



University of California Cooperative Extension

Sonoma County

Agricultural Value Chains and Economic Impacts:

Dairy, Grass-Fed Beef and Grains in the North Bay

Lake, Marin, Mendocino, Napa, and Sonoma counties

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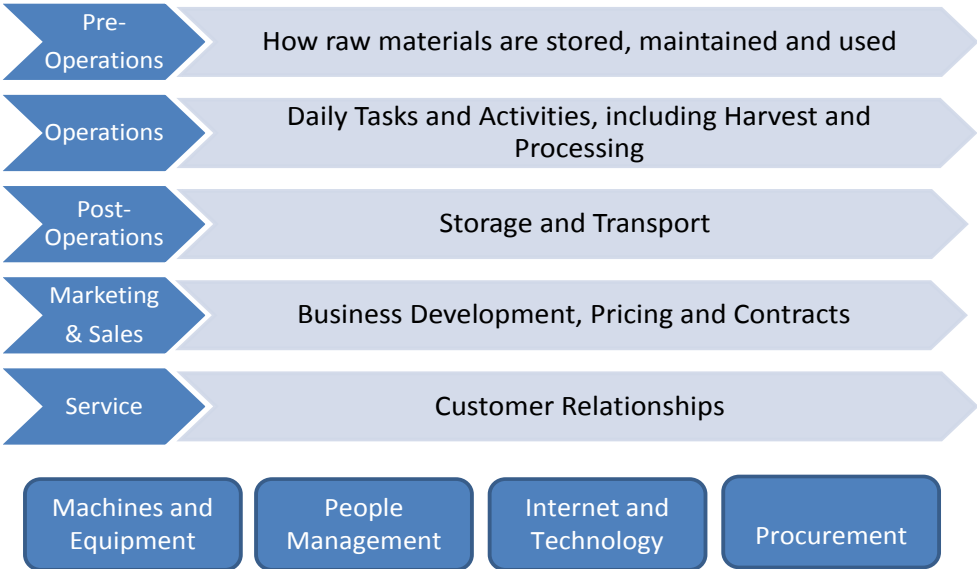
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Executive Summary

This report investigates the way farmers build value in their products for dairy, grass-fed beef and grain operations in the North Bay. Agricultural industries also build value in the community through their operations, suppliers, and businesses touched by farm workers and spending. This value begins building when farmers add value to raw inputs, such a milking operation to produce fluid milk from a cow. Like other production processes, farmers use inputs and services to add more value. Services purchased from third-party vendors can be seen as “allied” industries, which use farms and ranches as core clients. The supply chain for these services, retailers, wholesalers, and the farmers connects the regional industries financially.

Value chains also provide a way to compare each step of a production process and how it adds value as compared to an industry benchmark. The chain’s sum is the total value added or revenue generated by a firm or industry from its raw materials. Value chains also consider profit made as an “activity”. For each business in an industry, competitive advantage is built by doing one or more of these value-added tasks better than a competitor or the industry on average. A value chain can show policy makers where farmers and ranchers need help in either providing direct financial assistance, regional cooperation, or provide incentives to attract a regional supplier or service provider to lower costs and boost profits.

Figure EX-1: Typical Value Chain Components



Differences to industry benchmarks, especially regional comparisons to state and national models of firms in the same industry, provide policy makers with insight as to regional challenges for farmers, ranchers, and support industries. Figure EX-1 shows a typical supply chain. Farm value chains identify all activities on the farm, not those of other value-add products. Cheese making operations, for example, have their own value chain beyond a core dairy operation. Cheese as a final product uses fluid milk as a raw material. Supply chains link regional resources to support a larger number of farming operations and value-added goods and services.

The economic impact analyses provide estimates of how each agricultural business in this report affects both job creation and generating business and tax revenues in the North Bay. The specific economic impact analyses are based on 100 workers in each county for each industry. Policy makers can use these data to understand the broad economic impact that these agricultural industries have on the North Bay region, the other industries involved in both supplying and supporting agriculture, and how each industry’s expansion can affect the expansion of other businesses. Table EX-1 summarizes the multiplicative effects for operations in the dairy, grass-fed beef and grain farming on industries across the North Bay economy, not just those allied or associated with these ag industries. Industries as diverse as accounting and medical services, restaurants and dentists are affected by these businesses.

Table EX-1: Economic Impacts Summary, North Bay 2011

Ag Industry	North Bay Employment	Overall Employment	Overall Business Revenues	Overall Local/State Tax Revenues
Dairy (Fluid Milk)	100	131	\$19,144,000	\$768,000
Grass-Fed Beef	100	163	\$20,995,000	\$582,000
Grain Farming	100	121	\$7,529,000	\$212,000

1. Introduction

Agricultural industries provide economic impacts through farmers and ranchers adding value to crops or livestock. Grains harvested, milk produced, and calves raised are all value-added products. This report looks at three agricultural industries across five, North-Bay counties. Value chains describe each industry and show how these businesses build value from raw materials, such as seed, land and cows. Every business is assumed to seek competitive advantage, or an ability to generate more profit by doing one or more value-added tasks better than a competitor or the industry on average. Because of regional constraints, local agricultural producers may not be able to fully exploit their competitive advantages. The value chain can show policy makers where farmers and ranchers need help in either providing direct financial assistance, regional cooperation, or provide incentives to attract a regional supplier or service provider to lower costs and boost profits. For this study, the following agricultural industries are to be analyzed:

- Dairy Ranching: Sonoma and Marin counties;
- Grass-Fed Beef Ranching: Lake, Marin, Mendocino, Napa, and Sonoma counties; and
- Grain Farming: Lake, Marin, Mendocino, Napa, and Sonoma counties.

Allied industries, including trucking, storage, distribution, and processing of all types, provide value-added services that farmers cannot provide themselves. The services fill a need for farmers and ranchers at a cost. This is a critical idea in terms of understanding both the current state of local ranching and farming and also in building a local “ecosystem” for agriculture, specifically around dairies, grass-fed beef ranching and grain farming in this report. In some cases, there will few local options for certain services; in grass-fed beef, a large processing plant with an ability age beef in a refrigerated environment acts as an example. There may also be wholesale and retail customers of farmers, some of which may be a business associated with the farmer or farm operation directly; for example, a cheese manufacturer that buys fluid milk from a dairy owned by the same person or entity. To help inform the agricultural industries locally, value chains provide three major insights:

1. Identify relatively large costs of local ranching and farming versus industry benchmarks;
2. Identify major services that ranchers and farmers purchase from providers to add value to their products; and

3. Identify cost categories that ranchers and farmers could reduce through consolidation, cooperation or individually reducing costs.

If relatively high costs are due to an inability to source services or inputs at a low cost, policy makers and advocates for local agriculture can look at those activities as opportunities for local growth and expansion of supplier networks for farms and ranches.

The final section provides data on how each of these industries affects their communities in terms of economic impacts, using the value chain activities to estimate broader economic impacts of dairy, grass-fed beef and grain farming operations. Economic impacts show the jobs supported by a specific industry, business revenues generated, state and local tax revenues receive across a broad cross-section of companies in a defined region. We only look at the value added by farmers and ranchers to the primary agricultural product, not any additional, value-added products; for example, our look at dairy will not include cheese, yogurt, ice cream, butter, and other operations that use fluid milk as a raw material. The additional industries have their own value chains.

This study is broken into the following sections. Section 2 looks at what a value chain is and how it can be a strategic tool for farmers and ranchers. Section 2 also differentiates between value and supply chains and also speaks to similarities. Section 3 is an overview of the dairy industry and its regional, economic role in Sonoma and Marin counties. Section 4 is the grass-fed beef industry and its regional role in the North Bay counties of Lake, Mendocino and Napa, as well as Marin and Sonoma counties. Section 5 discusses the grain farming industry in the same North Bay counties. Section 6 discusses the economic impact methodology combined with the value chains to show affected industries. Section 7 provides conclusions and recommendations, and an appendix provides detailed data on the economic impact analyses.

2. Value Chains and How Farmers and Ranchers Can Use Them

Porter (1985) provided a way to graphically represent an industry or company's cost structure. This concept is known as the value chain.¹ The idea is simple. The sum of all a farmer's activities provides a total amount of "value added" or product revenue from combining raw inputs; each step or link along the chain adds value, but also comes with cost. Also, some steps may include the movement of an unfinished product to another country to be finished, making the value chain international.² Value chains show linkages between processes, costs and profits; these chains also identify major cost components for an industry or business to use for comparisons. For example, Figures 1a and 1b show an industry benchmark or a typical company's activities and proportions for overall activities. There are differences that signal possible changes the farmer can make to become more profitable; those differences can also signal how a regional industry may have disadvantages that organizations such as UC Coop can help to remove or reduce in terms of negative impacts on farms.

