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Energy, Agriculture, and Food: National, County, City Considerations

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The objective of this paper is to evaluate the available information, assess the specific situation in Whatcom County, and make recommendations on reducing vulnerability to peak oil. The paper includes a discussion of energy use in agriculture, identification of particularly vulnerable areas, and suggestion of ways to reduce the vulnerability of the county's agriculture and, indeed, the entire food system to peak oil and volatile energy prices.

The urgency that has given rise to such study has to do with the rising cost of total energy costs in agriculture. At the time of this writing, the U.S. House had just passed the American Clean Energy and Security Act, legislation that would set limits on greenhouse gasses (GHG) by, for example, limiting emissions from major industrial sources, including refineries and electricity and natural gas distributors. Direct emissions from agriculture, in the bill's current form, would be excluded from the cap.¹ Certainly, each step in the food production chain requires energy in a liquid, solid, or gaseous form, or in the final form of mechanical, electrical, or chemical energy – and produces various levels of carbon emissions.² According to the Congressional Research Service [CRS] report, “In the long run, a sustained rise in energy prices may have serious consequences on energy-intensive industries like agriculture by reducing profitability and driving resources away from the sector.”³ It also affects decisions regarding crop and activity mix, cultivation practices (relatively inexpensive tillage practices replacing expensive pesticides, yet possibly exacerbating soil loss), as well as irrigation and post-harvest practices.⁴ Writing energy policy with food security in mind is indeed in the national welfare; it is uncertain what the U.S. Senate will do with this Energy Bill.

¹ (*Bellingham Herald* AP, 6/27/09, A-1).

² Gustavo Best, “‘Energizing’ the food production chain for the attainment of food security”, July 1996, *Sddimensions* at www.fao.org.

³ (Schepf, 2004: Summary)

⁴ (See CRS Report RL30758, *Alternative Transportation Fuels and Vehicles: Energy, Environment, and Development Issues*, for a description and cost comparison of the major fuels natural gas, LP gas or propane, and electricity, and the alternative fuels biodiesel, ethanol, and methanol; USDA, Economic Research Service (ERS), *Agricultural Resources and Environmental Indicators, Agricultural Handbook No. 705*, December 1994, p. 106; and Miranowski, 2004.... **full reference, earlier in footnote?**

In 2003, total energy costs of \$28.8 billion represented 14.4% (5.2% direct and 9.3% indirect) of the annual production expenses of \$198.9 billion.⁵ The “energizing of agriculture”⁶ since 1945 has depended heavily on fossil fuels either directly (fuel or electricity to power machinery and equipment and also for heating and cooling of buildings, animals, and other products) or indirectly (fertilizers and other chemicals) (see Table 1). Further, high fuel and fertilizer prices in 2004 due in part to high natural gas prices have “contributed to a substantial reduction in U.S. nitrogen fertilizer production capacity — over a 23% decline from 1998 through 2003”.⁷ Such energy costs suggest a vulnerability to energy price fluctuation that can severely impact profitability, depending on commodity and locale.

Still, since the late 1970s and its associated energy price shocks, the direct use of energy by agriculture has declined by 26% while the energy used to produce fertilizers and pesticides has declined by 31%—averaging to about 28% overall—in part due to switching from gasoline-powered to more fuel-efficient diesel-powered engines and adopting conservation tillage practices for field crops.⁸ Agricultural energy use peaked at 2.4 quadrillion Btu in 1978.⁹

In the 25 years or so leading up to the first “oil crisis” of the late 20th century—the oil embargo of 1973—domestic real prices for oil in the United States had declined due to competition from lower priced imports and other factors.¹⁰ With low prices for both crude and refined petroleum, U.S. agriculture benefited from intensive use (subject to commodity and locale) of petroleum-based fertilizers and other chemicals, diesel-fueled tractors, and the ability to transport crops over long distances. In the three decades immediately following WWII, energy use in U.S. agriculture is estimated to have increased four-fold while crop yields increased only three-fold¹¹. Energy efficiency decreased (relative to output), especially with the use of chemical fertilizers and pesticides, but labor productivity increased, in part due to reduction in per acre farm labor. Still, with the first oil crunch, the vulnerability of agriculture to the vagaries of supply and price of petroleum-based products was evident. The impacts of this energy crisis, along with other long-range trends, affected virtually all scales of operations.

Table 1. Energy Uses in Agricultural Production¹²

Direct Use of Energy Fuel

Operating farm machinery and large trucks:

- field work (tractors, combines, mowers, balers, etc.)

⁵ (Congressional Research Service, 2004).

⁶ (Best, 1996)

⁷ (Schnepf, 2004: Executive Summary **no page number**).

⁸ Lester R. Brown of the Earth Policy Institute attributes reduction in tillage to a decrease in direct fuel use, as well. He notes that the combined use of gasoline and diesel fuel in farming decreased from a historic high of 7.7 billion gallons in 1973 to 4.2 billion in 2005 – a 45% decrease (guest post, “The Oil Intensity of Food,” at www.theoil drum.com/node/5533#more)

⁹ John Miranowski, “Energy Consumption in U.S. Agriculture”, presentation at USDA conference on Agriculture, June 24, 2004 at <http://www.farmfoundation.org/projects/03-35EnergyConferencepresentations.htm>.

¹⁰ H.O. & J.G. Youde, J. G. “Some impacts of the changing energy situation on U.S. Agriculture”, 1974, *American Journal of Agricultural Economics*, 56(5), 878-887 and Hanson, K., Robinson, S., & Schluter, G. “Sectoral effects of a world oil price shock: Economy-wide linkages to the agricultural sector”, 1993, *Journal of Agricultural and Resource Economics*, 18(1), 96-116.

¹¹ David Pimentel and Mario Giampietro, *Food, Land, Population and the U.S. Economy, Executive Summary*, Nov 21 1994, Carrying Capacity Network at www.dieoff.com/page40.htm.

¹² (Schnepf, 2004: 3). Source: Assembled by CRS from various sources. exact wording, from the report

- input purchase and deliveries (large trucks)

Diesel fuel

Operating small vehicles (cars and pickup trucks):

- farm management activities

Gasoline

Operating small equipment:

- Irrigation equipment

- Drying of grain or fruit

- Ginning cotton

- Curing tobacco

- Heating for frost protection in groves and orchards

- Crop flammers

- Heating/cooling of cattle barn, pig or poultry brooder, greenhouse, stock tanks, etc.

- Animal waste treatment

- Standby generators

Diesel fuel

Natural Gas (NG)

LP Gas (LP)

Electricity (E)

General farm overhead

- Lighting for houses, sheds, and barns

- Power for farm household appliances

Electricity

Custom operations

- Field work (e.g., combining)

- Drying

- Other

Diesel, Gasoline,

NG, LP, E

Marketing

- Transportation: elevator to terminal, processor, or port

- Elevating

Diesel

Gasoline

Indirect Use of Energy Fuel

Fertilizer

- Nitrogen-based (NG is 75% to 90% of cost of prod.)

- Phosphate (NG is 15% to 30% of cost of prod.)

- Potash (NG is 15% of cost of prod.)

Natural Gas (NG)

Pesticides (insecticides, herbicides, fungicides) Petroleum or NG

General concerns regarding energy use and prices have been echoed/reinforced by agencies such as the International Energy Agency (IEA), an intergovernmental organization focused on energy policy in the industrial world. In its World Energy Outlook 2008 report, the IEA offered that, “The world’s energy system is at a crossroads” and that,

“Current global trends in energy supply and consumption are patently unsustainable — environmentally, economically, socially. But that can — and must — be altered; there’s still time to change the road we’re on. It is not an exaggeration to claim that the future of human prosperity depends on how successfully we tackle the two central energy challenges facing us today: securing the supply of reliable and affordable energy; and effecting a rapid transformation to a low-carbon, efficient and environmentally benign system of energy supply. What is needed is nothing short of an energy revolution.”¹³

Most recently, there has been a significant rise in the price of oil (and to a lesser extent, natural gas), from \$58/barrel in mid-2006 to a peak of \$147 in July 2008 (about the time the Bellingham Energy Resource Scarcity and Peak Oil (ERSPO) Task Force first convened). It then dropped to a relatively stable \$50/bbl in early 2009. The volatility in oil prices – admittedly, the result of a variety of factors and agents – is perhaps the most challenging aspect of fossil fuel overdependence for county residents to deal with when, for example, the price of oil in the winter of 2009 was less than one-third of its peak in the summer of 2008.¹⁴

Two important reports have surfaced – the International Energy Agency’s annual World Energy Outlook mentioned above and a report by a United Kingdom industry task force¹⁵, which evaluated two authorities’ views on when peak oil may occur and how consumer behavior, as well as supply sources, might change to address the impending oil energy crunch. The report clearly states that “Neither the government, nor the public, nor many companies, seem to be aware of the danger the UK economy faces from imminent peak oil.”¹⁶ The reports suggest that the current recession is resulting in plummeting investment, not the surge in production that would be needed to keep up with rebounding, post-recession demand.

Energy and Agriculture

In terms of food (defined by the United States Department of Agriculture (USDA) as what humans eat), feed (defined as what animals eat) and, more broadly, agriculture (defined as the production of food and goods through farming and forest practices or, as articulated by Whatcom Farms, “the science, art and business of cultivating soil, producing crops, and raising livestock”¹⁷, our dependence on fossil fuels and increased costs is experienced primarily in higher prices for tractor fuel, agricultural chemicals, and the transport of farm inputs and outputs¹⁸. However, there are other effects. The second has been a logical consequence of high oil prices—increased demand for biofuels resulting in pressure to convert farmland from food and feed production to fuel production.¹⁹ A third effect is accelerated climate change and extreme weather events caused by fossil fuel-based greenhouse gas emissions, which is a concern already addressed by the city of Bellingham with initiatives such as its City’s Climate

¹³ See also Hirsch report (2005), the Portland Peak Oil Task Force report (2007), and the UK Industry Task Force on Peak Oil and Energy Security (2008).ii) this comes from the ERSPO report....so the complete references are there..I’m trying to make this a stand alone document...

¹⁴ taken from ERSPO draft, references there

¹⁵ taken from ERSPO draft, references there,

¹⁶ taken from ERSPO draft, references there

¹⁷ see Appendix C for terms

¹⁸ see Richard Heinberg, “What Will We Eat When the Oil Runs Out”, November 2007, The Lady Eve Balfour Memorial Lecture, Central Hall, Westminster, London.

¹⁹ see William Schulz. “The Costs of Biofuels”, 2007, *Chemical & Engineering News* 85 (51): 12-16).

Protection Action Plan.²⁰ A fourth effect widely identified and summed up neatly in the Heinberg lecture already referenced is the degradation or net loss of basic natural resources—principally topsoil (in certain parts of the country) as well as impairment of water supplies (seen in certain western states and practices) as a result of unsustainable production methods fueled by inexpensive energy.

