

## A Comparative Study between Organic and Inorganic Farming at Select Areas of Dhaka: Poverty Reduction and Market Management Possibilities

Md. Arafat Islam\*, Raisa Bashar, Abdun Naqib Jimmy, Nazmul Ahsan Khan

Department of Environmental Science and Management, North South University, Dhaka, Bangladesh

### ABSTRACT

Most of the farmers in Bangladesh appear to be interested in inorganic farming primarily because they believe it produces higher profit. Hence, one of the aims of this research was to find out whether inorganic food/farming really produce more profit than organic. The authors also tried to prove that organic farming can be at least as profitable as inorganic to help alleviate poverty. This research encompasses of secondary and comparative analyses, as well as primary analysis by using survey tools such as structured questionnaires and unstructured interviews with the locals (mostly farmers and consumers involved with both types of farming) of Savar, Srinagar and Rupganj. The survey found the production cost of inorganic corn (without externalities) to be 10,100 BDT/bigha (747.04 USD/ha), whereas it was valued at 5,900 BDT/bigha (436.39 USD/ha) under the organic farming system. Also, the lack of proper market management in Bangladesh is a big reason that organic farming/products are unpopular, according to the research. The stakeholders' opinions to understand the present status of inorganic farming were used to produce findings and propose recommendations, which can bring about poverty reduction in a truer sense at these areas, without harming health and environment in the long run.

**Keywords:** Inorganic farming; Market management; Organic farming; Poverty

### INTRODUCTION

Bangladesh is a poverty-stricken country with a high population density; the food demand is high here. Despite several drawbacks, Bangladesh fulfills the food demand through primarily inorganic farming, modern technology and trained/untrained farmers. Other than flooding, water logging, droughts or any such unexpected situation, Bangladesh never faces food challenges. Due to the surplus of food crop production, Bangladesh is now able to export too. As the nation has achieved food security, now it can afford to balance between commercial production and sustainability. Sustainability in the agricultural practices of Bangladesh is only going to be possible through organic farming practices. However, the use of organic fertilizers and techniques for farming needs more effort and it produces lower yield than its inorganic counterparts. In comparison though there are no health issues, because chemical fertilizers are not used in these techniques and for the same reason the

environment is not harmed either in the long run, sustaining soil qualities.

Under this research, inorganic farming refers to the use of chemical fertilizers and pesticides, which are detrimental to human health and environment; inorganic agricultural practices pollute water and reduce biodiversity. The use of pesticides also pollutes the air and soil. Inorganic farming can produce high yield in the short term, but in the long run production decreases due to soil degradation [1]. On the other hand, organic farming takes care of the soil and the yield production increases and is sustained, in the long run. The developed nations that often lead as a role model to developing nations, have now concentrated their interest in organic food consumption and production. Even in the capital Dhaka, the trend of organic food consumption has risen and people are willing to buy organic food at higher price. Hence, this research is timely as it will present a comparative analysis between the costs of organic and inorganic food production, evaluate the problems that discourage organic farming practices and analyze the

**Correspondence to:** Md. Arafat Islam, Department of Environmental Science and Management, North South University, Dhaka, Bangladesh; E-mail: arafat.nsu175@gmail.com

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stakeholders of three select agricultural areas near the capital of Bangladesh, Dhaka and the citizens of some elite areas of the city to propose recommendations and identify lacking that exists in the management of the organic food market, today.

## MATERIALS AND METHODS

### Background and rationale

Organic farming is not only environmentally sustainable, but it is also financially feasible compared to conventional farming, according to the authors. Several organic food reports state that sales grew 170% to 63 billion USD by 2011, worldwide. It is a direct signal that organic farming can financially benefit the developing nations. Moreover, there have been many instances when the inorganic fertilizer use in an intensive manner has caused severe health problems among members of communities; an example is Punjab's cancer train, where the use of inorganic chemical to boost yield killed off several farmers and their family members. Generally, farmers use abnormally high quantity of pesticides; multiple cropping systems are present in the developing countries, but for these practice farmers are dependent on chemical fertilizers. In contrast, organic farming can be environmentally and socially and economically good for the developing countries; cost from the use of technology is cut down too. Organic food has a high content of valuable nutrients and is free from chemical residues. Environmental qualities also improve *via* this method which affects the economy of the country positively [2]. The most important thing about organic farming is that it has positive externalities like the enhancement of the quality of food and freedom from pests and diseases which damage freshness and color.

