

UBC Social, Ecological Economic Development Studies (SEEDS) Student Reports

Assessment of UBC Food Services' Chicken Procurement Practices

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Group 9 – Scenario II

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Abstract

The environmental impacts of livestock are well known and have implications for general meat consumption and meat choices. As a group of students in LFS 450 working in collaboration with the University of British Columbia Food Services, we were assigned the task of conducting a sustainability assessment of UBCFS' Meat and Meat Alternative Food Products. Our group specifically focused on chicken. The aim of this report is to use a Life Cycle Assessment to evaluate the social and environmental impacts of conventional and organic chicken from a climate change standpoint. The information gained from this assessment is used to develop more sustainable strategies for UBCFS' procurement of chicken for Place Vanier and Totem residences.

Our methods included a thorough literature review, personal communication and a LCA. Other sustainability initiatives by on and off campus outlets are also discussed. Our findings and discussion of our LCA showed that it could not be determined whether one system was better than the other in terms of climate change issues. However, issues pertaining to animal welfare and use of medication implicate that the organic rearing system fares better. Our recommendations for UBCFS keep economic and social feasibility in mind so it is our suggestion that medication-free chicken is a more sustainable strategy for their chicken procurement.

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Introduction

Meat consumption is expanding towards excess and as a result, the growing demand for meat products is contributing to environmental damage in almost every major category. Some of these impacts include to deforestation, erosion, fresh water scarcity, air and water pollution, climate change and loss of biodiversity. In 2004, agriculture was responsible for 13.5% of total greenhouse emissions (Worldwatch Institute, 2009). It takes 28 calories of fossil fuel energy to produce one single calorie of meat protein, compared to the 3.3 calories it takes to produce plant-based protein. In addition, a meat-based diet requires 3,900 gallons of water more than a vegan diet (Worldwatch Institute, 2004). Methane gas, which is 25 times more potent as a greenhouse gas than carbon dioxide, contributes 14.3% of the total greenhouse gas emissions. Livestock is the major global producer of methane gas (Worldwatch Institute, 2009). From nearly every aspect, the production of animal protein is contributing to global climate change and the degradation of natural resources.

Since the development of the Vancouver Food Policy Council, the City of Vancouver has been increasing its understanding and its initiatives surrounding food security. The University of British Columbia, with a strong influence on the city and province's economies, has been following suit. The University of British Columbia Food System Project (UBCFSP) is a collaboratively project of the UBC Faculty of Land and Food System (UBC LFS) and the Sustainability Office's Social Ecological Economic Development Studies Program (SEEDS). The UBCFSP began in 2001 and involves many campus partners. It is growing in scope each year but the aim is to develop a secure food system within campus (Richer, 2008).

The University of British Columbia food providers are working to incorporate sustainable practices into their operations. These sustainable initiatives range from local and ethical food procurement initiatives to reducing the campus' carbon footprint. UBC Food Services (UBCFS) is one of the campuses main food service providers and are active in changing their practices to

increase overall sustainability of their operations. Past UBCFSP have worked with different campus partners including UBCFS to assess the ecological footprint of campus operations (Richer, 2009). Some 2008 projects were considered specifically the ecological footprint of food, but others were looking more generally at the overall ecological footprint of the campus. However, none of these past projects focused particularly on the procurement of meat. More recently, UBCFS representatives have expressed an interest in more thoroughly understanding the sustainability issues surrounding the meat and meat alternative choices offered at their student cafeterias at Vanier and Totem residences. This new interest in the meat procurement is directly in line with UBCFS' SPICE (Sustainability, People first, Innovative, Caring, Excellence) initiative which was adopted in 2007 (SPICE, 2009). UBCFS presented a willingness to explore new procurement options; however, it was understood that it was not feasible to plan a removal of meat options all together. As such, the project looks to explore more sustainable procurement options for products currently available at Vanier and Totem residence cafeterias.

Problem Definition & Objectives

Currently, UBCFS seeks to improve their understanding of the ecological impact of their meat and meat alternative procurement practices. A more thorough comprehension of the environmental impacts of their current products is needed, as well as an understanding of surrounding meat products in general. This has been identified as being important to moving forward to more sustainable meat options. In addition, more information is required that outlines potential alternatives to their current products. This information must demonstrate if new products exist that can enable UBCFS to progress their sustainability goals while also meeting their economic demands. Subsequently, the objective of this report is to conduct a sustainability assessment using a Life Cycle Assessment of selected proteins.

Taking a climate focus, this report strives to outline and recommend products that will better suit UBCFS sustainability initiatives while balancing their economic constraints. In order to better service UBCFS as a community partner, a larger group of students divided into smaller groups, each focusing on a specific protein options. The final four reports work together to outline all of the issues surrounding meat and meat alternatives presented above while being focused on a single protein. Our report focuses on UBCFS's procurement of chicken.