According to an oft-cited CRS study, in 2002 the U.S. agricultural sector used approximately 1.7 quadrillion Btu of energy from both direct (1.1 quadrillion Btu) and indirect (0.6 quadrillion Btu) sources.²¹ The 1.7 quadrillion figure, compared to other U.S. producing sectors, represents about 1 percent of total U.S. direct energy consumption;²² it should be noted that the agricultural sector remains particularly vulnerable to natural gas supply/price volatility. Natural gas is the major feedstock of nitrogen fertilizers and represents as much as 90% of the cost of production of anhydrous ammonia—a key component of most nitrogen fertilizers. It is also a major component in the production of phosphate (15% to 30% of the cost of production) and potash (15%) fertilizers. The total direct and indirect consumption of natural gas amounts to over 26% of total energy consumption in the agricultural sector.²³

With an agricultural energy use totaling about 1% of the US direct energy consumption, it is unlikely that adjustments in agriculture will have a large effect on supply and demand for the United States as a whole. However, within this sector, the amount of expenditures varies tremendously depending on commodity, production practice, and geographic place and, thus, it becomes quite important to situate our discussion. For example, the Pacific region—Washington, Oregon, and California — ranked second in terms of total agricultural energy costs at \$4.2 billion but relied more on direct fuels (43% of total energy costs in the Pacific region). Also, the Pacific dominated national electricity expenditures in agricultural production, with nearly \$1 billion in outlays in 2002 (accounting for 25% of national electricity costs in agricultural production).²⁴

Perhaps of most relevance to Whatcom County, is energy vulnerability in two major commodities—fruit and dairy production. The CRS report²⁵ notes that in 2002, “fruit and tree nut” energy costs of \$1.7 billion represented 17% of total production expenses, whereas energy use comprised less than 10% of total production costs in greenhouse, nursery, and floriculture production. For dairy, besides the necessary electricity mentioned above (for operating milking systems, cooling milk, and supplying hot water for sanitation), pasture management, feeding operations, and marketing activities also consume energy directly and indirectly, amounting to a total energy cost of \$1.2 billion for dairy and milk production in 2002, which admittedly was less than 7% of total production expenses.

²⁰ see <http://conservation.whatcomcounty.org/energy/BellinghamClimateProtection.shtml>

²¹ study (Schnepf, 2004: 4-5), *Energy Use in Agriculture or CRS study*

²² It does, however, include a disproportionate share of nitrogen and pesticide use (two major indirect agricultural inputs) amounting to 56% and 67%, respectively of the total used in the United States (Schnepf, 2004: 4; and, GAO, Natural Gas: Domestic Nitrogen Fertilizer Production Depends on Natural Gas Availability and Prices, GAO-03-1148, Sept. 2003, p. 4 and U.S. EPA, Pesticide Industry Sales and Usage: 2000 and 2001 Market Estimates, May 2004, p.6). Similar data on percentage of phosphorous and potash fertilizer use were not readily available.

²³ (Schnepf, 2004: 5)

²⁴ (Schnepf, 2004: 23).

²⁵ CRS report (p. 21)

Energy and the Food System

Certainly, the most startling statistics regarding fossil fuel use in food come from an assessment of the entire food system—from seed production to preparing an evening meal. Concern over such energy use has resulted from the early (and continuing) work of David Pimentel of Cornell University and Jules Pretty of the University of Essex and their colleagues to novelists such as Barbara Kingsolver and her academic partner Steven L. Hopp. Such authors claim that food systems, in their entirety, constitute large percentages of a nation’s total direct/indirect energy use. As Hopp notes, “Americans put almost as much fossil fuel into our refrigerators as our cars....400 gallons of oil a year per citizen”.²⁶ In *Food, Land, Population and the U.S. Economy* by David Pimentel and Mario Giampietro²⁷, the authors assert that, once food processing, packaging, and distribution, as well as energy used for shopping and home preparation of food (sometimes appearing as “residential energy use” in certain statistics), the percentage of total U.S. energy consumption represented by the food system is 17%.²⁸

Clearly, costs beyond the unprocessed product at the farm gate represent the lion’s share of energy use—presenting a quite different picture from the lowly 1% figure attributed to agriculture’s share of the U.S. energy bill! For decades, Pimentel and colleagues have warned of the decreases in energy efficiency in the food system, despite respectable (although not necessarily commensurate) yields and productivity in the agricultural sector.²⁹ To broaden the discussion even more, we need to take a good look at the kind of “food” provided in our American diet? Namely, the huge shift in the American diet over the past 50 years to processed foods. Ours is a diet dominated by corn and soy—discussed most notable by journalist-academics such as Michael Pollan, and too lengthy in details and import to go into in this document.³⁰ Suffice it to say that our highly-processed diet represents a consumption of 2,175

²⁶ (with Camille Kingsolver, NY: HarperCollins, 2007 *Animal, Vegetable, Miracle: A Year of Food Life*...p 5 Also see: Richard Manning, “The oil we eat,” *Harper’s Magazine*, February 2004, www.harpers.org/TheOilWeEat.html).

²⁷ (see Carrying Capacity Network, 11/21/1994 www.dieoff.com/page40.htm)

²⁸ Pimentel and Giampietro, Section III-Ecological constraints to food production in the United States, 1994.

²⁹ Such doom and gloom news has been eagerly accepted by some and demonized by others. Yet, to sum up much of Pimentel’s research and, at the risk of the proverbial mixing of apples with oranges and looking carefully at energy inputs and outputs, whereas agriculture in general breaks even, the entire food system is utterly inefficient at a ratio of 10:1—writes the Pimentels: “Specifically, in food production, for each food calorie consumed by humans, approximately 10 calories of fossil energy are expended (about one third each for agricultural production, processing and packaging, and distribution and cooking). In total, the U.S. food system consumes about 17% of fossil fuel (about 400 gallons of oil equivalents per person each year).” See David and Marcia Pimentel, “Land, Water and Energy Versus The Ideal U.S. Population” at http://npg.org/forum_series/forum0205.html. Also see <http://www.sustainabletable.org/issues/energy/> and Johns Hopkins Bloomberg School of Public Health, “How sustainable agriculture can address the environmental and human health harms of industrial agriculture”, *Environmental Health Perspectives*, May 2002. See also Martin C. Heller, Martin C. and Gregory A. Keoleian, *Life Cycle-Based Sustainability Indicators for Assessment of the U.S. Food System*, Center for Sustainable Systems: University of Michigan, 2000. See also Leo Horrigan, Robert S. Lawrence, and Polly Walker. “How Sustainable Agriculture Can Address the Environmental and Human Health Harms of Industrial Agriculture”, *Environmental Health Perspectives*. 2002.

³⁰ Such availability of corn and soy has translated into increasingly more manufactured food products based on these products (with corn supplying the carbohydrates, soy the protein, and both supplying the fat—Michael Pollan, *The Omnivore’s Dilemma* New York, Penguin Press 2006, p. 91)—with implications for diet (“from leaves to seeds,” in the words of journalist Michael Pollan, with corn contributing about 554 calories a day to America’s per person food supply and soy contributing another 257 (Michael Pollan *In Defense of Food* NY: Penguin Press 2008, p. 123).

pounds of food per person per year, amounting to about 3600 cal (with a comparison world average of 2700)³¹ in which “fast food” accounts for 34% of total food consumption for the average citizen or about one-fourth of our meals eaten outside the home³², which adds to the energy food bill.³³

Clearly, getting crop from seed to harvest takes only a part of the total energy used for food. Much of the energy bill accrues during the trip from the farm to your plate, with items in a typical US meal traveling 1500 miles.³⁴ Besides direct transport, what adds to the energy food bill is the food processing (drying, milling cutting, sorting, baling), packaging, warehousing, and refrigeration—all of which add to GHG emissions.³⁵

What exactly is the impact of high energy prices on the food bill? The effect of high energy prices is not clear. The CRS study gives figures of 3.5% of the cost of food as being attributable to energy expenses and 4% being attributable to transportation expenses alone. Jules Pretty and colleagues estimate that approximately 2.1 billion pounds could be saved in environmental and congestion costs by buying more locally.³⁶

The energy food bill includes only the costs of electricity, natural gas, and other fuels used in food processing, wholesaling, retailing, and food-service establishments.³⁷ Farmers receive 19¢ for every \$1 of consumer expenditures on food. This means that 81¢ of the consumer food dollar

In *New Solutions*, no. 13 July 2007 (p. 4), boldly presented is the distribution of corn molecules that come originally from corn in a typical McDonald’s meal as measured by a mass spectrometer -- with soda recording a 100% distribution, milkshakes 78%, and cheeseburgers 52%. Dietary choices are certainly influenced by the low cost and ready availability of corn- and soy- containing manufactured foods. With consumers making up to 200 food-related decisions daily (Brain Wansink *Mindless Eating: Why We Eat More Than We think* NY: Bantam Books 2006), overeating of high-calorie processed foods is commonplace – and has health and national health budget implications. Also see any work on industrial agriculture by Harriet Friedmann of the University of Toronto, for example, “Modernity and the hamburger: cattle and wheat in ecological and culinary change” at www.yale.edu/agrarianstudies/papers/hamburger.pdf and “What on earth is the modern world-system? Food-getting and territory in the modern era and beyond,” *Journal of World-Systems Research*. Vol. VI Summer/Fall 2000. Much of this applies to Whatcom County agricultural consumers rather than producers.

³¹ Pimentel and Giampietro reference here, Executive summary

³² (*Food consumption and access*, Lynn Brantley et al Capital Area Food Bank 6/1/2002

www.clagettfarm.org/purchasing.html

³³ See also www.communitysolution.org, *New Solutions* #13 and #14 (2007).

³⁴ This oft-quoted figure can be traced to early work by University of Essex’s Jules Pretty and many of his recent publications as well, especially his work with colleagues published in *Food Policy* (see JN Pretty, AS Ball, T Lang, and JIL Morrison, “Farm costs and food miles: An assessment of the full cost of the UK weekly food basket,” *Food Policy* 30(1): 1-20. For more, see www.essex.ac.uk/bs/staff/pretty or Pretty’s personal website,

www.julespretty.com. Pretty also has published widely on topics of energy efficiency in agriculture, and efficiency ratios. It is interesting that Cornell University’s David Pimentel, writing in and about the United States, has been derided for his topical work whereas Jules Pretty has been knighted (he has been awarded an OBE). See also “Implications of fossil-fuel dependence for the food system” by Jay Tomczak, Michigan State University 2005, popularized also in works by economist Jeff Rubin and journalists Alisa Smith & J.B. MacKinnon (the “Plenty” authors, *Plenty* (or, in Canada, *The 100-Mile Diet*), NY: Harmony Books 2007).

³⁵ (see Johns Hopkins Bloomberg School of Public Health report mentioned in note 5) It may be useful to note that nearer is sometimes not necessarily better – there are trade-offs to consider, e.g, manufacturing efficiency, energy mix, other waste production and processing with various economies of scale of central production.

³⁶ (see reference to the *Food Policy* article in note 8)

³⁷ Schnepf cites other studies and gives caveats, for example, in arriving at these estimates, transportation fuel costs, except for those in food wholesaling, are excluded.

is attributable to the marketers of food.³⁸ These food processors, transporters, wholesalers, and retailers have a greater capability than farmers for passing on their higher energy costs through the production-marketing system, and eventually to the consumer.³⁹

According to the CRS report⁴⁰,

A sustained increase in energy prices could be translated into higher food prices for consumers. Energy use adds to food production costs and consumer food prices beyond the farm gate in three stages: (1) food manufactured with energy-intensive technologies, (2) transportation of food products to regional markets in climate controlled cargo containers, and (3) storage and distribution of food items in environmentally controlled facilities. Food retailers are likely to use considerably more energy than the average retailer to control the environment for perishable food products around the clock, according to ERS.¹

Further, Hanson, Robinson and Schulner⁴¹ note that the effects on agriculture are not limited to the direct and indirect energy costs but are affected by further changes in currency exchange rates and eventual reduction in government supported agricultural programs. Increased fuel costs are often linked to decreased economic growth or even recession conditions (such as we are experiencing now). On the one side, recession layoffs have increased agricultural labor pools in developing economies such as China.⁴² Conversely, recession is likely to decrease demand for the products of small and medium-sized farms specializing in high-end and locally oriented products as consumers seek to alleviate rising household costs through the purchase of low-cost food products. Recession also may impact total farm income, with research suggesting that low-income farms, often small and medium-sized farms, have greater negative impacts (e.g.,

³⁸ (Schnepf, 2004: 31).

