A Review of Quantifying the Social and Environmental Benefits-Costs (externalities) of Organic Foods

Yasser Ghoreishi
Human Studies and Interdisciplinary Department, Laurentian University, 935 Ramsey Lake Road, Sudbury, ON – P3E 2C6, Canada.

ABSTRACT
The cost-benefit externalities for organic agriculture are improving. For the past few decades, organic agriculture has grown in terms of scale and scope. This growth has led to generally lower costs of expenses related to organic agriculture. Researchers have come up with a plethora of models that can draw cost-benefit analysis in terms of productivity, sustainability, returns and environmental costs (Balmford *et al.,* 2018). At the same time, organic agriculture touches the values of the consumer more acutely than what they have in the past. This paper discusses the improved benefit-cost (externalities) associated with organic agriculture and how they continue to improve. It focuses on the literature review of past and current relevant articles, conference proceedings papers and other reliable sources. The author centre on data sets that focus on the externalities of sustainability and costs. The conclusion of this paper indicates that there will be continued improvement of organic agriculture as an industry as technologies supporting organic agriculture improve. The paper recommends that there is a need to research the cost impact of farming externalities on the welfare of consumers and the choices that they make concerning foods.

Keywords: Benefits/Costs, Externalities, Environment, Human Health, Organic agriculture, Sustainable agriculture.

Corresponding author: yx_ghoreishi@laurentian.ca

INTRODUCTION

The state of organic farming has always led to numerous discussions on how to make suitable improvements in understanding the field. Conferences and convergences of scholars have explored significant theoretical and perspective shifts in the costing processes of production. In "The True Cost of American Food," April 14th – 17th / San Francisco conference, attendees examined the utility of organic food. The debates on organic farming are transposable, according to the parameters of this study to the province of Ontario, Canada. One of the most important factors is the necessity of measuring, monetizing and reflecting on the social health and environmental benefits and costs (externalities) for the sustainability of agriculture, including organic farms. It is not possible to reach the "true cost" of a wide-ranging farming system, without taking into account of these impacts and costs systems. Emerging conceptual frameworks and valuation methods on the "true cost" of the social and environmental externalities (benefits/costs) of sustainable agriculture and organic farming have sought to provide a guiding light toward management practices at the farm level. They have also increased individual citizen's consciousness and affects agriculture policies.

According to Garibaldi *et al.,* (2017), organic agriculture has grown in size and scope over the past few decades. Eyhorn *et al*., (2019) provides that the growth of the economy and technologies associated with organic agriculture systems has led to the development of organics to the point where these foods are becoming comparable in cost and availability to other food options for the consumer (Garibaldi *et al.,* 2017). Recent scholarly work has focused on understanding the exploitability of options in organic foods to make organics a viable competitor against foods which may be purchased for a cheaper price (Magnussona *et al*., 2003; Ozguven, 2012; Shafiea and Rennieb, 2012; Cheng, 2016; Vietoris *et al*., 2016; Baudry *et al.,* 2017; Azizan and Suki, 2017). The organic agriculture system is now at a point where it is essential to consider the actual cost of the food consumed and what the options are for the consumer.

Balford *et al.,* (2018) finds that within in the scope of sustainable food, research drawing conclusions associated with the organic agriculture system can lead to understanding what the cost is for the consumer and how

it is that the consumer could have their tastes exploited. Organic foods have not quite caught up with competitors; however, the economic advantages for organics are growing. Sain *et al.,* (2017) argue that organic foods will soon minimize the cost advantage of competitors. Organic foods will compete more effectively based on the philosophy that foods that have not been genetically modified or received some forms of treatment are better than those that have undergone massive chemical treatments or genetic modifications.

MATERIALS AND METHODS

This paper relies on the literature review of past and current relevant articles, conference proceedings papers and reliable sources in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) convention (Moher *et al.,* (2009). It examines and describes the existing methods and metrics tools in the field of previous studies used to calculate the externalities of sustainable farms in the USA. Using secondary data is crucial in acquiring sufficient information on organic foods and their prospective cost benefits. Notably, the selection of this approach resonates with the fact that secondary research or review of literature allows the analysis of critical points that the initial study may have overlooked (Bryman *et al.,* 2018). It may see additional dimensionalities in the information with a wide range of implications on collaborations within various disciplines.