Vision Statement & Identification of Value Assumptions

The vision statement for the UBC food system encompasses many aspects. However, the general goal of a sustainable food system is to protect and enhance the diversity and quality of the ecosystems while improving social equity. This vision statement places value on the ecological and social elements of food security. It is important to acknowledge all facets of the problems surrounding food security, and the vision statement for the UBC food system attempts to do so. However, it does assume that is it possible to weigh all of these matters equally, and address them holistically and without compromise. Our group felt that this is very challenging due to various stakeholders that all have different challenges and constraints. We felt it is near impossible to approach this vision without any conflicts. As a result, it is important to find the most appropriate balance to create progress, while understanding that not all problems are solved immediately. The following report demonstrated this balance and compromise, focusing on options that present improvements to the current practices while working within the limits of UBCFS.

Methods

Literature Review

To carry out our sustainability assessment of UBCFS use of chicken, we first did a literature review of procurement reports by J&K Poultry and Centennial Foodservice. This gave us an idea of the variety and volumes of chicken products that UBCFS orders from these two suppliers. Next, our

team did a literature review of the resources listed in our specific scenario. Some of the information in these resources include information on conducting an LCA, food production and GHG emissions, UBCFS sustainability initiatives, and issues surrounding meat procurement practices. Preliminary research on some of these resources helped us understand the scope of our project and how it relates to global issues.

Other sources of information from the UBC Library and reliable internet resources were also reviewed. Internet sources include government and industry documents as well as published, peer-reviewed academic articles pertaining to LCA poultry models. These sources gave us an understanding of the practices and regulations of the poultry industry and how an LCA is conducted.

Personal Communication

Much of our research was comprised of personal communication with UBC stakeholders, community partners, suppliers and other associates. This took on the form of phone conversations, email correspondences and face-to-face interviews. The timeframe for the majority of these personal communications began in early February 2010 and continued into the first few weeks of April. We approached most of the participants by email first, followed by a phone conversation and/or personal meeting. The exception is Dorothy Yip and Steve Golob, who we had the opportunity to meet with when they gave a presentation to the LFS 450 class. We found that phone conversations and email correspondence were the most convenient form of communication for both the participants and for our group. We also had the opportunity to meet personally with Steve Golob at the Place Vanier Dining Hall on March 22 where he showed us around the kitchen and preparation area. This allowed us to obtain a better appreciation for the size of the dining/kitchen operation at Place Vanier. Please see Appendix 5 for a list of all the participants in our study.

Life Cycle Assessment

Definition of a LCA

A life cycle assessment (LCA) is a "cradle-to-grave" approach for assessing the overall environmental impact of products, processes or services (U.S. Environmental Protection Agency [EPA], 2006). To estimate the cumulative environmental impacts of a product, an LCA evaluates all stages of a particular product's life cycle and considers each stage as interdependent. According to the EPA (2006), an LCA process encompasses four components:

- 1. Goal Definition and Scope:** Product is defined and context is established in which the assessment is to be made. The system boundaries and environmental effects are to be reviewed.
- 2. Inventory Analysis:** Identification and quantification of relevant inputs and outputs.
- 3. Impact Assessment:** Assessment of the potential human and ecological effects of inputs and outputs as identified in the inventory analysis.
- 4. Interpretation:** Evaluation of results from inventory analysis and impact assessment. This stage is used to select the preferred product to help decision-makers make a more informed decision.

Goal Definition and Scoping of LCA

The goal of our LCA was to evaluate and compare the social and environmental impacts of conventional and organic chicken from a climate change standpoint. The intended audience for our comparative LCAs is UBCFS stakeholders and LFS colleagues. The LCA approach is a scalable technique so we chose a "cradle-to-gate" perspective that concentrated on the comparison of these two products with respect to inputs and practices that differ the most in their respective life cycles.

The greatest differences between conventional and organic chicken production is in the feed as well as differences in animal rearing practices and potential impacts to human health. Based on

these core differences, our LCA research focuses on their pre-slaughtering stages of production. Thus, the system boundaries include the production of crops and animal rearing up to the point where the birds are ready to be slaughtered. We did not focus on subsequent stages, transport to slaughter house, slaughtering, processing and distribution, since they are similar in both poultry systems. In addition, we did not focus on waste management practices because they are also similar.

Based on our modified LCA, our group identified a set of indicators to assess the sustainability of conventional and organic chicken systems. We chose indicators that we found were significantly different between the two systems. The indicators we chose include climate change, use of medications/antibiotics, and animal welfare practices.

The components of "Impact Assessment" and "Interpretation" of our LCA are combined into one section and presented in the Discussion portion of our report. The impact assessment of the indicators for both systems will be discussed on a comparative basis in this section.

Findings

UBC Food Service's Current Procurement Practices for Fresh Chicken

The first step in UBFS' procurement of chicken involves the selection of a chicken supplier via a Request for Bid (RFB) system (Appendix 1). Bidders/Suppliers must bid for a contract with UBCFS based on the guidelines and conditions specified on the RFB. In addition, they must detail a full description of their materials, products and services. Dorothy Yip, the General Manager of Retail Operations and Purchasing and also Project Coordinator for UBCFS, then selects the appropriate supplier based on their bid. The evaluations of the bids are based on the bidder's price, product selection and availability. However, the lowest bid is not necessarily accepted as other conditions are also taken into consideration. This can include reputation, past performance, quality, expertise and environmental conditions (Appendix 1). As part of the supplier's competitive bid, they are encouraged to detail their contribution to the reduction of solid waste to UBCFS and any

other beneficial environmental initiatives like the use of new ecological friendly packaging materials, reduction of packaging materials, alternate and newly developed products and removal of waste materials off campus (Appendix 1).

