UBC Social Ecological Economic Development Studies (SEEDS) Student Report

Logistics of Using Fish from UBC Farm Integrated Aquaculture on Campus

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LFS 450

April 5, 2013

Abstract

A rise in global of seafood demand has elicited intensive fishing practices of marine wildlife. Intensive fishing of marine wildlife threatens the ecological sustainability of our aquatic ecosystems. In aspiring to sustain the ecological integrity of our marine ecosystems, we are encouraged to consider alternative methods of fish production. Aquaponics is a land-based, closed fish production system, which is widely regarded as sustainable. Harvesting fish through the use of an aquaponics system is deemed sustainable as the outputs of one biological entity become the inputs of another. This project's objective was to qualitatively assess the fish demand by UBC food outlets and to determine as whether the fish demanded of UBC food outlets could be met by the UBC Farm's aquaponics system. Gathering the demand of UBC food outlets considered seafood purchasing patterns, the type of seafood purchased, as well as the logistical aspects of processing fish. To complete these goals, our team organized interviews with key informants, including purchasing managers at UBC, chefs, licensing officers, and other aquaculture producers. Gathering the demand of UBC food outlets facilitated in qualitatively assessing whether the demand for fish existed. Literature reviews were conducted to determine the requirements of a fish processing facility. The correspondence with chefs and purchasing managers at UBC indicated that there is a demand for local and farm-raised fish. Chefs and purchasing mangers at UBC prioritized food safety and Ocean Wise licensing as their major concerns of fish from the UBC Farm. Scenarios for selling seafood products to UBC food outlets and processing fish were discussed to provide feasible options that the UBC Farm could consider for their future operations. This project aimed to provide a framework that the UBC Farm could

reference, in furthering their endeavours of an aquaponics initiative. The UBC Farm does have a fish market among UBC food outlets, which we have determined are logistically feasible.

Introduction

Marine ecosystems are increasingly threatened as global rise in seafood demand depletes ocean wildlife populations (Fisheries and Oceans Canada, 2011). A reduction in aquatic wildlife populations destabilizes marine ecosystems and jeopardizes our future ability to subsist upon this system (Fisheries and Oceans Canada, 2011). Aquaponics is a land-based method of fish production that is considered to contain the capacity to alleviate our ocean wildlife reliance (Fisheries and Oceans Canada, 2011). Aquaponics systems allow farmers to cultivate fish using plant waste, thus reducing environmental impacts by reducing nutrient loss and impacts on the ocean (Fisheries and Oceans Canada, 2011).

The UBC Farm has expressed an intent to raise and sell fish in an aquaponics system (Riseman, 2013). This project's objective was to assess the campus' fish market demand and logistical feasibility for an aquaponics system on UBC Farm (Riseman, 2013). In addition to assessing the UBC campus' market demand for fish, provincial and federal regulations concerning handling, storing, and processing of fish were considered. To conclude, it was important to identify licensing certifications required for the seafood UBC food businesses would purchase because of cost and regulatory factors (Riseman, 2013).

Beyond supporting UBC Farm's new initiative, this project aims to answer some points addressed in the LFS 450 2011 "UBC Food System Project Vision Statement for a Sustainable UBC Food System", which strives to create an utopian food system. The group agrees with the general ideas of all the vision statements, and in particular the points addressing animals raised for food, locally grown food for local communities, culturally and ethically appropriate food production and promotion of awareness by producers and educators. This is because these are the ideas that encompass our project's goals: to have an ethical, local, and sustainable system that is inclusive and welcoming to all members of the UBC community.

The group suggested the revision of the statement regarding "zero waste". The word "waste" connotates that a material is useless. Our group believes that all materials from a system maintain utility. Therefore, materials deemed as inutile for that respective system should be assessed for their potential utility in an alternate system. We also proposed revisiting the idealization of a neutral emission utopian food system. The idealization of a neutral emission utopian food system suggests that the concept of ecological sustainable system cannot be attain, unless it is emission neutral.

Although this aquaponics project is in its initial stages of planning, we believe that the UBC food system's stakeholders that we are targeting are aware of the UBC Farm's aquaponics initiative. We expect that there is a campus demand for fish, and that the UBC Farm's aquaponics project will be able to produce a supply that allows this initiative to be feasible and is a profitable endeavour.

Methodology

The original project scenario and description was approved by Sophia Baker-French, coordinator for the UBC Food Security Project and instructor for LFS 450. This original scenario provided the students of this group the basic framework to begin researching a proper protocol. Thus, a brief literature review was conducted in order to understand basic aquaponics systems and their associated provincial and federal regulations. Doing so also indicated fish processing references. Notes passed on by the course instructor and collaborative partners provided initial data, which included the purchasing details of fiscal 2011 for UBC Food Services. All facts regarding the project protocol and its subsequent ideas are found through "Conducting Key Informant Interviews" (USAID, 1996).

Scenario project partners included several key individuals who took part in the drafting of the original scenario, including Dr. Andrew Riseman and Véronik Campbell. Véronik Campbell is the Academic Advisor for UBC Farm and Dr. Riseman is an Associate Professor at UBC and Academic Director for UBC Farm. Speaking with them was necessary for turning developed speculations into realistic project goals. The subsequent results provided in the discussion section are formulated according to the layout proposed by Véronik Campbell. Questions for interviewees ranged from types of fish demanded to barriers and solutions in fish processing. Obtaining appropriate responses for these questions was used to measure success of the project.

