

ACHIEVING SUSTAINABLE DEVELOPMENT GOALS THROUGH ORGANIC AGRICULTURE: EMPOWERING POOR WOMEN TO BUILD THE FUTURE

Sununtar Setboonsarng and Elsbeth E. Gregorio

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Achieving Sustainable Development Goals through Organic Agriculture: Empowering Poor Women to Build the Future

Sununtar Setboonsarng and Elsbeth E. Gregorio

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ABSTRACT

The paper outlines the positive contributions of organic agriculture in achieving the Sustainable Development Goals (SDGs). It draws upon empirical evidence from a series of studies financed by the Asian Development Bank Institute in 2005–2006 showing the benefits of organic agricultural practices and contract farming of organic agriculture products in selected Asian countries. The case studies showed that organic agriculture helped lead these countries toward the path of achieving their respective development goals, particularly the Millennium Development Goals, by 2015.

The positive impacts of organic agriculture on health, incomes, and the environment are facilitated by its own well defined standards and market-based certification systems which ensure premium prices for organic producers. This has helped achieve high consumer awareness of its benefits and increased consumer demand both in developed and developing countries. Most importantly, organic agriculture fosters gender equality as it creates meaningful work (diverse tasks). It offers economic opportunities (low costs); promotes health (no synthetic chemicals); encourages biodiversity and traditional knowledge (retention of traditional seeds and farming practices); and ensures equitable work standards (equal wages and opportunities). This is particularly true for farmers, especially women, in small farming communities.

Beyond 2015, the commitment of governments to fight for a sustainable and poverty-free world continues in the SDGs. This makes organic agriculture a crucial development strategy in the SDGs era.

ABBREVIATIONS

ADB	-	Asian Development Bank Institute
CSA	-	community-supported agriculture
FAO	-	Food and Agriculture Organization of the United Nations
GHG	-	greenhouse gas
IFAD	-	International Fund for Agricultural Development
IFOAM	-	International Federation of Organic Agriculture Movements
MDG	-	Millennium Development Goals
SDG	-	Sustainable Development Goals

I. INTRODUCTION

1. The adoption of the 2030 Agenda for Sustainable Development in September 2015 at the United Nations General Assembly in New York by 193 countries marked a new era of global commitment to poverty eradication and sustainable economic transformation. The Sustainable Development Goals (SDGs) has 17 goals built on the Millennium Development Goals (MDGs). The adoption of the MDGs by world leaders in September 2000 was then a historical event when, for the first time, all nations agreed on a set of eight time-bound antipoverty goals adopted as milestones in international and national development. The clear targets, indicators, and monitoring systems of the MDGs gave development efforts urgency and focus to achieve the goals by 2015.

2. The MDGs have helped alleviate the lives of over a billion people out of extreme poverty, reduced hunger, enabled more girls to attend school, and helped protect the planet. They have accomplished much but so much more remains to be done. Fifteen years from the adoption of the MDGs, nations again gathered and adopted the 17 SDGs as new goal posts in development (United Nations 2015a).

3. The SDGs, or the Global Goals, include a total of 169 targets that are integrated and indivisible, balancing the three dimensions of sustainable development: economic, social, and environmental. The SDGs build on the momentum and success of the MDGs to continue the path that would end the indignity of poverty, inequality, and injustice, and tackle climate change by 2030. Furthering the fight against extreme poverty of the MDGs, Goal 1 is poverty eradication; followed by Goal 2: end hunger, achieve food security and improve nutrition, and promote sustainable agriculture. Both goals highlight the basic need of feeding the world's population, which is expected to grow to 9.6 billion by 2050 (United Nations 2013). Achieving Goal 1 will facilitate the realization of other goals particularly for the poorest of the poor who mainly rely on natural resources for survival. Poverty eradication in Goal 1 will amply decrease the stress on the environment by poor households (Ford 2015).

4. Majority of the poor are subsistence farmers in the rural areas where roughly 70% of the developing world's 1.4 billion extremely poor people live. Increasingly, rural farmers are women taking on farming responsibilities left by men as they migrate to urban areas for jobs. This and the rise of commercial agriculture have continued the feminization of agriculture across regions, especially pronounced in Africa (World Bank 2016).