Information on UBCFS Chicken Suppliers, Products, Volumes & Prices

Currently, J&K Poultry supplies UBCFS with most of their fresh chicken. In the case of Vanier place, this includes breasts (split skin on, bone in), whole fryers, thighs, drumsticks, wings, chicken tenders and chicken bones (Appendix 2; see Appendix 3 for a full list of products and volumes supplied by J&K Poultry for all UBCFS in 2009). J&K is a further processing plant as well as a distributor of federally inspected poultry products and is not a slaughtering house (J&K Poultry, 2010). J&K sources fresh and frozen products, and hand-cut most their meat so they are able to portion and package according to their client's needs. All the fresh non-frozen chicken received at J&K are from approximately 5 farms in British Columbia's Lower Mainland. Their fresh products are not sourced from out of province or out of country (personal communication, 03/22/10). J&K is aware of the environmental initiatives that set them apart from other producers and processors. They do not use polystyrene (Styrofoam) and they offer re-usable plastic totes for some of their chicken products; in particular, the absorbent property of the totes are ideal for products with high juice content. Chicken products are placed directly into the bags and the used bags get returned to J&K where they are cleaned, sanitized and re-used (personal communication, 03/22/10).

The volumes of chicken products supplied by J&K to Vanier Place vary from week to week because it is dependent on the menu set out by Steve Golob, head chef at Vanier Place. In a typical week, 150-300 pieces of breasts, whole fryers, thighs, drumsticks and wings are ordered (these items are ordered on a by-piece basis); deliveries are made up to 5 times a week. For the chicken tenders, 140kg to 160kg are used on a weekly basis. The volumes of various chicken cuts in a single

entree were detailed by Mr. Golob and include 300 wings, 120 chicken halves, 250 each of chicken thighs and drumsticks and 35 to 40 whole chicken fryers per menu entree (personal communication, 03/09/10).

The prices points for each product are as follows: 5.99/kg for chicken breasts (split skin on, bone in), 4.89/kg for chicken fryers, 4.99/kg for chicken thighs, 4.49/kg for drumsticks, 5.29/kg for wings and 6.75/kg for frozen chicken tenders (personal communication with, 03/30/10).

Centennial Foodservice also supplies 8-20 4kg cases of boneless chicken breasts to Vanier Place per week at a price of 9.35/kg (Lui, 2010; see Appendix 4 for a full list of poultry products and volumes supplied by Centennial Foodservice for all UBCFS for 2009). Centennial Foodservice is a federal distribution facility and they also further process and custom portions a variety of meats (Centennial Foodservice, 2007). The fresh non-frozen chickens sourced by Centennial for UBCFS are also from local farms in the lower mainland (Personal communication, 03/31/10).

LCA of Conventional & Organic Chicken

Inventory Assessment of Conventional Broiler Chicken

A broiler chicken is a type of chicken that is specifically raised for meat production as opposed to those chickens used for egg production (layers) and egg hatching (broiler breeders) (BC Chicken Marketing Board, 2009). Most conventional broiler chicken production in Canada is based on a vertical integration system where a single company owns two or more stages in the supply chain (Scanes et al., 2004). In Canada, most are grown under contract that is planned by poultry processors and feed manufacturers (Proudfoot & Hamilton, 1991).

Conventional chickens are selectively bred for high growth rates (Laidlaw, 2003). Chicks are vaccinated at the hatchery and hormones/steroids are not used in chicken feed as their use in Canada is prohibited (BC Chicken Marketing Board, 2009). Day-old chicks are then transferred from the hatchery to a broiler house/barn where they are reared and fed for 5-6 weeks to an

approximate weight of 2.0kg each; the birds typically do not leave their barns until they are ready to be slaughtered. All chickens grown in Canada for meat purposes are 'free run' which means they are not confined in cages and are able to move freely throughout a barn (BC Chicken Marketing Board, 2009).

The average Canadian farm has about 29,500 birds at any one time and raises 192,000 a year (Laidlaw, 2003). Each barn houses 10,000 to 30,000 birds with a density of approximately 16-18 birds/m² (Proudfoot & Hamilton, 1991).

Physical facilities for production include window-less, insulated broiler houses located on well-drained land and a separate furnace building that contains an incinerator for disposal of dead birds (Proudfoot & Hamilton, 1991). Construction materials of the buildings consist mainly of steel tubes, bricks, polyvinyl chloride, polyurethane and concrete for the foundations (Boggia et al., 2010). The size of most conventional broiler houses in Canada is 40ft by 150-300ft (Ontario Ministry of Agriculture Food & Rural Affairs, 2009).