Obtaining key informant interviews was crucial for understanding the possible directions this project could take. This included key community stakeholders to obtain a greater perspective of the project scope. It was also significant to provide depth beyond

the description specified from the original scenario document. The key informant interviews were necessary to understand UBC Vancouver's overall demand and opinions on UBC Farm-raised fish and its complications. The questions proposed to each interviewee were based on the drafted concerns planned by group members.

Victoria Wakefield, purchasing manager of UBC Food Services, and Nancy Toogood, food and beverage manager of AMS Food Services, were two experts that could potentially provide the group with information about purchasing demands and the prices that the two food services purchase their food for. Another key informant was Head Chef Steve Golob of Place Vanier. His experience with processing fish on-site could be significant, including his estimations on the demand of seafood in his kitchen. Several other chefs included Josh McWilliams at the Point Grill, Chef Andreas at Sage Bistro Catering and UBC Food Services Executive Chef Piyush Sahay.

This same interview methodology was applied to off-campus interviewees. Bruce swift, former owner of Swift Aquaculture, could provide the group details on how he operated his aquaculture system, while giving his recommendations for similar projects. 7 Seas Fish Co. and Ocean Wise were external organizations that were contacted to understand specifications for processing and demand scenarios.

The project progressed with continuous communication among all student members of the Aquaponics Group, with various updates to the LFS 450 Teaching Team and original scenario project partners. Interviews were conducted in person, online via e-mails, and through the telephone. All interviewees were handed a media release and a consent form. Collectively, demand and processing were two separate fields the team needed to explore in order to fully draft possible scenario outcomes.

Results: UBC Demand

The results from key informant interviews presented in this report are specific to questions regarding demand and marketability of fish. The complete set of questions asked of participants and summarized responses are included in Appendix IV. Additional logistical information on processing is also included in Appendix II.

Victoria Wakefield, purchasing manager of UBC Student Housing and Hospitality Services:

Demand on campus

Yes. See graph on purchasing details for UBC Food Services in Appendix I.

Species preference

Not Specified.

Ocean Wise licensing

Ideally, UBC Farm would be both BC Certified Organic and Ocean Wise licensed. However, the real answer is that UBC Farm will not need Ocean Wise per se, as long as the new aquaponics system is sustainably operated. Still, UBC Food Services does have all purchased seafood Ocean Wise licensed. This is to ensure that the industry is sustained under optimal practices and could keep future supplies of fish in the market. An aquaponics system created on campus would in fact meet those same principles that are required with Ocean Wise, but Ocean Wise would guarantee sustainability for consumers.

Volume and frequency of buyers

See graph and velocity report in Appendix I.

Cut preferences

Preferably, all fish are cleaned, portioned, and deboned, sold at price per pound.

Handling and storing fish

Not Specified.

Additional certifications

The new practice that will be undergone by UBC Farm's aquaponics system would fall under "local sourcing", a paradigm UBC Food Services would want to follow. However, there are still food safety guidelines that need to be followed by UBC Farm, including the Canadian Health and Food Inspection Regulations.

Barriers to fish production

Seafood is much more complex to integrate into a business than produce. In addition, the total price and fish availability must be appropriate. If there was a need for additional processing labour, the labour costs would add to the overall price per pound. It was still unclear what the costs to raising fish at UBC Farm are. It was known, however, that sourcing locally is beneficial to cost, although UBC has never had an aquaponics system in the past. In addition, UBC Food Services had never sourced from land-based growers, and the public's reaction to this new fish production method was unclear.

Nancy Toogood, AMS Food & Beverage Manager:

Demand on campus

There are several food outlets that currently provide fish on their menus, and thus the AMS Food Services has a central purchaser that deals with the intake of fish. The major outlets are Honour Roll and catering services, with additional canned salmon for

Bernoulli's, as well as cod for the Burger Bar. It was significant to note that, with the construction of the new Student Union Building, an executive chef will be hired—a key contact for future students in considering the demand for fish for new food outlets. Many of the following points would address the demand of fish products with regards to the new SUB building and its outlets, such as the Perch.

Species preference

The Burger Bar currently goes through high volumes (50-60 orders) of cod for their fish & chips order; BC wild salmon was also in high demand for summer catering services. In the new SUB, the Burger Bar can look into usage of Tilapia or other white fish. The Perch, being a more specialized food outlet, may be able to provide specialty items such as whole rainbow trout on its menu. With regards to the demand of salmon, the high volumes for catering may exceed the capacity of UBC Farm to produce, but was something to consider. A question to consider asking the future executive chef is whether there is interest in shellfish, such as crayfish.

Ocean Wise licensing

All fish currently provided by AMS Food Services are Ocean Wise; however, the aim of the AMS was ultimately sustainability. If the marketability of sustainably produced UBC Farm fish was there, the AMS Food Services could provide some to their requirements. The fish must be processed in a HAACP recognized environment.

Volume & frequency of orders by buyers

AMS Food Services currently obtain their high volumes of fish in Styrofoam containers. Styrofoam packs are cost effective, considering the volume of fish that the AMS Food Services must provide to students, but are not the ideal solutions.

Cut preferences

Since the Burger Bar listed fish & chips as a menu item, white fish are preferred filleted, at around 3-4 pounds per order. For catering services and future SUB outlets, there could be a possibility for whole fish or minimally processed (gutted and beheaded) fish listed as specialty menu items.