Figure 1a: Example Value Chain Diagram: Activities

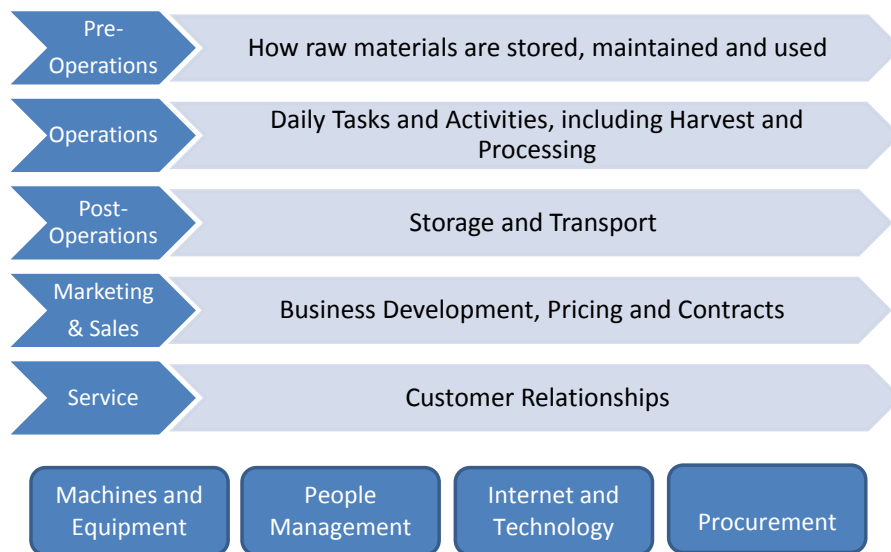


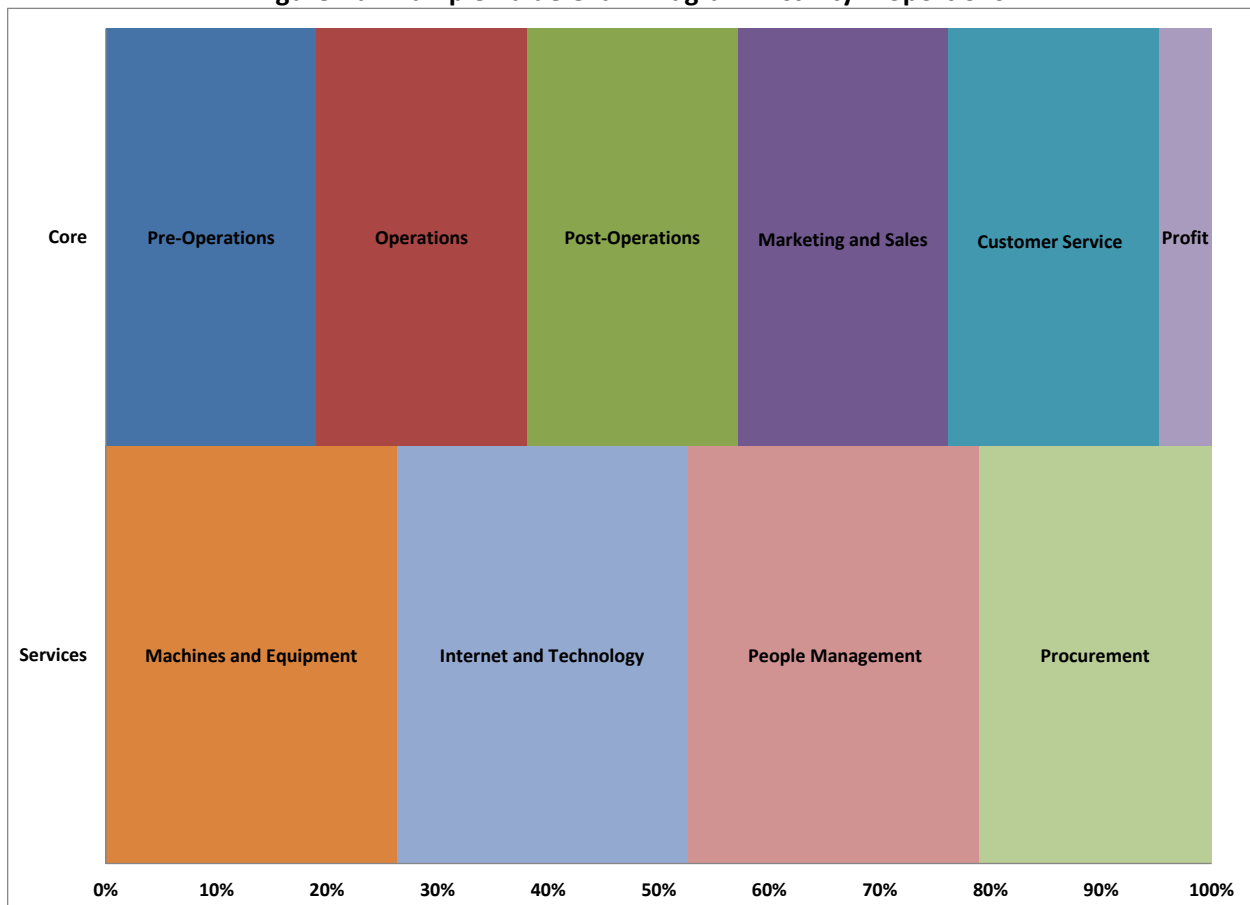
Figure 1a shows a typical value chain diagram for any industry by major cost categories. This example shows that core activities (the arrows) are supported by services (the foundation blocks) reading from left to right. The core activities are linked to each other by how adding value to a raw

¹ Recent studies focus on global value chains and how products through the value chain through international relations. See Okello, et al. (2011) for a simple way to use value chains (<http://dx.doi.org/10.5539/jas.v3n4p188>).

² See Sanchez-Hernandez (2011) for a more complete look at value chains using mapping and international relations.

input (a cow, for example) leads to a final sale. Figure 1b provides another way to look at these activities; such a diagram is used later to compare how much of each activity is used to add value for a typical farmer in the North Bay versus an industry benchmark. Figure 1b illustrates that we can also look at value chains as proportions of activities. Profit should be viewed, however, as a cost of doing business, as few businesses survive when profits are less than zero over long periods of time. Value chain can become integral tools of running a business by monitoring links in relation to one another as a process and comparing costs to industry benchmarks. The size of each link has two roles in terms of communicating information to farmers, advocates or policy makers. First is the relative proportion of each activity in terms of how the specific company or farm adds value to raw materials. Second is to compare the proportion of each activities percentage of value added to an industry standard or average. In Figure 1b, the five core activities and profit make up 100% of the value added by those activities; the same holds for services. However, Figure 1b does not imply there is equal value added by core and services activities; Figure 1b suggests that all services activities “support” all core activities.

Figure 1b: Example Value Chain Diagram: Activity Proportions



Consider an issue local dairies may face. If dairies in Sonoma and Marin County were paying a larger cost for storage and transportation than industry averages, then comparing local dairies value chains to an industry benchmark would show that difference. Each dairy within the North Bay can be evaluated against larger-area value chains for activities where cost structure, profit margins and total value differ from a set of industry averages. If a grain farmer buys seed to plant for the next year's harvest, the farmer likely wants to profit from that purchase. To profit from that purchase, the farmer must foresee an ability to generate revenue by as much as the seed costs per unit plus a markup. Retaining a markup, or profit margin, on certain or all activities generates profit along the chain and summarizes after all activities are completed. The profit is what is left over after expenses, and the revenue is sum of all the value added. This is a good way to consider the use of value chains; accounting systems may not break up expenses into what the business actually does as activities; the value chains provide that graphic representation by arranging activities performed and services used by the company as a process map from start (far left) to finish (far right).

Value chains generally have the following components:³

Core Activities:

- Pre-Operations: these are the jobs and tasks that bring the raw materials to the farmer, which could include the purchase and delivery of feed, birth and care for new animals, purchase and delivery of seed for crops, purchase and delivery of any good or service directly related to the final product.
- Operations: these jobs include daily tasks performed to deliver the final product, animal or crop. This is a large breadth of possible tasks, but can be constrained to only include daily maintenance of herd, crops, or other tasks that directly affect the final product. Mending a fence would not be part of this task, for example (see below). Harvesting and milling and on-site processing of animals for sale would be examples of operations activities;
- Post-Operations: Tasks here include those that move the final product from the farmer to the next stage of the supply chain. Tasks include prep for delivery, loading, storage of final product for delivery, and transportation if the farmer pays for that task. Think of these tasks as everything from the end of operations to delivery of the final product.
- Marketing and Sales: These activities are about business development for the final product, both marketing to and selling to the next link in the supply chain. For some farmers, this will be distribution; for others, this will be retail. These tasks may include meetings with distributors and final consumers, designing labels, etc.; and
- Service to Direct Customers: These are activities that happen after the final product delivery to market. These tasks may include providing additional products based on a quality problem, identifying a solution to a customer problem otherwise, or refining the final product as needed for the customer.

³ See Oster (2001) for an overview in complement to Porter (1985). It is important to not see these as necessarily sequential steps in time, as customer service may happen any time, for example.

Service Activities:

- Machines and Equipment: These services include maintenance and service to the capital and land where operations take place. This includes mending fences, servicing equipment not directly related to operations (for example, fixing a milking machine is operations while fixing an ATV is firm infrastructure), and other tasks that maintain the ability to operate and the land and equipment used to operate.
- People Management: This category includes all activities dealing with the farmer's labor force, beyond paying wages and salaries. Benefits, payroll expenses, organizational development, training, and other labor-force decisions come under this category.
- Internet and Technology: This activity includes the development and deployment of technology to be used in operations, but not the operations of the equipment. This would also include the purchase of computers, tractors, milking machines, laboratory equipment and machines, etc., but not their use. Their use would be in a specific core activity above.
- Procurement: These activities are the costs and time involved in purchasing inputs, materials, supplies, and equipment. Once the goods and services are purchased, their use is designated to a core activity above. An example is buying feed or seed. That purchase, the time and wages paid to make the purchase, would be in this category. Once procured, the service activity stops and the core activity begins.

It is good to see these categories as guidelines for identifying and categorizing processes in an industry or for a company. Going through the exercise of categorizing these activities and services can help a company differentiate what is a core activity versus a service. Value chains are used in many cases to generate this information for a business. Some companies have outsourced marketing and sales because the margin of providing "value" from that activity or service internally is too low. What may be confusing is that "service" is a core activity. "Service Activities" are tasks that indirectly support final product(s) delivery and service the marketplace, where services in the core activities are specific to direct customer service.

This is a crucial step for any industry or company that is looking to expand or grow: the company's core competencies, the activities the company does "best", should be those that deliver the highest profit to the firm for value-added activities; a farmer should not have both cattle and pigs unless pigs and cattle are more profitable together than focusing on one or the other. Another example may be that a dairy farmer herself may not be the prime person to set up marketing for the dairy products to distributors; the farmer may be better off purchasing this service, even though it may seem expensive, because the overall profit is greater. A comparison of a local firm to a regional value chain shows differences and possible entry points for new service providers or for cooperation on some activities. The economic impact analysis in this report how local agriculture activities connect financially to other

regional businesses. It is important to explain the subtle difference between value and supply chains and also to show how they are related.

Supply Chains versus Value Chains

A supply chain is a “chain” of firms and industries that come in contact with a good from its raw materials to the final product’s sale through financial relationships. Basic supply chain categories include the following “links”:

- Supplier: the entity that converts the raw materials into an initial, finished product;
- Wholesaler: wholesale markets where suppliers pay for the distributor’s services and links to final consumers; and
- Final Consumer/Retailer: firm how purchase distributor goods to be sold to final consumers.

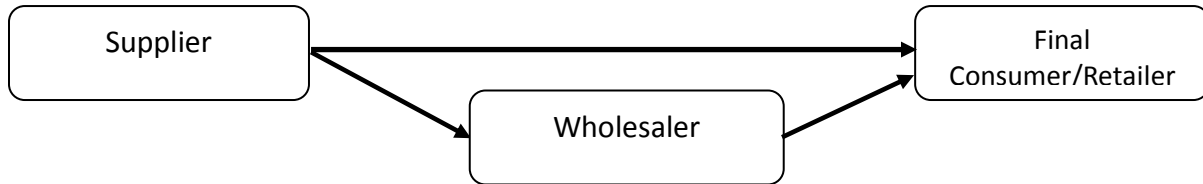
For agricultural businesses, final “consumers” may be livestock or grain processors that buy the final goods from farmers and adds even more value for final sale to a subsequent consumer. Final consumers may also be sales at farmer’s markets. Farmers are usually suppliers in agricultural supply chains; farmers generate and add value to raw materials initially that go into products that need more value-added services (packaging, for example), distribution to retail outlets, and other activities the farmer cannot provide.

The wholesaler purchases the product from the supplier, and then uses its competitive advantages to add value through logistics, transportation, or links to major retailers. The retailer, due to owning storefronts and other relationships with final consumers, adds value to the products also. The supply chain would connect all firms that provided value from the inputs to the final consumer and describes the “ecosystem” for farming revenues. A value chain is generated for a specific firm in a supply chain, for any firm in each of the three supply-chain links. These tools complement each other in describing competitive advantages and opportunities each supply chain link through how each link and each firm representing those links may add value to a product.

A common confusion between value and supply chains takes place when the supplier is also the distributor. Notice in Figure 2, there may be a direct link between the supplier (farmer) and the final consumer or retailer. It is important that to see that even at a farmer’s market, there is a “distribution” or wholesale function taking place due to the increased costs of the farmer going to the farmer’s market. The key idea is whether the revenue (the value-added) by that additional activity adds more revenue than cost. If so, there is a reason for a farmer to use a farmer’s market, and be the wholesaler

in a sense, versus selling to a wholesale market. For each industry discussed below, a value chain and supply chain are provided.