Other physical requirements for broiler chicken production includes automated feeding and drinking systems, computerized heating systems that are centrally located with heated floors (embedded plastic piping in concrete floor with circulating warm water), computerized ventilation systems, lighting that can be controlled for intensity and litter/bedding made of planer-wood shavings (Proudfoot & Hamilton, 1991).

The percentage composition of conventional broiler chicken feed in Canada varies depending on the age of the broiler but is generally composed of 46-66% ground corn/maize, 12-33% solvent-extracted soybeans, 10% ground wheat, 5% fishmeal and ~3% poultry grease (Proudfoot & Hamilton, 1991). Other minor constituents include salt, ground limestone, vitamin/mineral premix, modified amino acids and coccidiostat, a drug used to prevent a common chicken disease known as coccidiosis (Proudfoot & Hamilton, 1991). At 6 weeks, a male broiler

chicken consumes 296mL of water and 183g of feed per day (Proudfoot & Hamilton, 1991).

General antibiotics can be added to the feed and range from 5-50g per tonne of feed. Antibiotics for disease-controlling purposes can be added at 100-400g per ton of feed (Scanes, 2004). General antibiotics include bamermycin, arsencials and nitrofurans which are developed solely for use as production promoters and performance enhancers and have no medicinal applications. Inputs involved in conventional feed production include land, fertilizers, pesticides, human labour and machinery.

The feed efficiency ratio (FER), which is the amount of feed needed to produce 1 unit of broiler chicken, Canadian broiler chicken flocks in 1988 had an average FER of 1.85kg at 6 weeks (Proudfoot & Hamilton, 1991).

The wastes produced by on-farm poultry production include nitrogen and phosphorus from excreta and dead birds. A house with 1000 birds with an average weight of 4lb. will produce 2700lb. of manure on a dry basis in 9 weeks time (Scanes, 2004).

In terms of animal welfare practices, the provision of farm animals' basic needs is required under federal and provincial legislation (BC Ministry of Agriculture, Food & Fisheries, 2004). The rearing of chickens is subject to the Health of Animals Act and the Prevention of Cruelty to Animals Act which identifies and regulates animal care practices that are subject to prosecution (BC Ministry of Agriculture, Food & Fisheries, 2004). Lastly, voluntary codes of practice like the Recommended Code of Practice for the Care and Handling of Farm Animals – Chicken, Turkeys, and Breeders from Hatchery to Processing Plant (Canadian Agri-Food Council, 2003), are adopted as the industry standard. Included in these codes are guides for the provision of feed and water, housing, sanitation, handling, catching and loading, transportation, and animal behaviour.

The practice of de-beaking confined birds is a widely accepted and a common act in the industry to prevent cannibalism (Scanes, 2004). Cannibalism is a serious problem in broiler flocks

and is caused by a combination of stress conditions like overcrowding, light intensity, overheating, insufficient ventilation etc. It is difficult to control once started so prevention is important. The practice involves cutting one-third of the beak off by a conventional electric de-beaker; the use of laser type de-beakers reduces the stress associated with electric ones. Evidence suggests that there are no detrimental effects when correctly performed and that bird performance is even improved (Proudfoot & Hamilton, 1991).

The Meat Inspection Act and Regulations states that “81 (1) No animal shall be slaughtered unless (a) it is rendered unconscious in accordance with a method prescribed by or authorized under Section 83” (Department of Justice Canada, 1985). In Section 83, one such approved method is the application of an electrical current to the head to render them unconscious prior to slaughter. This is a common industry practice in humane slaughtering and also improves efficiency and quality (Sams, 2000). The slaughtering of organic chickens is similar to that of conventional.

Since much of the fresh poultry consumed in Canada are within country or province, human labour practices involved in the poultry production industry are covered by Canada’s Labour Laws. These laws cover labour-management relations, collective bargaining, unfair labour practices, workplace health and safety, and employment standards (Human Resources and Skills Development Canada, 2009).

In Canada, supply management is in effect to prevent over production of poultry products to keep the industry sustainable, allowing farmers equitable returns (BC Chicken Marketing Board, 2009). This also helps to keep prices stable for consumers. The establishment of marketing boards in Canada have resulted in quota systems. A producer must obtain a license or quota to produce and sell broilers through the normal distribution channels. The boards have the ability to adjust market prices within certain limits (BC Chicken Marketing Board, 2009).

The packaging of fresh conventional chicken products differs depending on its intended use, format and cuts. Plastics are the most common packaging material for poultry meat due to its versatility, cost and convenience. Restaurants and other facilities that utilize high volumes of poultry products will usually order their products by the case lot. These cases are commonly known as 'wet shippers' where the product is placed into a wax-coated corrugated boxes filled with ice; in some cases, a plastic liner may be used to prevent leakage. The boxes are then put into pallet-sized units for shipping with stretch wrap used to stabilize the pallet during shipping and loading (Sams, 2000).

In our research, we found that slaughtering practices and materials used for packaging did not vastly differ between conventional and organic systems. However, it is possible that organic poultry processors use less packaging materials because organic chickens are typically purchased whole rather than in portions (Sams, 2000).