5. Commercial agriculture generally uses the conventional practice which is input-intensive. This often requires cash outflows for synthetic chemical inputs such as fertilizers, herbicides, and pesticides; irrigation; and monoculture of high-yielding varieties. It is widely recognized that these practices (i) pollute soil, water, and air that harm the health of humans and ecosystems; (ii) disturb the soil, which leads to soil erosion and degradation of farmlands and aquatic ecosystems; (iii) negatively affect biodiversity; (iv) use fossil fuel that contribute to climate change; and (v) negatively impact rural communities from large-scale commercialization (Ching 2017). Moreover, massive crop failures are more likely with climate change (University of Leeds 2010), preventing farmers from recouping cash inputs, which can lead to debt and poverty spiral. For the 500 million smallholder farmers in the world, farming practices that require low cash cost and external inputs while improving crop yields, health, incomes, and the environment, is a key development strategy.

6. Given the increased awareness of the negative externalities associated with conventional agriculture, consumers are calling for safe, sustainable, and climate-friendly agricultural products. However, not all consumers can tell which products are produced without the use of toxic substances

and are climate-friendly. The market mechanism to support sustainable and climate-friendly practice is still lacking. Among various climate-friendly agriculture practices that mitigate greenhouse gasses (GHG), sequester atmospheric carbon in the soil, and improve resilience of farming system to climate change, organic agriculture has stood out as one sector whose associated market institution is relatively well developed. Central to this identity of organic agriculture is the fact that it is well defined with its own standards and market-based certification systems. Most importantly, consumer awareness of its benefits and consumer demand are high and well in place, both in developed and developing countries.

7. Indeed, demand for organic food and products has steadily risen as environmental and health safety concerns increasingly influence consumer purchases. In the United States alone, sales of organic food and nonfood products rose by 240% between 2002 to 2011. In 2016, the size of the market rose to \$47 billion, giving organic sales 5.3% of the total food market in the country (United States Organic Industry Survey 2017). Demand for organic food around the world has also increased. In developing countries such as India, the organic food market was growing at 25%–30% in 2015. Global organic food market value is estimated to have reached \$104.5 billion in 2015, nearly double the value in 2012 of \$64 billion (Markets and Markets 2015).

8. Organic agriculture is also known to build upon the comparative advantage of the disadvantaged poor farmers and smallholders. Marginal farmers who practice low-input traditional agriculture are mostly located in remote areas that are relatively pristine with minimal or no chemical inputs, making them suitable for quality organic production specifically demanded in lucrative urban markets and markets of developed countries. More importantly, organic agriculture creates opportunities for women. According to the International Federation of Organic Agriculture Movements (IFOAM 2008, organic agriculture fosters gender equality as it creates meaningful work (diverse tasks). In addition, it offers economic opportunities (low costs); promotes health (no synthetic chemicals); encourages biodiversity and traditional knowledge (keep traditional seeds and farming practices); and ensures equitable work standards (certification requirements help ensure equal wages and opportunities). Moreover, organic production of local or indigenous varieties is harmonious with traditional farming practices, and more resilient to pests, diseases, and to climate extreme; hence, organic agriculture is an effective climate change adaptation strategy without requiring extensive public support.

9. This paper draws upon empirical evidence from a series of studies (Table 1) financed by the Asian Development Bank Institute (ADBI) in 2005–2006 that provide empirical evidence of the benefits of organic agricultural practices and contract farming of organic agriculture products in selected Asian countries (Setboonsarng and Markandya 2015; Setboonsarng and Leung 2014).¹ The case studies showed that organic agriculture helped lead these countries toward the path of achieving their respective development goals, particularly the MDGs, by 2015. Beyond 2015, the commitment of governments to fight for a sustainable and poverty-free world continues in the SDGs. This makes organic agriculture a crucial development strategy in the SDGs era, as its benefits are not only sustainable, but most importantly, enhance the well-being of humanity and that of the planet. It is in this vein that this paper outlines the positive contributions of organic agriculture in achieving the SDGs and its impact on women in agriculture.

¹ Results of the ADBI case studies are found in these books.

II. ORGANIC AGRICULTURE AND ACHIEVING THE SUSTAINABLE DEVELOPMENT GOALS

10. “Ecological” and “regenerative” define the very nature of organic agriculture. Organic agriculture is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity, and cycles adapted to local conditions, rather than on the use of synthetic chemical inputs with adverse effects. Organic agriculture combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved (IFOAM 2008). This means organic agriculture does not use synthetic chemical inputs that can harm human health and the environment, but rather relies on ecosystem management to enhance its productive and functional capacities (Setboonsarng and Markandya 2015).