Figure 2: Example Supply Chain and Regional Role



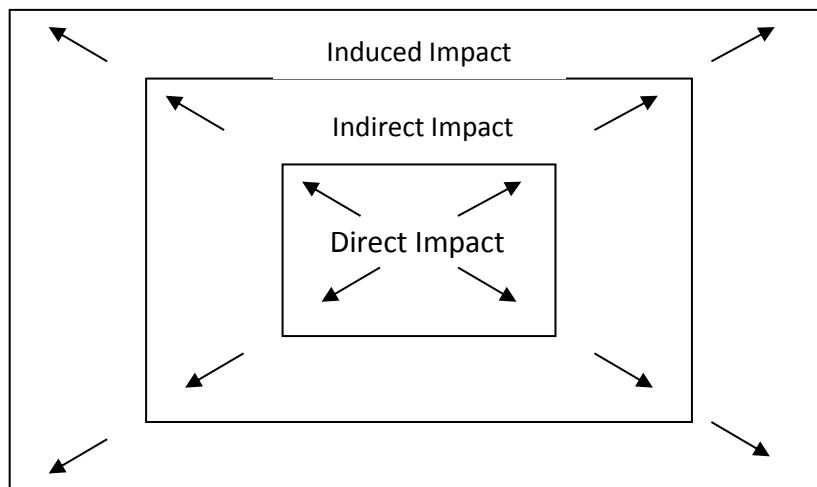
Supplier Roles	Wholesaler Roles	Final Consumer Roles
Ranchers/Farmers Home Producers	Food Services/Restaurants Processors Packaging Storage Facilities	Households Retailers Food Services/Restaurants

Notice that each supply chain function is not unique in terms of regional role. It is possible to sell milk to a restaurant which becomes an ingredient in food sold as retail; the restaurant adds value to the fluid milk like a packaging plant would in terms of regional role. Also, notice that the wholesale role may be circumvented; in agriculture, some specialized products such as dairy, grass-fed beef and grains may go from farm to plate directly. The supply chain connections may also dictate to farmers and ranchers styles and timing of production; economic impacts flow through supply chains and beyond to the broader economy.

Economic Impact Analysis Overview

Like dropping a rock into a pond, an industry’s existence or expansion has ripple effects on a local economy and beyond based on new jobs created. The IMPLAN[®] model used here, which stands for IMpact analysis for PLANning, is a model by which municipalities and counties worldwide analyze the employment, revenue, wage, and tax effects of economic events. This model has three impact classifications, summing to a total effect. The **direct** effects are those specific to the event. For example, for a dairy rancher and their operations, hiring new employees and selling products provides wages and payments to support local employment, and generate new tax and business revenues. This includes the farmer buying services from allied industries. **Indirect** effects come from these workers and support businesses taking new income and spending a portion on other businesses’ goods and services. This revenue flow to other businesses leads to more employment, wages, revenue and taxes.

Figure 3: Economic Impact Concept



For example, when a newly hired dairy worker goes out to eat at a restaurant, there are indirect effects from the original dairy expansion; the affected restaurant uses a larger amount of a local linen cleaner's services than before, which creates indirect effects from new linen service demand. These additional, indirect jobs and revenues then create induced effects. The **induced** effects are similar to the indirect effects, but come from indirectly-affected workers and firms and their economic gains. For example, a new linen-service worker, hired due to the restaurant's expansion described above, may go to the grocery store, dry cleaners, or doctor's offices more often, which induces growth in retail sales, employment and taxes even faster. These effects in sum are the total or overall economic impacts. Figure 3 shows the ripple effect idea of the multiplier process. The next section looks at dairy farming in Sonoma and Marin counties through the value chain to the dairy business' economic impacts.

Layout of Each Industry Section

This report looks at three specific industries from here: dairies producing fluid milk, ranchers producing grass-fed beef, and farmers producing grains. Each section will show an example value chain, proportions of costs from rancher and farmer surveys, interviews and financial studies of these industries, followed by a brief description of a typical supply chain. These sections will then show economic impact data specific to North Bay counties: for dairies, Sonoma and Marin; for grass-fed beef and grain farming, Sonoma and Marin and Napa and Mendocino and Lake. What each section should do is provide an overview of the allied industries (industries that service and connect to the ranching and farming activities), the costs for the typical operation, and a way to consider needs for the industries to remain vital and growing in the North Bay.

3. The Dairy Industry in Sonoma and Marin counties

While the dairy industry is not just simply fluid milk, but also cheese, cream, butter, powdered milk production, and other products, our focus here will be on fluid milk production. The typical dairy rancher generates raw materials (fluid milk) for multiple, value-add products and final consumption. There can be combinations of supply chain links on the same dairy ranch, each with a unique value chain; for example, a dairy operation may add a cheese-making facility. When this happens, ranchers set up cheese-making businesses as a wholesale customer of the fluid milk, dairy business. The cheese operation adds more value to the fluid milk. There may be a distribution point that is removed from the supply chain, and redirected toward wholesale cheese markets rather than wholesale, fluid-milk markets. A value chain can be made for each “business” under the dairy’s umbrella and should be.

Table 1: Sonoma and Marin counties (Dairy Employees, Businesses, Annual Wages) 1990-2011

Sonoma and Marin	1990	1995	2000	2005	2010	2011
Employees	613	595	616	654	513	574
Dairies	130	127	104	97	87	88
Wages (Thousands)	\$8,377	\$9,221	\$12,109	\$15,150	\$13,931	\$16,663

Sources: Employment Development Department of California (EDD) and Bureau of Labor Statistics (www.bls.gov)

As discussed, a value chain can provide a sense of the profitability of both starting a cheese manufacturing business versus cheese producers that sell milk on wholesale markets otherwise. Table 1 shows the recent history of employment, number of dairy operations, and wages paid in Sonoma and Marin counties, and provides data for the economic impact of the dairy industry on these counties’ economies.

The Value Chain for Dairy Products

An example value chain for Sonoma and Marin dairies is shown in Figures 4a through 4c. Notice the relative size of each link is proportional based on each link’s proportion of total revenue or value added. The last two services are likely the more crucial to both dairy and grass-fed cattle farms in terms of the support activities and the economic impact of these industries. Technology development can include the use of organic or grass-fed methods to differentiate local farm products from others, and procurement can also be used to meet regulatory requirements on feed, equipment, and other parts of the value chain. How each link of the value chain is attached to the other is different from industry to industry. Figure 4a shows the basic value chain for dairies.

Figure 4a: Value Chain for Fluid Milk Production⁴

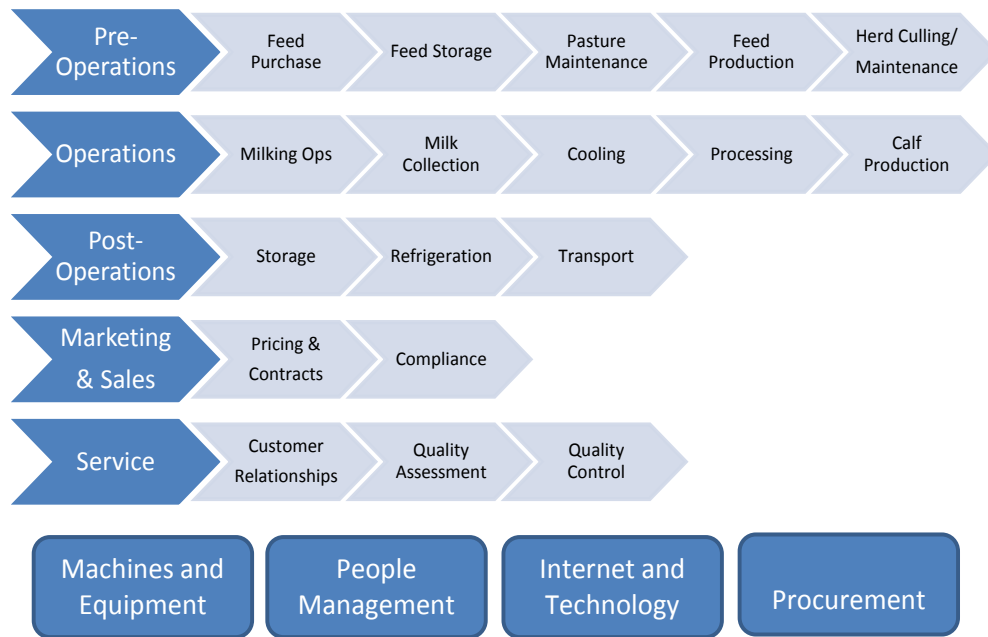


Figure 4a summarizes core and service activity categories based on interviews with local dairy ranchers and their cost structure; for every dollar of revenue earned by the dairy, the dairy spends a percentage of revenue on the activities within the value chain. Figure 4b shows a typical value chain based on industry benchmarks. Notice the proportions of the core activities versus the services. Most of the costs are in operations for dairy farmers, with very little in marketing and sales, or in customer service. Figure 4b also shows the proportions as 100% of the core activities and 100% of the services activities, where the percentage inside each block represents the percentage of the total value-add activities. Figure 4c provides an example value chain for a typical Sonoma County or Marin County dairy operation.⁵

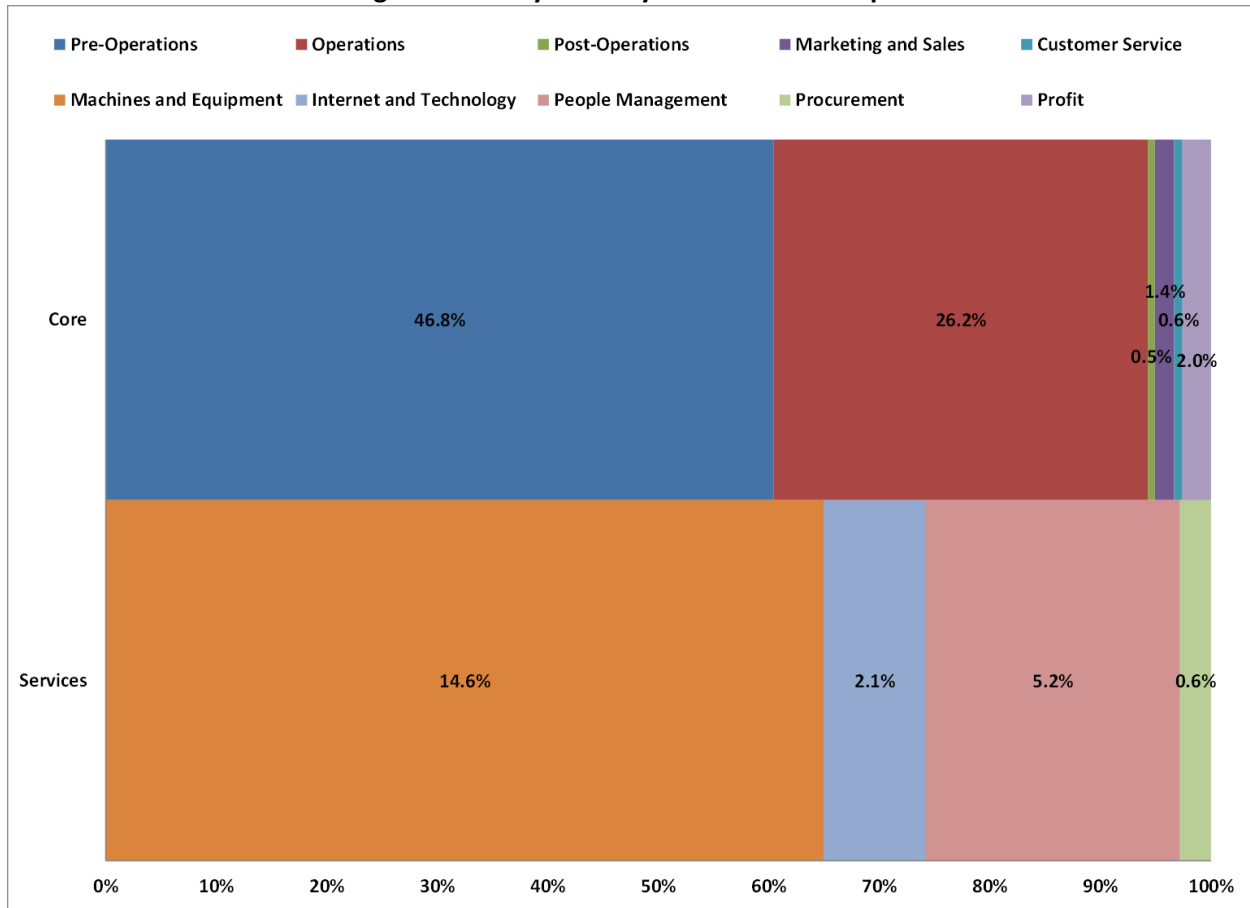
Notice also that the overall mix of activities leads to a larger profit at the industry level than at the individual dairy level in Sonoma and Marin Counties. What these differences suggest, at a strategic level, is that the current mix of activities is not as profitable for local dairies, and that mix activities more like the industry as a whole would be more profitable. However, it may not be possible to augment certain activities locally due to the lack of regional “assets” (allied industries that provide such services, space, warehousing, transport, markets) to profitably increase the use of services and adds more value

⁴ This assumes that wholesale markets are the focus of the typical dairy farming operation.