³⁹ "Food Marketing and Price Spreads: USDA Marketing Bill," ERS, USDA, available at [<http://www.ers.usda.gov/Briefing/FoodPriceSpreads/bill/>] and discussed in Schnepf, 2004.

⁴⁰ (Schnepf, 2004: 30-31),

USDA, 2002 Farm Bill, Title IX — Energy, online information available at [http://www.usda.gov/farmbill/energy_fb.html]. For more information see CRS Report RL31271, Energy Provisions of the Farm Bill: Comparison of the New Law with Previous Law and House and Senate Bills.

For more information, see State and Federal Incentives and Laws, at DOE's Alternative Fuels Data Center, at [http://www.eere.energy.gov/afdc/laws/incen_laws.html].

DOE, EIA, Table 1.2, "Energy Production by Source, 1949-2003," and Table 1.3, "Total U.S. Energy Consumption by Source."

For the status of pending energy legislation and additional related bill contents, see CRS Issue Brief IB10116, Energy Policy: The Continuing Debate and Omnibus Energy Legislation, at [<http://www.congress.gov/erp/ib/pdf/IB10116.pdf>]. For a discussion of the tax provisions in the bills, see CRS Issue Brief IB10054, Energy Tax Policy.

For more information, see CRS Report RL32204, Omnibus Energy Legislation: Comparison of Non-Tax Provisions in the H.R. 6 Conference Report and S. 2095; and CRS Report RL32078, Omnibus Energy Legislation: Comparison of Major Provisions in House and Senate-Passed Versions of H.R. 6, Plus S. 14.

⁴¹Phimister, E., Roberts, D., & Gilbert, A. (2004). The dynamics of farm incomes: Panel data analysis using the farm accounts survey. *Journal of Agricultural Economics*, 55(2), 197-220.

⁴² Hoppe, R. A., Korb, P., O'Donoghue, E., & Banker, D. (2007). Structure and finances of U.S. Farms: Family farm report. Washington, D.C. : United States Department of Agriculture.

employment lay-offs) from recessions.⁴³ Since most small and medium-sized farmers depend on off-farm earnings for household income, this most likely would be the case, especially given that about 85 percent of farmer's household income was generated outside the farm in 2007.⁴⁴

Focus on Whatcom County

Peak oil concerns suggests a volatility of energy prices in agriculture. The previous section discusses why and how there could be effects on the entire food system—how much of this might apply to Whatcom County? To address some concerns at the county level, we need to distinguish between different kinds of producers and consumers in the food system.

Categorizing, situating, and Understanding the Food System

For further discussion, we offer the following distinction:

- *Producers*: focused on the triple bottom line (economic, social, environmental) at all scales
- *Consumer-producers*: conscious about where food is coming from focused on the quadruple bottom line (economic, social, environmental, personal – with a premium on taste)
- *Consumers*: focused on bottom-line, although some of the above may apply

Those in each category have different interests and goals, related to peak oil effects, as described below.

Producers, in what often is referred to as “production agriculture”, follow an economic bottom line to stay in business, as well as social and environmental frameworks to comply with regulations in areas of their business. Depending on volume of production, they will be producing for state, national, and world markets. Consistency in volume and quantity of product is a concern and operations, particularly regarding liquid and gaseous fuels and agricultural chemicals, are vulnerable to volatile energy process. As Figure 1 shows, US Agricultural trade is huge, now close to 70 billion dollars per year in exports and contributing significantly to our balance of payments. Whatcom county farmers figure prominently in this, especially in dairy and berries for global markets (currently more than 65% of the U.S. Red Raspberries are produced in Whatcom County with 99 growers harvesting over 7,200 acres, most of which are shipped to Ocean Spray and Smuckers to be used in juice and jam)⁴⁵. Virtually all fluid milk—1.37 billion pounds per year from less than 200 dairies—was processed as powdered milk at the Lynden, Washington Darigold Plant for export in 2002; this amounts to 4 million pounds of fluid milk (about 480,000 gallons) being processed daily at the Darigold Plant in Lynden.⁴⁶ According to Whatcom Counts, Whatcom county is in the top .5% of 2,563 dairy counties in the U.S. (or something like this) and ranks #1 in terms of milk production per cow, producing more than 1.3 billion pounds of milk each year and the county is the largest producer of powdered milk in the nation, producing enough dairy products to meet 75% of Washington state's entire

⁴³ Department of Natural Resources and Parks (DNR). (2008). Snoqualmie flood-farm task force report. Seattle, WA.

⁴⁴ Pierzga, K., & Harris, A. M. (1999). Flood policy on the Chehalis river in Lewis county, Washington: Who makes the decisions? , The Evergreen State College, Olympia.

⁴⁵ see Whatcom Counts' *Agriculture – A Hidden Whatcom County Treasure* by Allison Roberts 2/22/07 (also see www.whatcomcounts.org)

⁴⁶ (<http://www.nwbusinessmonthly.com/Businesspulse/bp2002/june/0602bpdairy.html>).

According to the *National Agricultural Statistics Service*, Whatcom county farms numbered 1,679 in 1997 and 1,485 in 2002; land in farms was 113,797 in 1997 and 148,027 in 2002. According to WSDA Ag Pub 120-127 (R/12/06), the food processing industry accounted for 1,517 FTEs in 2005.

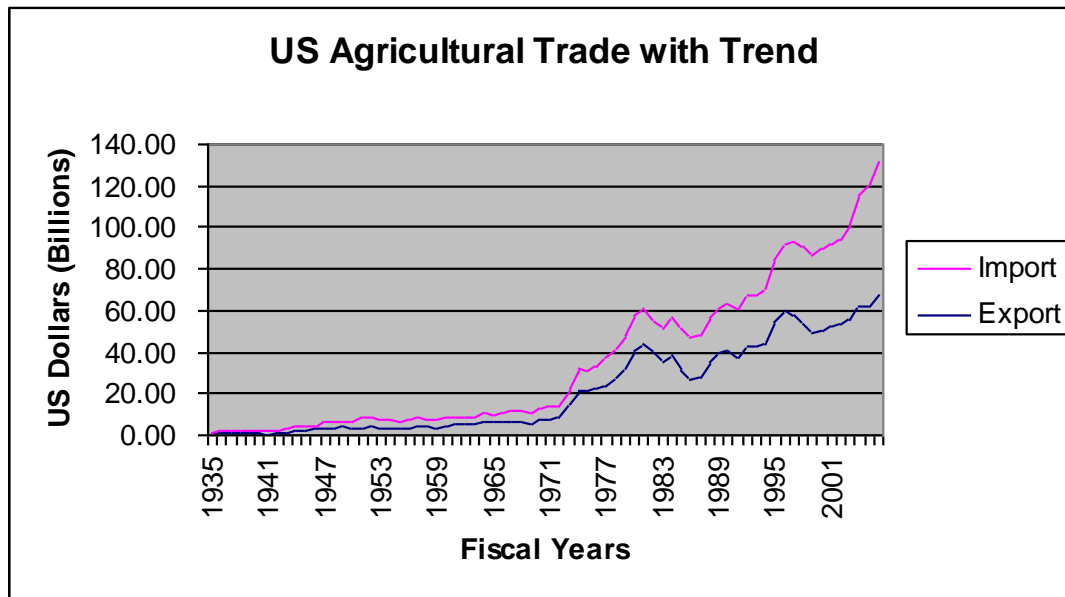


Figure 1 U.S. Agricultural Trade

Smaller-scale producers may have markets external to the county or state or may produce for local markets. Volatile energy prices are also a concern, but they many have the flexibility to adapt production and marketing strategies (see recommendations) that reduce such vulnerability.

Producers, in particular, are concerned with high energy prices, as suggested by the spike in value of sales over the past few years shown in Figure 2 with figures not adjusted for inflation.

Whatcom County Farm Petroleum Purchases

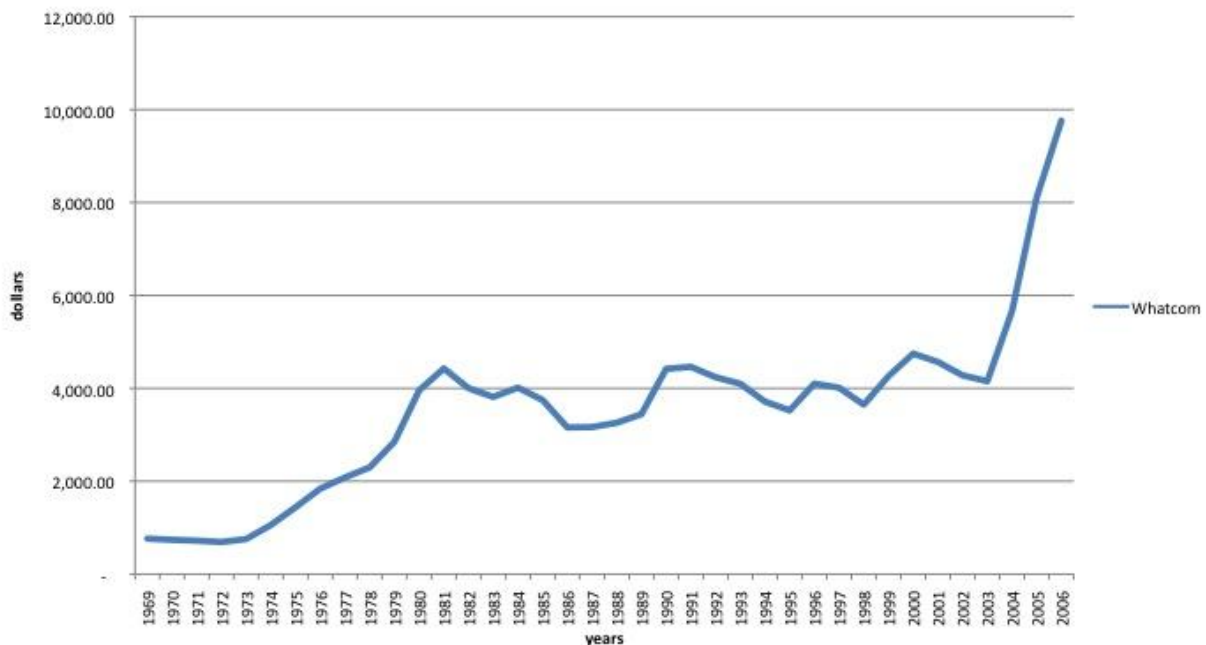


Figure 2 Whatcom County Farm Petroleum Purchases in Dollars, 1969-2006⁴⁷

Bottom-line Consumers are looking for the least-priced food, whether in a supermarket or in a food co-op. Mostly, they're looking for "a deal," in the words of a Trader Joe staffers in June 2009.⁴⁸

The "*Producer-Consumer*" term is taken from SLOW FOOD literature⁴⁹ and is an inclusive term ranging from gourmards, to Food Bank recipients, to Just food CSAers, to backyard gardeners. These are the individuals who may be most affected by/interested in the recommendations that follow. When doing so results in lower food prices, all would most likely consume foods produced in energy efficient systems, with fewer GHG emissions, and with less food miles. Using the term, FLOSS—Fresh, Local, Organic, Sustainable, and Seasonal—gives us some kind of common understanding as to one or more characteristics of energy-efficient food systems. Consumers do not need to ascribe to all five components, one may suffice (usually "Fresh" being one of the easiest components with which to find agreement⁵⁰). FLOSS, an idea developed by Henning Sehmsdorf of Lopez Island⁵¹, will be mentioned throughout this report.