11. In view of the 17 SDGs and its 169 targets (United Nations 2015b), this paper discusses how organic agriculture can be a key strategy to achieve the SDGs by drawing evidence from smallholder organic farmers and crops cultivated in marginal areas in six countries, and from studies in other regions of the world. The ADBI study included evidence from north and northeast regions of Thailand (rice), Wuyuan and Wanzai counties of Jiangxi Province in the People’s Republic of China (PRC) (tea), Kandy area in Sri Lanka (tea), Cambodia (Nieng Mali rice), Vientiane Province of the Lao People’s Democratic Republic (Lao PDR) (Japanese rice), and eastern Bhutan (lemongrass), point to organic agriculture as a key strategy to achieve the SDGs. The potential contributions of organic agriculture cut across various goals as antipoverty strategies positively affect not only the economic dimensions, but also the social, health, and environmental aspects. Details on impacts of organic agriculture are discussed when gender segregated data are present. Survey data have Table 1 provides the profiles of survey data. Details of survey methods and profile of respondents were reported in the two books as earlier mentioned.²

Table 1: Survey Data Profile

Country	Areas	Crops Covered	Survey Respondents and Year Conducted
Bhutan	Drametse in eastern region	Lemongrass	2006: 96 respondents, including owners of distillation units, employed operators of distillation units, and grass and firewood collectors from organic and conventional management groups
Cambodia	Provinces of Kampong Speu, Kandal, Takeo, and Kampot	Neang Malis rice	2005: 615 farmers
China, People’s Republic of	Wuyuan and Wanzai Counties of Jiangxi Province	Tea Horticulture crops (ginger, soybean, strawberry)	2006: 240 farmers in Wuyuan 2006: 220 farmers in Wanzai
Lao People’s Democratic Republic	Vientiane Province	Japanese rice	2004: 585 farmers
Sri Lanka	Kandy (in the administrative district in the central highlands)	Tea	2006: 200 farmers

continued on next page

² Follow-up surveys in the same study areas in Bhutan, Cambodia, and Thailand were believed to have been carried out by the governments. However, the data and results of the analysis are not made available to the public.

Table 1 continued

Country	Areas	Crops Covered	Survey Respondents and Year Conducted
Thailand	North and northeast regions	Rice (three-year data)	2003: 445 farms 2005: 243 farms 2006: 626 farms
	Nakorn Prathom Province (periurban area about 2 hours from Bangkok)	Asparagus	2004: 148 households
	Petchburi Province	Banana	2005: 110 farmers
		Under low external inputs integrated agriculture/aquaculture	2003, 2005, 2006: 2,747 total farms

Source: Asian Development Bank Institute Survey Data (2005-2006).

A. SDG 1: End poverty in all its forms everywhere

12. Organic agriculture is a key antipoverty strategy particularly in rural areas, providing rural employment, lowering input costs for small farmers, and raising incomes by offering premium prices for produce. Organic farming practices also enhance farm biodiversity and resiliency in light of weather patterns, which have become increasingly extreme and erratic. In addition to the income and health benefits, under organic contract farming, contracting agribusiness firms offer contracted farmers access to assured markets and credits, reduced risks of price fluctuations and production, and extension services to help farmers transform their production from subsistence farming to more profitable commercial agribusinesses.

1. Higher Incomes from Premiums

13. The fight to end extreme poverty in rural areas through organic agriculture is brought by the ADBI study, which showed that organic agriculture provides more benefits than conventional agriculture to the smallest landholders. Given the same farm size, organic farmers have higher incomes than conventional farmers owing to price premiums for organic produce, which range from 10% (Thai rice in 2006) to 75% (organic tea in Sri Lanka), giving organic farmers higher levels of profitability, particularly when yields stabilized 3 years after transition. This result is also echoed by a study conducted by the International Fund for Agricultural Development (IFAD) in Latin America and the Caribbean in 2003, which found organic agriculture to be prosmall farmers. The most recent study by Nemes (2013) from the Food and Agriculture Organization of the United Nations (FAO) analyzing over 50 economic studies revealed that in the majority of cases, organic systems are more profitable than nonorganic systems. Higher market prices and premiums, or lower production costs, or a combination of the two, generally result in higher relative profits from organic agriculture in developed countries. This is also true in developing countries, where relatively greater profitability is due to higher yields combined with high premiums. This is supported by the report of Hine, Pretty, and Twarog (2008), which revealed that organic production gave farmers access to premium value markets, giving them additional income to pay for education, health care, and adequate housing, and achieve relative prosperity.