Handling and storing fish

The Burger Bar currently stores frozen cod for their fish & chips. Catering services accept and gut whole fish, while fish from Albion are distributed to outlets from the receiving area. Fulltime staffs are allowed to take away the offal.

Barriers to fish production

As the students are the main factor in making decisions, one of the biggest concerns was the marketability of non-Ocean Wise farmed fish from the UBC Farm. It would be highly beneficial to have a universal UBC food labelling system for both UBC Food Services and AMS Food Services, which could provide sustainably produced food to students without the associated cost. Furthermore, the high volumes of fish products consumed by AMS Food Services is a limiting factor for UBC Farm, which has a lack of bulk purchasing—one solution is the implementation of a "community meal" consisting of entirely UBC Farm produced ingredients. This, and other recommendations, will be discussed later.

Steve Golob, head chef at Vanier's:

Demand on-campus

There was a high demand for seafood at Vanier's. Salmon was especially popular because it is easily marketed and enjoyed by many. It could be noted that the campus was interested in knowing where food sources come from, including the types of fish purchased. An example Steve provided was the sale of wild salmon at the dining hall initiated by students several years ago. In that scenario, though prices were higher because the fish were wild-caught rather than farm-raised, consumers were aware of their food choices and the positive impacts they had on the environment, so sales increased significantly regardless of the cost.

Species preference

Shrimp was a best-seller, followed by salmon, cod, and scallop.

Ocean Wise licensing

Vanier's would prefer to have its fish be Ocean Wise licensed because quality can be guaranteed to customers, but the decision ultimately rests upon UBC Food Services.

Volume and frequency of buyers

Volume and frequency were not documented, but UBC Food Service's velocity report can be referred to. Since menus are offered at 35-day intervals, volumes will vary depending on the menu.

Cut preference

Vanier's would purchase processed fish in the form of fillets with pin bones removed. The fish is required to be shipped in reusable plastic containers.

Handling and storing fish

Vanier's kitchen has some space for storage of fresh fish for the following day's menu. When fish are brought in, it must be kept under ice in plastic containers during shipment. Vanier's uses 60 portions of 3-oz salmon daily. The fish must be cleaned, gutted, filleted and have pin bones removed prior to delivery. Salmon is pre-portioned in Vanier's kitchen or by the main commissary.

Additional certifications

There are no additional certifications Steve has listed, though he emphasized the seller must follow all food safety requirements outlined by UBC Food Services and food inspection agencies.

Barriers to fish production

Steve listed several major obstacles in fish production and processing. An important point included staff training: trainees must efficiently and correctly cut fish, ensuring meat quality. In addition, there must be sufficient refrigeration space for processed fish. Finally, staff safety protocols are important to avoid work-based injuries.

Josh McWilliams, head chef at The Point Grill:

Demand on-campus

There was demand for seafood at the Point Grill from UBC Farm. Purchasing decisions are made by chef Josh McWilliams based on customer demand, but

approximately 25-30% of entrees contained seafood. Popular menu items included calamari, prawns, salmon, and cod. There are seasonality variations to the demand. Wild salmon are highly requested between June to October. The Point Grill attempts to source local seafood, citing line-caught BC Sockeye, BC lingcod, and prawns from the US.

Species preference

Shellfish, including crayfish and prawns, would be in demand. Trout would also be a preferred choice, as would herring and other small fish. Perch was listed as more favourable than tilapia. Salmon would not be favoured because of the large demand for wild salmon at the Point Grill.

Ocean Wise licensing

Ocean Wise licensing was required for seafood served at The Point Grill, based on the policy for all UBC Food Service outlets. However, local sourcing of sustainable seafood was indicated as being more important than the licensing itself.

Volume and frequency of buyers

Seafood is ordered on a daily basis, based on the current inventory and menu. Monthly purchasing is relatively consistent. Seafood storage is limited and not suitable on a long-term basis. Certain seafood purchases may be made for the purpose of freezing when prices are favourable; however, fresh fish is preferred. While freezing would not be feasible for finfish, crab was an example given as a seafood option for freezing. Seafood orders are placed with 7Seas Fish Co. Ltd.

Cut preference

The Point Grill was able to accept whole fish that are gutted and headless, such as trout. The restaurant is able to do pin-boning on-site.

Handling and storing fish

Pin-boning and portioning of fish are done in-house. Storage are generally limited to fresh fish.

Additional certifications

Fish products purchased from 7Seas Fish Co. Ltd. are often MSC and/or Sea Choice-certified, which are beneficial from The Point Grill's perspective.

Barriers to fish production

There was still a potential reluctance of customers to purchase farmed fish, which could affect marketability. The price points and cuts for fish raised at UBC Farm would have to fall within market prices and quality to be purchased. The customer demand for seafood is so high that production from UBC Farm would be a relatively small component of restaurant's purchases. If processing were to be accomplished at UBC Farm, it would not be a barrier to The Point Grill, as long as it was done safely.

Sage Chefs of Sage Bistro Catering

On-campus Demand

The Sage Restaurant purchases fish seven days a week and its main supplier for fish was Albion Fisheries, Ltd.; 7Seas Fish Co. Ltd. was the restaurant's alternative. Approximately 75% of the fish Sage orders are allocated towards lunch and dinner meals. The remaining 25% are subject to catering menu requests. The summer period, from May through August, is their busiest season due to an increase of catering demands for conferences. During these months, salmon are consistently in highest

demand. In addition to considering which menu options are most popular, Sage makes an effort to purchase fish that are seasonably available.

