significant cost, hindering harvest efficiency and quality control. For Salanova lettuce, raised beds with black plastic mulch have shown promise to reduce weed pressure.

Seed Selection

There are numerous factors to consider when choosing which varieties of seed to use in mesclun production, including production efficiency, appearance, taste, disease resistance, re-growth rate, yield, and texture. Most growers source seed from Johnny's Selected Seeds in Maine and High Mowing Organic Seeds in Vermont. Salanova has become the dominant lettuce variety chosen for mesclun production, specifically the incised types. When direct seeding lettuce, romaine and oak leaf varieties are preferred. Red Russian kale, arugula, tatsoi, mizuna and red giant mustard are the top choice varieties for mustard greens.

Planting

Planting normally occurs on a weekly basis. Depending on the time of season and forecast, growers will delay or advance planting to adjust for varying degree days and to avoid inclement conditions for germination. If planting is delayed, re-growth from previous plantings can be used to buffer supply shortages.

Planting equipment includes a mix of hand held and tractor based tools. The size of planting is the determining factor on which tool is most efficient. Both hand-held push seeders, such as the Jang JP-1 Precision Seeder, and tractor mounted high-density seeders, such as ones developed by Sutton Agricultural Enterprises, are used for direct seeding. Transplanting lettuce plugs is either done by hand or with the use of a water wheel transplanter.

Direct seeded crops are planted at a rate of 30-40 seeds per foot depending on variety with anywhere from six to 12 rows per bed. Salanova is transplanted bare ground or into plastic mulch at three rows

per bed with six inches to one foot in-row. For some growers, density is determined by current weather conditions. When temperature increases and more moisture is present, growers will reduce density to allow for increased airflow, helping to prevent disease.

Irrigation

Irrigation is mainly needed to ensure proper seed germination and crop establishment, especially during drought conditions. Overhead irrigation is the most common system. Depending on soil type, there is enough natural rainfall and soil moisture to sustain mesclun crops in the three to four week growth period before harvest. That said, irrigation is an important tool for maintaining a consistent production cycle and should not be absent from a grower's tool kit.

Fertility

Nitrogen is the most limiting nutrient when producing baby greens. Pre-plant application with a granular fertilizer, such as Krehers 5-4-3 composted chicken manure applied during tillage is most common in organic production systems. Using a field rotation that includes green manures and pastured poultry has shown to be effective in providing significant fertility to produce healthy greens.

Weed Control

Initial cultivation includes stale seed bed techniques during bed preparation and planting phase of production. This includes use of a flame weeder, both pre- and post- planting, or multiple passes using a tractor-mounted basket or flex-tine weeder prior to seeding. After a crop is established, cultivation for direct seeded crops normally includes one hand weeding before harvest. For transplanted lettuce, mechanical cultivation using a basket weeder or beet knives is used when plants are small. Prior to harvest, hoeing and/or hand weeding one to two times is necessary. If plantings are maintained for a second harvest, one additional hoeing or hand weeding is needed. When planted into plastic mulch, mechanical cultivation is used to control weeds along plastic edges and wheel tracks. In the spring and especially the fall, weed pressure is reduced, and hand weeding may not be necessary before harvest.

Pest Management

Flea beetles are the major insect pest in mesclun crops, specifically in mustard greens. Row covers applied directly after planting are essential for exclusion. Rhizoctonia (bottom rot) and Downy Mildew are the two major disease causing organisms of concern. Managing planting density to increase airflow and using disease resistant varieties are the main strategies for control. Salanova has shown to be very resistant to Rhizoctonia. Other pests can include deer and small animals, which can be controlled with electrical fencing.

Harvest

Hand-harvesting with lettuce knives is the most effective way for small-scale growers to ensure quality control and increase yield in variable conditions. Average yield for first cut is half a pound per bed foot for most mesclun crops. Salanova has shown potential to yield up to one pound per bed foot. Harvest standards include leaf size at a height of three to six inches with stem length at a maximum of three to four inches. While harvest labor is the largest production expense, it is important that growers get the most out of small plantings and work around pest and disease damage. That said, hand harvesting requires increased labor, and in turn, increased management to ensure the same quality standards are being met by each harvester. Mechanical harvesting equipment can greatly reduce labor cost and yield a consistent product, but it requires a greater level of consistency through the crop establishment process as well as the proper scale to justify the expense and potential decrease in yield per bed foot.

Post-harvest processing

The second largest expense and most critical process to ensure quality control in mesclun production is post-harvest processing, which includes cooling, washing, drying, sorting and packaging. Hydro-cooling immediately from the field is essential to maintain freshness and extend shelf-life. A triple-rinse washing system is the most effective way to produce a clean and safe product.

Most growers use a manual and low-tech system for post-harvest processing. This system includes the use of bulk stock tanks to immerse greens in water for cooling, cleaning and combining individual greens to form a proper mixture. Using a net system, greens are dunked and transferred between tanks with minimal handling. Large paddles are used to mix and agitate during the washing process.