As already discussed, the American food system is dependent on fossil fuels. What if higher oil and natural gas prices were to impact the kind and variety of food produced for local markets?

This may place a further strain on the ability of low-income households to put food on the table, subsequently increasing the demand for income and food assistance through the use of the Supplemental Nutrition Assistance Program (including electronic systems for transferring

⁴⁷ 2006Source: Bureau of Economic Analysis

⁴⁸ Informal conversation, Gigi Berardi.

⁴⁹ (see Carlo Petrini's *Slow Food Nation* Bra: Italy, Slow Food Editore 2005; and the spring 2009 issue of *the snail*)

⁵⁰ various consumer protection legislation vehicles since the 1950s have been designed to address freshness (as well as safety) of the American food supply

⁵¹ see csanr.wsu.edu/demofarms/HolisticHighLife.pdf

benefits to retailers, EBT) and food banks. What do others in the county think? Although not a scientific, statistical study, in late fall 2008, we asked a handful of farmers, residents, educators, and farm suppliers for their measured opinion regarding peak oil effects on food.

An Exercise

In fall, 2008, the Food and Agriculture subcommittee of the ERSPO Task Force developed a questionnaire as a vehicle to stimulate discussion on peak oil and related issues. The responses are of individual cases and in no way are meant to represent any one group (farmers, farms, co-op members, etc.). In its final form, the questionnaire represented an exercise to stimulate discussion (and that it did) rather than a survey to produce data to extrapolate to a larger population. For many, the questionnaire was a lightning rod—and participants were divided as to even the basic premises of the effort—whether “local” was indeed cheaper or less resource dependent than buying from national food channels.

Requests to participate in the exercise were extended to the Farm Friends distribution list and posted on the Whatcomfarms Google Group. 35 responded—approximately one-half were vegetable growers and one-quarter animal producers. The exercise captured middle- to small-scale producers and included several dairy operations, berry producers, as well as tree fruit (mainly, apples). Besides farmers, other agricultural support industries were represented—in particular, marketing and/or education professionals, as well as banking, farm supplies, and agricultural chemical interests, in addition to those providing “other technical assistance.” Most of the respondents lived in either Bellingham, Lynden, or Everson and ranged in age from 45-64 years, although a quarter represented the 25-44 year-range. Participants could answer a total of 30 questions related to energy use, farm practices, and ideas for reducing the energy food bill, particularly as they applied to 2008 but with some speculation as to what the following years might look like for peak oil issues.

Admittedly, one of the main issues about the exercise is that it tried to isolate peak oil/high energy price impacts on farm operations. It did not include other price changes and possible adjustments, nor how relative prices of goods produced might change (thus, affecting the net returns). Further, one can't ignore Whatcom County's important position in the global food economy (discussed above) and what the response might be if Whatcom county dairy products become much more competitive (compared to say, ever-increasingly expensive Great Lakes dairy output that is pricey perhaps due to excessive transportation costs), thus driving up land values here for anything other than dairy. Still, the ramifications of this would ripple through the food system in the County—with even more barriers to entry for emerging farmers—all fair game for discussion among our participants.

The exercise was successful in stimulating discussion. Indeed, most participants felt that the percentage of the 2008 operating budget spent on various energy fuels and sources (diesel, gasoline, electricity, natural gas, and propane) was low—less than 6 percent of the total. Two-thirds of the participants estimated that, for the next few years, there would be higher or much higher change in farm energy purchases, with about one-third answering that there would be an insignificant change. Costs affected were fertilizer and transport (goods and products to and from the farm), as well as supplies (especially feed). Participants were divided, however, as to the impact of high energy prices—about half agreed or strongly agreed that energy price increases would affect the amount and variety of food produced in the County.

In general, most participants agreed that food would cost more as a result of peak oil increasing the cost of growing, transporting, processing, and distributing food. Participants agreed that foods that are highly dependent on fertilizer inputs, transported over long distances, require time-sensitive refrigerated transport, or are highly processed will experience the most significant cost increases, such as fresh fruits, vegetables, and dairy products [this fits with references cited in this report and elsewhere].

There was disagreement, though, as to what this would actually mean for county agriculture, as I've already alluded to. For some, there was support for the idea that the kinds of foods processed would shift, introducing business pressures and opportunities for food producers and processors. The relative costs associated with the production, processing, and shipping of different kinds of food crops would cause some crops to be favored over others. Others thought that such ideas were preposterous, stating, "One simply doesn't know. If prices for energy go up, the question then becomes how will other prices change that impact on farming and how will farmers adjust to price changes. One can not speculate about change [in agricultural production] simply on the basis of asserting fuel costs will go up."

One thought was that crops grown locally, processed less or locally, and shipped over shorter distances without refrigeration, would be the most available and least expensive. Further, households would experience increased pressure to grow, process, and handle their own food. This was contested by some participants:

Again, it is relative prices that will give insight to the answers to this statement, not just changing the price of fuel. For example, there is no reason to believe locally grown stuff will be less expensive because that depends on the opportunity costs of land, labor, and capital. One could just as easily see local food being more expensive given that even with high fuel costs transportation is only one and then not a big part of production costs. Households will only grow more [food] themselves if the opportunity costs of their time are greater ...gardening than earning income some other way... Those who like to garden will garden. They'll do it for non-economic reasons.

Almost all participants supported the following ideas for education and support activities.

1. Educate: Local government needs to take action that helps all citizens' understand including: Informing key stakeholders in the food system about the impacts of high energy costs; and provide financial incentives so that farmers, processors, grocery stores, etc. will have a plan to deal with the impacts of high energy costs.
2. Preserve Farmland: Local government should: preserve existing farmland and productive soils for agriculture use. Cities should open up public and private land for food growing (e.g. financial incentives to lease land) for community gardens.
3. Expand marketing opportunities for farmers: Local governments should examine and adjust regulations to help local farmers sell directly to consumers through additional farmers' markets, farm stands, CSAs, and a public market.
4. Strengthen current hunger relief and emergency agencies and systems: Local government should prepare for increased food demand from a higher percentage of community members in need; develop a short or mid-term emergency food supply plan; and, establish a major food warehousing should a crisis (like an earthquake) occur.

5. Increase local food processing: Local government should prioritize food processing as an economic cluster, including incentives to encourage development.
6. Educate citizens: Local government should work with WSU Extension and local schools to educate citizens about food growing, processing, preserving, cooking, and composting.
7. Increase composting: Cities should start planning for local composting sites to improve tilth of individual and community gardens and eliminate green waste in landfills.

Regarding energy production on farms, (wind, solar, biogas), respondents were enthusiastic, although most participants asked for technical and financial assistance, as well as regulatory change to develop on-site renewable energy sources.⁵² Also agreed on was the need for an educational effort to identify and communicate the true costs of various foods. Participants were enthusiastic about this ERSPO initiative to anticipate increasing energy costs and develop solutions for positive outcomes.

In short, how does this relate to current farming practice and food supply in Whatcom County? The safest thing to say is: We don't know! This was neither a statistically-designed nor probabilistic survey. We cannot expand to any farm or consumer population with this, nor speculate on various positions on questions raised of such populations. Still, what it does show is at least some interest in the farmer and farm-support community to work together to increase energy efficiency on farms and support agriculture in general.

According to WSU extension professor Craig McConnell, energy inputs in Whatcom County agriculture are relatively low. For example, water pumping needs for farmers are relatively low and, although there are feed inputs hauled mostly on truck that more interstate transport via rail could reduce costs, manure is relatively high in nutrients and, to a certain extent, could substitute for costly fertilizers. Much of the electricity use, which in the Pacific Northwest is mostly hydroelectric, is represented by that needed for cooling. Pesticide use is relatively low, in part because modern-day chemicals are so concentrated that in the Puget Sound area it is likely that nonfarm pesticide (e.g., in woods and forests, and in public areas) is higher than on the farm. As a method of pest control, tillage could be relatively high, but WSU extension and other farm support groups are encouraging a reduction in tillage to control soil loss. Indeed, in Whatcom County, other parts of the food chain (for example fluid milk processing in one of the largest dehydration plants in the country—the Darigold Plant in Lynden) may be most vulnerable to energy price fluctuations. Lastly, one of the largest parts of the current national energy bill has to do with household behavior and practices – with more energy being used to refrigerate and prepare food than that used to produce it;⁵³ transportation, i.e., driving a 2-tonne car to pick up a 30 pound bag

⁵² See (Gustavo Best, “‘Energizing’ the food production chain for the attainment of food security” July 1996 *SDdimensions* www.fao.org) for a good discussion of bioenergy (using waste products not first-generation crops; and discussed elsewhere in this report), rural mechanization, and various forms of solar energy (direct and indirect). See white papers of the WSDA, eg, agr.wa.gov/bioenergy as well as new bulletins on related topics at www.businessweek.com/print/bwdaily/dnflash/mar2005; www.nef.org.uk/greenenergy’ www.nrel.gov), as we anticipate new initiatives to be proposed by the Obama administration regarding renewable energy sources’ contribution to total U.S. energy inputs. See also the 2008 “Agricultural Waste Management in Whatcom County” by Grace Lilly, Noelani Penney, and in conjunction with WSU Extension County Food Assessment project for a good discussion of current and projected uses of county wastes from dairy, berry, and nut operations; excerpts from their report are available through Gigi Berardi via <http://www.wvu.edu/resilience/SmallFarmResilienceGrant.shtml>).

⁵³ See Lester R. Brown (Earth Policy Institute)’s guest post, “The Oil Intensity of Food,” at www.theoil Drum.com/node/5533#more

Overall, it is clear that agriculture uses a small proportion of the nation's energy. However, even the CRS report notes that higher and unstable energy prices can affect direct and indirect energy inputs and make agriculture unprofitable. The report concludes that agriculture may have to find ways to become more energy independent and we concur—with the belief that volatile prices of energy used in agriculture, particularly for drying and cooling, irrigation, as well as for costly fertilizers and pesticides, will continue. It is important for farmers to have technical assistance to become more resilient (and some agencies that do that are listed below).⁵⁴ More importantly, reasoned and strong attention to land use planning and preservation of farmland is needed. Enhancing farm resiliency in this way can thus be a key component to supporting the long-term economic viability of area farms.

Examples of area advocacy and farm support organizations in Whatcom county are given in Appendix A. Such groups give support and ideas, to enhance flexibility and increase farm resilience.

Home-grown in Whatcom County: Assessing capabilities

Whatcom County's prime agricultural lands and climate, plus farmer know-how and ingenuity allow for a relatively large volume of production and niche market (e.g. powdered milk, red raspberries, etc.) position. Nevertheless, as seen in our exercise, participants and other county residents in general are concerned about food supply costs in Whatcom County.

Whatcom County is situated in the Pacific Northwest and easily is a cornucopia of diverse foods. Farms here have a comparative advantage over farms elsewhere to produce dairy (representing 55% of county commodity production) and fruits, nuts, and berries (representing 14% of county commodity production).⁵⁵ All farms, irrespective of scale of operation, are stewarding land resources, contributing to household, regional, or national “balance of payments”, and perhaps most importantly, keeping land in “open space.” Farms’ commercial success is an important economic multiplier for the county—for example, they are a major employer (the raspberry industry alone provides 6,000 seasonal jobs for the 6 week harvest period).⁵⁶

Are county farms feeding Whatcom County? For the most part, no. Rather, they are contributing to a more favorable balance of payments (primarily with dairy powder and berry exports) than we (as United States’ citizens) would have had otherwise. And what about county consumers? They are very much part of the market economy and procure food at wholesale and retail outlets of many kinds. Some also shop at the various county Farmers’ Markets and/or participate in Community Supported Agriculture (CSA) opportunities and/or “grow their own.”