Species preference

The fish that Sage has identified as ideal are halibut, tilapia, shellfish, crayfish, or shrimp, in addition to salmon

Ocean Wise licensing

If it was the intention of UBC Farm to endeavour in the production and marketing of farmed fish to Sage, the restaurant would prefer fish that are Ocean Wise licenced. This was an effort to remain consistent with the visions and mandates of UBC Food Services. The origin and quality fish feed employed by the UBC Farm will become the conclusive factor as to whether Sage restaurant will diverge from their Ocean Wise licence requirement.

Volume and frequency of buyers

Seven days a week, head chef Andreas determines the quantity of fish demanded for the day. The quantity demanded is contingent upon whether Sage is serving lunch, dinner, or whether it is participating in a catering event. The quantity can often vary. Prior to placing a fish order, chef Andreas must refer to the available frozen stock. Fish currently frozen is prioritized for that day's meals and the discrepant amount between the amount of frozen fish available and fish required is what will be ordered.

Cut preference

Sage welcomes the idea of purchasing whole fish. Their ideal cut would be fillets and the requirement Sage has requested from The UBC Farm was that the fish are gutted

prior to shipment. Sage has had success marketing fish cuts to patrons, which other comparable restaurants have identified as undesirable.

Handling and storing fish

Sage Restaurant expressed an interest in fish processing upon the expectation that there would be an adjustment in price reflecting labour. Sage Restaurant also had the ability to store fish. Chef Andreas raised the concern that fish handling requires expertise. If fish handling and processing failed to adhere to industry standards, fish palatability would be compromised. Finally, any fish that have been previously frozen must be thawed prior to shipment.

Additional certifications

None indicated by Sage.

Barriers to fish production

If Sage were to allow purchasing exceptions from UBC Farm, Stephanie and Andreas' greatest concern would encompass fish feed supporting the project's aquaponics system. Chef Andreas expressed that commercial fish feeds usually contain chemical additives and hormones.

Piyush Sahay, Executive Chef of UBC Food Services Department

Demand on campus

Chef Sahay would consider purchasing fish and shellfish raised on the UBC Farm, provided it was produced and processed safely and sustainably. Fresh fish would be in higher demand than frozen. Niche products like shellfish may be possible for catering and restaurant menus, but not for students.

Species preference

Shellfish like crayfish would be in demand as it is harder to find locally. Tilapia and trout are not preferable among customers.

Ocean Wise licensing

All seafood currently purchased by UBC Food Services is Ocean Wise licensed. Any future seafood that the UBC Farm sells would have to be Ocean Wise licensed.

Volume & frequency of orders by buyers

Seafood is ordered as needed for catering and student menus. Orders are made five days a week and fresh fish are served the day it was ordered or the following day.

Cut preferences

Fillets (skin on) and whole fish (gutted and headed) are both currently purchased. Preferences between fillets and whole fish vary on the availability of labour.

Handling and storing fish

Whole fish are processed, including pin-boning and portioning; skins are removed. Storage is limited for fresh fish but UBCFS kitchens have the capacity to store several boxes of frozen shellfish.

Barriers to fish production

Considerations that Chef Sahay would make before accepting UBC Farm raised fish included the sustainability of the operation. The health of the fish and the safety of the product would be important before a decision could be made. If waste were concentrated, Chef Sahay would want to be sure that contamination did not occur. In terms of vegetable production, he would have concerns about using animal waste as

fertilizer. Large food providers are able to do batch testing on vegetables that are held for two to three days before transport. Small producers may not be able to have the same capacity for holding time or testing.

Olivier Greber, Vice President Value Added, 7 Seas Fish Co. Ltd.:

Description of an ideal supplier of fish

According to Mr. Greber, producers must be reliable. If they claim they have the product, they need to be able to produce it. Volumes of fish and the quality of the fish must also be consistent.

Bringing small lots of fish to 7 Seas Co. Ltd.

7Seas Co. Ltd. may accept small amounts of fish but this is dependent on the type and marketability of the fish. Some producers bring in 10,000lbs of fish while others bring in 50lbs. However, producers that do bring in small amounts generally have fish from "low quantity markets." These are fish that are very marketable like high quality wild fish from Alaska. Mr. Greber explained the importance of generating interest in the product. If 7Seas Co. Ltd. are to market a product to customers, it is important that the customers know when they can get it.

Cost of processing fish

The cost of processing depends on the cost and marketability of the fish. The Farm would need to find financing that allows the fish to be at market price. In the past, 7 Seas has done some processing for small producers but they are trying to move away from that type of processing

UBC Farm fish marketability for 7Seas Co. Ltd.

For 7 Seas to sell fish raised on UBC Farm, the operation would have to distinguish itself from other farmed fish. Mr. Grebert indicated that many people are farming trout or tilapia. A story behind the product is important but a market for the product must also be present. 7 Seas has had experience working with a marketing model based on targeting specific restaurants; this is no longer a viable model. In this case, a producer may raise 300lbs of fish from their operation but only 100lbs may ultimately be marketed to restaurants. This puts 7 Seas in the position of having to sell the surplus on the market where prices may be lower.

7 Seas and Ocean wise

7 Seas carries many Ocean Wise licensed products but it is not realistic for all the fish they sell to be entirely Ocean Wise licensed.