⁵ Interviews with local farmers and ranchers populated this data for each of the industries here. UC Coop in Sonoma County and Sonoma State University will continue to update and expanded these datasets.

to fluid milk. The percentage value-added for industry post-operations (0.5%), marketing and sales (1.4%), customer service (0.6%) are relatively small in terms of pre-operations and operations activities.

Figure 4b: Dairy Industry Benchmark Example

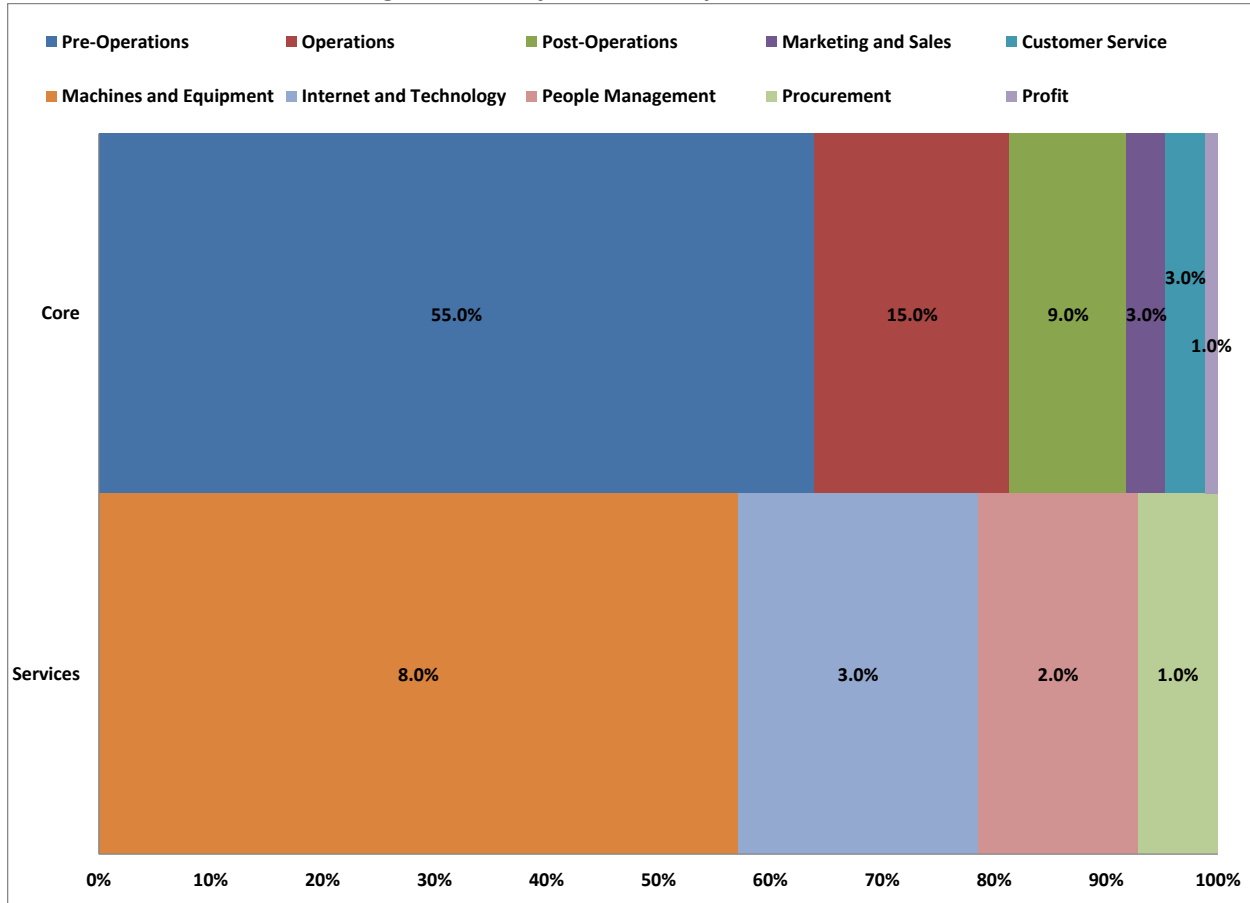


Source: USDA, Milk Costs of Production, California

Here is the importance of comparing Figures 4b and 4c and similar combinations in this document. Notice that for the industry example in Figure 4b, value added by inbound logistics and operations is slightly larger than for the typical, regional dairy in Figure 4c. These are subtle differences between Figures 4b and 4c; such differences are the essence of using value chains for strategic purposes. If there are costs faced by an individual firm that are larger than those faced by the industry, policy advocates can look more deeply into why the costs are larger. For example, dairies in Sonoma and Marin counties may face larger “outbound logistics” costs, and thus spend a larger percentage of revenue in adding value to fluid milk in transportation costs. There may be few or more expensive transport options in the North Bay than for dairies otherwise in California. As a result of this difference, UC Coop can investigate how to reduce that cost through seeking out lower-cost transportation, looking for ways fluid milk may have more local options, or a cooperative model of selling fluid milk to

distributors. The value chain differences from an industry benchmark value chain illustrate ways to improve performance and missing supply-chain links in a regional market that may help reduce local costs to dairy ranching.

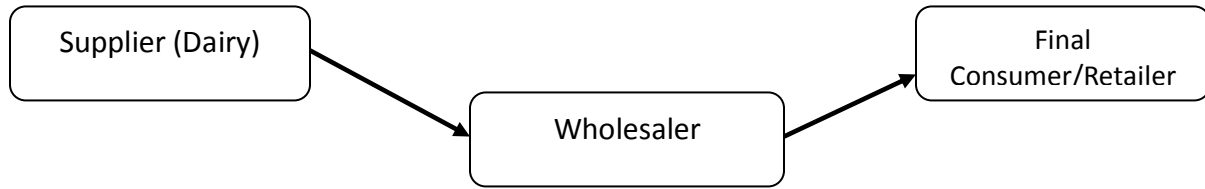
Figure 4c: Dairy Ranch Example, Value Chain



Source: Interviews with North Bay Ranchers

The value chain and supply chain connections in dairy industries are complex and multi-product oriented. For example, raw fluid milk is an input to many value-added products (cheese, yogurt, butter, ice cream, creams, etc.) that may demand fluid milk in multiple forms, milk fat percentages, and volumes. Also, some dairies have expanded their operations to include one or more value-added products. As such, there can be some confusion over the use of overhead and how one value chain stops and another begins. In short, the dairy supply chain ends with the production and delivery of raw fluid milk to the next supply chain link, which may be the next room over from the milking facility to the cheese-making facility.

Figure 5: Dairy Supply Chain and Connections



Supplier Roles	Wholesaler Roles	Final Consumer Roles
Ranchers/Dairies	Processors	Households
Home Producers	Packaging	Retailers (Grocery)
	Storage	Restaurants
	Value-Add Manufacturers	

Figure 5 shows an example supply chain for a dairy. The supply chain shows that dairies may not be the only suppliers, but more importantly, there are many options in terms of wholesale markets and there is limited ability to go from dairy to consumer directly. Even if the dairy is able to sell its fluid milk directly to a consumer through a storefront, there is still a “wholesale” function, which may live at the dairy itself or be owned by the dairy owner. For example, if fluid milk is processed, packaged and distributed to a farmer’s market, the processing, packaging, and distribution functions that may be right next door to the dairy “purchase” the fluid milk from the dairy. For many small producers, this vertical integration may not an option.

**Table 2: Employment Impacts, Jobs from Dairies, 2011
Based on 100 Dairy Workers in each of Sonoma and Marin Counties**

Industry	Direct	Indirect	Induced	Total
Dairy cattle and milk production	100.0	0.2	0.0	100.2
Support activities for agriculture	0.0	5.3	0.0	5.3
Real estate agencies	0.0	2.5	0.4	2.9
Wholesale trade businesses	0.0	2.4	0.3	2.7
All other crop farming	0.0	1.9	0.0	1.9
Cattle ranching and farming	0.0	1.5	0.0	1.5
Accounting services	0.0	0.8	0.1	0.9
Food services and drinking places	0.0	0.2	0.6	0.8
Bars and Restaurants	0.0	0.1	0.5	0.6
Transport by truck	0.0	0.5	0.0	0.5
Employment services	0.0	0.4	0.1	0.5
Investment Banking	0.0	0.1	0.2	0.3
Maintenance and repair for farm buildings	0.0	0.3	0.1	0.4
All Others	0.0	5.6	7.6	13.2
Total	100.0	21.5	9.8	131.2

Using the value chain and supply chains in combination, higher costs for individual ranches with respect to the industry benchmark point to supply-chain deficiencies in terms of delivering low-costs products and services to farmers. If those relatively high costs are due to regional deficiencies, there are opportunities to either expand the number of options at the wholesaler or final consumer/retailer portion of the supply chain to help suppliers. This study shows further links to a broad range of industries throughout Sonoma and Marin counties through the dairies' economic impacts.

Economic Impact of Dairies

Tables 2 through 4 use the employment data in Table 1 as the current state of the dairy industry in these counties and associated economic impacts. To illustrate the effects, we assume 100 employees per county at the end of 2011 between the two counties on average for Tables 2 through 4. Using the actual employment data scales the overall effects; if there are 580 workers in dairies in Sonoma and Marin County combined, the employment effects in Table 2 can be multiplied by 5.8 as an estimate.