2. Low Cash Cost of Inputs

14. While conventional agriculture promotes high external inputs, organic agriculture builds on the recycling of farm resources, which are less costly and affordable to poor farmers. The case studies show strong and direct contribution to improving household incomes through higher yields and lower cash

costs in production than conventional agriculture. For instance, in the organic tea farming case in Sri Lanka, the lower variable costs add to incomes as farmers spend less on inputs, such as labor wages, seeds, fertilizer, pesticides, machinery and equipment, energy, irrigation, and other expandable items such as buckets. Total production costs of organic agriculture remained lower in the Sri Lankan case despite the government subsidy for chemical inputs received by conventional farmers. As organic agriculture is also common for small plots, cash cost for labor is reduced by contribution of family labor. A significant number of cases in the survey have lower total production cost³ than conventional agriculture, particularly after farm ecosystem is restored, except in a few organic farms that purchased bio-pesticides, which are safer but costlier. With less cash inputs, farmers need not borrow money to finance production. By contrast, conventional farms run the risks of a downward poverty–debt spiral in case of crop failures and low price of products. Moreover, chemical inputs not only increase cash spending of conventional agriculture, but also expose workers to harmful chemicals that are health hazards.

3. Employment Generation

15. Providing incomes through employment is a key antipoverty strategy. The ADBI studies show a tendency for organic agriculture to generate higher employment than conventional agriculture in cultivating the same crops. In the case of organic tea farming in the PRC, 80 more labor days per hectare are used, which could employ surplus labor, particularly landless laborers. Moreover, absorbing unskilled labor into organic agriculture is less challenging than nonfarm sectors given the traditional farming knowledge of farmers in a marginal ecosystem, making them easily trainable for commercial organic farming. In terms of tasks, some organic agriculture practices require more labor than conventional agriculture. Generally, these tasks are involved with land preparation, fertilizer production and application, and weeding in particular, which requires more hired labor. Manual tasks in organic practices include mulching, terracing, traps, and manure or composting. The fact that organic agriculture is generally more labor-intensive than conventional agriculture can make it an effective employment generation strategy in rural areas.

B. SDG 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture

1. Food Security and Nutrition

16. As organic agriculture system is generally more diversified, this implies that farmers have more homegrown food for consumption, as supported by the data on lesser food spending of organic households. With more diversified cropping systems, the risk of income losses associated with seasonal variations and crop failures are reduced (FAO 2002), which improves food security. This diversity also allows farmers to derive extra income from the sale of additional produce and nontimber forest products. Moreover, Worthington (2001) reports that organic crops are better at improving dietary quality, as they have a higher nutrient value than nonorganic food, hence improving the health of organic farming households with the same food intake. Baranski et al. (2014), in their review of 343 studies, found higher nutritional value in organic crops that have been previously linked to a reduced risk of chronic and neurodegenerative diseases and certain cancers. Their review also reveals that organic produce contain higher concentrations of antioxidants, lower concentrations of a toxic metal called cadmium, and a lower incidence of pesticide residues than the nonorganic crops across regions and production seasons.

³ Production cost in this study refers to cash costs plus noncash costs.

2. Improved Agricultural Productivity and Resilient Productive Systems

17. The misperception or myth that organic production is of low yield is steadily disappearing. Yields of organic agriculture are comparable or even higher than conventional practice, particularly in marginal and rainfed areas where the poor usually reside. Given similar farm size, organic farmers enjoy higher incomes as shown in the case of Thailand. The difference is especially large for the smallest landholders. As input costs are low and productive bases are enhanced with organic agriculture practices, productivity of organic farmers is high. This is supported by a study of Hine, Pretty, and Twarog (2008), which revealed the increased amount of food production of organic farming in their review of 114 projects in Africa covering 2 million hectares and 1.9 million farmers. They found that organic agriculture increased yields. The average crop yield was an increase of 116% for all African projects and 128% increase for the projects in East Africa. In cases such as in Ethiopia where composted residues coming from biogas digesters are applied to crop fields, yields increased by over 100% and water use efficiency also improved (Edwards, Egziabher, and Araya 2011).