Bruce Swift, Former Owner of Swift Aquaculture:

Processing

Bruce Swift did on-site processing for fish harvested for personal use but all fish sold were processed in CFIA inspected facilities. Mr. Swift would choose processors that would work with smaller volumes of fish, were easy to access, and were cost effective. Since he was marketing the fish himself, he had to manage all aspects of distribution, including transport to the processing facility and delivery to the restaurant. Being independent meant that he had to fit into the processors schedule and call in advance. When processors are busy, it could be difficult for them to accept smaller amounts of fish.

He found that Albion was the most accommodating of smaller lots. The price of processing his fish varied in amount and size of the fish.

His advice for UBC Farm operation would be to do on-site processing. Developing a commercial kitchen on-site for fish processing and washing vegetables would be an ideal scenario. He emphasized the need for food safety measures to be in place. He cited his own experience with false accusations of unsafe food from his neighbor as a reason to have well established safety procedures for processing anything for public consumption.

Marketing and demand

Mr. Swift emphasized that avoiding becoming a "commodity" was very important to him. Competing with the productive capacity of the market is difficult as a small producer. Therefore, the story behind his product set him apart from other fish on the market. He would go to chefs directly to market his product and would develop a working relationship with individual restaurants. He was able to find restaurants that understood the value behind fish raised in a land-based system. Marketing the fish himself did add overall time to his operation compared to selling directly to a processor. He was able to meet the demand from the restaurants that he provided salmon and vegetables to and a surplus amount of fish was not a barrier to his production because he smoked the additional fish.

Mr. Swift advised that a producer should work directly with restaurants. Meeting with chefs and presenting a number of species options for their consideration is one way to assess demand. Inquiring into chef's preference for value added products would be valuable as well. For example, he suggested that if someone was marketing to caterers

they could suggest a number of possible appetizers like finger fillets of trout. He suggested trout as an easy to produce aquaculture species and watercress as an easy to grow and marketable vegetable.

Ocean Wise licensing

Swift Aquaculture had Ocean Wise licensing. Mr. Swift suggested speaking to Ocean Wise directly about their current requirements.

Results: Processing and Regulations

Licenses and applications

The BC Ministry of Agriculture, Food Protection Branch requires all fish processing facilities to apply for licenses in order to perform processing and/or cold storage (Ministry of Agriculture 2012). For aquaculture operations, this application process will need be completed, once the aquaculture system is established. In the BC MAGRI 2012 application form for "Fish or Marine Plant Processing and/or Cold Storage License", annual fees for different operations were listed (see Appendix ii).

These fees apply to provincially licensed operations. While all freshwater fish are permitted to be processed under a provincial license, saltwater species raised in saltwater and bivalves must be processed at a CFIA approved facility (BC MAGRI, 2011). There are no restrictions on size or volume for a licensed processing facility. There was a requirement exception on a processing license for producers who stun and bleed their fish, but do not eviscerate their fish (BC MAGRI, 2011). In this case, the facility must still meet the inspection standards of the Health Authority. The processing licensee was ultimately responsible for the safe operation of the facility, ensuring it operated under the

requirements of the BC Fish Inspection Regulations (M.Wallden, personal communication, March 5th, 2013; BC MAGRI, 1996b).

When a processor sends their application, they must accompany the application with a detailed floor plan, or plant profile, detailing the specifics of their operation. The site layout, details of the water supply, and the establishment's floor plan should be included; details of which are outlined in Fish Processing Plants: Guidelines for Plan Approval and Structural Requirements and briefly summarized in Appendix ii (BCCDC, 2009). Once applications have been received by the MAGRI, the MAGRI may elect to engage the Health Authority and/or Vancouver Coastal Health, both of whom would assist the processor in establishing the operation in the safest possible manner (S. Joseph, personal communication, March 1st, 2013; BCCDC, 2012).

In addition to these licenses, processing facilities must also produce and complete the Annual Fisheries Production Schedule at the end of the year to report final processed fish weights and market selling values to the BC Ministry of Agriculture (BC MAGRI 2012). A facility that does not perform custom processing, storing, or freezing of BC commercial seafood products will need to complete a Licensed BC Fish Processing Plant declaration form to confirm custom processing was not performed (BC MAGRI 2012).

An on-site processing facility

The Fish Processing Plants: Guidelines for Plan Approval and Structural Requirements by the BCCDC (2009) provides basic details for operation requirements of a processing facility (Appendix ii). The requirements for operating a processing facility include specific details on building structure, wall structure materials and the angles of

floor slants to allow fluid removal. There are also information regarding the sanitation of the building, refrigeration of meat produced in the facility, transportation of fish meat, offal composting, and labelling of produced fish meat.

Ocean Wise licensing

What is Ocean Wise?

Ocean Wise is a not-for-profit program initiated by The Vancouver Aquarium in 1999. Ocean Wise encourages restaurants, retailers, and suppliers to employ sustainable methods of fish harvesting and production.

What is the process of obtaining an Ocean Wise licence?

The UBC Farm's Ocean Wise licensing eligibility is subject to the origin of the fish feed, effluent water losses, chemical usage, fish habitat, and waste resource management. UBC Farm aquaculture's resource management practices will be evaluated using the Monterey Bay Scale (Appendix V). Ocean Wise considered The Monterey Bay Scale as the best known measure of sustainability for aquaculture, in order to qualify for consideration of Ocean Wise licensing. It is difficult to predict how a producer will score prior to a full evaluation by Ocean Wise. UBC Farm may not receive an Ocean Wise licensing prior to fish production.

Challenges which prevent Ocean Wise licensing of Recirculated Aquatics Systems (RAS)?