Inventory Assessment of Organic Broiler Chicken

In order for a chicken to be considered organic, the bird must be raised according to strict organic production methods from the time of its birth, but exact guidelines may vary with organic certification body used. There are no commercial hatcheries producing certified organic broiler chicken in BC; however, some growers have hatched their own chicks. Conventional chicks are allowed for organic production so most producers purchase chicks from conventional hatcheries; however, the suppliers must certify that birds have not been medicated including vaccinations. If synthetic medical treatments are used, meat birds cannot be marketed as organic (BC Ministry of Agriculture and Lands, 2007).

In contrast to the conventional chicken industry, most of the BC certified organic chicken producers do not raise chickens under contract with a processor. Organic producers frequently use organically-certified, custom processing facilities and then undertake their own marketing. The only

licensed processing facilities that currently process certified organic chicken are located in the Lower Mainland. Certified organic chicken producers in BC typically use multiple channels for marketing their product. Producers sell to specialty meat distributors, retailers such as restaurants, specialty meat retailers and natural food grocers, and directly to consumers. Wholesale prices for certified organic chicken are currently double the typical conventional price. (BC Ministry of Agriculture and Lands, 2007).

Organic feeds are essentially the same as regular feeds but must contain at least 80% of all the feed ingredients from organic sources. All organic feed ingredients such as vitamins that are not of 100% natural origin must be approved by a certification body. The feed that is administered must be certified organic and cannot contain hormones, antibiotics, growth promoters or meat by-products (Chicken Farmers of Canada, n.d.).

Typically, organic corn is used for energy, while organic soybeans provide protein. Roasted, extruded soybeans are used because feeds that have been defatted with chemical solvents are not permitted. Organic rations start at about 20-21% protein and finish at 15-16%. Such a low-protein ration is used to slow down the rapid growth of meat type broilers since the conventional breeds can be used for organic rearing systems (Boggia et al., 2010).

The typical organic farm is larger than conventional ones due to pasture lands. The pasture in organic rearing should be free of synthetic chemicals for three years before it can be used. Organic seeds must be used when seeding pastures and weeds should be managed with cultural practices rather than synthetic chemicals. The ration is a key to profitable chicken production. A feed conversion of 2.8 is considered acceptable for organic poultry with a final weight of 3.5 kg (Boggia et al., 2010).

Each organic rearing barn houses about 9,600 birds with an indoor density of 9.6 birds. Buildings typically have 2 warm air generators and 6 ventilators for cold air. Farms produce

approximately 67,200 organic chickens a year (Boggia et al., 2010).

All organic chickens are free range, meaning that birds have access to the outdoors. The Certified Organics Association of BC requires growers to allow their birds access to sunshine and air on pesticide-free pasture for a minimum of 6 hours a day, weather permitting. The approximate outdoor bird density is 4 birds/m² (BC Chicken Marketing Board, 2009). Organic chicken farmers also must be cautious with sanitation since antibiotics are not typically used. Bedding must be dry and levelled, and must be certified organic since birds will tend to peck at their bedding. Typical bedding may be wood shavings that are not from treated wood, organic corncobs, organic hay or straw or organic corn foddors (MOSES, 2007).

There are additional guidelines imposed on organic poultry production that is regulated by ECOA Animal Welfare Task force (AWTF, 2009). The practice of de-beaking is not permitted in organic chicken farming (Eco Friendly Planet, 2008).

Examples of On and Off Campus Sustainable Food Outlets

At UBC, many food outlets are striving to take a more sustainable approach to food procurement. Of the many food outlets on and off UBC campus which are characterized by high levels of sustainability initiatives, Sage Bistro on UBC campus, University of Victoria food outlets, and Bishop's Fine Dining Restaurant will be discussed. Being that this paper focus on sustainable chicken production, it will take a closer look at these three food operations' initiatives related to chicken procurement.

Other Sustainable Chicken Options

Polderside Farms is located in Chilliwack, BC. The farm is known for "raising [their] poultry in a low density, stress-free environment, feeding them a natural diet of grains and vegetables". Their chicken is sold in more than 65 restaurants and retail stores in BC. Currently,

Polderside Farms sells organic chicken, wholesale, for \$ 7.40/kg. Birds are slaughtered offsite before being delivered to restaurants and retailers (Polderside Farms Ltd, n.d.).

Jerry Dawson, general manager of J&K Poultry, informed us that he can obtain 2 poultry products that are more sustainable than conventional ones: Organic poultry and Non-medicated poultry. Both are sourced from local farms located in Salmon Arm and Abbotsford. The main difference between these two products is that the non-medicated birds are not fed a feed that is certified organic. Both types of poultry do not receive antibiotics or medications. Also, the non-medicated variety is also somewhat free-range in that it does spend some of its time outside the barn. Lastly, carotenoids are added to its feed to give its meat a more yellow color so consumers and processors are able to differentiate it from conventional chicken. The pricing for organic is 9.00/kg and 5.99/kg for non-medicated (personal communication, 04/16/10).