The price and quality of organic products are two main concerns for the market management of organic product. Equality in price of organic and inorganic products is not acceptable, because the quantity of production of organic farming is lower than inorganic farming. Certainly, it is important to note that organic products' prices will always be higher (even if slightly) than inorganic products, not only in the local market, but also in the national and international markets. Efficient access is needed for the proper market management of organic products. Additionally, it is essential to stop or reduce the oversupply of organic products in the markets; otherwise it can decline the willingness to pay of the customers. Better contracts and links will help the new growers of organic food to be guarded against price risk as well. This message of better market management, new subsidization and taxation practices, infrastructure development to directly benefit organic farmers and a manner of certification of the healthier alternatives to inorganic food needs to be realized by the concerned private and public authorities; the research is hence timely and essential. It will also help to bridge the gaps in literature which fail to address whether, in reality, the true costs of organic farming is higher or lower than inorganic.

### Data collection

To do this, both primary and secondary analyses were done. Primary data was collected in three selected areas of Dhaka

district covering the north eastern, western as well as southern regions in early 2018 to get a more comprehensive idea about the thoughts of people and also the market scenario. The authors also tried to find out the current situation of the market in terms of organic products and organic farming system and organic farming practices that are being done in the area by the farmers. This was done through focused group discussions where the farmers and consumers were randomly selected and put into two groups and the authors tried to distinguish among the more talkative farmer, who would contribute more information on how their economic situations and social ways have seen changes. The authors also tried verifying the information given by interviewees on their earnings and how they did so. Apart from this, semi-structured as well as structured questionnaire consisting of 20 questions each, were used to survey the farmers (male and female), consumers and stakeholders individually to get more detailed information about their income, market situation and their future prospects about organic farming [3]. Authors' observations, key informant interviews from managers of supermarkets of the elite areas of Dhaka city stocking organic food (fish, meat, food grains, vegetables and fruits) and short interviews from the buyers of organic food were also part of the data collection process.

### Study area

Authors selected three areas-Savar, Srinagar and Rupganj-surrounding Dhaka district from different directions to get a comprehensive idea about organic farming. Dhaka is the capital city and the trend of consuming organic food will start from here. The three areas were selected cause these the areas are close to Dhaka. Road network also good between Dhaka and the these three areas and finally, these are the three areas surrounding Dhaka from where vegetables import everyday at Dhaka. Already in upscale areas like Gulshan, Banani, Dhanmondi the trend of having organic food is starting and the organic food is mainly coming from the selected areas.

### Sample size and sampling techniques

Total number of surveys was sixty, and for each area fifteen to twenty five interviews were conducted. The samples were chosen randomly from population directly and indirectly involved with the farming practices of the areas. The percentage of farmers at Nayarhut, Savar was 24.34%, at Dogachi Bazaar of Srinagar, Mawa was 25% and at Rupganj, Narayanganj was 27%. The authors also selected female interviewees; the numbers were 4 at Savar, 6 at Srinagar and 3 at Narayanganj for more randomness; the rest were males. The interviews were taken from morning to noon; 3 days were needed to cover each area. The sample included different levels of farmers (rich, poor; old, young; experienced, inexperienced). The farmers' education levels were also observed, and the authors tried to find out whether they have minimum knowledge about organic farming and whether they are educated already or taking training/are trained on this issue or not.

The values were collected in the area unit of bigha which is the local norm and the national currency of Bangladeshi Taka (BDT) [4]. The values have been, henceforth, converted to

United States Dollars (USD) and hectare (ha) for standardization.