18. By contrast, the high yields of conventional agriculture are unsustainable without steady water supply and higher inputs of fertilizer in succeeding planting seasons, as documented in some Asian countries, particularly in rice production. For example, as early as the 1980s, a mere 6.5% improvement in yield entailed quadrupling the amount of fertilizer and increasing pesticides by a factor of nine. Since 2000, yields have further declined to such an extent that grain production has actually fallen (Ho et al. 2008).

19. As conventional agriculture cannot be effectively applied in marginal areas with no irrigation and access to external inputs, organic agriculture poses as a key solution to improving yields in a sustainable way in marginal areas. Marginal lands are often ill-suited for conventional agricultural practices but respond well to low-input farming techniques that capitalize on biodiversity (Sharma 1998). Moreover, the inexpensive chemical-free systems improve incomes and health of small farmers, and the state of the environment. In drylands, the addition of organic matter through organic practices can improve soil quality allowing the soil to supply plants with balanced nutrients (Sharma 2005). While yields initially decline in the first year after transition from conventional to organic agriculture, yields are generally stabilized by the third year. Sophisticated organic farmers may even surpass previous yields using intensive farming techniques (IFAD 2005).

3. Protection of Genetic Resources

20. Genetic resources are rapidly declining worldwide due to changes in land use, climate change, and monocropping practice in conventional agriculture. Preservation of genetic resources by public sector in the form of ecological reserve or gene bank is costly and not effective (Mondiel and Setboonsarng 2015). At the same time, the majority of remaining diversified plant genetic resources resides in remote farms of poor farmers in developing countries who cultivate a wide array of traditional varieties of crops and livestock using organic methods. Most farmers in the ADBI study grow small plots of traditional varieties of rice and vegetables for their own consumption due to preference to taste and resiliency. These farmers are in fact providing invaluable services to humanity by operating a living gene bank that not only conserves genetic resources but also allow these genes to evolve with the changing climate. When provided with market access, these farmers could sell their traditional varieties as healthy organic products at premium prices, which can sustainably serve as a payment for their environmental services.

C. SDG 3: Ensure healthy lives and promote wellbeing for all at all ages

1. Improved Health

21. The inappropriate use of agrochemicals, including pesticides, herbicides, antibiotics, growth hormones, etc. and their residues in food stuffs are known sources of modern illnesses. Thus, the chemical-free farming practices of organic agriculture can improve the well-being of farmers and consumers. The ADBI study reflected this point in lesser out-of-pocket medical spending than conventional farmers. Case studies in north and northeast Thailand revealed that over 90% of respondents noticed improvement in the overall state of health after conversion to organic agriculture, and none felt worse off. The study revealed that organic farmers continue with organic practice despite erosion of price premium over time as more organic farmers enter the market, owing to nonincome benefits, especially on health.

22. In terms of catastrophic health expenditure, in the same medical expenditure category as a proportion of total household spending, organic farmers spend significantly less than conventional farmers at all expenditure levels. This indicates that organic farmers are less likely to incur medical spending beyond their income levels. This may imply better health conditions of organic farming households and better welfare as they have more to spend on other household necessities owing to lower health-related expenditures. Moreover, organic farmers tend to adopt a healthier lifestyle, e.g., quit smoking. Organic farming households spend less on tobacco than conventional farming households, highly significant at 1% in 2006 for Thai rice sample and significant at 10% in the PRC horticulture case. Health-conscious farmers may be self-selecting themselves into organic agriculture, but the fact remains that organic farmers lead healthier lives.

23. According to the World Health Organization (2011) conventional agriculture using chemical fertilizer, animal waste disposal, and land use changes have increased nitrate levels in surface and ground water. As such, organic agriculture which does not use chemical fertilizer can reduce the risks of increasing nitrates in drinking water that can lead to gastric, bladder, and esophageal cancers in adults and blue-baby syndrome in infants, particularly when nitrate levels are above 10 parts per million. It is acknowledged that conventional farming exposes vulnerable workers to harmful chemicals as landless laborers are often hired to perform health-hazardous tasks, such as pesticide spraying, which worsens the conditions of the poorest in rural areas. As the poor, including migrant workers, usually do not possess sufficient knowledge on the proper use of pesticides and herbicides, they often harm themselves through improper handling of chemical inputs. Hence, the practice of organic agriculture provides a safer alternative to avoid the health complications arising from exposure to agrochemicals.

D. SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

1. Promotes Education of Children

24. The need for higher functional skills such as record keeping of inputs for certification and managerial and marketing skills, as well as the knowledge-intensive nature of modern organic agriculture, often influence families to keep their children in schools. In the case of rice-growing households in the PRC and Thailand, improved incomes in organic agriculture led these families to spend more on their children's education. In Thailand's case, education expenditures by organic farming households are roughly an eighth higher than those of conventional farming households; while in rice and tea farming households in the PRC, education spending is nearly double that of conventional households.

E. SDG 5: Achieve gender equality and empower all women and girls

1. More Women Participation

25. As knowledge on traditional practices, which are largely organic, often remains among elderly women in rural communities, conversion to organic agriculture requires tapping on their knowledge and wisdom and allow them a prominent role in training new generation of organic farmer, particularly young women. In organic tea agriculture in Sri Lanka, the study results show improvements in gender equity and women empowerment. Comparing conventional and organic households, the study revealed fewer women are working outside their village through involvement in organic cultivation; more males are found to be sharing domestic activities; and more women are involved in household decision making, which may be due to more women from organic households than conventional households participating in various trainings activities.

2. More Employment Opportunities

26. Women are often disadvantaged when it comes to employment opportunities. Examining rural employment generated by organic agriculture in terms of gender-specific opportunities, organic agricultural often increases women-friendly tasks such as weeding, as opposed to men spraying herbicides. The focus group discussions revealed that farmers perceive organic agriculture to provide safe employment opportunities for women, e.g., no exposure to pesticides enables women to work within the village rather than commute to other towns. Nongovernment organizations that promote organic agriculture, as in Sri Lanka and Thailand, engage women in new organic agricultural activities, such as training women as inspectors for certification of organic produce. In a focus group discussion in Sri Lanka, a women happily mentioned that in working in organic agriculture, when she return home she can touch her children without having to take a shower to get rid of toxic agrochemicals from her body.

27. In general, the modernization of organic agriculture will likely increase the demand for managerial, administrative, and technical skills, which will give more chances for women to be employed. Paid employment in organic agriculture can empower women and has positive spillovers on the well-being of their families and communities as a whole. Revenga and Shetty (2012) argue that gender equality enhances economic efficiency and improves other development outcomes through the following:

- (i) **Improved overall productivity.** The FAO (2011) estimates that if women farmers have the same access as men to productive resources such as land and fertilizers, agricultural output in developing countries could increase by as much as 2.5%–4%.
- (ii) **Improved family's well-being.** Greater control over household incomes by women increases welfare as more resources are spent on food and education of children. This can enhance countries' growth prospects as revealed in Brazil, the PRC, India, South Africa, and the United Kingdom (World Bank 2011).
- (iii) **Delivered basic public goods.** Empowered women would advocate policy choices that provide for basic public goods at the local level, as was the case in India, which led to greater provision of water and sanitation, a necessity that mattered more to women (Beaman et al. 2011, Revenga and Shetty 2012).

F. SDG 6: Ensure availability and sustainable management of water and sanitation for all**1. Reduced Water Pollution**

28. The practice of chemical-free farming of organic agriculture improves not only the health of humans but also that of the environment. With reduced chemical fertilizer application and proper soil management, runoff is minimized, as applied fertilizer unrecovered by crops leads to eutrophication. Pollution of ground waters, salinization, and waterlogging are also limited (FAO 1996). Water pollution arising from herbicides and pesticides runoff that are harmful to ecosystems are also mitigated in organic agriculture.

G. SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all**1. Integrated Farms**

29. Organic agriculture can facilitate integration of its processes to reduce and/or eliminate wastes and produce its own renewable energy. This is particularly true for organic operations that include animals, whose wastes products are energy sources.

30. One example is the Tigray project in Ethiopia, managed by the Institute of Sustainable Development. The project worked with farmers to revegetate the landscape to restore the local ecology and hydrology. Revegetation of marginal areas and field borders, and sustainably harvesting the biomass, provides a steady source of nutrients on top of those that are generated through good organic practices in the fields. The biomass from this revegetation is then sustainably harvested to make compost and to feed biogas digesters. Biogas is used by farmers for cooking, which saves wood and other vegetation; and for lighting, allowing the villages some level of energy independence. Meanwhile, the residues from the biogas digesters are applied to the crop fields. This has increased yields by over 100% and improved water use efficiency (Edwards, Egziabher, and Araya 2011).

H. SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all**1. Safe Work Environment**

31. Nonexposure to harmful chemicals in organic farms has improved well-being of farm workers. As discussed, the study revealed organic farmers often continue with organic farming despite the erosion of premiums due to nonincome benefits, particularly to health. During field visits, when farmers were asked why they converted to organic farming, many replied that they were influenced by the death of neighbors at a relatively young age, which the farmers attributed to victims' frequent exposures to herbicides and pesticides.

2. Sustainable Livelihood

32. Organic agricultural practices enhance natural productive bases; hence productivity of lands can increase the longer organic practices are employed. Resilience of crops and farmlands is promoted under organic agriculture, which is a key adaptation strategy in a warming climate. Hence, farmers reduce risks of devastating crop failures and zero incomes under extreme weather conditions, which are likely to increase as global temperature increases.

I. SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation

1. Modernization of Organic Agriculture

33. The modernization of organic agriculture would involve further training as processes become automated, digitized, and standardized. Necessary infrastructure and facilities in terms of harvest and postharvest processes would need to be provided as the sector develops and expands. Large-scale farming and food processing using organic principles are expanding rapidly in both developed and developing countries as the sustainability of the production systems is assured. Growing consumer demand also led to proliferation of new innovative marketing strategies using information and communication technology to bypass traditional market chains. These innovative arrangements, such as advance payment for organic products and community support agriculture, often include risk sharing schemes between consumers and producers, leading to improved social cohesiveness and inclusive growth.

34. For organic farms that have been contracted by agribusiness firms to produce according to their specifications, knowledge and understanding of certifications and traceability systems are important. Some agribusiness contractors provide various trainings and supervision to ensure compliance with requirements; this support can help farmers improve the quality of their produce and operations, making them more profitable in the market.

J. SDG 10: Reduce inequality within and among countries

1. Integration of Small Organic Farmers into Global Markets

35. At the international level, some organic farmers have been contracted by agribusiness firms to produce crops according to their requirements. These farmers, often in remote and marginal areas, have the chance to partake of the benefits of globalization. Through the firms, small farmers are integrated into international supply chains that cater to global demands, giving them stable and higher incomes.

2. Stem Rural–Urban Migration

36. At the local level, greater employment opportunities from organic agriculture could help stem the tide of migration to urban areas and help ease overcrowding in the poor areas of cities. In a case study of integrated farmers in Thailand, in the 44.5% of households with a member who has migrated to urban areas in search for employment at the time of study, 12.4% have since returned to their villages because of organic farming

**K. SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable;
SDG 12: Ensure sustainable consumption and production patterns**

37. Organic agriculture is increasingly practiced in urban areas and promotes sustainable cities by recycling food and organic wastes through composting that can be used in urban agriculture. It also offers alternatives to consumers who support ethical food production, are concerned with food safety, and/or who want to be involved in sustainable production of their own foods.

1. Ethical Consumerism

38. The growth of ethical consumerism has increased the support of consumers for crops that are produced in environmentally and socially responsible production systems. Awareness among consumers is increasing on the fact that organic agriculture is one form of sustainable and climate-friendly production. By voting with their dollars and by choosing to consume organic products, consumers feel they are supporting sustainable production as well as consumption. In developed countries such as the United States, direct-to-consumer outlets such as farmers markets and roadside stands for organic products have grown rapidly. Sales were up from \$812 million in 2002 to \$1.3 billion in 2012. Meanwhile, the number of farms selling directly increased from 116,733 in 2002 to 144,530 in 2012.

2. Community-Supported Agriculture

39. Organic agriculture is often the motivation for supporting community-supported agriculture (CSA). CSA is a community of individuals who work on, support, and finance a farm operation wherein growers and consumers provide mutual support, and share the risks and benefits of food production. In return, members receive their share of harvests during the growing season. Most CSA groups are organic as members often choose this alternative route to ensure eco-friendly farms producing safe and healthy crops. By direct sales, farmers benefit as they receive better prices for their crops, gain some financial security, and are relieved of marketing their produce. Moreover, some CSA services offer additional farm products like honey, eggs, dairy, fruit, flowers and meat, all of which are produced responsibly and sustainably (United States Department of Agriculture 1993).