**Table 3: New Tax Receipts, Annual Averages from Dairies, 2011, Thousands of \$
Based on 100 Dairy Workers in each of Sonoma and Marin Counties**

Type of Tax	State and Local
Employment Taxes	\$11
Sales taxes	238
Property taxes	261
Personal Income	152
Other Taxes and Fees	107
Total State and Local Taxes	\$768

**Table 4: New Sales Revenues to Businesses, Annual Averages from Dairies, 2011, Thousands \$
Based on 100 Dairy Workers in each of Sonoma and Marin Counties**

Industry	Direct	Indirect	Induced	Total
Dairy cattle and milk production	\$14,769	\$26	\$2	\$14,797
Real estate agencies	-	500	67	567
Wholesale trade businesses	-	389	49	437
All other crop farming	-	422	-	422
Banks and Credit Unions	-	253	37	289
Rental Income for Property Owners	-	-	215	215
Cattle ranching and farming	-	202	1	203
Support activities for agriculture	-	182	-	182
Electric power utilities	-	55	4	59
Transport by truck	-	55	4	59
Bars and Restaurants	-	14	37	51
Maintenance and repair construction: nonresidential	-	43	3	46
Accounting, tax preparation, and payroll services	-	41	4	45
All others	-	898	878	1,775
Totals	\$14,769	\$3,077	\$1,299	\$19,144

The data in Tables 3 through 4, as in the tables in the Appendix, show how other industries are affected by change in the dairy business. These industries are related to dairies through economic connections, and rely on dairies as part of their own value chains. Notice that wholesale operations are among these industries, as are retailers and restaurants. The supply chain members are just part of the story in terms of the importance of dairies to this region.

Table 2 shows the level of employment for dairies in these counties as the direct effect of this industry. From there, more employees are supported in real estate, wholesale markets, cattle ranching otherwise, accounting, and commercial real estate construction. Table 4 shows the business revenues that come from dairy ranching businesses at 2011 levels. Notice the industries are slightly different concerning revenue generation and employment. This is because some of the allied industries (those that are indirectly affected by the dairy business) use fewer workers to generate their products than others. Table 3 shows the state and local tax revenues generated by dairies in Sonoma and Marin counties. The dairy business has activities that generate fluid milk as a final product. If other businesses exist within the dairy, they would have separate value chains. The dairy business in Sonoma and Marin counties employs over 570 workers and represents approximately 87 ranches based on the data in Table 1. The milking operations are the most costly activity, but services are also costly to procure raw materials (hay, silage, parts, machinery, etc.). The economic impacts of this industry are wide in breadth, including accounting firms, bars and restaurants, real estate, and other farms.

4. The Grass-Fed Beef Industry in North Bay counties

Grass-fed beef ranching is where a cattle farmer selects specific types of feed for livestock and marketing paths to wholesale and retail markets. Choosing “grass-fed” as a marketing label for calves and cows depends on the way calves and cows are raised and fed once off the mother’s milk. The U.S. Department of Agriculture (USDA) has rules for labeling meat from grass-fed livestock. The rules stipulate that meat labeled "grass-fed" must come from animals fed solely on grasses, hay and other non-grain vegetation.⁶ Table 5 shows recent history and state of the beef industry in Sonoma and Marin counties from 1990-2010. Grass-fed labeling helps consumers choose meat from pasture operations that consider the environment and consumer health differently than conventional ranching methods. Farms with grass-fed beef use sophisticated land management practices to maximize productivity by raising livestock on pastures that avoid crowding and illnesses.

Table 5: Data for Beef Industry in North Bay Counties

North Bay Counties	1990	1995	2000	2005	2010	2011
Employees	163	131	161	81	89	112
Ranches	57	56	45	34	32	34
Wages (Thousands)	1,879	2,188	3,645	2,309	3,275	3,330

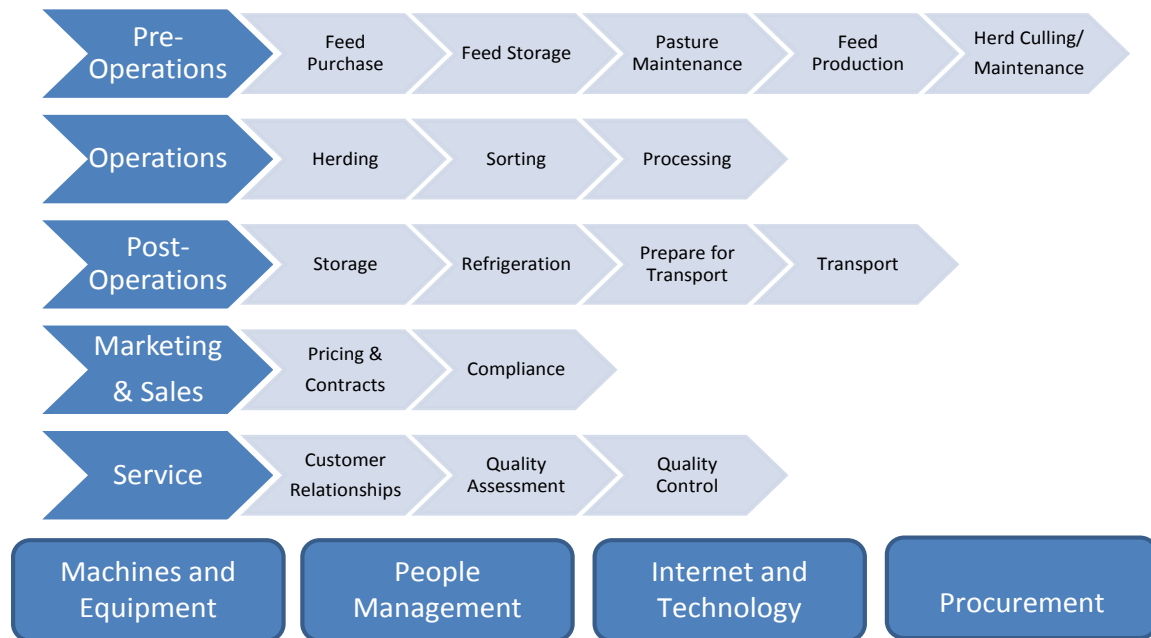
Sources: Employment Development Department of California (EDD) and Bureau of Labor Statistics (www.bls.gov)

The value chain for grass-fed beef is similar to conventional beef because many of the same activities are involved. Where local grass-fed beef ranchers differ from larger operations in the industry would be on marketing and on storage. From interviews with local ranchers, the hanging time after processing is an important aspect of providing the quality for restaurants and other final consumers. This quality difference, and by adding value to ensure that quality, changes the way grass-fed beef is raised versus conventional beef, and should add profit to the ranch. Figure 6a shows the value chain for grass-fed beef in terms of activities; Figure 6b provides an example of industry benchmarks for the typical ranch and its value chain proportions. For example, such a facility provides services that allow ranchers to expand volume and markets because of market demands for aging. Interviews also revealed that any one rancher would be unlikely to invest in a consolidated facility; there was discussion of the

⁶ Please see <http://www.csuchico.edu/grassfedbeef/regulations/label-process.shtml> for links to the application for grass-fed labels and an overview of the rules and issues. To obtain grass-fed meat label approval by the USDA requires submitting a label application and a sketch of your proposed label. Up to eight different components may be required on the label itself. What these eight components include can vary depending on the objectives for an individual label. Other supplemental information may also be necessary if “animal production” or “nutritional claims” are made.

utility in a mobile or centralized slaughter facility simply to process animals, and then a second facility to complete processing and value-added activities to bring the meat to market (hang, cut and wrap).

Figure 6a: Example Value Chain for Grass-Fed Beef

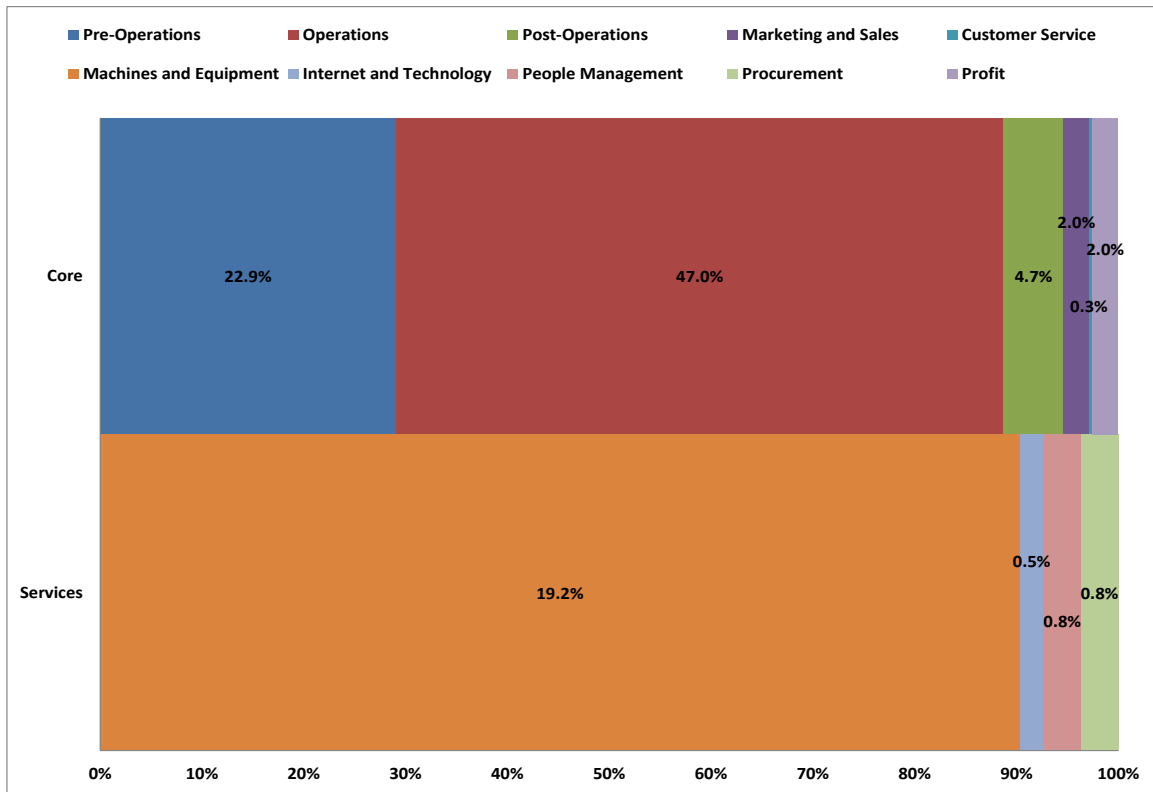


Notice that Figure 6c, which shows the value chain for a North Bay rancher, has a slightly different mix of value-add activities than the industry but the same profitability (for every dollar of revenue from grass-fed beef ranching, profits are 3% or \$0.03). This suggests a slightly different mix of activities, or looking for slightly higher profit margins on some activities would yield slightly higher profits than the industry benchmark. In a similar way we looked at dairies, it may not be possible to find allied industries or options regionally for services that provide higher margin activities. This is a signal to policy makers that there is a regional shortfall in these support assets for local agriculture. The links between the value and supply chains for grass-fed beef are critical connections for most grass-fed beef farmers, and where some may look to vertically integrate (combine supply chain links onsite to reduce costs or increase profitability). Facilities that allow for “kill, hang, cut, and wrap” activities were suggested in local rancher interviews as a needed expansion of regional resources for this industry.

Similar to dairies, most of the value-added activities in Figure 6c are in inbound logistics and operations for individual beef ranches. The relative marketing and sales portions of the core activities are due to the use of community-supported agriculture (CSA) arrangements to sell directly to final consumers, restaurants or retailers. When a rancher engages in such sales arrangements, they are

adding value to their final good (grass-fed beef in an uncooked form) versus asking a wholesaler to “advertise” and “market” the grass-fed beef to the supply chain’s retail links.