## RESULTS AND DISCUSSION

### Data analysis

**Demographic information:** Most of the farmers and consumers who were interviewed were between the ages of 25 to 35 (54%). Unsurprisingly, most of the farmers and consumers interviewed were males (78%) as these areas are patriarchal societies. 16 samples from Savar, 25 samples from Srinagar and 19 samples from Narayanganj were taken for this survey depending on the number and availability of the farmers and consumers. Most of

the respondents (80%) were farmers, but, to understand the consumers' perspectives and organic food demand, the authors also tried to involve a few consumers and suppliers, like teachers (10%) and businessmen (10%), in the survey. Almost all the farmers (77%) were also the landowners. The most popular crops grown were found to be other vegetables like carrots, radish, beans, cauliflower, etc. (53%), potatoes (23%), rice (16%) and corn (11%). Also, most (53%) farmer earned 10000 BDT-15000 BDT/month (118.34-177.51 USD/month) which is about 200 USD lower than the national average; the rest earned around 50 USD (26%) or equal (21%) to the national average income. The data are represented in Table 1.

**Table 1:** Demographic information of the study areas.

Demographic parameters	Number/Percentage	
Age	(25-35 years)	54% (N=32)
	(36-45 years)	46% (N=28)
Gender	Male	78% (N=47)
	Female	22% (N=13)
Location	Savar	27% (N=16)
	Narayanganj	32% (N=19)
	Srinagar	41% (N=25)
Profession	Farmers	80% (N=48)
	Businessman	10% (N=6)
	Teachers/Student	10% (N=6)
Owners of land	77% (N=46)	
Landless	23% (N=14)	
Most popular crops	Other vegetables	50% (N=30)
	Rice	16% (N=10)
	Corn	11% (N=6)
	Potato	23% (N=14)
Income per month	10000-15000 (118.34-177.51 USD)	53% (N=32)
	15001-20000 (177.53-236.96 USD)	26% (N=16)
	20001-25000 (236.70-295.86 USD)	21% (N=13)

### Methods of agriculture

Most of the farmers said that they harvest crops twice in a year (74%) and many of the farmers declared that they use spade (7%) to plough the land. Many of the farmers (91%) believe that artificial irrigation is a better water source for their agricultural

land than rivers or rain water, because they can frequently and efficiently supply water to their land by using water pumps [5]. Also, manure is a very common fertilizer for the farmers (80%) and it is usually used before cropping the land, both as the main fertilizer by the organic farmers and as a supplement by the inorganic ones.

## Organic farming and inorganic farming: Introduction and status in the areas

To get a better understanding of the area's view on both types of farming the farmers and other stakeholders were asked about organic fertilizer and whether they used it before or not; 73% said that they have applied organic fertilizer and the rest said that they did not. Next, they were asked about the most used organic fertilizer they used; 43% people said that they use manure as an organic fertilizer, followed by 18% people who preferred compost, 11% who used organic liquid pesticide and 17% who use both manure and compost. Additionally, the authors tried to evaluate how many farmers followed organic farming practices in the areas and it was found that from the 95% of the people who were surveyed, only 5%-10% farmers follow organic farming practices. Also, 52% people said that organic farming practice makes the soil more fertile and 18% people said that organic farming practices protect the soil microorganisms; this shows that they know about the benefits of this practice. Furthermore, 30% people said organic farming system protects the soil, leading to reduced irrigation needs and in turn lower farming costs. When asked about the environmental effects of organic farming, 96% people said that they believed it to have no environmental effects. Additionally, from the 96% people who said that organic farming is beneficial for the environment gave the reasons of non-use chemical (24%), use of septic elements (19%) and preservation of beneficial insects (12%); 45% people believed all the reasons combined provides the benefit.

Next, the farmers and stakeholders were asked about inorganic fertilizers and where they collected these from; 64% of the people said that they collected from the nearest market, followed by 16% who said that they were "provided at farming site" these by the non-governmental agencies; 13% and 7% people said that they collect from the nearest market, non-government agency and from government agencies, respectively. They were also asked about the popularity of inorganic fertilizers and which type they used more; 57% people replied that they mostly use urea, 7% and 5% people said that they used potash and TSP, respectively [6]. When asked about the yield storing process, 39% responded that they depend on cold storage for food storing, another 39% people said that they follow the traditional system for storing food and the rest 22% followed both types of storing processes, "as the situation required." In addition, they were asked about the possibility of health damage by inorganic farming practices. More than 80% people believed that inorganic farming has health effects and from among them, 53% people said that they face skin and lung problems; the rest 47% people said that inorganic farming is also responsible for cancer. In one question they were asked about their satisfaction from inorganic farming system to which 59% people said that they are not at all satisfied with the inorganic farming system and 41% people said that they are only just satisfied. Correspondingly, they were asked about the environmental effects of inorganic farming practice and 86% people replied that inorganic farming practices damage the environment through air and waterways and in the same token, 14% people believed that inorganic farming does not have any

environmental effects. These results showed that the farmers and other stakeholders were highly aware of the pros and cons of both types of fertilizers and farming practices.