Once greens are cooled and washed, greens are transferred to drying equipment. Most growers use repurposed washing machines to spin-dry greens, while others use commercial salad spinners, such as the Electrolux Greens Machine. Drying greens tends to create a bottle neck in the process due to limited capacity, but it is important for greens to be as dry as possible to extend shelf-life. A final step in the process can include a further drying and inspection step, where greens are laid out on a sorting table and graded before being packaged.

Packaging

Processed greens are packed in food-grade plastic bags for sale. For retail sales, a five to eight ounce pack size is most common, along with a three to five pack size for bulk sales. Bags are then packed into cardboard or wax boxes or re-useable plastic containers for distribution. Packaging is done almost entirely using manual labor, which favors bulk packs as more efficient and cost-effective.

Market Analysis

Our research examined price and demand data as well as anecdotal evidence from buyers of various local and regional market channels including retailers, distributors and institutions. We analyzed seven market channels for organic mesclun. All markets indicate locally grown, organic mesclun is in demand in both retail and bulk packaging. However, price and availability are the most limiting factors to increasing local market opportunity as well as regional market entry.

Mesclun Demand

Salad greens represent an overwhelmingly large share of total fresh produce purchases in the marketplace. While head lettuce remains popular, consumer trends have consistently favored convenience, increasing demand for more ready-to-eat products such as pre-washed, chopped lettuce and mesclun. The industry has taken advantage of this trend and what was once a premium, niche product is now produced as a commodity. Wide accessibility through large scale, automated production has driven down prices, especially for conventionally grown mesclun.

Within the various markets examined in this study, the majority of mesclun is supplied by national brands. Demand in individual local markets ranged widely from approximately 2,000lbs to 100,000lbs annually with local product representing anywhere from 25% to 50% of purchases when available. Currently no significant amount of locally grown mesclun is supplying regional markets, as the majority is sold into local channels. It is mostly sold in bulk and almost entirely organically produced. Consistent quality has been anecdotally cited as a limiting attribute of local supply, but the most limiting factors to increased market growth are price and annual availability. Opportunity exists for locally grown mesclun in shorter supply chains, as retail prices have remained high, ranging from \$10 to 14/lb.

Current wholesale pricing for organic mesclun averages \$5.50/lb for local product direct from farm and \$5/lb for non-local through distributors. If sold through a distributor, local product is estimated to sell at \$6.88/lb. Conventional non-local product averages \$3.25/lb through distributors. This disparity in wholesale pricing has caused some buyers to completely rule out purchasing local product. Even buyers who prioritize local are balancing purchasing expenses by supplementing locally grown mesclun with non-local product throughout the year. Finding solutions to reduce production costs and lower wholesale prices during the growing season will increase market access both locally and regionally. Both retail and bulk packages have potential for increased demand, but production analysis indicates bulk is a more viable option. The market favors larger suppliers when it comes to retail packaging, as more expensive containers, such as plastic clamshells, are desired. Efficiencies in scale through bulk purchasing of supplies and automation in packing lines are required to compete in this category.

Sample Enterprise Budgets

The following sample enterprise budgets are based on a hypothetical farm that represents the average scale of production for farms within the Intervale Food Hub supplier network. All budgets are calculated for a farm ownership model with associated capital and fixed costs. Many assumptions have been made, and cost of production will vary based on a specific business's unique financial situation.

Mesclun Budget Assumptions

The example farm includes a small-scale mesclun enterprise, which represents 50% of total farm income, and assumes an equal proportion of the farm mortgage and fixed expenses, including land taxes and \$1 million in liability insurance.

The farm has a mortgage of \$250,000 for 30 years at 3.5%, with a farm purchase price of \$300,000. This includes existing building structures that could be renovated to house mesclun processing and storage areas, as well as farmer housing.

The mesclun enterprise utilizes a three acre land base per year in order to harvest a 1/8 acre area weekly for a total of 24 weeks. Each 1/8 acre assumes a yield of 800lbs of greens, consisting of 75% lettuce and 25% mustard greens. There is 5% shrink built into the budget to account for loss throughout the production process.

Lettuce production is based on using Salanova varieties and associated production costs such as greenhouse plug production, field transplanting and use of plastic mulch are included. It is assumed the farm owns a greenhouse for plug production. Greenhouse maintenance includes material and installation costs to replace the plastic covering every five years.

The final product sold is split 50/50 between retail and bulk pack at \$6/lb and \$5.50/lb respectively. Pricing is based on the current average market price for local, certified organic mesclun.

Labor is based on a rate of \$15/hour, which includes all payroll expenses. Labor is calculated for all required labor unless listed separately, which could include labor performed by farm owners. Harvest productivity is estimated at 25lbs per hour. Post-harvest labor includes washing, packing and delivering product. Productivity is estimated at 50lbs per hour for washing and packing. Delivery includes four hours of labor with a total of 60 miles driven per week. Marketing and sales labor assumes management of 12 sales accounts requiring two hours of labor per week.