Discussion

Comparison of Conventional & Organic Chicken based on LCA

The environmental performance of conventional chicken compared to organic is not as well defined as it appears on the surface. The discrepancies can be attributed to complexities of balancing energy inputs and emissions of the greenhouse gases (GHG) of carbon dioxide, methane, nitrous oxide. Overall, it does appear that conventional systems fare better than organic systems in terms of GHG emissions however it is not possible to come to any clear conclusion.

Carbon dioxide is produced by the combustion of fossil fuels. In animal production, carbon dioxide emission is associated mainly with fertilizer production, feed production, energy used in powering farm facilities and all post farm gate stages (Garnett, 2007). Up to the farm gate, livestock related fossil fuel use is relatively low compared to post farm gate use of fossil fuels. There are two categories for energy/fossil fuel use: Primary and secondary. Primary includes major agricultural fuels like oil, gas and electricity whereas secondary includes the use of fossil fuels for the

production and transport of farm inputs like feed.

A study by Bokkers and Boer in 2009 assessed the ecological performance of conventional and organic broiler production systems in the Netherlands. They found that in a conventional system, 25% of total energy use is from primary sources and 70% from secondary. Primary energy use in the conventional system is used mainly for lighting, ventilating and heating barns. In the organic system, the amount of fossil fuels used for heating barns is much higher due to lower bird density. Overall, primary energy use for the organic system is 25% higher than the conventional system (Bokkers & Boer, 2009). In terms of energy values, total energy use per kg of live weight is estimated to be 30-59% higher in organic systems.

The results of the study by Bokkers and Boer are mirrored by the study done in 2006 by the British Department of Environment, Food and Rural Affairs. For every tonne of poultry meat produced, it was estimated that organic systems utilized 15,800MJ of primary energy compared to that of 12,000MJ for conventional (Williams, 2006).

Organic poultry has a higher feed efficiency ratio and a longer growing period for the heavier chickens that are produced, resulting in a net increase in energy requirement for organic poultry meat production. Many certifiers require a relatively high level of light in the house to encourage bird activity and may require windows in order to provide direct sunlight. In contrast, the conventional industry usually keeps lights low for broilers to reduce activity (Fanatico, 2008). Therefore, although it is often believed that the global warming potential effects can be reduced by adopting organic production systems, the reality of some research proves the opposite for poultry. In addition, land use was always higher in organic systems, with lower yields and overheads for fertility building and cover crops (Varies and Boer, 2010).

Methane emission in broiler production is from manure only. Methane emission from manure is considered negligible because it is immediately incorporated into the ground. Thus, the

emissions to the air are so undetectable that they can be considered null (IPCC, 2006).

Nitrous oxide contributes to smog and is estimated to be 300 times more potent than carbon dioxide. In poultry production, it is produced through nitrification and denitrification of the organic nitrogen in livestock urine and manure, as well as from use of fertilizers in feed production.

Through the process of nitrification, ammonium and ammonia from manure can be converted and indirectly emitted as nitrous oxide (Garnett, 2007).

The study by Bokkers and Boer estimated that manure from organic broilers emitted 51% more nitrous oxide than its conventional counterpart (2009). This can be attributed to the differences in rearing time; a conventional broiler produces much less manure in 6 weeks time than that of an organic one with a rearing time of 11 weeks. Feed constituents also influence the amount of nitrogen excreted in manure. The use of synthetic and modified amino acids in conventional poultry diets have shown that this reduction in nitrogen content results in a reduction of nitrogen excretion. A study by Boggia et al. (2010) showed comparable results for nitrous oxide production: organic systems do produce more nitrous oxide than conventional whether by direct or indirect means.

The study by Boggia et al. used the LCA method to compare environmental impacts of conventional and organic poultry systems in Italy (2010). This study demonstrated that the feed production phase is a larger contributor to environmental impacts than that of the animal rearing phase and that overall, the organic system had better environmental performance. They found that for the impact categories of climate change and fossil fuel use, conventional systems have far higher values and that these impact categories are mostly influenced by feed production (Boggia et al., 2010). This study attributed the differences to synthetic fertilizer use which is prohibited in organic crop production and is typically less energy and emission intensive.

We could not determine the reasons why the study by Boggia et al. had differing results from the study performed in the Netherlands and the UK despite similar methods and boundaries (LCA cradle-to-farm-gate approach) but it may be due to assumptions made in their methods, production differences due to geographic location or sourcing of their feed ingredients. Regardless, it is evident that sustainability is not easy to measure and is a complex balance between many fluxes.

Antibiotics can be added to the feed in conventional chicken for use as disease treatment and prevention. The main reasoning behind providing antibiotics is for the welfare of consumers and animals. The Chicken Farmers of Canada and the Canadian Food Inspection Agency support the judicious use of antibiotics to prevent losses and potential food safety problems.

There are certainly food and human safety issues in regards to use of antibiotics in conventional poultry meat production. Using antibiotics in animal production can result in a high risk of infectious microorganisms developing resistance to antibiotics (Bokkers & Boer, 2009). This resistance may have similar implications as previously seen in the Avian Flu pandemic of 1997 (WHO, 2010).