Figure 6b: Industry Value Chain Proportions, Grass-Fed Beef



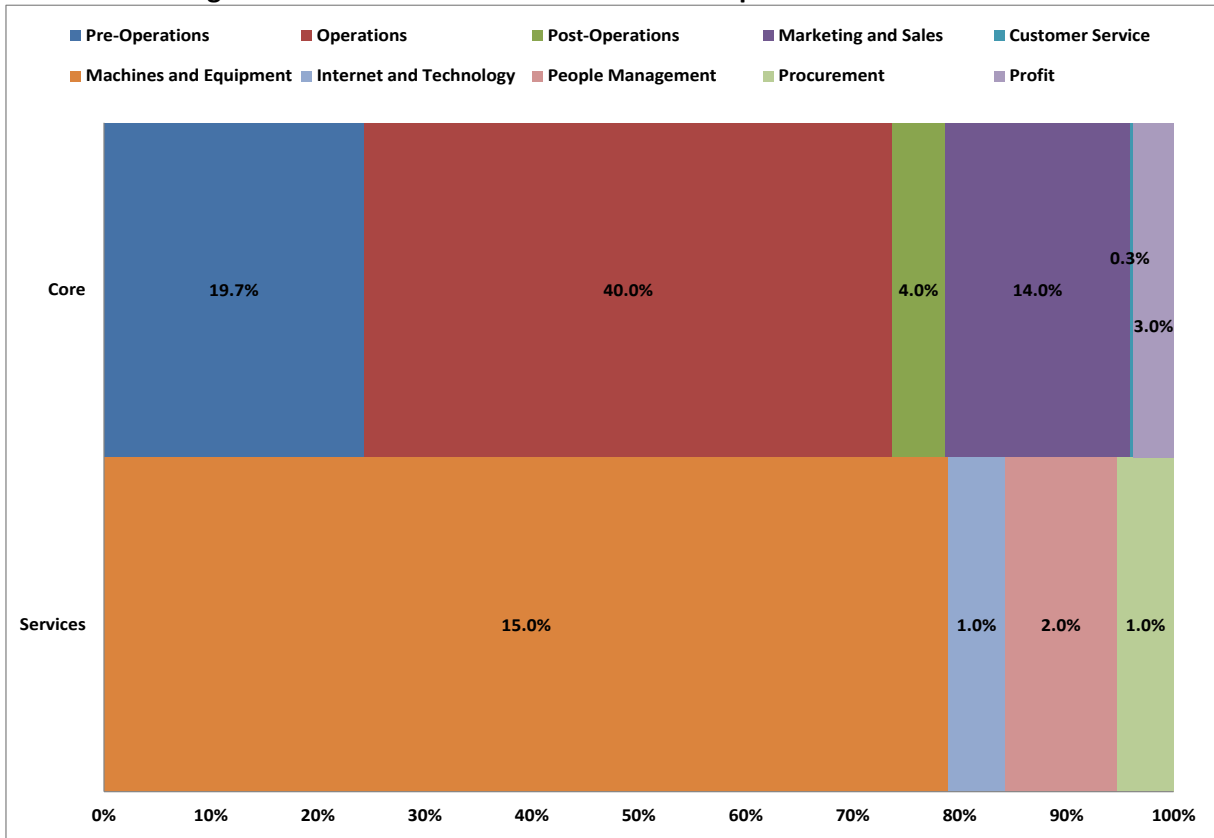
Source: UC Coop (2012)

Further, the outbound logistics portion of the individual ranch’s value chain shows little in value-added. Many of the beef ranchers interviewed suggested demand for grass-fed beef to “hang” (age after processing) in a refrigerated way adds value and profit. This is a major connection between value and supply chain management: how customers demand the final product’s quality or characteristics can change both the supply and value chain configurations for individual producers. Such value-added activities, based on new or expanding consumer demands, should be made only if there is more profit from them; the value chain expansion should happen for both the augmented activity and the profit that remains. A recent study by UC Davis on the niche meat sector provides some additional insight into the value of labeling as “grass fed”.⁷ The grass-fed beef labeling is centered on the marketing activity more than any other in the value chain. These are additional costs in the value chain for the beef rancher. The pursuit of a grass-fed beef label needs to provide enough in terms of value to the rancher

⁷ Please see <http://ucanr.org/sites/sfp/files/143985.pdf> for the study.

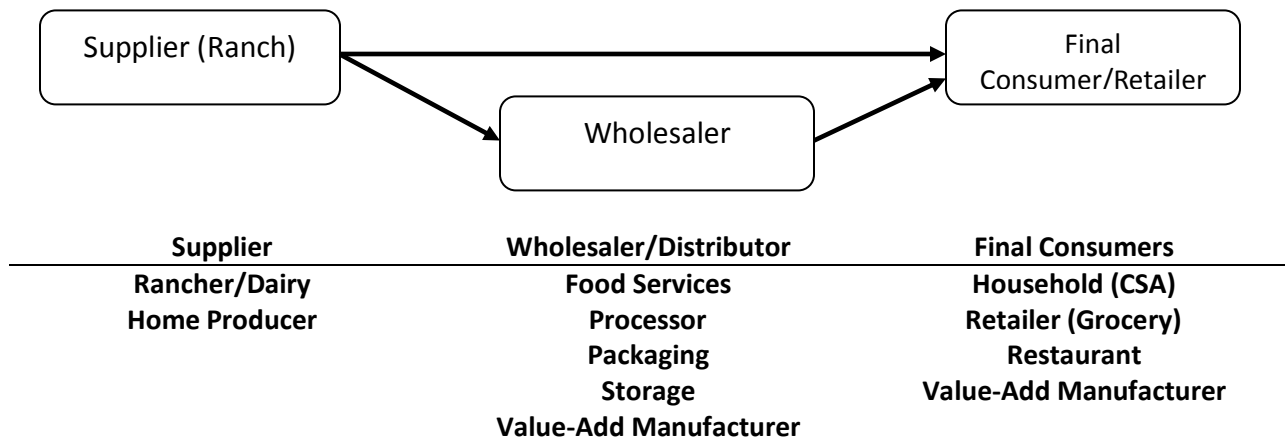
to pay both initial conversion to grass-fed from conventional and labeling pursuit costs, as well as the maintenance of the ranch to remain in compliance. Partnerships with local restaurants and grocery stores can also reduce the need for wholesalers in the supply chains and increase the profitability for local ranchers and retailers.

Figure 6c: Individual Rancher Value Chain Proportions: Grass-Fed Beef



Source: Interviews with North Bay Ranchers

Figure 7: Grass-Fed Beef Supply Chain and Connections



In contrast to the dairy business, beef ranchers may consider operations that produce direct-to-consumer. However, unless the grass-fed beef is going in a dressed form, and not cut/wrap/delivered, there is a “wholesale” function somewhere in the supply chain. Figure 7 has a direct link between the ranch and final consumer, but there is a caveat: to consume grass-fed beef in its final form, there is value added at another step in the supply chain beyond the processing function. The kill and hang (aging) processes, even if located on the ranch, should be seen as a different business, which “purchases” calves from the ranching businesses at the end of the ranch’s value chain.

The economic impact analysis below shows the effects of beef ranching on the five North Bay counties of focus: Lake, Marin, Mendocino, Napa, and Solano. Grass-fed beef should cost more due to this change or opportunity cost for the farmer and their need to be compensated. The health benefits and other marketing possibilities provide more value to this product, similar to red wine versus other alcoholic beverages. A niche exists through the story of grass-fed beef, if you will, but the logistics for farmers to generate this difference is important.

Economic Impacts of Grass-Fed Beef on the North Bay

Much like the dairy analysis above, there are jobs, business revenues and tax receipts supported by this industry. The data in Table 6 for 2010 are the beginning of these data for Sonoma and Marin counties. Tables 6 through 8 provide more details for the grass-fed beef industry in these counties. Notice that the businesses affected by the grass-fed cattle business is a mix of industries that direct service the ranches like support activities (veterinary services, feed stores), other crop farming (hay farms locally, for example), transport by truck (local livestock trucking and refrigerated hauling), and those that service workers and other businesses and employees affected by the grass-fed beef business (such as bars and restaurants, medical and dental offices, private hospitals, etc.).

As in the analysis of dairies above, the breadth of industries affected is a major consideration to the regional importance of each industry, where both businesses and workers are serviced by other firms, and these are “export” focused businesses, selling goods beyond the region in which they operate. These industries draw income from outside the region and then generate more commerce as a result through the economic impacts.

**Table 6: Employment Impacts, New Jobs from Grass-Fed Beef Farming, 2011
Based on 100 Ranch Workers in Lake, Marin, Mendocino, Napa and Sonoma Counties**

Industry	Direct	Indirect	Induced	Total
Cattle ranching and farming	100.0	26.1		126.1
Support activities for agriculture		5.8		5.8
All other crop farming		5.2		5.2
Real estate establishments		4.3	0.4	4.7
Wholesale trade businesses		1.6	0.3	1.9
Banks and Credit Unions		1.5	0.1	1.6
Bars and Restaurants		0.4	1.2	1.6
Investment Banking		0.9	0.4	1.3
Transport by truck		1.1		1.1
Non-bank lenders		0.3	0.1	0.4
Medical and Dental Offices			0.3	0.3
Private hospitals			0.2	0.2
Private household operations			0.1	0.1
Services to buildings and dwellings		0.1		0.1
Accounting services		0.1		0.1
All Others		5.3	7.7	13.0
Totals	100.0	52.7	10.8	163.5

**Table 7: New Tax Receipts from Grass-Fed Beef Farming, 2011, Thousands of \$
Based on 100 Ranch Workers in Lake, Marin, Mendocino, Napa and Sonoma Counties**

Type of Tax	State and Local
Employment Taxes	\$11
Sales taxes	188
Property taxes	206
Personal Income	94
Other Taxes and Fees	83
Total State and Local taxes	\$582

If the grass-fed beef industry in the North Bay counties employs 100 people directly, which supports over 163 jobs throughout the five counties (including the original 100 workers). Those workers help to generate over \$12 million in revenue for these beef operations and \$20.9 million in total revenue for businesses throughout the counties; they also create through their economic impacts over \$582 thousand in annual state and local taxes. These estimates are for every 100 workers among the five NorthBay counties.

**Table 8: New Sales Revenues to Businesses from Grass-Fed Beef Farming, 2011, Thousands \$
Based on 100 Ranch Workers in Lake, Marin, Mendocino, Napa and Sonoma Counties**

Industry	Direct	Indirect	Induced	Total
Cattle ranching and farming	\$12,340	\$3,126		\$15,466
All other crop farming		952		952
Real estate establishments		810	79	889
Banks and Credit Unions		659	44	703
Wholesale trade businesses		250	44	294
Support activities for agriculture		260		260
Rental Income for Property Owners			223	223
Investment Banking		98	37	135
Transport by truck		111	4	115
Natural gas distribution		97	10	107
Pharmaceutical preparation manufacturing		35	9	44
Bars and Restaurants		8	34	42
Electric Utilities		24	2	26
Private hospitals			25	25
Non-Bank Lenders		16	6	22
Legal services		13	6	19
All Others		814	859	1,673
Totals	\$12,340	\$7,273	\$1,382	\$20,995

Notice that the similarities in the allied industries compared to dairy ranching. In the grass-fed beef case, wholesale trade, banks and credit unions and real estate are major service components, as are local crop farming, grocery stores, and bars and restaurants. In terms of business revenue, in Table 8, the allied industries are very similar to dairy. The rental income for property owners is likely a mix of both employee rentals of homes throughout the two counties as well as land rentals for pasture.