### Organic vs. inorganic: Poverty alleviation

More than 80% people said during the survey that inorganic farming system is more expensive than organic farming system and the cost of inorganic fertilizer is 3500 to 4000BDT/bigha (258.88-295.86 USD/ha) whereas organic fertilizer costs from 500 to 1000 BDT/bigha (39.98-73.96 USD/ha). Also, the irrigation cost of inorganic farming practice is 2000 to 2500 BDT (23.67-29.59 USD) as stated by 77% of the people and only about 500 to 1000BDT (5.92-11.83 USD) cost for lands employing organic farming system. In addition, most of the organic fertilizers (cow dung, compost, chicken witch, organic liquid pesticide) are available and can be made at home where inorganic fertilizers (urea, TSP, potash, chemical pesticide) are not found easily and are costly [7]. Additionally, 89% farmers believed that they need to take loan if they follow the inorganic agricultural system and 97% farmers said that if they will follow the organic farming system they will not need to take loan.

Table 2 is a compilation from primary data collected and a secondary source to evaluate whether truly the cost of production is lower for organic farming than inorganic farming or not. The total yield per unit area was also found, per unit area. The two crops used to compare were tomato and corn. In inorganic farming practices chemical fertilizers such as sulfur, synthetic fertilizer, pre-plant fertilizer and zinc foliar were used, while organic farming needed compost, manure, blood meal fertilizers, organic liquid pesticide and bone meal fertilizers. Input costs were taken to be the costs of fertilizer, pest control, technology, labor and irrigation. For the production of inorganic tomato and corn, 9,600 BDT/bigha (710.06 USD/ha) and 10,100 BDT/bigha (747.04 USD/ha), respectively, whereas their organic counterparts' input costs were 5,980 BDT/bigha (442.31 USD/ha) and 5,900 BDT/bigha (436.39 BDT/ha), respectively: This is almost half the price. However, the comparative data for inorganic vs. organic shows that organic farming practice leads to lesser net production (0.25 vs. 0.12 for tomatoes (50% lesser) and 0.30 vs. 0.20 for corns (33% lesser)) in tons/bigha. Resultantly, the total output cost of inorganic tomatoes are higher than organic ones 1,200 BDT/bigha higher (88.76 USD/ha); same is the result for corns 1,500 BDT/bigha higher (110.95 USD/ha). However, if we look at the bigger picture of which practice produces more benefit in total terms, the prize goes to organic farming, as organic tomatoes and corn produce a 7,820 BDT/bigha (578.40 USD/ha) and 9,600 BDT/bigha (710.06 USD/ha), respectively, while their inorganic counterparts produce the lesser total benefits of 5,400 BDT/bigha (399.41 USD/ha) and 6,900 BDT/bigha (510.36 USD/ha), respectively.

If we assume that the scenario seen for the vegetables, tomato and corn, is universal within the farming sector, then poverty alleviation can be brought about by organic farming, not only as well as but better than inorganic farming, especially if we are looking at the long-run. However, it is important to note here that the organic products do not look as appealing as inorganic

products, according to the managers of stores and shoppers interviewed, and hence, many consumers avoid them as they have the misconception that the healthier the food appears, the healthier it is in terms of consumption; in reality, though, black and brown spots and less shine are an indicator of freshness and higher nutrient levels. Additionally, even though the cost of production is lower for organic farming, their market prices seems to be higher in the supermarkets that stock both inorganic and organic food in the elite areas visited by the authors; many of the key informants believed that this can be a result of the absence of economies of scale which raises the per unit cost of transporting and stocking organic food or the intervening parties between the farmers and the stockers who spike up the prices: It could also be due to the farmers charging higher prices, because they only see their short-term efforts,

which is higher than that needed for inorganic farming (which uses chemicals and technology, making the production process easier). The inorganic food's prices are, as a result, lower as the external costs of health, environment and society are not included. Also, the higher price premium and lack of awareness about the benefits of organic food discourages consumers from buying them and even if they do, the profits do not reach the producers themselves, but gets lost in the market supply chain [8]. To summarize, although, the comparative analysis shows more pros on the side of organic farming/food hypothetically, in reality, we do not see the application. This raises several implications and resultant recommendations.