Whatcom County does boast a high percentage of locally-owned businesses, including farms who practice direct-marketing, restaurants that locally source food they cook and process, chefs who cater and provide cooking classes with a local flair. Sustainable Connections has worked

⁵⁴ Indeed, it's a critical component of “*Changing the Way America farms*,” see book of the same title by Neva Hassanein Lincoln: University of Nebraska press 1999

⁵⁵ (<http://whatcom.wsu.edu/ag/2002agcensussummary.html>).

⁵⁶ <http://www.wcfarmfriends.com/go/doc/1579/181808//>.

doggedly to promote a “Buy Local or Bye-Bye Local?” campaign.

WSU Extension is undertaking a Community Food Assessment to try to determine where are the “food deserts” and “areas of food surplus,” and Colleen Burrows and Drew Betz of WSU Extension have made great strides in trying to assess local production capabilities and consumer needs, food imports, and exports.⁵⁷ Students at Western Washington University, in classes in Anthropology and in Huxley College, have collaborated with WSU Extension in collecting data on a variety of related topics, ranging from agricultural waste management, agricultural workers and employment opportunities, direct farm marketing, and Whatcom county fishing.⁵⁸

Still, most of the food consumed in Whatcom County is produced outside the region. What happens when the price of food soars? People spend down. They purchase less meat, less dairy, and turn to less expensive value-added products (processed foods). People’s food choices, consumer education on nutrition and healthy eating, and sourcing locally-produced foods are all interests that Haggen supermarkets have. In a recent phone interview⁵⁹ with Becky Skaggs, Vice President of Strategic Planning for Haggen, she noted its long-standing tradition of purchasing local products – a 75-plus year tradition. She added,

We have many discussions with Sustainable Connections on this very topic, whose sole purpose is to promote local. I’d like to think that we can be a resource to them, too. We’ve worked [for some time] with groups of farmers as to what they need to get products to market. We have the ability to work with farmers to help them with insurance and liability.... We were concerned with consumer education and country/place-of-origin labeling before [such ideas were enacted] into laws. We carry Bellewood Acres apple products and Twin Brook’s glass-bottled milk. Even Nature’s Path and Erin Baker is in our own backyard, now selling nationally as well.

Haggen’s definition of local includes products from Washington and Oregon and indeed much of the dairy products, marketed under Darigold, Wilcox (dairy and eggs), and Organic Valley labels are local. BC hothouses provide tomatoes and “significant produce” comes from the Puyallup valley. Adds Skaggs, “consumers are used to getting produce out of season—oranges—and from tropical [areas] like bananas. Our produce comes from California and the Baja peninsula, peaches from the Okanogan.” Skaggs noted that Haggen’s staff has visited most of the farms from which they purchase produce. Skaggs admits the subject of taste is difficult. “It’s so subjective,” says Skaggs, “we need to work on the bigger middle ground, how can we help customers shop better, eat better, and select foods that are healthier for their families.”

Sourcing local foods contributes to resiliency of systems, communities, and individual businesses and increases the capacity to flexibly respond to changes in external conditions such

⁵⁷ Such assessments give us some understanding of food supply channels. On a national level, in the February, 2008 issue of the USDA/ERS’s *Amber Waves: The Economics of Food, Farming, Natural Resources, and Rural America* (see www.ers.usda.gov/AmberWaves), the highest percentages of U.S. food imported – based on volume -- were for fish and shellfish (79%), fruit and nuts (32%), wine and beer (16%), vegetables (13%), grains and products (12%), sweeteners and candy (11%), red meats (10%), and dairy (35%).

⁵⁸ For Whatcom County data contained in these reports, contact Gigi Berardi via <http://www.wvu.edu/resilience/SmallFarmResilienceGrant.shtml>

⁵⁹ June 26, 2009, Bellingham.

as high energy prices.⁶⁰ Resiliency is what needs to characterize our farms as they struggle to maintain 148,027 acres of land in farms and financial solvency. Resiliency also should describe household food-procurement (recommendations for this are given below). Support for the current structure of agriculture, dominated by small- to medium-sized farms, is keen. Institutional capacity also is strong to recognize and establish farm and food partnerships and networks—and especially, for the purposes of this report, support those businesses producing food for local markets.

Some Considerations for Ways Forward

Energy and Agriculture: Producer Concerns (various scales of production)

Whatcom County, together with its incorporated cities', main goal should be “no net loss in the county's farmland soils”(as stated by one of the county's main farm advocacy groups, Whatcom Farm Friends and in a recent editorial by executive director Henry Bierlink.⁶¹ The group also well articulates main components of initiatives to keep Whatcom county land in farms.⁶² These include Farmland Preservation and Market-based Programs. Farmland preservation can be accomplished through market-based processes that match willing sellers with willing buyers. The current Purchase of Development Rights program is a modest example. A Transfer of Development Rights program may also have promise in this regard.⁶³ Market-based programs can significantly contribute to keeping farmland in working farms. It's also important from the perspective of farmers that such programs protect the current value of their land. In addition, these programs can limit increases in production costs, ease reduction of farm debt, facilitate the expansion of working farms, and lessen the difficulty of transition to the next generation of farmers (the last, a key component of all farm support groups throughout the county).

In short, unrestrained development will gut agriculture in Whatcom County and threaten any possibilities for an inclusive food security agenda.⁶⁴ These same ideas have been voiced by national organizations, too, as well as print (from the *New York Times* to the *Bellingham Herald*) and broadcast media. For example, in its *Sweet Earth: Lessons from the Land* series of reports on KUOW FM⁶⁵, the following recommendations were given.

- Observe and follow other counties' efforts to protect farmlands from encroaching development.⁶⁶
- Develop programs to help new farmers, including immigrants, similar to those of Bellingham's Sustainable Connections and other organizations for aspiring farmers to

⁶⁰ Alesch, D., & Holly, J. (2004). *Surviving extreme events: A guide to help small businesses and not-for-profit organizations prepared for and recover from extreme events*. Fairfax, VA: Public Entity Risk Institute.

⁶¹ “Wise decisions for farms more important than ever,” *Bellingham Herald* 6/28/09, B-2

⁶² (see <http://www.wcfarmfriends.com/go/doc/1579/192744/>) Also see Whatcom County Comprehensive Plan, May 1997 and a paper prepared by Matt Shipkey of the Planning Services Division of Whatcom County for the 2/27/02 meeting of the Whatcom County Agricultural Advisory Committee discussing actions and options in protecting the critical mass of agricultural acreage identified through the Comprehensive Plan Process.

⁶³ (see Appendix C)

⁶⁴ See “Zoning rules erode farm protections” by Ericka Pizzillo *The Bellingham Herald* 4/23/00 as a special report “Breaking up the farm” and “Farm smalls, sounds grow crop of complaints from newcomers” by Ericka Pizzillo *The Bellingham Herald* 4/24/00 and related articles in the “Breaking up the farm series.”

⁶⁵ (see <http://www.kuow.org/specials/sweetearth.php> for radio transcripts),

⁶⁶ For example, almost 30 years ago, King County residents voted to tax themselves to preserve rapidly disappearing farmland. The county used the \$50 million it raised to buy the development rights to about 14,000 acres of land. Issues remain about actually farming the land.

make that land productive

- Address farm labor issues.⁶⁷
- Resolve regulatory impediments.⁶⁸
- Support direct marketing opportunities
- Support the Farm-Food connection with Farm-school, Farm-hospitals, Farm-prisons, which involves some work-share opportunities (a number of groups are working on such connections in the Bellingham area).

The support for farms and farming has an enormous base of support in Whatcom County – from Slow Food convivia to heritage seed farms, from farm implement stores to members of the local Weston A. Price Foundation chapter, from Western Washington University dining services and Sustainability office to the Whatcom Agricultural Advisory Committee—many interest groups are finding common cause. And quite a few individuals as well— see Appendix B for reflections from a rebel farmer: Walter Haugen. His recommendations are focused on needed changes in direct marketing and reducing barriers to entry for new farmers.

Some of Walter Haugen’s main points include more farmers’ markets; the Bellingham’s Farmers’ Markets are certainly thriving (see Fig. 3), but Haugen recommends markets modeled after Ferndale’s – no stall fees (although this would require some outside funding for, say portable toilets) and with additional locations (north side of Bellingham, Lynden). He also recommends innovative CSA (Community Supported Agriculture) share programs such as Growing Washington’s Just Food program (in which it coordinates several dozen farmers’ produce to provide Just Food CSA boxes for low-income families, bulk produce for their own Growing Whatcom CSA, restaurant orders, and Local Farm Exchange (LFE) orders, which they use to stock their retail stand on Railroad Avenue in Bellingham).

Haugen’s other ideas include informal work shares whereby anyone could contract with the farmer to work each week and be paid in food or “mini-sharecropping” whereby a homeowner in the county marks off an acre of their property and invites a new farmer to grow food. Land rent is paid with a CSA subscription (currently worth about \$450 for 20 weekly boxes), about double what land rents are for most farmers in Whatcom County; such an arrangement also could improve the soil fertility and tilth of the soil, depending on what, if any, vegetative cover is currently there. See Appendix B for more ideas, including personal farmer programs, reduction in “ridiculous rules” and institutional barriers, and land-use opportunities provided by changes in land in usufruct (real property rights of limited duration).

⁶⁷ See also the 2008 “Community Food Assessment: Agricultural Workers and Employment Opportunities” by Nicole Brown, Lindsey Karas, and Tara Tisdale and in conjunction with WSU Extension County Food Assessment project; excerpts from their report are available through Gigi Berardi via <http://www.wvu.edu/resilience/SmallFarmResilienceGrant.shtml>).

⁶⁸ For example, with USDA-certified mobile slaughterhouses (See www.lopezclt.org/sard/mpu.html; www.igfcmeats.com/2.html; www.sanjuanislander.com/groups/lopez-trust/award.shtml; smallfarms.wsu.edu/animals/onFarmSlaughtering.html; www.fsis.usda.gov/OA/foodsafety/mobile/2004report.htm; as well as BC Food Processors Association: Meat Industry Enhancement Strategy “Mobile Processing Units (MPUs) – Overview of Options,” April 2007. Also see “Blaine may allow chickens” by Zoe Fraley *The Bellingham Herald* 6/21/09, B-1, for but one example of regulatory restrictions eased by, say, zoning amendments and “Do goats belong in your garden?” by Jennie Grant in *Ways to Grow* Seattle Tilth June/July 2009, Volume 32, No. 3. P. 1).

Regarding Haugen's point about the Bellingham Farmer's Market, growth in vendor sales has been very respectable (Fig. 3).