This report utilizes an inclusion criterion that investigates papers with keywords such as benefits/costs, externalities, human health, environment, sustainable agriculture, organic agriculture. The searches will be on sources such as PubMed, Web of Science, Cochrane Library and other university-related repositories with papers from 2013-2016. The resulting datasets would undergo evaluation based on several significant externalities such as sustainability and cost implications to the farmers and the consumers. The papers would them undergo a thematic analysis to isolate the key issues that arise in bringing down the costs of producing organic foods and making them more competitive. Thus, systemic reviews will additionally look at the methodologies that have led to the outcomes indicated. The framework used is as shown figure 1 below.

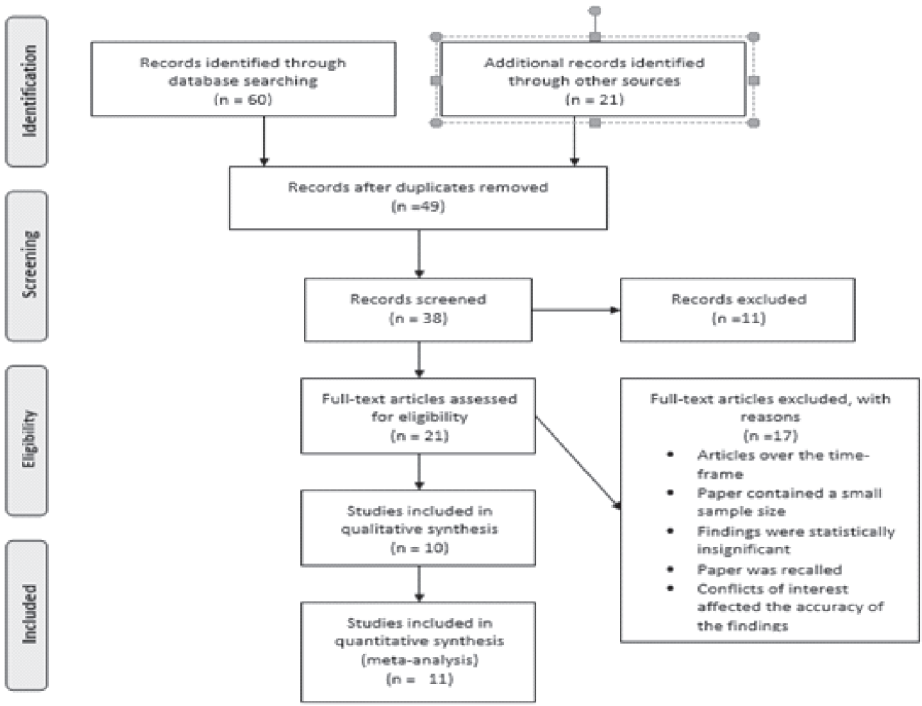

Figure 1: PRISMA Model (Source: Moher et al., 2009)

DISCUSSIONS

Understanding Farm Sustainability

De Olde *et al.,* (2016) and Ryan *et al.,* (2016) present that farm sustainability is an essential element of the overall system of food production. The farm must not be inundated with different technologies and methods of production that will eventually damage the quality of the goods that people receive on the farm. Ryan *et al.,* (2016) argue that calculating these costs could be difficult for the farm because of all the different variables involved. Sandhu, (2016) determined that the farm is an entity where the nature of inputs will impact the nature of environmental outputs, as well as the social and natural capital of the farm. According to Balmford *et al.,* (2018), externalities of the farm are such that foods can be produced in a way that does not create a significant environmental or social damage to life. Sandhu, (2016) notes the several environmental benefits such as water regulation, carbon

sequestration, nitrogen fixation and nutrient cycling as being benefits of farming; however, the nature of how it is that farmers engaged in these activities can have a significant impact on society as a whole.

Informing the Public on the True Cost of Foods

Ferreti *et al.,* (2017) argue for the consideration of the total cost of organic foods. Nierenberg et al. (2016) encourage the discussion of cost beyond the scope of economics. Issues such as natural resource use and damage, human rights and animals are critical determinants in the true cost of the food people eat. This consideration may be due to discrepancies in costs that can contribute to damage in the scope of what is justifiable concerning environmental, economic or socially sustainable production methods (Carlson, 2016; Chen and Saghanian, 2017; Hilmi *et al.,* 2018). Some foods have a greater presence all over the supply chain, which may affect the cost implications on other products.