Fish feed is typically the greatest barrier to obtaining a qualifying Ocean Wise score. Conventional fish feeds contain optimal protein requirements for farmed fish. However, they rely on the harvesting of fish meal and oil from marine environments. Fish that are harvested from marine environments primarily for the preparation of farmed fish

feed, are not considered sustainable by The Monterey Bay Scoring Scale, hence score poorly.

Overcoming the challenge of feed and fish that are easily Ocean Wise licensed?

The UBC Farm could consider raising fish that are not carnivorous. Fish that can be raised on a plant based diet and a plant based protein diet, typically attain a score of 5.5 on the Monterey Bay Scale more easily than those RAS employing fish meal and fish oil. Omnivorous fish (examples – tilapia, bluegill, koi and catfish) have a reduced protein requirement.

Are there advantages that RAS systems in regards to obtaining an Ocean Wise License?

RAS are not scored in the areas of areas of escape, disease, and waste. Escape, disease and waste are barriers that can make it more difficult to obtain the license.

Are there any feed producers in the Lower Mainland that you could recommend?

Taplow Aquaculture is a local fish feed supplier. Taplow is Ocean Wise licensed.

What are the costs associated with obtaining an Ocean Wise License?

Mike approximated an annual cost of $250 per year for The UBC Farm.

Discussion

UBC Demand

By interviewing key contacts from the UBC food system, the team was able to gain a preliminary understanding of the potential demand from UBC food providers that could be important for further discussion on strategies for establishing a UBC Farm aquaculture system. The adoption of a policy for purchasing Ocean Wise seafood by both UBC Food Services and the UBC AMS suggests sustainability of seafood choices is an

important component of the overall purchase of seafood on campus. The interview with Nancy Toogood and correspondence with Victoria Wakefield confirmed that the basis for purchasing Ocean wise seafood is to provide seafood harvested in a sustainable manner. Similarly, the chefs interviewed on campus were aware of, and valued, aspects of seafood sustainability that included harvesting methods, distance the fish have to travel, as well as sustainability issues specific to aquaculture, such as the type of feed used for the operation. While our interviews with food service providers on campus suggested that Ocean Wise certification was less important than the sustainability of the operation itself, ensuring customers that the fish are raised sustainably would be important for the proposed operation. Provided the proposed operation follows sustainable principles, there is an overall interest in fish raised at the UBC Farm from food providers. However, the providers we spoke to indicate that addressing marketability, meeting price points, and ensuring the safety and quality of the fish raised are also paramount to the overall demand.

One of the potential barriers to this type of operation raised by the chefs and food providers we spoke to was the issue of approximating market price points for farm-raised seafood. Since the project's objective was to assess demand from food providers for any preferred species amongst other aspects of demand, we did not have any detailed cost-analysis to provide for potential species of interest. Future studies related to campus demand may benefit from presenting species to project partners where cost-analysis data on a per pound basis can be given to food providers on campus. Developing feasible scenarios for production that address cost, marketability, and logistics of the operation itself may provide more tangible avenues for matching demand to potential production

capability. Below are sets of scenarios, based on species favoured by food services and their interests. Related scenarios for fish processing are provided below, keeping locality as a significant goal and addressing on-site processing considerations.

Scenario 1: Production of tilapia for fish and chips

The chefs interviewed indicate that tilapia was not ideal for their menu structure, due to a lower awareness of tilapia amongst customers and less favourable taste qualities. However, tilapia offer advantages we've identified from the interviews and in the literature review. Firstly, tilapia is a hardy species with high growth and the ability to subsist on a largely plant-protein diet (DFO 2006; Rakocy et al. 2006). In addition, the Monterey Bay Aquarium Seafood Watch for tilapia shows it is a best choice for seafood that is produced in a closed recirculating system (Zajdband 2012). Although the logistics of raising fish is beyond the scope of our report, it may be important to consider before dismissing tilapia because of the lower preference for tilapia from Sage Bistro, The Point Grill, Vanier's, and Wescadia. If there was an educational component and possible student involvement in the project, the production ease of raising tilapia could be valuable. This is because the support of the student community at the farm can help to raise awareness of the tilapia species' as a fish alternative on campus, which can help campus consumers know of this sustainable choice. The improvement of the campus' knowledge about tilapia can then help to improve the production of tilapia by making it a viable source of meat production. Additionally, Nancy Toogood expressed interest in tilapia or other white fish fillets for the purpose of fish and chips at The Burger Bar. Frozen Cod is currently the 8th highest species in terms of annual cost that the AMS purchases. This scenario could be favourable in terms of the flexibility of tilapia

production and the potential for longer term storage by freezing the fillets. However, the processing demands of this scenario may be more strenuous than those involving whole gutted fish. Filleting on site would require a provincial processing license and the time commitment of filleting may be greater than simply gutting a whole fish. If breading or further dressing is required, it may require the services of a processing facility like Albion. The amount of handling and time between culling a fish and freezing it increases the risk of pathogen exposure which would make freezing on-site ideal (BCCDC 2012). This scenario may require a walk-in freezer to be on-site and a reefer truck capable of keeping the fish below -18^{o}C during transport (BCCDC 2012).