There are also issues of ecological sustainability with antibiotic use. Issues like leaching into groundwater and eventually to water systems and potential impact on soil microbiology are some of the issues at hand.

The current structure of the conventional poultry system is more focused on cost reduction and maximizing returns through fast broiler weight gain and feed efficiency. Organic production on the other hand, while driven by similar goals, does place more value on animal health and welfare.

In conventional chicken production, the birds are permanently housed in a high stocking density. In organic farms, welfare of poultry is enhanced due to enriched housing conditions like access to a free range area. Organic rearing systems require their birds to access to sunshine and air

on pesticide-free pasture for a minimum of 6 hours a day. The opportunity for animals to perform at least some natural behaviour by allowing outdoor access not only improves their well-being, but may also improve their ability to cope with future stresses.

The overcrowding conditions as seen in conventional systems have resulted in the routine practice of de-beaking. This widely accepted act is to prevent cannibalism. In contrast, organic chickens have a much lower bird density so the practice of de-beaking is usually not practiced in organic rearing systems.

There are several indicators for animal welfare as mentioned in the Bokkers and Boer study (2009). These indicators include: time spent walking, footpad lesions, and heart abnormalities.

The amount of time spent walking for poultry in conventional systems versus organic ones is not attributed to the confinement conditions inherent in each system. Rather, it is more correlated with the genetic background of the birds. Conventional systems breed broilers that grow faster whereas organic systems have slower growing birds. Bokkers and Boer found that the fast growing broilers spent less time walking than that of organic broilers (2009).

Footpad lesions have implications for chickens because they may cause pain and discomfort.

Footpad lesions were exacerbated in poor housing conditions like chemical irritants found in their bedding. In organic rearing systems, bedding must not contain any chemical preservatives. Thus, the prevalence of footpad lesions were higher in conventional systems (Bokkers & Boer, 2009).

Fast growing birds also have more issues with heart abnormalities than slow growing ones; mortality rates due to cardiovascular disorders were thus higher in these types of breeds (Bokkers & Boer, 2009).

Sustainability Initiatives by On and Off campus Food Outlets

Of the many food outlets on the UBC campus working toward being more sustainable, Sage Bistro is of particular interest in terms of serving more sustainable chicken options. Chef de cuisine,

Andreas Kodis from Sage Bistro told us that the restaurant serves organic chicken when possible, for special occasions, and when requested. The reason organic chicken is only served occasionally is primarily due to the large differences in cost. When asked about the possibility of cutting down the costs associated with processing and delivering, Andreas felt that these costs are minor and would not decrease the price of organic chicken. In other words, the price of buying organic chicken would not decrease much if he were to pick up the chicken from the processing plant or if he were to buy whole chickens and butcher them himself. These jobs, usually done by the 'middle man', do not add much to the costs of purchasing organic chicken. For this reason, he believes that it is more efficient and economical to buy processed chicken and use the services of a supplier. Currently, he purchases organic chicken from Polderside Farms and Maple Hills.

Like UBC, the University of Victoria (UVIC) understands the issues associated with food procurement and sustainability. For this reason, it aims to become more sustainable by having a set of strategies with goals and actions. Some of the actions taking place include offering healthy, local, and diverse food choices (UVIC, 2007). Of the many sustainability initiatives, Rita Fromholt from UVIC's sustainability department, shares that UVIC has a general policy involving buying only 'cage free' eggs (personal communications, 03/09/10). Although the food outlets on campus make an effort to purchase local products, purchasing organic chicken have a barrier of higher costs. The location is also a barrier to buying organic chicken (personal communications, 03/09/10).

An off-campus food outlet characterized by its high focus on sustainability is Bishop's Fine Dining Restaurant. The organic chicken served at Bishop's Fine Dining Restaurant is purchased direct from farmers, such as Polderside Farms and Thomas Reid (personal communications, 03/10/10).

All of these food outlets are striving to become more sustainable in terms of chicken procurements despite the barriers. Some of the obstacles they face include higher costs, volume fluctuations, and location.

Recommendations

UBCFS

After researching both different suppliers and chicken product options we have developed some preliminary recommendations for UBCFS with regards to their procurement of chicken. Recommendations are based on the findings of this report, however, they should be considered preliminary recommendations because there is still more research to be done (see subsequent subsections). Using our comparative LCA we have shown that organic chicken is not necessarily an improvement over conventional chicken from a climate impact standpoint. In addition the high price of organic chicken is without a doubt a barrier for UBCFS. With this in mind we feel UBCFS could look to make other changes to the products they are purchasing from their current suppliers. Working within the framework of their current suppliers, could result in an easier transition, and perhaps fewer additional costs. Medication Free chicken provides a substantial change to the current chicken products, without incurring a large price change.

Our research revealed other supplier options, but given the price increase and complication in switching suppliers, we feel this is not the best option at this point. However, using these options in the future may be a valuable addition to UBCFS' procurement initiatives. For instance, if a relationship could be developed directly with a local producer, it is possible some of the cost associated with switching to a more expensive product, such as organic chicken, could be alleviated. But it should be kept in mind that such a relationship could result in some new management complications.