The case of corn is perhaps one of the most elaborate instances of foods that have significant impacts on the supply chain. About 65% of all of the world's maize production comes from the US; however, only about 1% of that food will go to humans (Nierenberg *et al.,* 2016). The rest will be processed and added to the feed of animals and used to produce goods such as high fructose corn syrup (HFCS). There is a specific threat that comes from processing corn into HFCS because fructose in high amounts can lead to obesity. Nierenberg *et al.,* (2016) concluded that it is best for a full-cost accounting that expresses the negative impact of production. Costs have to expose the costs of unhealthy practices associated with the way that the food system works and how food is stored. Subsidies must also consider contrary practices that arise from the production of food.

Giraudeau, (2017) explains that despite efforts to create a model of accounting for agricultural systems, determining exact numbers related to social and environmental costs and benefits is challenging. Dubois, (2018) highlights that this problem arises from the lack of direct linkage between production and the supply chain for agricultural goods to social and environmental costs is relatively undefined.

Sandhu, (2016) designs an assessment method that could measure costs and benefits in the scope of social capital in terms of the cost of production for agricultural products. The findings reported that

environmental and social benefits depend on natural and social capital on farms. Calculation of costs and benefits must also take into consideration the alternatives for the cost of conventionally produced goods (Chen and Saghanian, 2017). Some examples of this include bushels of corn, soybean, milk and beef. Corn has environmental and social benefits of $1.00 per bushel, with an environmental cost of $1.00 and a farm gate value of $4.00. This data is evidence that in the scope of social and environmental costs and benefits, corn is a value-neutral item.

On the other hand, a bushel of soybean has social and environmental benefits of $3.19 and an environmental cost of $3.17. A gallon of organic milk will generate social and environmental benefits of $.28 and has an economic cost of $.25 (Sandhu, 2016). This data shows that the social and environmental costs of these goods are relatively close to the benefits. The objective should be that the social and environmental benefits of these things should be pointedly more significant than the costs (Chen and Saghanian, 2017). For that reason, lower environmental strain and the wellness of citizens should arise from organic food production.

Treatment and nourishment of the animals held in captivity become a part of our food supply. Andrus *et al.,* (2016) examine the cost of different treatment methods that animals experience. Animal welfare is an essential element of agricultural externalities because the treatment of animals can have a potential impact on the quality of the food.

The researchers estimated that 90% of all eggs come from chicken that will never move their wings. From a fundamental economic standpoint, there is a lack of support for this approach as gestation crates create an average value for the farmer of $.34 a point and cost less than $.07. At the same time, there is only a cost of $.01-.02 per egg. The savings are insignificant. However, there is a direct economic value to free-ranging chickens and other livestock that is not exploited by farmers. There is some form of cost-benefit in more progressive approaches to farming and agriculture.

Skaf *et al.,* (2019) asserts that there is still difficulty in general associated with quantifying the benefits which come from the implementation of sustainability methods. This case is because of the lack of direct links between benefits and changes in activities from conventional to organic methods of production. Sandhu *et al.,* (2016) discussed potential

methods for assessing sustainability in agriculture. The researchers noted that four primary boundaries understate sustainability and the cost of food production. The researchers noted that good governance, environmental integrity, social wellbeing and economic resilience are four critical dimensions associated with successful measurement of how sustainability can occur in farming. Essentially, measuring production in the scope of determining the extent to which production conforms to a bottom line is a key for how an accounting system can account for the costs of production in agriculture and agricultural gains can potentially be measured (Skaf *et al.,* 2019).

FINDINGS

With the growth of organic farming, Balmford *et al.,* (2018) articulate that there exists more data that can enable the determination of cost-benefit externalities. Researchers have come up with extensive data models that have increasingly improved the quality and value of cost-benefit analysis. The manipulation of consumers is a critical evaluation point in the determination of costs, given that as many more people seek to use organic foods, the costs of foods has increased. Nonetheless, as Balmford *et al.,* (2018) insinuate, this costing does have negative implications on the prospective sustainability of foods. Sain *et al.,* (2017), however, proposes that this shift may be due to a decrease in the competitive advantages that existing players in the market. As cost models increasingly improve their costing accuracy, the information will allow a decrease in the prices by increasing the bargaining power of consumers.

Sustainability is critically one of the value propositions within food production. Maintaining the quality of food requires, according to Ryan *et al.,* (2016), to use technologies that do not induce harm to the systems within the farm. This sustainability thrives on limitations of the environmental damage that is permissible in food production (Balmford *et al.,* 2018). The social implications should be in line with efforts towards water regulation and nutrient cycling (Sandhu, 2016). The costs on the environment are perhaps one of the crucial calculations in the cost-benefit externalities. It adds to what are the socially acceptable ways of producing foods.