**Table 2:** Organic vs. inorganic farming practice: Cost-benefit analysis.

Farming/Types of materials and cost	Inorganic farming		Organic farming	
	Tomato	Corn	Tomato	Corn
Fertilizers	Sulfur, synthetic fertilizer, pre-plant fertilizer and zinc foliar		Compost, manure, bloodmeal fertilizers, organic liquid pesticide and bonemeal fertilizers	
Fertilizer cost (BDT/Bigha)	4000 (47.34 USD)	4000 (47.34 USD)	1000 (11.83 USD)	1200 (14.20 USD)
Pest control cost (BDT/Bigha)	1500 (17.75 USD)	1500 (17.75 USD)	1400 (16.57 USD)	1000 (11.83 USD)
Technology cost (BDT/Bigha)	2500 (29.59 USD)	2500 (29.59 USD)	1600 (18.93 USD)	1500 (17.75 USD)
Labor cost (BDT/Bigha)	500 (5.92 USD)	600 (7.10 USD)	880 (10.41 USD)	1000 (11.83 USD)
Irrigation cost (BDT/Bigha)	1100 (13.02 USD)	1500 (17.75 USD)	1100 (13.02 USD)	1200 (14.20 USD)
Total Input Cost (BDT/Bigha) (TIC)	9600 (113.61 USD)	10100 (119.53 USD)	5980 (70.77 USD)	5900 (69.82 USD)
Net Production (Ton/Bigha) (NP)	0.25 (1.56ton/ha)	0.30 (1.88ton/ha)	0.12 (0.75ton/ha)	0.20 (1.25ton/ha)
Total Output Cost (BDT/Bigha) (TOC)	15000 (1109.47 USD/ha)	17000 (1257.40 USD/ha)	13800 (1020.71 USD/ha)	15500 (1146.45 USD/ha)
Total Benefit (BDT/Bigha) (TB)	5400 (399.41 USD/ha)	6900 (510.36 USD/ha)	7820 (578.40 USD/ha)	9600 (710.10 USD/ha)

Suppose,

Price per kilogram of inorganic product  $\rightarrow Y$

And,  $Y < X$

For organic product,

$TBOP \rightarrow (TOC - TIC) \times NP \times X$

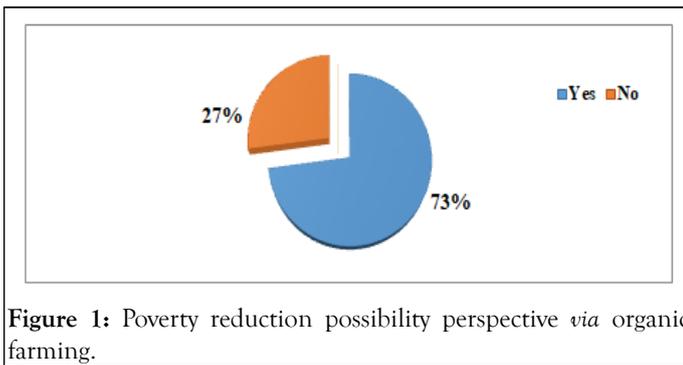
For inorganic product

$TBIP \rightarrow (TOC - TIC) \times NP \times Y$

And the result shown above the table is,  $TBOP > TB$

### Changes in perspective about organic food

It was found that farmers are more aware than before. Most of the farmers (52%) who were involved in the survey, knew about the national and international market demand for organic food. Many of the farmers (73%) believed that organic farming practices can be a way to alleviate poverty, as shown in Figure 1.