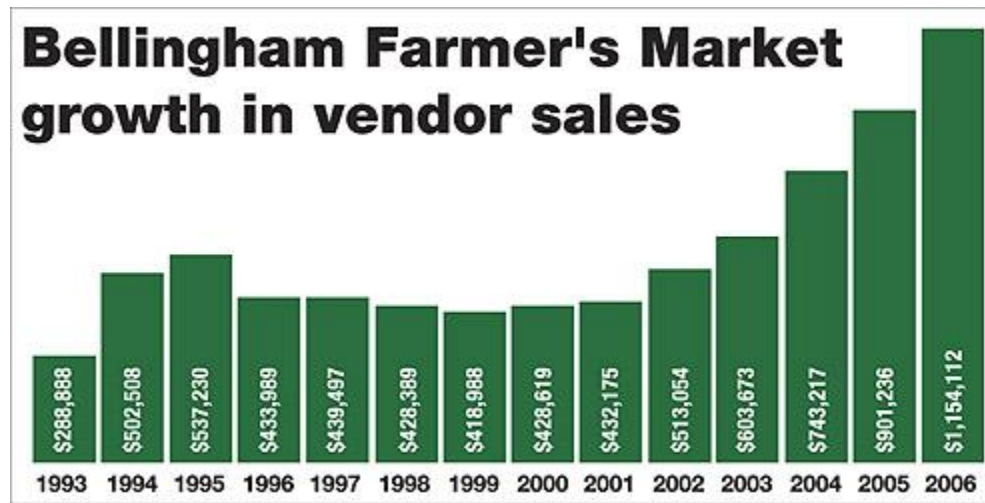


Figure 3 Bellingham Farmer's Market Growth in Vendor Sales, 1993-2006⁶⁹

Energy and food: Consumer, consumer-producer concerns

Much of what Walter Haugen said applies to consumer producers aggressively seeking local and/or healthy food or, more broadly, some variation of FLOSS—Fresh, Local, Organic, Sustainable, and Seasonal—who, themselves, may be looking for technical and financial assistance in their own form of “backyard” farming.⁷⁰

Figures 4, 5, and 6—charts prepared by Nick Crandall and Kendra Cutting in June, 2008 using most recent WSDA data and in conjunction with WSU Extension County Food Assessment

⁶⁹ From Schiller, Heidi. 2008. “After 15 years, the market's all grown up.” *Bellingham Business Journal*. From “Direct Farm marketing in Whatcom County” by Kevin Dolan, Amy Strohm, and Michelle Toshack in June, 2008 and in conjunction with WSU Extension County Food Assessment project; excerpts form their report are available through Gigi Berardi via <http://www.wvu.edu/resilience/SmallFarmResilienceGrant.shtml>.

⁷⁰ Studies support that organic farming is energy efficient. Detailed life-cycle studies in the UK, for example, show that, on average, organic farming requires about 15% less energy to produce an equivalent amount of food. Data would show a higher average efficiency if it weren't for the relatively inefficient poultry and greenhouse vegetable production. See:

<http://www.lifeaftertheoilcrash.net/>

http://www.intnet.mu/iels/PO_consequences.htm

<http://www.communitysolution.org/problem.html#12>

<http://www.ers.usda.gov/AmberWaves/April06/Features/Energy.htm>

New Internationalist, No-dig for victory, no.402, July 2007 p.12.

<http://www.communitysolution.org/ppts/GreatestChallenge.ppt>

<http://www.soilassociation.org/web/sa/saweb.nsf/89d058cc4dbeb16d80256a73005a2866/cccdcd1cb9>

as referenced in *The Impact of Peak Oil on Rural Communities*(A report produced for the Groundswell Group, Cornwall).

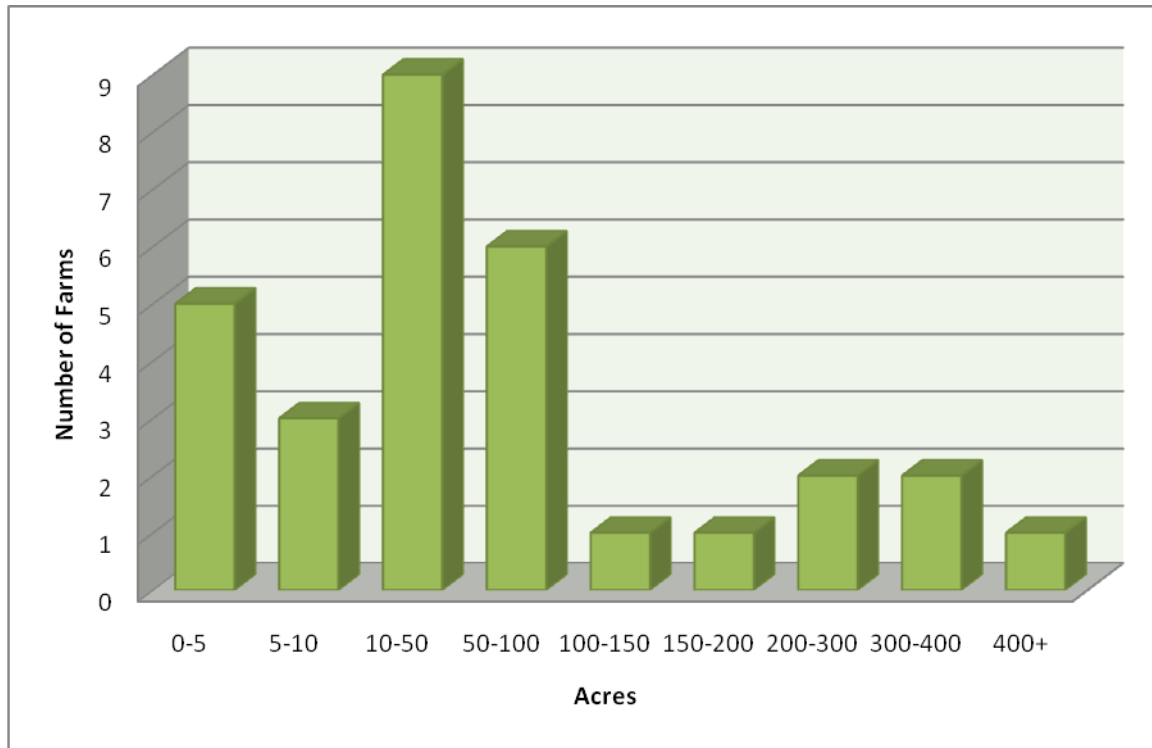
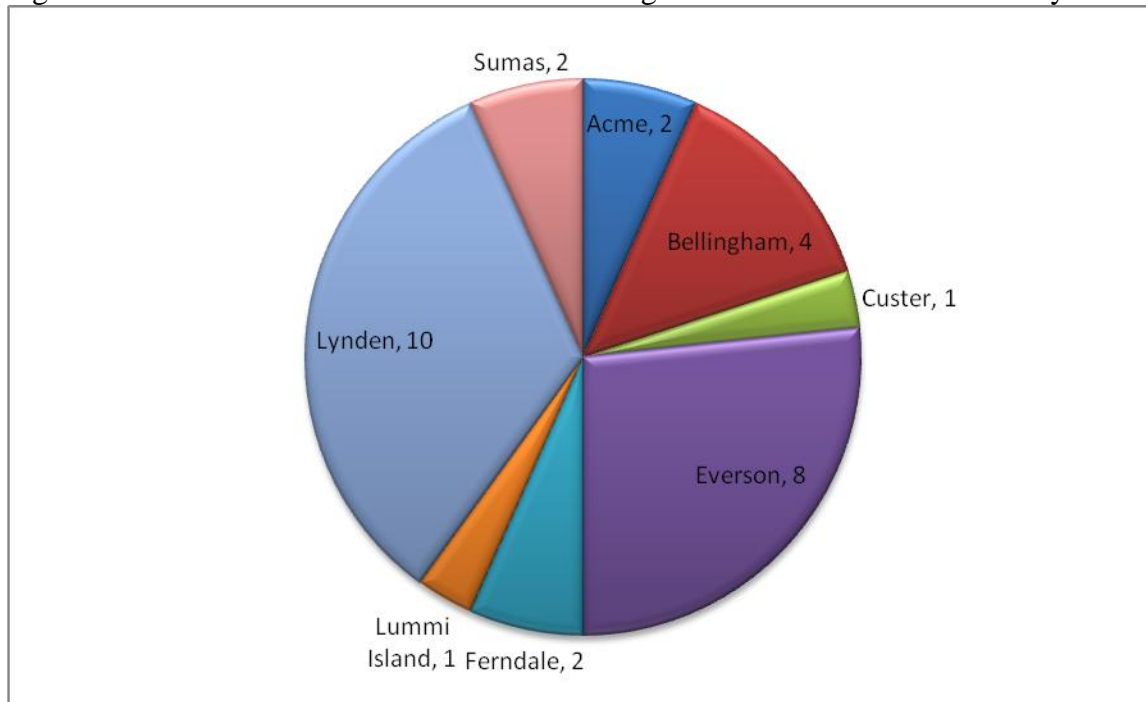
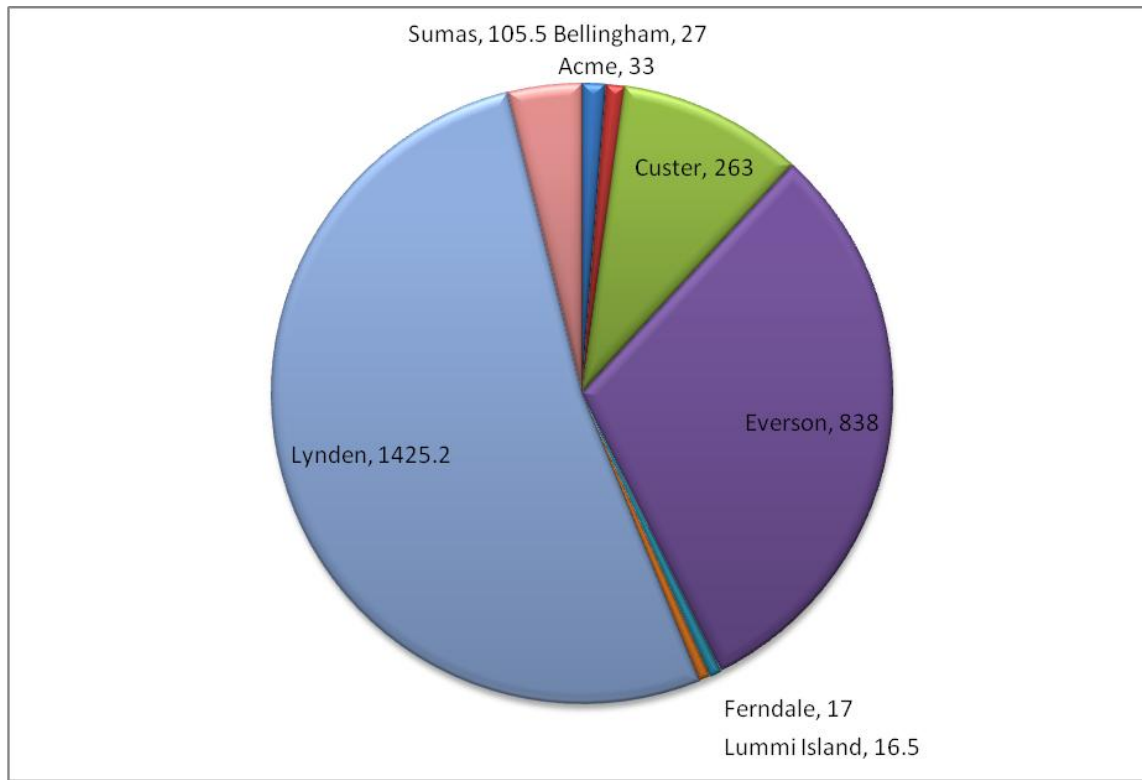


Figure 4: Size Distribution of USDA Certified Organic Farms in Whatcom County⁷²



⁷¹ (excerpts form their report are available through Gigi Berardi via <http://www.wvu.edu/resilience/SmallFarmResilienceGrant.shtml>).

⁷² (Washington State Department of Agriculture).