5. Grain Farming Industry in the North Bay counties

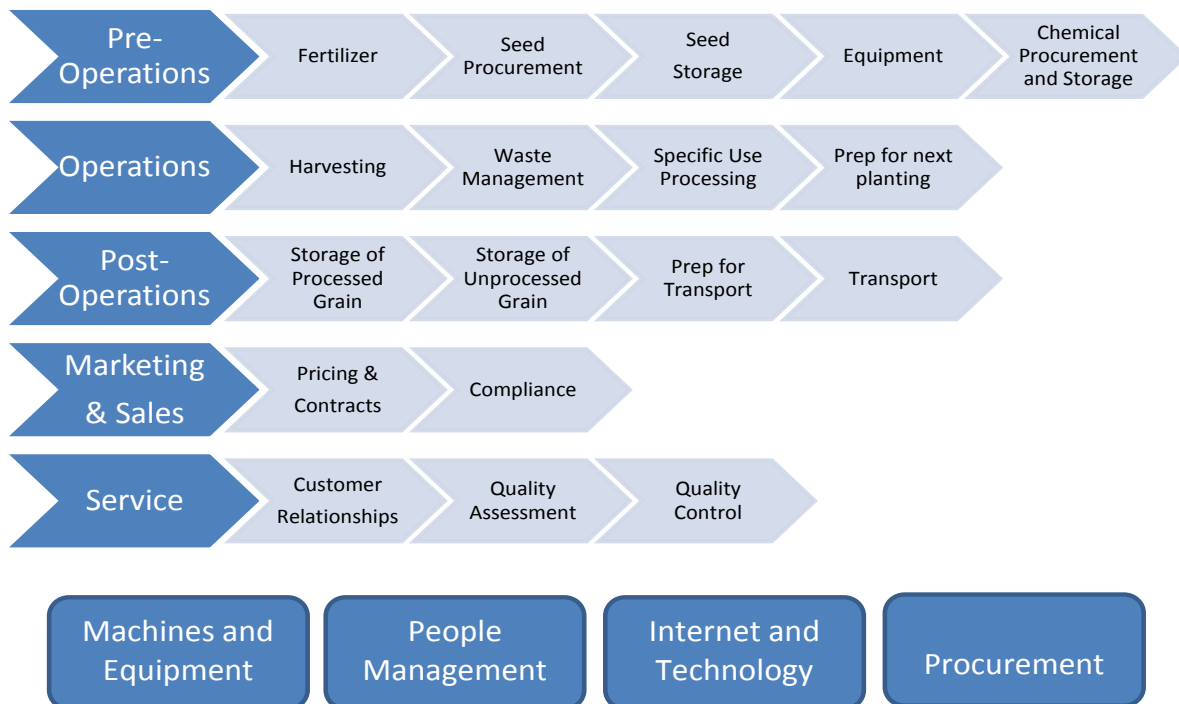
Grain farming uses land and seed as major inputs. There are also machines required for land maintenance, harvests, milling, packaging, and other activities along the grain farmer’s value chain. There are also links to regional food manufacturing, including bakeries and restaurants. Because harvests are seasonal, the value chain has different components based on the tasks and time of the year. For example, the use of harvesting equipment is a value-add service for grain farms, as is the debt amortization for paying it off over time.

Table 9: Data for Grain Farming Industry in the North Bay Counties

North Bay Counties	2005	2010	2011	% Growth 2005-2010
Employees	42	26	25	-38%
Grain Farms	22	17	18	-23%
Wages paid Annually (Thousands of \$)	1,183	823	959	-30%

Sources: Employment Development Department of California (EDD) and Bureau of Labor Statistics (www.bls.gov)

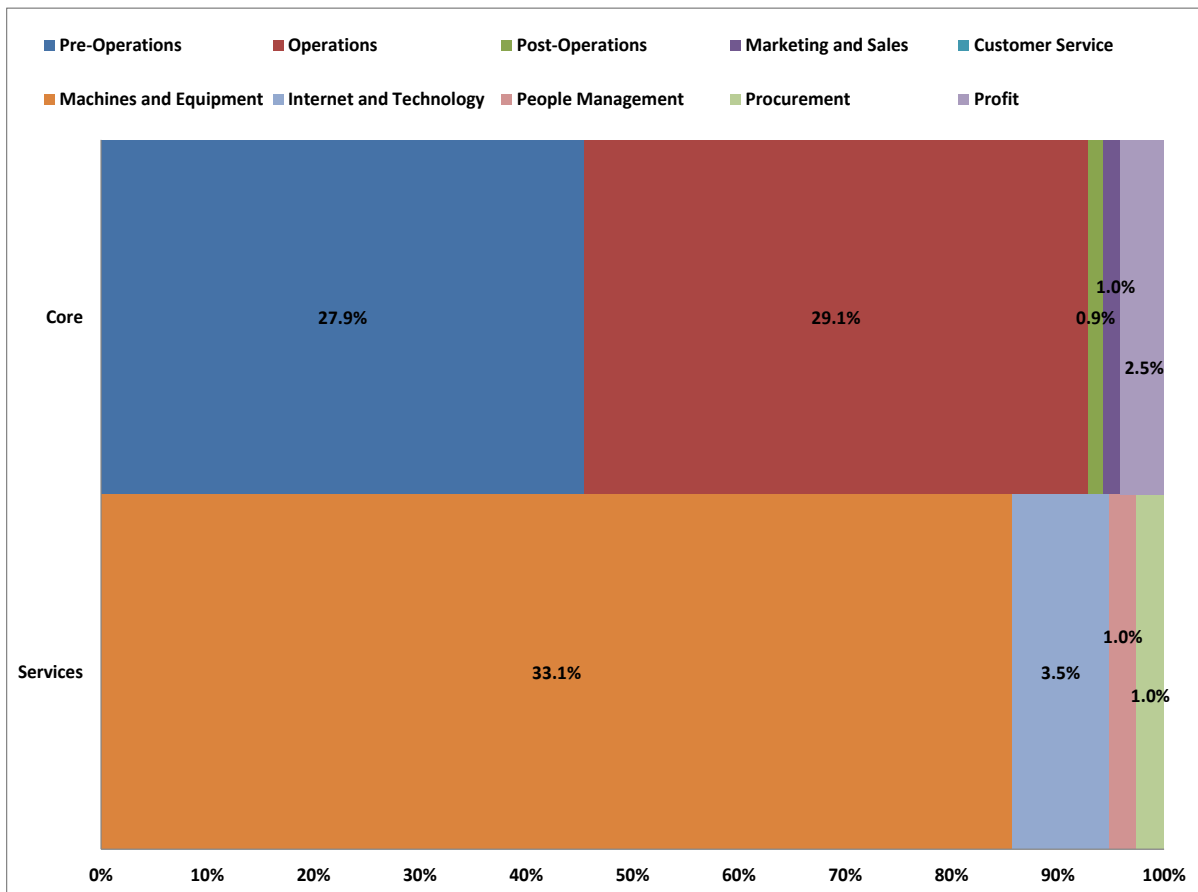
Figure 8a: Value Chain for Grain Farming



According to the EDD, the only counties in the North Bay (Lake, Marin, Mendocino, Napa, and Sonoma) that have viable employment in grain farming operations as of 2011 are Lake and Mendocino. Table 11 shows these figures, where only from 2005 forward are there viable data on employment, wages and the number of farms. The number of farms has gone down from the 2005 figures through 2010. The economic impact analysis is going to be based on 100 workers across the five-county region and their impacts. The appendix will show that same analysis for the counties individually that have no current, documented operations.⁸ What is interesting is how the North Bay is estimated to provide industrial allies for grain farming businesses. Figure 8a provides a value chain for grain farming.

Grain farming as has specific supply-chain management issues like any other agricultural operation. Cleaning the grain may not be necessary if bulk market or direct sales to a final consumer of the grains are the market. Customer services had no value added for the typical grain farmer.

Figure 8b: Grain Industry Benchmark Value Chain Proportions



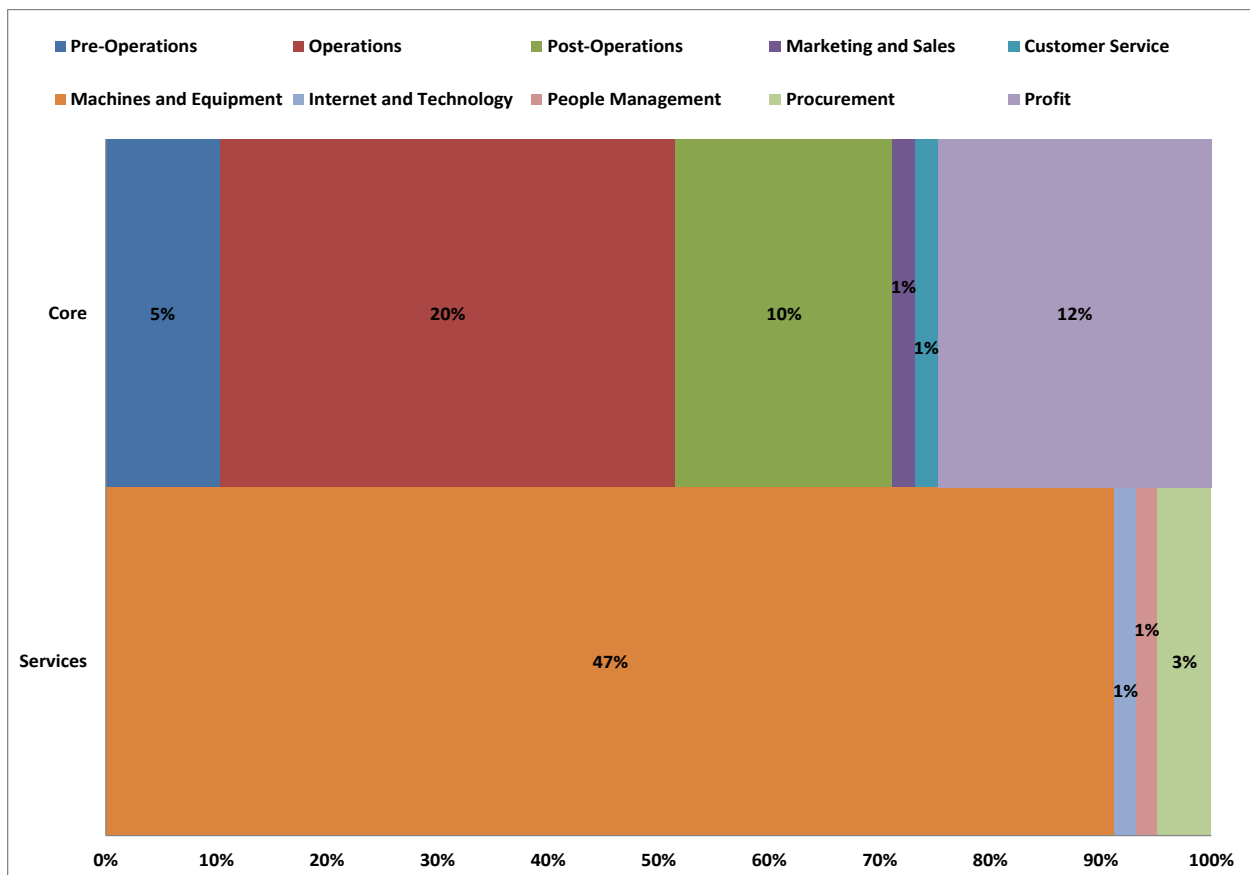
Source: UC Coop (2010)

⁸ There may be grain-farming operations in place, but not necessarily enough to be payroll businesses and thus have official statistics for employment, wages, and number of businesses.