LFS 450 Colleagues and Future Groups

Our LCA became very focused, and as a result certain aspects of the production chain were covered in less detail. Future groups should look to build on this study by adding information to our framework in order to create a more comprehensive view of the issue. More research into the chicken feed needs to be done in order to better compare organic and conventional production. Manure waste management did not seem to differ between the options investigated, but in order to move from a comparative LCA to a LCA that will yield quantifiable data it will be important to thoroughly research this topic.

We also feel that this issue may not be best understood with a life cycle assessment alone, and that in some cases it gives a conflicting picture of certain products depending on given boundaries; especially in the case of organic versus conventional. In addition to a more comprehensive LCA future projects should consider more issues such as animal welfare, which is difficult to quantify in terms of emissions. By balancing the research approach with a broad range of indicators a more complete view of the food security issues surrounding chicken procurement will be created.

Future projects could also look to do more research into additional sustainable chicken, perhaps looking for examples outside of the country. By doing so two main objectives will be fulfilled: Firstly, progress to creation of a catalogue of chicken options for UBCFS, and secondly develop more areas for future research. In all it will help to better understand the sustainability issues surrounding chicken production and processing.

Conclusion

Our comparative LCA approach showed that conventional and organic chicken do not differ as much as expected in their respective environmental impacts. The discrepancies found in our research are most likely due to the boundaries and parameters set by our comparative LCA, but more

importantly the limitations of using an LCA alone to determine a products value to food security. Additional research into medication and animal welfare started to shed more light on the positive impacts of organic chicken productions. We feel that organic chicken is the better option, but this issue needs further research. Research is needed for the LCA, to better understand if these two options are in fact close in their ecological impacts, and if so why. Research is also need for additional issues, not properly accounted for by the LCA. We have outline some parameters, animal welfare and medication, but this list is by no means exhaustive.

These findings present a good building block, and illustrate where changes are best made given the current understand of the problem. However, there are limitations to our findings and to life cycle assessments in general. As a result more works needs to be done to progress this project, and find options that better serve both UBCFS' economic constraints and the more broad sustainability initiatives. In future, dialogues with UBCFS should try to establish where they could be flexible economically, and by how much. Doing so would allow for a more thorough assessment of new chicken procurement options. And finally, future LFS groups should look to this project as a starting point, using it to develop a framework for their research.

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Appendices

Appendix 1: Request for Bid document

Please see attached document.

Appendix 2: J&K Poultry Ordering Form

		J & K Poultry									
		May 2009-2010									
		604-253-8292									
		FSC 14580									
		Jerry cell#604-671-5909									
ITEM	PACK	CODE #	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On
Chicken Bones		no charge									
Chicken Breast - Split skin on, bone in	226-283g	CBRBP									
Chicken Fryer	2.5-3#	FSM									
Chicken Thigh -	113-170g	CTH									
Drumstick	113-140g	CORUM									
Wing - Whole Bulk	64-75g	CWP									
Chicken Tenderloin (fresh) (6.98kg)	by kg (10's)	CTEN									
Prarie Pride Raw Turkey (65.99kg)	CS	TETRAHIS									
Chicken Thigh(Bin-Skinless \$5.79)	PCS										
order by the pcc.(except tender)											
ITEM	PACK	CODE #	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On
Chicken Bones		no charge									
Chicken Breast - Split skin on, bone in	226-283g	CBRBP									
Chicken Fryer	2.5-3#	FSM									
Chicken Thigh	113-170g	CTH									
Drumstick	113-140g	CORUM									
Large Wing Tip on	64-75g	CWP									
Chicken Tenderloin (frz) (6.98kg) (6.35kg)	5kg box	CTEN									
Prarie Pride Raw Turkey (65.99kg)	CS	TETRAHIS									
Chicken Thigh (Bin-Skinless \$5.79)	PCS										
Chicken Trim (Frz) \$6.98/kg (NEW)	PCS										
ITEM	PACK	CODE #	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On	Delivery On
Chicken Bones		no charge									
Chicken Breast - Split skin on, bone in	226-283g	CBRBP									
Chicken Fryer	2.5-3#	FSM									
Chicken Thigh	113-170g	CTH									
Drumstick	113-140g	CORUM									
Large Wing Tip on	64-75g	CWP									
Chicken Tenderloin (frz) (6.98kg)	5kg box	CTEN									
Prarie Pride Raw Turkey (65.99kg)	CS	TETRAHIS									
Chicken Thigh(Bin-Skinless \$5.79)	PCS										

Appendix 3: J&K Poultry Ltd. Chicken Velocity Report 2009

Due to length of document please refer to Vista.

Appendix 4: Centennial Foodservice Poultry Products Velocity Report 2009

Due to length of document please refer to Vista.

Appendix 5: List of Participants

Andreas Kodis, Chef de cuisine at Sage Bistro

Tony Lui, Sales Representative for Centennial Foodservice

Steve Golob, Head Chef for Vanier Place

Jerry Dawson, General Manager for J&K Poultry

Dorothy Yip, General Manager of Retail Operations and Purchasing & Project Coordinator for UBCFS