Figure 5 USDA Certified Organic Farms by City for Whatcom County⁷³Figure 6 USDA Certified Organic Acreage by City for Whatcom County⁷⁴

Certainly, there are initiatives at the national level⁷⁵ that exist in some form in virtually every county in Western Washington to connect farmers with consumers or producer-consumers. These include the following programs and entities: Farm to School (all levels), Farm to College, USDA Community Food Projects grant application assistance, Food Policy Councils, Community Food Assessment, as well as vehicles such as resource lists and conferences.⁷⁶

Besides Whatcom Farm Friends, there are other important governmental (e.g., Washington state University extension) and non-profit organizations (e.g., Sustainable Connections and the Community Food Co-op, Growing Washington), as well as newer initiatives such as Sustainable Bellingham and the Resilient Farm Project serving as strong advocates for county farms and farming; many other groups were mentioned in the previous section, all of which are finding ways to boost farming. Information and support ranges from developing farm business management skills, technical support for water management or small yard livestock rearing, or

⁷³ (Washington State Department of Agriculture).

⁷⁴ Washington State Department of Agriculture).

⁷⁵ (<http://www.foodsecurity.org/>)

⁷⁶ See also “What’s on your plate? Farm-to-school programs promote health” by Gail Feenstra (p. 8-9) and “A survey of Farm-to college programs: History, characteristics and student involvement” by Sarah C. Murray (pp. 12-13) in *Community Food Security News* Winter 2006. Also, *Farm-to-Cafeteria Connections* by Kelli Sanger and Leslie Zenz. Olympia: WSDA January 2004. See also *Marketing programs* Olympia: WSDA 2005.

A handful of notable Educational and Action Opportunities or Resources follows.

- Besides Sustainable Connection's What's FRESH! Food & Farming E-Newsletter (which contains information and other resources to find local food and agriculture in Whatcom County), its Food & Farming Program works to educate and provide resources to producers and buyers and makes connections between farmers, institutions, retailers, and restaurant, as well as raise support of local farms. The Program includes projects such as: Food To Bank On, which connects beginning sustainable farms with training, mentors, and market support while providing fresh high-quality food to Whatcom's hungry. As a result of the program, Whatcom food banks have received \$50,000 in fresh produce from these farmers since its inception in 2003. Also of note is The Whatcom Farm Incubator Project (WFIP), which offers beginning farmers support for access to land, farm infrastructure, mentoring, and small business support services. Sustainable Connections also offers "Trade Meetings," which brings Whatcom food buyers & producers together twice a year to forge new business relationships and establish markets for local products. Chef Farm Tours also make such connections—bringing chefs and retailers to local farms and fisheries. Sustainable Connection's Food Farm Finder, which features 132 local businesses including farms, restaurants, markets, fishers, caterers, etc. and its Local Wholesale Directory both help connect food buyers and producers.
- The Whatcom County Food Bank Farm (co-run by Growing Washington, Small Potatoes Gleaning Project, and the Bellingham Food Bank (known also as Alternatives to Hunger) began in July 2007 and serves over 500 families who use the food bank each week. Cascade Christian Services offers a very low lease rate for three acres of cultivable land and two large greenhouses situated between Bellingham and Lynden on the Guide Meridian.

There is no denying that underlying most of these programs and initiatives is the assumption (if not direct mission statement with Sustainable Connections) that efforts to prioritize local are essential for achieving one if not all of the FLOSS components. It is *desirable* in achieving a robust local economy. Sustainable Connections campaigns such as *Eat Local (Every) Week* raise awareness about challenges and benefits of local.

Those interested in creating community by prioritizing local are most likely also enjoying books in the locavore genre (e.g., Michael Pollen's *The Omnivore's Dilemma*—a book which has been adopted and promoted by WWU Professor Mary Metzger, Director of the Western Reads program), Alisa Smith and J.B. MacKinnon's *Plenty*, and Barbara Kingsolver's *Animal, Vegetable, Miracle*. Stephen Hopp, contributing to *Animal, Vegetable, Miracle* discusses that eating just one local meal a week would reduce the United State's oil consumption by over 1.1 million barrels of oil each week. Although there are many assumptions that go into such a calculation, the point remains that eating such a meal, especially when some or all is produced in one's own garden, reduces transport costs and achieves at least some of FLOSS (Fresh-Local-Organic-Sustainable-Seasonal). It's an experiment that many are trying and some are living. What is actually possible in Whatcom County? Could we be self-sufficient? A "Future of Food"

panel hosted at WWU in January 2008 answered solidly in the affirmative.⁷⁷ But what would this involve?

The following is a slightly paraphrased testimony by Sustainable Bellingham's Angela McLeod, her thoughts on EAT LOCAL WEEK, and her attempts to try a 100% local (confined to Whatcom, Skagit, and San Juan Island counties) diet—"foods grown here, not just produced, prepared or packaged here." What did her experiment bring? (1) Vegetables from the Farmer's Market with potatoes and fresh corn and carrots becoming a primary source of complex carbohydrates (replacing rice, wheat, oats, and other grains), (2) locally-caught wild fish, local chicken and eggs, local Skagit Valley Beef, and Pelican brand canned tuna (packed in Bellingham and caught from the NW Pacific Ocean). As noted in *Plenty* by Alisa Smith & J.B. MacKinnon, she couldn't find a local source of salt (they tried to substitute kelp granules that were wild harvested from waters around San Juan Islands). Honey was local. Oil was in the form of locally-grown Holmquist Hazelnut oil. Sorrel provided some acerbic taste. Dairy products came from Edaleen Dairy and Pleasant Valley gouda.⁷⁸

Buy/Grow Local or Bye-Bye Local? The discussion Continues

Interwoven throughout much of this report are fundamental questions about the importance and meaning of local and whether or not it is a way to achieve a lower food bill for Whatcom County residents. Many of the recommendations of this food section had to do with making a Farm-Food connection, which reduces "food miles" and supports county farms, firms, and businesses, building perhaps a more resilient food system. Education activities include everything from "food-miles labeling" to facilitated discussion groups on the topic, to different ways of community networking, outreach, and, in general, information sharing.⁷⁹ As a start, take a look at the article titled "If It's Fresh and Local, Is IT Always Greener?", which highlights some of the confusing pieces of the local question and maybe offers some ways forward.⁸⁰

Certainly, for others in the county there does not seem to be confusion—only barriers. As given in the May 2008 Co-op Community News, Local Foods Connection, a national non-profit based in Iowa City makes note of how Iowa has elucidated barriers to local food access, so as to arrive

⁷⁷ See igcr.blogspot.com/2008/02/future-of-food.html. Groups in Seattle are trying the experiment, too. See "Seattle group commits to local-foods diet: Experiment supports farmers, cuts fossil-fuel use" *AP The Bellingham Herald* A-4.

⁷⁸ See Sustainable Bellingham archives for a full list of produce and products that contributed to their Whatcom County diet.

⁷⁹ see Jason Bradford, "Can My County Feed Itself?," "Energy Farm" blog from Mendocino County, CA which looks at different classes of food security threats (including diet, land requirements, and available land space at <http://archive.energyfarms.net/search/node/can+my+county+feed+itselfB> and at <http://sustainablebellingham.org/wiki/wikka.php?wakka=FoodArticles> for what's possible.

⁸⁰ "Consider strawberries. If mass producers of strawberries ship their product to Chicago by truck, the fuel cost of transporting each carton of strawberries is relatively small, since it is tucked into the back along with thousands of others. But if a farmer sells his strawberries at local farmers' markets in California, he ferries a much smaller amount by pickup truck to each individual market. Which one is better for the environment? Mr. Tomich said a strawberry distributor did the math on the back of an envelope and concluded that the Chicago-bound berries used less energy for transport. Maybe. Regardless, the story raises valid questions." See "If it's Fresh and Local, Is It Always Greener?", *New York Times*, December 9, 2007 at http://www.nytimes.com/2007/12/09/business/yourmoney/09feed.html?_r=1&oref=slogin

at workable solutions.⁸¹ The barriers are the following, some of which have already been mentioned in this report:

1. Financial restrictions
2. Preparation and storage of food
3. Distribution of food
4. Lack of knowledge and education
5. Cultural values and lifestyles
6. Physical challenges
7. Preparation and storage of food (social service agencies)
8. Fulfillment of government nutrition standards – agencies and institutions

Barriers are there, for sure. But if a young chef/foodservice manager (Charles Claassen) in the remote location of the Environmental Learning Center of the North Cascades Institute can produce affordable, tasty meals, using local and seasonal produce en masse that is FLOSS (Fresh-Local-Organic-Sustainable-Seasonal), can't anyone?

Food Security: The boldest suggestions?

In the interests of advancing food security (i.e., knowing how much and from where one food is coming/has come from), besides the usual safety nets (Supplemental Nutrition Assistance Program, and various food distribution programs),⁸² even more adventurous distribution networks and aggressive county-feeding projects are possible. Distribution networks and mechanisms can certainly be more inventive than those depicted in the *New York Times* article just mentioned—and numerous examples already exist in Whatcom County. Here's one we haven't quite yet thought of (although Growing Washington's various programs come close):

Consumers are increasingly asking for locally grown produce, but distribution can be a problem. A Michigan man, Eric Hahn, has begun a business that distributes produce from local farms to area restaurants, homes, and stores. Hahn was the sales representative for a national food distributor out of Detroit. The sweet cherries he trucked to nearby stores were brought from Washington state (!) because the cherries ripen earlier there, and the growing season is longer. But the stores and restaurants Hahn supplied were constantly asking for local cherries. At one point, Hahn convinced his company to work with some small growers on a pilot distribution project, but the fruit and vegetables still had to go through the warehouse in Detroit. There were also some other logistical problems, so the company stopped the program. So, Hahn quit his job, took \$5,000 out of his savings account, traded in his Volvo for a van and started Cherry Capital Foods. Now, he distributes food grown on about 60 local farms to more than 100 nearby restaurants, resorts, store, and schools. There is some debate about the environmental benefits of buying food locally, but Cizma said it's just the right thing to do. He said there's no reason for him to buy food from California or China when he has a local alternative. "Let's think about Michigan's economy for a minute. We need it here more than they need it there," he said. Hahn's said he spent nearly every day this summer in his van, and his revenues have grown to

⁸¹ Each of these barriers, and more, is discussed in greater detail at www.sustainabletable.org/features and at localfoodconnection.org

⁸² Which are increasingly more necessary, with an estimated 4,000 Whatcom County residents experiencing at least one episode of homelessness annually. See "Count shows more homeless people" in *Bellingham Herald* April 18, 2008. See also Patricia Allen, "Reweaving the food security safety net: Mediating entitlement and entrepreneurship", *Agriculture and Human Values* 16: 117-129, 1999.

Growing our own?

In “Transforming Communities Through Locally Grown Food,” reporter Carolyn Baker discusses relocalization efforts in Rutland, Vermont specifically around agriculture and food; patterned after the Intervale model, a large tract of prime agricultural land in Burlington, Vermont that was originally Abenaki Indian land, now exists to provide food for thought and also consumption—money remains in the region and so does the food. Rutland is looking at farming 130 acres of prime agricultural land similar to Intervale, which itself provides 10% of Burlington, Vermont’s food. As Baker notes, “Any region in America can affect the transformation that the forward-thinking folks in Rutland are making happen with their passion, commitment, and incredibly hard work as they engineer local economic solutions and give new meaning to the word ‘community.’”⁸⁴ Imagine what might be possible in our own county.