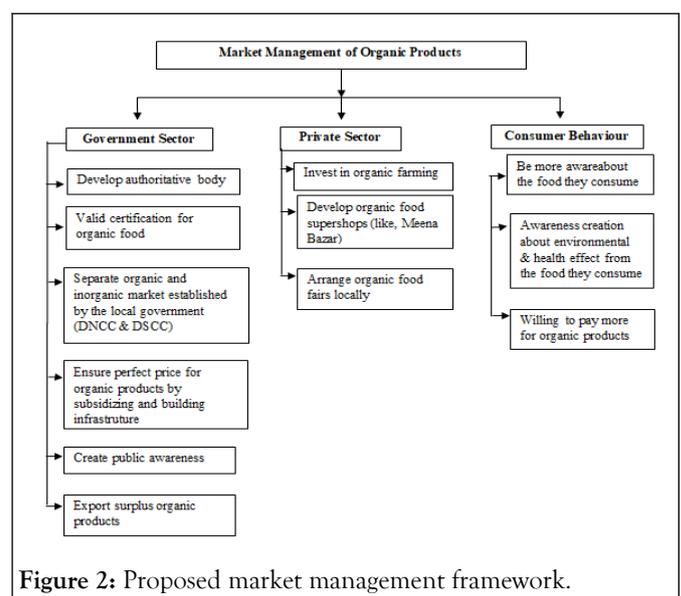
The authors not only focused on the farmers' perspectives, but also the consumers' perspectives. Many of the consumers (39%) are likely to buy organic food if it is available and out of this 39%, most of the consumers (78%) would like to buy organic vegetables because these are healthy, 16% would like to buy them because they do not have any side effects on health and 6% consumers think they are more natural and fresh.

To summarize, it was found from the analysis and collected data and comparison with literature review that in contrast to the popular belief that inorganic farming produces more profit organic farming practices are rather better for the alleviation of poverty [9]. The evidence of this was found by analyzing the cost of production, loan scenario, environmental issues and health costs associated with both types of framings. Unfortunately, most people surveyed were unaware of the increasing benefits from organic farming and increasing cost of inorganic farming in the long run and they still believe that just because the present yield for the latter is higher, that is why it is better for both short term and long run poverty alleviation. Additionally, consumer awareness of the benefit and cost of organic food and inorganic food, respectfully were low which points towards the need for enhancing market management.

From the cost-benefit analysis, it was found:

- The total input cost of organic farming is lower (around 50%) lower than inorganic farming for tomatoes and corns.
- However, organic farming produces lower yield (33%-50%) in per unit area terms than inorganic farming for tomatoes and corns.
- Also, the total output cost of organic farming is lower than inorganic farming for tomatoes and corns.
- Hence, the net benefit/profit from organic farming is higher (around 30%) than inorganic farming per unit area for tomatoes and corns; this should ensure organic farmers poverty alleviation.
- The external costs of organic farming practices is almost negligible, whereas for inorganic farming it is high due to the use and production of toxic substances, health and environmental issues and degradation of soil quality; this should make the prices of inorganic food higher in the market if the market was not flawed.
- However, those supermarkets stocking both organic and inorganic food, charge higher price for the former, which implies a market flaw
- The higher price and less-than-glossy appearance of the organic food discourage consumers from buying it, coupled with their lack of awareness.

- Inorganic farmers also were found to have higher loans than their organic counterparts as the investment cost is higher; this makes them less self-sustained and lower poverty alleviation occurs.
- Hence, the above analysis entails that a new market management framework to supplement the existent one be created, to encourage the production [10-12]. Supply and consumption of organic farming/food and discourage the inorganic farming practices as demonstrated in Figure 2.
- The initiatives must come from three sectors-the government, the private producers and distributors and the consumers.
- The government must develop authoritative bodies to encourage and monitor organic farming and selling/buying of organic food, initiate valid certification for organic food items, create separate markets for organic and inorganic food, subsidize organic food to encourage its sell and bring down the price premium, create public awareness about the benefits of organic farming and food (both in the producer and consumer sectors) and use their links to export any surplus organic food so that it does not go to waste and harm the 'organic farmers [13-15].
- Next, the private sector can contribute by investing in organic farming (with support from the government), develop organic food shops and better infrastructure in partnership with the government and hold occasional food fairs to spread awareness about organic items. Lastly, the consumers could make themselves more aware about the benefits of organic food and the costs of inorganic food to their health and the environment and be more willing to pay a little extra, especially the higher-income families, to buy the organic alternatives.