Unfortunately, the cost inclusion of organic foods is complex. Ferreti *et al.,* (2017), mentioned in their quest to allow the consideration of the total

costs of organic foods. This scope would entail the natural resources, human and animal protection and rights, as well as environmental concerns. The production of food concentrates on more than labour costs, land and supply chain operations. The impact that it has on living organisms is fundamental and must be part of calculations. Humans and animals' input to these processes and some of the practices that some farmers engage within have high human cost implications on welfare. (Andrus *et al.,* 2016). Unethical processes have a long-term implication on costs and sustainability (Carlson, 2016; Hilmi *et al.,* 2018). Nieremberg *et al.,* (2016) foster the necessity to involve foods that affect multiple arenas of the food chain. With corn, for instance, the costing can be multifaceted based on consumptions and health outcomes as well (Ferreti *et al.,* 2017). In arguing for true costs of organic farming, the health implications and some of the negative uses to which the product goes into must reflect.

Nonetheless, models for agricultural systems cannot determine the costs of all inputs, as Giradeau, (2017) present. Existing systemic issues related to lack of direct costing across food supply chains and production in relation to social and environmental gaps presents a wide range of gaps in which current modalities are insufficient (Chen and Saghanian, 2017). Consequently, relating the same information to quantifiable benefits of sustainable methods presents widespread challenges (Skaf *et al.,* 2019). The dimensions of good governance, environmental integrity, social wellbeing and economic resilience present key performance measures on sustainability (Skaf *et al.,* 2019). However, their scope does not conclusively assess and present prospective models for costing and benefit analysis. Extensive research can present better articulation on techniques that can reflect adequate measurements and values of the investments made towards sustainable organic farming.

CONCLUSION AND RESEARCH NEEDS

In closing, sustainability in agriculture focuses on accomplishing positive social and environmental goals (Skaf *et al.,* 2019). This scope must ensure that farming systems work towards the realization of better outcomes. Organic foods, despite their massive influence of change toward sustainability, require refinement in assessment tools. Production for farmers is costly, thus requiring modalities that would improve their

completeness with farms using non-organic farming protocols. At the same time, it is vital to understand the implications of production. As technologies lead to more elegant approaches to production, researchers must understand what this means. Organic foods have not quite caught up with competitors; however, the economic advantages for organics are growing, and it is possible that in the future organic foods will minimize the cost advantage that competitors have. The priority of future research will focus on assessing the citizen's awareness of the costs - benefits (externalities) of sustainable agriculture.

Researchers must consider the net social health and environmental benefits/cost (net externalities) to the final production cost; the market price of the organic products appears cheaper than as it is marked. Unveiling the exact monetary value of the benefits and costs would be able to encourage farmers and practitioners to implement technologies and methods to lessen the negative impact on human health and the environment. Again, it will assist consumers in deciding whether to buy products with higher environments and social benefits or less environmental costs based on provided information (benefits/costs) (Chen and Saghanian, 2017). It is worth considering how many people are aware of and concerned about social and environmental costs and how to include benefits in advertising organic farming. Information needs of organic farmers should survey, and information delivery systems should meet their needs.

REFERENCES

Andrus, B.M., Sukhdev, P., Shapiro, P., & Ikerd, J. (2016). *Pricing the Priceless. Sustainable and costs of different production system.* Published by the Sustainable Food Trust.

Azizan S. & Suki N. (2017). Consumers' Intentions to Purchase Organic Food Products. IGI Global 10.4018/978-1-5225-2331-4.ch005.

Balmford, A., Amano, T., Bartlett, H., Chadwick, D., Collins, A., Edwards, D., ... & Waters, H. (2018). The environmental costs and benefits of high-yield farming. *Nature Sustainability*, *1*(9), 477-485.

Baudry J., Péneau S., Allès B., Touvier M., Hercberg S., Galan P., Amiot M., Lairon D., Méjean

Bell, E., Bryman, A., & Harley, B. (2018). *Business research methods*. Oxford

university press C. & Kesse-Guyot E. (2017). Food Choice Motives When Purchasing in Organic and Conventional Consumer Clusters: Focus on Sustainable Concerns. Nutrients 2017, 9, 88; 10.3390/nu9020088.

Carlson, A. (2016). Investigating retail price premiums for organic foods. *Amber Waves, May, US Department of Agriculture, Economic Research Service, Washington, DC*.

Chen, B., & Saghaian, S. (2017). *Does Consumers' Preference for Organic Foods Affect Their Store Format Choices?* (No. 1377-2016-109930).