⁸³ See Peter Payette, “The Challenge of Eating Local: Distribution” Interlochen Public Radio, Morning Edition, 1/04/08, NPR at <http://www.npr.org/templates/story/story.php?storyId=17840850>

⁸⁴ See www.energybulletin.net/39243.html

APPENDIX A: Examples of area advocacy and farm support organizations in Whatcom county

Whatcom County

- Ag Plastics Recycling, www.re-resources.org
- Anti-Hunger Coalition Resilient Farm Project IGCR, <http://igcr.blogspot.com/2008/11/everyday-farming-is-food-security.html>
- Community Food Co-op's Farm Fund, www.communityfood.coop
- Community-to-Community Development's Food Justice Alliance Programm www.foodjustice.org
- Farmers Growing Trees for Salmon, www.whatcomcd.org
- Ferndale Farmers Market, ferndalefarmersmarket.org
- Food not Lawns, goodnotlawns@gmail.com)
- Farmers' Market in three Bellingham locations, see Bellingham Farmers Market , www.bellinghamfarmers.org
- Fourth Corner Slow Food, www.fourthcornerslowfood.com
- Growing Washington, www.growingwashington.org
- Mary Ellen Carter, www.cookingwithmaryellen.com and Ciao Thyme, www.ciaothyme.com
- Opportunity Council, Whatcom
- Small Potatoes Gleaning Project, www.gleaningproject.org
- Students for Sustainable Food
- Sustainable Connections Food & Farming Program, www.sustainable-connections.org
- Tom Malterre, Whole Life Nutrition, info@wholelifefoodnutrition.net
- Uprising Organic Seeds
- Washington State University Whatcom County Extension, www.whatcom.wsu.edu
- Whatcom 4-H Youth Development, whatcom.wsu.edu/4-h_youth.html
- Whatcom Anti-Hunger Coalition, bfbcd@openaccess.org
- Whatcom County Farm Friends, www.wcfarmfriends.com
- Whatcom Conservation District, www.whatcomcd.org
- Whatcom County Land Trust, www.whatcomlandtrust.org
- Whatcom Fresh, www.whatcomfresh.org
- Whatcom Weston A. Price Foundation Nooksack Salmon Enhancement Association, www.n-sea.org

Regional

- Cascade Harvest Coalition
- Meals that Heal, MealsThatHeal@wavecable.com
- Northwest Agriculture Business Center, www.AgBizCenter.org
- Northwest Research & Extension Center

Washington State

- American Farmland Trust
- Farm Services Agency

- Local Food Action Initiative
- Puget Sound Food Project
- Risk Management Association Programs
- Tilth Producers of Washington
- Washington State Department of Agriculture Small Farm and Direct Marketing Program (agr.wa.gov) (Fred Berman)
- Washington State Department of Agriculture Disaster Preparedness
- Washington State Farm Bureau
- Washington State University Extension
- Washington Sustainable Food and Farming Network (www.wsffn.org)

APPENDIX B: Reflections from Whatcom County farmer Walter Haugen

Walter Haugen has suggestions for change Whatcom county farming in two general areas: Direct Marketing and Sustainability. He recommends:

- More farmers' markets. Perhaps modeled after the Ferndale Farmers' Market , which consistently averages several dozen vendors during the growing season. The market operates without stall fees and allows anyone to join. [The Bellingham Farmer's Market has a different organizational set-up but, by all accounts, is thriving (see below)]. Additional markets could be added in Lynden and on the north side of Bellingham. Because there are no stall fees and portable toilets are needed for most available locations, outside funding would need to be secured. These locations are important, however, because many people in the county don't want to drive into downtown Bellingham on a Saturday (food miles!).
- Co-opetition: We need to quash the idea of niche protection, which has slowed the growth of new farmers' markets. There are very few sustainable farmers right now, so limiting the number of farmers' markets in a region and fighting for a limited number of farmer vendors is a failed strategy. We need to just get more farmers going in direct marketing and to do this we need more venues. I have several farmers near me in Ferndale and we compete, but we also cooperate in seed orders, advice, work, etc.⁸⁵ Walter recommends that we embrace and advocate co-opetition.
- CSA share programs: Community Supported Agriculture (CSA) share programs are a wonderful alternative distribution network. They also provide the small farmer, who may have few credit resources, with a source of working capital early in the year. In addition, the money is paid back in produce. This is a win-win situation for the farmer and the shareholder. It also encourages better health and community relationships. Growing Washington is a nonprofit that has several programs directly beneficial to sustainable agriculture. One of these is the Just Food program. They get outside money to buy CSA shares and then they distribute them to poor people. They need money each year to do this, but again, there is a lot of bang for the buck here. Walter currently provides two CSA shares to this program, and he provided three shares last year. I recommend money be given to Growing Washington for these and other programs. Growing Washington is also addressing the transportation issue. For example, they drive out to my farm on their Wednesday pickup route in Ferndale and pick up four orders from me at one time: Just Food CSA boxes, bulk produce for their own Growing Whatcom CSA, restaurant orders, and Local Farm Exchange (LFE) orders, which they use to stock their retail stand on Railroad Avenue in Bellingham. This is a very good way to curtail transportation costs.
- Informal work shares: One of the components of a CSA share program is work by the members. Some CSA programs require a certain amount of work each week (i.e. a formalized work share), but this is hard to administer and shareholders are not consistent in their commitments. It is also a problem with the farmer having to supervise unskilled workers (and yes, weeding carrots is skilled labor). My alternative is informal work shares. Anyone can contract with me to come out and work each week and they are paid in food. No money changes hand and I keep track on my spreadsheet how much food credit each family has. Because it is not tied to a CSA share, anyone can join the program. Again, this is a win-win situation and something

⁸⁵ For a fuller [discussion], you can read my article on this subject at <http://www.whatcomindy.com/archives/issue225.pdf> (page 9).

- that will become more necessary in the years to come. Haugen recommends that we popularize this idea. This idea also addresses transportation, as people do not have to drive their car—they can simply bicycle out to a participating farm and take their food home in their panniers or rear-rack basket.
- Mini-sharecropping: Many people decry the McMansions throughout the county on 5-acre parcels. Many people are also working on the land use issue with very complicated proposals that cost a lot of money and will take years to implement. A simple way to get something going right now is mini-sharecropping. The idea is simple. A homeowner in the county marks off an acre of their property and invites a new farmer to grow food. Land rent is paid with a CSA subscription (currently worth about \$450 for 20 weekly boxes). This is approximately double what land rents are for most farmers in Whatcom County, so it is a fair rent for the landowner. It is a win-win situation because a new farmer gets access to land and pays the rent in produce. In addition, the homeowner gets the soil built up on his/her property and will have a better situation in the years ahead when they may want to grow some food themselves. There is actually a state program to put people together in this manner called FarmLink, but Haugen encountered resistance there.
 - Buying clubs: Most food co-ops start as buying clubs and this is a concept that needs to be revisited, simply because there is no overhead for a storefront, employee wages, etc. It provides an alternative to the farmers' market for farmers who cannot afford time away from the farm. It is also another incubator for new farmers.⁸⁶
 - Personal farmers: There are now personal farmer programs in both San Francisco and Portland, and Haugen first heard about them from an article in *The Independent*, a London newspaper he gets via email, so there is some buzz worldwide. This is a good idea and we could encourage this via some partial funding and volunteers. Haugen is always happy to show people how he does things, as are most sustainable farmers he know. However, this idea needs some dedication, some seed money, and some marketing. Haugen recommend we find some money to fund this.
 - Reduction in ridiculous rules. An example is the prohibition against mixing lettuce unless you have a food processor's license.
 - Insurance for farmers: One of the reasons few small farmers sell to Haggen, Costcutter, Safeway, and other supermarket chains is the high insurance requirements. Insurance will also be necessary to participate in the new farm-to-school-cafeteria supply chain. If the county or the state would provide blanket insurance policies for farmers at a subsidized premium cost, like Basic Health, we could open up more supermarkets to local produce. As you probably realize, this recommendation leads down the path towards a greater status for farmers in our society, but as in the Cuban model, it is inevitable. We could get out ahead of the curve by recommending this item.
 - Land in usufruct: Usufruct is simply a real property right of limited duration. In the Cuban model, farmers were given access to public land and had the right to use the land as long as they grew food. When they stopped growing food, the usage rights reverted back to the state (the state never gave up title). Whatcom County could easily adapt this model on a small-scale and provide land use opportunities for new farmers. There are three types of usufruct in US civil law and the relevant category here would be industrial usufruct, which is profits produced by cultivation.

⁸⁶ See http://www.plentymag.com/blogs/notebook/2008/07/farewell_to_the_farmers_market.php

Haugen adds, in sum, sustainable agriculture will require a lot more farmers than we have now. In order to get more farmers, they will have to make more money for their products. Direct marketing is key to getting more money for farmers. Farmers' Markets are just a start, but when people cannot even get on board for something as simple as more farmers' markets, it is unlikely that more alternatives will be formed. Also, governmental policies are part of the problem, and it is unlikely local governments can actually move fast enough to help solve the problem. In the winnowing-out process, it is likely that strong recommendations will be diluted in the City and County Councils. Weak recommendations will also be diluted even further. The result is a lot of sound and fury, signifying nothing.

Regarding Haugen's point about the Bellingham Farmer's Market, growth in vendor sales has been very respectable (Fig. 3).

APPENDIX C: Definitions from Whatcom Farm Friends⁸⁷

Agriculture: The science, art and business of cultivating soil, producing crops, and raising livestock. Farming - growing and harvesting of food, fibers, forests, and flowers - providing almost everything we eat, wear, and use. Agriculture is the world's oldest, largest, and most essential industry. Yet, in America's urban society, 90% of the population has little contact with the systems that determine our general food welfare and standard of food quality. Only 2 million Americans are actually farmers, even though agriculture is our nation's largest industry. But, over 20 million people work in agriculture. Growers produce the raw products and other people turn them into the things we use and eat every day.

Farm: In 2002, a farm is defined as any place where \$1,000 or more of agricultural products were produced and sold, or normally would have been sold. The \$1,000 threshold can be met by any combination of sales and government payments. Abnormal farms are institutional, experimental, and research farms.

Land in Farms: The acreage designated as "land in farms" consists primarily of agricultural land used for crops, pasture, or grazing. It also includes woodland and wasteland, provided it was part of the farm operator's total operation. Land in farms includes acres in the Conservation Reserve Program (CRP) and Wetlands Reserve Programs (WRP).

Purchase of Development Rights - PDR: We may consider the ownership of land to be the possession of a "bundle of rights" associated with that land. These rights include the right to possess, use, modify, develop, lease, or sell the land. Mineral rights constitute one of the items in the bundle with which most people are aware. If the mineral rights have been separated from the remaining items in the bundle, the owner is prohibited from drilling for oil or from mining the land. The right to develop a piece of land for residential, commercial, or industrial purposes is also a right within the bundle. The purchase of development rights involves the sale of that right while leaving all the remaining rights as before. PDR is a voluntary program, where a land trust or some other agency usually linked to local government, makes an offer to a landowner to buy the development rights on the parcel. The landowner is free to turn down the offer, or to try to negotiate a higher price. Once an agreement is made, a permanent deed restriction is placed on the property, which restricts the type of activities that may take place on the land in perpetuity. In this way, a legally binding guarantee is achieved to ensure that the parcel will remain agricultural, or as open (green) space forever. This is because the agency involved retires the development rights upon purchase. The deed restriction may also be referred to as a conservation easement, or, since most PDR programs are designed to preserve agricultural use, an agricultural conservation easement. As a result, PDR programs are occasionally called PACE programs (purchase of agricultural conservation easements).

Transfer of Development Rights—TDR: Transfer of development rights (TDR) is just one tool used to preserve farmlands. TDR is the exchange of zoning privileges from areas with low population needs, such as farmland, to areas of high population needs, such as downtown areas. These transfers allow for the preservation of open spaces and historic landmarks, while giving urban areas a chance to expand and satisfy growth needs.

⁸⁷ <http://www.wcfarmfriends.com/go/doc/1579/181808/>