Also, there may be subtle differences between specialty/heirloom grain markets and the sale of grains to local consumers. Land ownership versus lease or purchase is a major consideration in the cost structure of these businesses, as debt service can be a large cost. Many of these grains are dry-farmed and irrigation is not an issue; the issue is the amount of rainfall and timing of that rainfall with respect to harvests. Similar to dairies, grain farmers must package their harvest for movement between supply chain links. Grain could be packaged on-site as a final, value-added activity, to then be purchased by a final consumer. For grain farmers that make direct sales, the use of a storefront or some retail functionality would be necessary to sell the grain; this suggests a new value chain for the retail portion of the business, as well as the packaging function.

For grain farmers, many wholesale functions may be on the farm; the grain farmer should be “selling” grain to that wholesale function (though it may be owned by the farmer) if vertical integration is added to the grain farm overall to increase profitability. Figure 8c uses data provided by grain farmers in the North Bay to produce a comparison value chain to the industry benchmark in Figure 8b.

Figure 8c: Individual Grain Farmer Value Chain Proportions

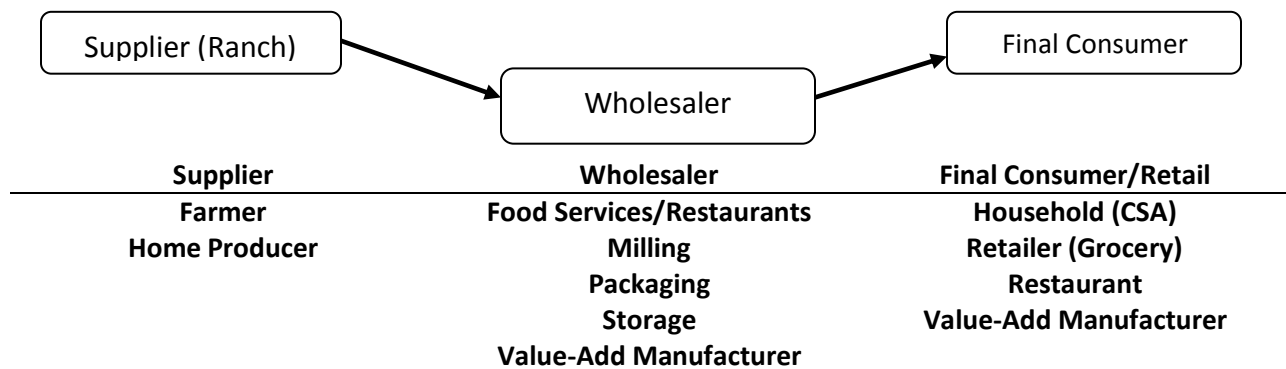


Source: Interviews with North Bay Grain Farmers

There are two differences between Figures 8b and 8c of note. In the core activities, differences exist in operations and in customer service in terms of more value-added activities, and less on outbound logistics and marketing/sales. North Bay grain operations tend to focus more operations and customer service (post-transaction engagement with the other parts of the supply chain) rather than looking at broadening markets and modes of delivery and packaging. Notice that the amount of value-added activities is disproportionately larger for infrastructure in regional grain production versus the industry, due to the amount of machinery and physical capital used (land and machine costs). This is a signal that farmers are being rewarded through such a mix by higher profits than the industry benchmark, likely due to economies of scale in the use of machines and land in this region.

Also, most of the value added in services is in firm infrastructure and equipment. Grain farmers identified that needs such as tractors, milling and cleaning equipment, and other physical capital, including the costs of land, were large costs in terms of providing more value to farmed grain. For dry farming methods, water will not be as large an issue in terms of infrastructure; if irrigation is needed, irrigation would be part of both the infrastructure and technology components.

Figure 9: Grain Farming Supply Chain and Connections



Grain farming will utilize logistics and transportation to move grain from farms to markets. Storage may also be an issue for many farmers, where harvest would then necessitate storage before market delivery. Notice that the operations portion of grain farming is relatively high. This makes sense concerning crop farming and that harvest is the most intense time of the year in terms of labor and machine costs. However, grain farms operations will have a large amount of maintenance also, as well as water and fertilizer management. For example, if individual bagging is needed, where a size is determined, this will add a process to some grain farmer's activities with respect to those that sell to wholesale markets.

This supply chain reaction to customers may warrant a centralized processing facility, or a business to fill that regional gap in removing the need for such a facility for this industry to remove that activity from their value chain and pay for this value-add service. Grain farming further affects industries throughout the North Bay region as shown in Tables 10 through 12 below.

Economic Impact Analysis

Grain farming will have many of the same allied industries as other ranching efforts at the industry level. Banks and credit unions, real estate agencies, commercial construction and repair, and wholesalers will be allied industries. Each of Tables 10, 11 and 12 show the effects on the five counties if 100 workers were employed in grain farming throughout the region. Notice that industries such as medical and dental offices and non-bank (payday) lending derive employment from grain farming. In terms of revenues, many of the same firms as ranching gain benefits from this industry's existence. One mystery in these numbers is the number of firms that would be supplied by grain farmers and may have their value chains enhanced in terms of profit from buying local grains. This includes local bakeries and baking operations out of homes.

Table 10: Employment Impacts, New Jobs from Grain Farming, 2011 Dollars, North Bay Average Based on 100 Ranch Workers in Lake, Marin, Mendocino, Napa and Sonoma Counties

Industry	Direct	Indirect	Induced	Total
Grain farming	100.0			100.0
Support activities for agriculture		6.8		6.8
Real estate agencies		3.3	0.3	3.6
Bars and Restaurants		0.1	0.7	0.8
Wholesale trade businesses		0.6	0.1	0.7
Banks and Credit Unions		0.5	0.1	0.6
Maintenance and repair construction: nonresidential		0.4		0.4
Investment Banking		0.2	0.2	0.4
Non-bank lending		0.2	0.1	0.3
Medical and Dental Offices			0.2	0.2
Services to buildings and dwellings		0.1		0.1
Transport by truck		0.1		0.1
Private hospitals			0.1	0.1
Private household operations			0.1	0.1
All Others		2.9	4.1	7.0
Totals	100.0	15.2	6.0	121.2

Table 11: New Tax Receipts from Grain Farming, 2011 Dollars, North Bay Average Based on 100 Ranch Workers in Lake, Marin, Mendocino, Napa and Sonoma Counties

Type of Tax	State and Local
Employment Taxes	\$5
Sales taxes	55
Property taxes	60
Personal Income	61
Other Taxes and Fees	31
Total State and Local Taxes	\$212

These data represent what a set of grain farmers in the North Bay counties would produce in economic impacts if 100 employees worked on such farms. These tables represent annual jobs supported, business revenues and tax receipts due to such an operation. Official data on grain farms suggests very few operations exist in the North Bay; what these data provide is a guide to what the effects would be if there was at least 100 workers employed. While this analysis is about grain farming, it is an intriguing supply chain issue to ask about the demand for local grain farming. The economic impact data do not reveal that connection at a high level. The value chain for this industry is affected by costs of water, fertilizer, fuel and other input into any crop farming process. Costs are likely dominated by maintenance of property, seed placement, and harvests for most operations.

Table 12: New Sales Revenues to Businesses from Grain Farming, 2011, Thousands of \$ Based on 100 Ranch Workers in Lake, Marin, Mendocino, Napa and Sonoma Counties

Industry	Direct	Indirect	Induced	Total
Grain farming	\$4,832	\$1		\$4,833
Real estate agencies		646	41	687
Support activities for agriculture		322		322
Banks and Credit Unions		241	24	265
Rental Income for Property Owners			123	123
Wholesale trade businesses		88	23	111
Maintenance and repair construction: nonresidential		69	4	73
Other state and local government enterprises		44	11	55
Natural gas distribution		48	5	53
Non-bank lending		15	8	23
Fertilizer manufacturing		17		17
Private hospitals			16	16
Bars and Restaurants		3	12	15
Extraction of oil and natural gas		8	1	9
Transport by truck		6	1	7
All Others		437	481	918
Totals	\$4,832	\$1,947	\$750	\$7,529

Using a hypothetical example of 100 workers across the five-county region, there would be a total of 121 workers supported by grain farming. These workers and grain farms would support over \$7.5 million in business revenue (including the farming revenue of over \$4.8 million), and generate over \$212,000 in state and local taxes. The economic impacts of this industry are wide in breadth and similar to the other farming operations in this study. Bars and restaurants, real estate, banks and credit unions, and companies that support farming (provide services to farmers) dominate the allied companies.

A Final Note on the Economic Impacts

The data show the “multiplicative” effect of these farmers and ranchers on our regional economy. The amount of leakage for most agricultural products is large; many regions produce more in food than they could possibly consume internally, and usually focus on urban markets that lack local ag resources. Second, there are services for local farmers not listed in these economic impacts because the services provided by these allied industries exist outside the North Bay. Finally, in a region such as the North Bay, these economic impacts show there are broad effects on many industries; by more direct sales and local focus on completing the value chain through filling in services regionally, these impacts can be increased. The mix of agricultural land and medium-sized cities and towns provide a strong mix of markets and expansion for these farmers. The economic impact data shows that broad support is possible due to the broad range of industries affected.

6. Conclusions

Value chains are tools for comparison and introspection for any business. They provide a way to categorize every activity of the business, and what proportion of business revenues are generated by each activity. For example, a grain farmer may currently use a common milling machine and rent that time from another farmer. If the grain farmer purchased their own milling machine, the value added to their grains may exceed the purchase cost and generate more profit. Value chains identify where businesses can improve their profitability versus industry comparisons, and also where the business is using allied services and products. Value chains represent the value added by each step of a production process, where the chain's sum is the total value added by the firm or industry to the raw materials. Profit should be viewed, however, as a cost of doing business.

Like any other production processes, farmers use both raw materials and services to add value. Some services can be seen as "allied" industries, hired by agricultural industries to perform tasks that cannot be economically performed on the farm. By considering both industries together, we can analyze the regional supply chain for dairy ranching, grass-fed beef ranching and grain farming for a specific area. Economic impact analysis can provide estimates of how each allied business is affected in terms of job creation, and in terms of business and tax revenues derived from the overall effects.

The dairy business in Sonoma and Marin counties employ over 570 workers and represent approximately 87 dairies. The dairy business generate or helps to generate over \$19 million of revenues and an additional 31 jobs for Sonoma and Marin county businesses for every 100 people employed at dairies, as well as generate over \$768 thousand in state and local tax revenue. The grass-fed beef business in the North Bay counties supports over 163 workers, for every 100 workers on cattle ranches, across many industries in the North Bay. The grass-fed beef business generates and supports over \$20.9 million of revenues for North Bay businesses, as well as approximately \$582 thousand in state and local tax revenue.

For every 100 workers across the same North Bay counties as grass-fed beef (Lake, Marin, Mendocino, Napa, and Sonoma counties), grain farming would support an additional 21 workers beyond the grain farms. The economic impacts would be over \$7.5 million in business revenue (including grain farming revenue of over \$4.8 million if 100 workers were employed), and generates over \$210 thousand in state and local taxes. The economic impacts of this industry are wide in breadth and similar to the other farming operations in this study. Bars and restaurants, real estate, banks and credit unions, and companies that support farming (provide services to farmers) dominate the allied companies.

7. References

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