Cheng, X. T. (2016). Perception of consumers towards organic food: A review. International Scholars Journals: 2375-0693 Vol. 4 (6), pp. 428-437, June 2016.

De Olde, E. M., Oudshoorn, F. W., Sørensen, C. A., Bokkers, E. A., & De Boer, I. J. (2016). Assessing sustainability at farm-level: Lessons learned from a comparison of tools in practice. *Ecological Indicators*, *66*, 391-404.

Dubois, A. (2018). Nurturing proximities in an emerging food landscape. *Journal of Rural Studies*, *57*, 1-12.

Eyhorn, F., Muller, A., Reganold, J. P., Frison, E., Herren, H. R., Luttikholt, L., ... & Smith, P. (2019). Sustainability in global agriculture driven by organic farming. *Nature Sustainability*, *2*(4), 253-255.

Ferretti, G., Neri, D., & Borsari, B. (2017). Issues of Food Safety and Quality: Are "Organic" Foods Better?. *Nutrition Guide for Physicians and Related Healthcare Professionals*, 273-282.

Food Trust, The True Cost of American Food – Conference Proceedings. Ch. 20. P. 151 –156.

Garibaldi, L. A., Gemmill-Herren, B., D'Annolfo, R., Graeub, B. E., Cunningham, S. A., & Breeze, T. D. (2017). Farming approaches for greater biodiversity, livelihoods, and food security. *Trends in ecology & evolution*, *32*(1), 68-80.

Giraudeau, M. (2017). The farm as an accounting laboratory: an essay on the history of accounting and agriculture. *Accounting History Review*, *27*(2), 201-215.

Hilmi, Y. S., Sari, P. N., & Suryantini, A. (2018). Organic Rice Farming Characteristic and Food Consumption in Sleman District. In *Proceeding of the 2nd International Conference on Tropical Agriculture* (pp. 121-130). Springer, Cham.

Magnussona M., Arvolaa A., Hurstia U., Abergb L., Sjodena P., (2003). Choice of

organic foods is related to perceived consequences for human health and environmentally friendly behaviour. Appetite 40 (2003) 109–117.

Moher D, Liberati A, Tetzlaff J, Altman D. G, & The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med 6*(7): e1000097. doi:10.1371/journal.pmed1000097

Nierenberg D., Muller, A. Merrigan, K., & Hilton, S. (2016). Why we need true cost accounting. *Sustainable Food Trust, The True Cost of American Food – Conference Proceedings. Ch. 2. P. 21 – 26.*

Ozguven, N. (2012). Organic Foods Motivations Factors for Consumers. Procedia - Social and Behavioral Sciences 62 (2012) 661 – 665.

Ryan, M., Hennessy, T., Buckley, C., Dillon, E. J., Donnellan, T., Hanrahan, K., & Moran, B. (2016). Developing farm-level sustainability indicators for Ireland using the Teagasc National Farm Survey. *Irish Journal of Agricultural and Food Research*, *55*(2), 112-125.

Sandhu, H. & Holden P., (2016). Case study analysis of US farming systems. *Sustainable Food Trust, The True Cost of American Food. – Conference Proceedings. Ch. 5. P. 40 – 47.*

Sandhu, H. S. (2016). The future of food and agriculture. *Farm Sustainability Assessment Report. The future of food and agriculture: quantifying social and environmental benefits and costs of different production system. Published by the Sustainable Food Trust.* http://sustainablefoodtrust.org/wp-content/uploads/2013/04/The-Future-of-Food-and-Agriculture-web.pdf

Sandhu, H.S., Scialabba, N.E., Fenichel, E., Stewart, L., & Bandel, T. (2016). Methods and Metrics. Sustainable Food Trust, *The True Cost of American Food – Conference Proceedings.* Ch. 21. P. 157 – 164.

Shafiea F. & Rennieb D., (2012). Consumer Perceptions Towards Organic Food. Procedia – Social and Behavioral Sciences 49 (2012) 360 – 367.

Skaf, L., Buonocore, E., Dumontet, S., Capone, R., & Franzese, P. P. (2019). Food security and sustainable agriculture in Lebanon: An environmental accounting framework. *Journal of cleaner production*, *209*, 1025-1032.

Vietoris V., Kozelová D., Mellen M., Marcela Chreneková M., Potclan E. J., Fikselová M., Kopkáš P., & Horská E., (2016). Analysis of Consumer Preferences at Organic Food Purchase in Romania Pol. *J. Food Nutr. Sci.*, 2016, Vol. 66, No. 2, pp. 139–146.