## CONCLUSION

To summarize, it was found from the analysis and collected data and by comparison with literature review that in contrast to the popular believe that inorganic farming produces more profit, organic farming practices are rather better for the alleviation of

poverty. Unfortunately, most people surveyed were unaware of the increasing benefits from organic farming and increasing cost of inorganic farming in the long run and still believe that just because the present yield for the latter is higher, that is why it is better for both short term and long run poverty alleviation. Also, according to literature review, inorganic farming system have several environmental and health effects. Unfortunately, it was evaluated that even though only 32% people are unaware about environmental and health effects of inorganic farming, they still prefer it for the money. So, most of the farmers in Bangladesh seem to be interested in inorganic farming primarily, because they believe it produces higher profits and because of the popularity from the consumers' side too. Hence, the authors also tried to prove that organic farming can be at least as profitable as inorganic farming to help in poverty alleviation. Now, Bangladesh has become a middle-income country and additionally, it does not have any problem with food security. So, the nation should think about food quality, not quantity anymore and go towards organic farming. Also, if certification system is authorized as a part of market management for organic food, along with public awareness, correction of organic food prices, infrastructure building and investment in the organic farming sector, it will be possible to ensure a price premium for organic products which in turn will favor those farmers who perform organic farming. Hence, going towards organic food is both economically and environmentally a good decision, but is only possible through the enhancement of market management by the authorities, producers and consumers alike; the process must be gradual, but is essential to sustain profits and keep on improving the country's farmers' economic status.

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## REFERENCES

1. Faroque MA, Kashem MA, Bilkis SE. Sustainable agriculture: A challenge in Bangladesh. *Int J Agric Res Innov Tech (IJARIT)*. 2011;1(2355-2020-1483):1-8.
2. Faruk MA, Alam MJ, Sarker MM, Kabir MB. Status of fish disease and health management practices in rural freshwater aquaculture of Bangladesh. *Pak J Biol Sci*. 2004;7(12):2092-2098.
3. Klonsky K. Comparison of production costs and resource use for organic and conventional production systems. *Am J Agric Econ*. 2012;94(2):314-321.
4. Niggli U. Sustainability of organic food production: Challenges and innovations. *Proc Nutr Soc*. 2015;74(1):83-88. [Crossref] [Google Scholar] [PubMed]
5. Rasul G, Thapa GB. Sustainability analysis of ecological and conventional agricultural systems in Bangladesh. *World Dev*. 2003;31(10):1721-1741.
6. Reganold JP, Wachter JM. Organic agriculture in the twenty-first century. *Nat Plants*. 2016;2(2):1-8.
7. Meemken EM, Qaim M. Organic agriculture, food security, and the environment. *Annu Rev Resour Econ*. 2018;10:39-63.
8. Silverstone R. Organic farming: Food for the future? *Nutr Food Sci*. 1993;93(5):10-14.
9. Seufert V, Ramankutty N, Mayerhofer T. What is this thing called organic? How organic farming is codified in regulations. *Food Policy*. 2017;68:10-20.
10. Kilcher L. The Contribution of Organic Farming to Sustainable Development. *World Organ Agric*. 2006:91.
11. Doring TF. How Scientific Is Organic Farming Research? *Org Farm*. 2017;3(1):1-2.
12. Crowder DW, Reganold JP. Financial competitiveness of organic agriculture on a global scale. *Proc Natl Acad Sci*. 2015;112(24):7611-7616.
13. Jouzi Z, Azadi H, Taheri F, Zarafshani K, Gebrehiwot K, Van Passel S, et al. Organic farming and small-scale farmers: Main opportunities and challenges. *Ecol Econ*. 2017;132:144-154.
14. Kirchmann H, Bergstrom L, Katterer T, Andren O, Andersson R. Can organic crop production feed the world? Organic crop production-Ambitions and limitations. 2008:39-72.
15. Seufert V. Organic agriculture as an opportunity for sustainable agricultural development. *Research to Practice Policy Briefs, Policy Brief*. 2012;13.