Scenario 2: UBC plate

A supply system structured around the ongoing demand from catering, Sage bistro, and the Point Grill for whole gutted and headless finfish and shellfish could be an interesting scenario to explore. In this scenario, the UBC Farm could focus on timing production of a freshwater fish like trout that could be sent with minimal processing to these restaurants that would portion it themselves. An organized distribution strategy between these restaurants could minimize the marketability issues indicated by Olivier Grebert of 7 Seas regarding this type of strategy. Bruce Swift was able to use this model of selling directly to chefs who valued the story behind his product. According to him, competing as the producer of a "commodity" wasn't feasible in terms of matching the price of conventionally raised fish. If matching conventional price points is an issue, developing the story behind the fish and finding chefs with a similar vision could be valuable.

Chef Andreas from Sage expressed interest in the marketability of a "UBC Plate" on campus, where almost every ingredient on the plate is produced on the UBC Farm. Nancy Toogood also saw a similar idea, as Chef Andreas for AMS, and thought more on the idea of the "1.5 kilometer plate". Her interest in marketing a "UBC Plate" scenario would be best suited for restaurants in the new SUB including The Perch and Palate. Overall, there is a consensus by all informants there was marketability for local products. With finfish and shellfish, there is an ease in processing because only the guts will need to be removed, while the whole fish can be sold directly to restaurants and catering businesses on campus. While this level of processing is simpler than filleting, a provincial processing license would still be required.

Some chefs noted crayfish and other freshwater shellfish could be incorporated into the marketing scheme and be part of the farm's plan to cultivate multiple trophic levels. With several trophic layers and vegetable products offered by the system, there can be a higher recognition of the farm on campus, advocating the farm's capacity to produce a local dish, as opposed to using frozen options. If salmon or trout become key production species, UBC Farm's colder weather throughout the year may be better accommodated, while tilapia will require extra heating (Savidov and Brooks, 2004). Using tilapia for fish and chips could reduce the visibility of the product if it is incorporated alongside the cod currently sold. A "UBC Plate" scenario would showcase products from the farm.

One key issue to note about selling whole, fresh finfish and shellfish is the relatively short time the fish can stay fresh. Ensuring the fish that are processed meet the demand from restaurants would be important. If the fish are fresh, less freezer storage

would be required. This would be beneficial for restaurants and caterers who lack the capacity for long term storage. Without storage, strategies would need to be developed to address a potential surplus or deficit in production. Commercial processors would be able distribute surplus fish that were not sold to restaurants. Olivier Greber indicated that surplus fish produced in land-based operations are difficult to distribute beyond the restaurants that can market the higher priced fish. If fish were processed on site, smoking and freezing the fish for future use in catering may be a strategy to address a surplus. If fresh fish are demanded, the proposed operation would have to keep up their production with the demand. The need for fresh fish may require more frequent labour then a scenario for frozen tilapia.

Scenario 3: Farmgate sales

Based on discussions within group members, the UBC Farm farmgate sales could also be a possible scenario for marketing fish products, in addition to weekly vegetable sales. This will have a lower, less strenuous demand compared to the campus demand listed in the results and appendix. This could be a summer option that works cooperatively with the other scenarios suggested, where extra fish produced over the summer that would otherwise be sold to facilities that only operate during winter terms could be sold weekly at the farm. In this case, the UBC Farm may only need to produce and process small volumes of fish a week, then sell accordingly during weekly market sales while reducing transportation costs to the campus.

Processing

Scenario 1: On campus at UBC Farm

The cost for a freshwater fish processing fish license is relatively low at $50 annually. It is also possible for an on-campus industrial kitchen to be used for processing more than just fish. Therefore, the costs for operations can be distributed amongst multiple food products. This could potentially be integrated into the Farm Centre that is being built.

There is a lower food mile when fish are processed on-site, so the ecological footprints can be much lower, as opposed to sending fish to a plant and returning the products back. In addition, because most processing plants may be hesitant in returning the offal from processing, on-campus processing can allow the farm to keep all byproducts to be used as fertilizer. This is especially important if the farm would like to maintain their values of creating a closed, sustainable system with little external inputs and wasted outputs. Independent of the demand and processing level, the offal produced by processing fish can still be of significant use to the improvement of nutrients and other ecosystem services in the farm.

The processing can become a student-involved initiative, where students could conduct research in improving processing practices. In addition, students could find new ways of using fish by-products. Not only can there be a student involvement, there can be an increased number of job opportunities on campus, creating a stronger UBC community and maintaining work and money to a local scale.

Scenario 2: On campus at UBC food outlets

There could be a possible opportunity for different UBC food outlets to provide fish processing services for a partnership. However, this option will require longer negotiations and further cooperation by the UBC Farm with the different outlets because processing adds labour and cost.

Scenario 3: Off campus

Though there are reduced social benefits of local processing with outsourcing processing to fish processing plants, there may be greater economic benefits for having off-campus processing. There would be less labour needed to maintain operations and oversee processing employees. In addition, there is guaranteed quality and value added processing that the off-campus processors can provide, which ensures the safety and quality of the fish.

However, as previously mentioned, locality will be lost when delivering fish to an off-campus facility. Economically, the farm will need to conform to the marketing strategies and production schedules of the processing plant.. The UBC Farm will also need to purchase a refrigerated vehicle to transport the fish.

Other Considerations

Ocean Wise License would be a good license to obtain, as this facilitates marketing of the UBC Farm's fish to the UBC campus' food outlets. Ocean Wise licensed fish is what many UBC food businesses indicated as a preference. Furthermore, Ocean Wise licensing is accompanied with opportunity to network with other Ocean

Wise licensed restaurants, producers and suppliers (M. McDermid, personal communication, March 12th, 2013).