The enterprise assumes a line of credit to purchase supplies at the start of the growing season as well as an operating loan to purchase equipment and infrastructure. The \$25,000 line of credit is assumed to have a 7% interest rate with the principle being paid back within 12 months. The \$113,536 operating loan is assumed to have a 5% interest rate with a 7-year term.

For more information, please contact:

Intervale Center
180 Intervale Road
Burlington, VT 05401
802-660-0440
www.intervale.org



Sample Budget for Small Mesclun Enterprise

Income	Unit	Quantity	Price/unit	Total	Cost/unit	% cost
Mesclun	lb	18,240	\$ 5.75	\$ 104,880.00		
Total Income				\$ 104,880.00		
Expenses						
Variable						
Potting soil	yard	7.00	\$ 105.00	\$ 735.00	\$ 0.04	1%
Seed flats	ea	1200	\$ 1.58	\$ 1,899.24	\$ 0.10	2%
Seed, cover crop	lb	600	\$ 2.00	\$ 1,200.00	\$ 0.07	1%
Seed, lettuce				\$ 2,500.00	\$ 0.14	2%
Seed, mustards				\$ 850.00	\$ 0.05	1%
Plastic mulch	ft	14400	\$ 0.03	\$ 381.60	\$ 0.02	0%
Row cover	ft	9600	\$ 0.08	\$ 796.80	\$ 0.04	1%
Fertilizer	lb	2400	\$ 0.24	\$ 576.00	\$ 0.03	1%
Labor - production	hours	468	\$ 15.00	\$ 7,020.00	\$ 0.38	7%
Labor - harvest	hours	768	\$ 15.00	\$ 11,520.00	\$ 0.63	11%
Labor - post-harvest	hours	734	\$ 15.00	\$ 11,010.00	\$ 0.60	10%
Labor - marketing/sales	hours	48	\$ 15.00	\$ 720.00	\$ 0.04	1%
Packaging supplies				\$ 2,500.00	\$ 0.14	2%
Fuel - tractor	gal	100	\$ 3.00	\$ 300.00	\$ 0.02	0%
Fuel - greenhouse heat	gal	200	\$ 3.00	\$ 600.00	\$ 0.03	1%
Electricity - greenhouse/processing	month	9	\$ 30.00	\$ 270.00	\$ 0.01	0%
Delivery	miles	1440	\$ 0.54	\$ 777.60	\$ 0.04	1%
Equipment repairs and maintenance				\$ 500.00	\$ 0.03	0%
Greenhouse maintainence				\$ 140.00	\$ 0.01	0%
Interest on operating capital				\$ 1,774.00	\$ 0.10	2%
Total Variable				\$ 46,070.24	\$ 2.53	44%
Fixed						
Insurance				\$ 2,500.00	\$ 0.14	2%
Taxes				\$ 3,000.00	\$ 0.16	3%
Mortgage				\$ 8,131.74	\$ 0.45	8%
Total Fixed				\$ 13,631.74	\$ 0.75	13%
Total Expenses				\$ 59,701.98	\$ 3.27	57%
Net Income				\$ 45,178.02		
Loan for Start-up/Capital expense				\$ 19,300.92	\$ 1.06	18%
Net after Capital Expense				\$ 25,877.10		
Net after Capital without Paid Labor				\$ 60,653.10		
Cost/lb after Capital Expense					\$ 4.33	
Net/lb after Capital Expense					\$ 1.42	

Capital Budget for Small Mesclun Enterprise

Item	# of units	Cost per unit	Total Cost
Field			
Greenhouse	1	\$15,000.00	\$15,000.00
Tractor	1	\$25,000.00	\$25,000.00
Mower	1	\$1,500.00	\$1,500.00
Fertilizer spreader	1	\$550.00	\$550.00
Disc harrow	1	\$1,500.00	\$1,500.00
Rototiller	1	\$1,750.00	\$1,750.00
Flame weeder	1	\$850.00	\$850.00
Mulch layer	1	\$5,000.00	\$5,000.00
Transplanter	1	\$3,000.00	\$3,000.00
Cultivation tools	1	\$2,000.00	\$2,000.00
Seeder	1	\$600.00	\$600.00
Irrigation	1	\$5,000.00	\$5,000.00
Shovels	2	\$25.00	\$50.00
Lettuce knives	6	\$15.00	\$90.00
Harvest containers	100	\$15.00	\$1,500.00
Scales	1	\$150.00	\$150.00
Processing			
Stock tanks	3	\$260.00	\$780.00
Fish nets	4	\$50.00	\$200.00
Paddles	2	\$40.00	\$80.00
Greens Machine dryer	2	\$3,000.00	\$6,000.00
Drying table	2	\$150.00	\$300.00
Scales	2	\$300.00	\$600.00
Bag taper	2	\$18.00	\$36.00
Processing room	1	\$10,000.00	\$10,000.00
8x10' cooler	1	\$12,000.00	\$12,000.00
Distribution			
Used refrig. box truck	1	\$20,000.00	\$20,000.00
Total Capital Expense			\$113,536.00