Stakeholder's Recommendation

UBC Farm

1. Visit Albion Fisheries Inc. to understand the technicalities of fish processing by June 2013. The interview with Steve suggested, that if members of the UBC Farm visit a fish processing plant, they may better understand the management practices required for a fish processing.

2. Confirm the licenses and regulations for fish processing with the Ministry of Agriculture and Vancouver Coastal Health by July 2013. This ensures UBC Farm is able to meet license requirements when the aquaponics system proposal is developed.

3. Determine as to whether the Farm Centre will have the ability to process fish. Otherwise, a processing area will need to be built. Alternatively, there is also the option of off-campus processing. In both cases, refrigerated transport would be required and must therefore be considered.

4. Confirm with Victoria Wakefield that UBC Food Services will be willing to purchase fish from UBC Farm not licensed with Ocean Wise by July 2013. If UBC Food Services is not willing to purchase fish without an Ocean Wise license, the UBC Farm will need to adjust the aquaponics proposal by exploring other potential markets or opting to pursue an Ocean Wise license.

5. Decide on fish species to be produced before a business plan is submitted. Fish species vary in dietary requirements (e.g., tilapia will require a heating system, trout will require cooling system). The cost and complexities of the operation will shift depending on the species.

6. The UBC Farm should pursue an Ocean Wise license, when the aquaponics operation begins. This project revealed that UBC populous entrusts a significant confidence within Ocean Wise seafood mandate. Thus Ocean Wise licensing, has the potential to capture more buyers, as this is facilitated by the Ocean Wise label.

Future LFS 450 Aquaponics Groups

1. Perform a risk analysis of operations (e.g., disease risks, funding possibilities, etc.) to ensure processing and production are possible by April 2014. From speaking with several chefs and aquaculturists, great concerns for human consumption of fish have been recognized. In addition, an analysis of variable costs and disease outbreak impacts on the economical aspects of the aquaponics system would aid in preventative measures, especially on the costs for labour and feed.

2. Create a marketing strategy for selling specific fish species for UBC Farm by April 2014. Several chefs have noted the difficulties of some species to market due to their low impacts in consumers' minds. By creating a marketing plan, UBC Farm would have a clear methodology on how production could be manifested and how consumers could be made aware of their choices.

3. Determine the production methods, processing regulations, and fish rearing issues for one species of fish UBC Farm would like to focus on by April 2014. The technicalities of raising fish, as mentioned in one of the SMART recommendations, will vary based on

species. This recommendation could help UBC Farm understand ethical, regulatory, and economic conflicts that could occur.

Scenario Evaluation

Throughout this project, the feasibility of beginning an integrated aquaculture/ aquaponics system on UBC Farm has been discussed and investigated. Valuable insight have been given by our various partners, and have been gladly received. Three core questions and projected outcomes have been identified:

1. To investigate the demand of BC farmed fish across the UBC Point Grey campus;
2. To investigate the logistics of processing UBC farmed fish and the limitations thereof, and;
3. To develop scenarios therein for the UBC Farm, project stakeholders, and future students to consider

Through detailed conversations with project stakeholders and key persons across campus, it is indicated that there is a definite demand for fish products, particularly those marketed to have less environmental impact, present among faculty and staff of UBC. Food service providers on campus have expressed an interest in this project, which has the potential of producing community-scale, local and fresh fish for the campus to enjoy. The demand of UBC farmed fish across the UBC Point Grey campus has been investigated and found to exist; therefore, the first projected outcome has been achieved.

The processing of whole fish and consequent fishmeal produced is a crucial part of this project, particularly for the implementation of an aquaponics system. Various possibilities for the processing of UBC farmed fish has been considered, including: on-

site, at the farm; on-site, by the purchasers, with the fishmeal being sent back to the farm; off-site, at a third party processor. Each comes with its own set of limitations and possibilities; for both on-site possibilities, aside from the need for training and employee costs, processing sites and methods must comply with standards set out to ensure, not just the Ocean Wise labelling, but also the safety and standards found accompanying the demand. Off-site processing takes away from the community value, and has potential to cost more than what the system produces. The logistics of processing UBC farmed fish and the limitations thereof have been investigated; therefore, the second projected outcome has been achieved.

Taking into account the existing demand for and the logistics of processing UBC farmed fish, three scenarios each for processing and marketing have been proposed and discussed: for marketing, we describes scenarios looking into tilapia production, the introduction of a "UBC Plate", and utilizing farmgate sales. Processing can either be completed on-site at the UBC Farm, negotiated with UBC Food Services, or off-site with a third-party processor. Having investigated the first two questions, scenarios therein have been developed for the UBC Farm, project stakeholders, and future students to consider; therefore, the third outcome has been achieved.

Group Reflection

The group feels one of the greatest achievements of this project was the collaborative efforts of the team to complete such a large project in a limited time frame. Assessing the UBC Farm's aquaponics feasibility, allowed for many scenarios to be considered. Thus it required consulting beyond the scenario's description to solidify and

understand the objectives and goals of the project. Once the basic framework was set, the team was able to work efficiently to complete tasks on a timely manner and deliver the appropriate answers to the teams and appropriate stakeholders. The differing opinions of each project member and their diverse education and cultural backgrounds shifted the projects in many directions. The group's desire in further developing a sustainable initiative at UBC, contributed to the project's success, and allowed us to overcome barriers which impeded may impeded progression of our project.

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