3. Reduce Waste and Recycle

40. Organic agriculture promotes the recycling of food and organic wastes through composting, such as vermicomposting (composting using worms) and composting to make natural fertilizers for urban agriculture. Composting is a key organic agriculture practice of adding organic matter to soil, which improves soil quality, hence productivity.

L. SDG 13: Take urgent action to combat climate change and its impacts

41. With climate change, agriculture is even more vulnerable to changes in environmental conditions that can have devastating effects on agricultural productivity. Higher temperatures can decrease yields and increase pest infestations and weed growth, which threaten food security (Gilbert 2012). Conventional agriculture is prone to soil erosion and degradation of the productive bases, water exhaustion, contamination in the face of deforestation and desertification, and loss of biodiversity, among others (Hill 2005). Organic agriculture can provide remedies by creating resilient productive bases while also mitigating the impacts of climate change.

1. Mitigate Climate Change

42. GHG emissions of human activities are the drivers of climate change. Agriculture, the human food producing sector, contributed about 14% of global GHG emissions in the form of carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) in 2004. N₂O and CH₄ have heat-trapping capacity that is 298 times and 24 times higher than CO₂, respectively, over a 100-year time horizon (IPCC 2007).

43. In the practice of conventional agriculture, fertilizer application to soil releases N_2O , while CH_4 is released by the enteric fermentation by ruminants, manure management, and rice cultivation (Brink et al. 2000). Two reports by the Consultative Group on International Agricultural Research (CGIAR) using estimates from 2005, 2007, and 2008 revealed that agricultural production releases 12,000 megatons (mt) of CO_2 equivalent per year—up to 86% of all food-related anthropogenic GHG emissions; followed by the manufacture of fertilizer releasing up to 575 mt. The whole food system released 9,800–16,900 mt of CO_2 equivalent into the atmosphere in 2008, including indirect emissions from deforestation and land-use changes. A more recent study by the Food and Agriculture Organization revealed that in 2014, GHG emissions from agriculture, forestry, and fisheries have almost doubled in the last 50 years and will likely increase by 30% by 2050 given the current trend.

44. Under organic agriculture, the carbon footprint of the sector is reduced owing to the following: (i) synthetic fertilizers, which are fossil-fuel based and whose production is energy-intensive, are not used; (ii) organic operations perform better on a per hectare scale than conventional agriculture, with high level of efficiency of energy use (FAO 2002); and (iii) organic practices build soil organic matter, which help sequester carbon from the atmosphere and enhance the carbon-storing capacity of soil.

M. SDG 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

1. Reduce Water Pollution

45. The conventional agriculture sector is the largest consumer of freshwater ecosystems, and the application of synthetic chemical inputs is a major cause of degradation of surface and groundwater resources through erosion and chemical runoff. As discussed above, without the use of chemical inputs in food production, organic agriculture prevents pollution of both surface water and groundwater, and eutrophication.

N. SDG 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt biodiversity loss

1. Restore Carbon in Soils and Improve Degraded Lands

46. Organic agriculture can reduce and even reverse the ill effects of conventional agriculture to the planet. Organic practices restore the life in soils, which is an important carbon sink. Carbon sequestration from the atmosphere through soil rehabilitation also positively impacts SDG 13 in mitigating climate change.

47. As revealed in a study by the Rodale Institute, organically managed soils can store more than 1,000 pounds of carbon per acre while nonorganic systems cause carbon loss. Conversion to organic fertilizers can also increase soil carbon by 15%–28% and nitrogen content of the soil by 7%–15% (Hepperly 2003, Cleary 1999).

O. SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels; SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development

1. Agribusiness Firms as Partners in Development

48. In the age of globalization, organic farmers have been contracted by agribusiness firms to produce according to their requirements. The requirements may not only include physical properties of produce but also sustainable production practices and high level of traceability. This changing structure of agricultural trade has become an integral part of effective rural development.

49. Organic contract farming has emerged as a promising rural development strategy that has gained momentum in the Asian region. Contractors, often multinational agribusiness companies, provide technical training, production inputs, and market linkages to smallholders. Contracted farmers in turn benefit from a steady supply of consistent quality produce. Farmers in this contractual arrangement, especially small-scale farmers, have assured markets for their produce, providing a steady income stream. The arrangement is also evolving to better address the needs and capacities of all parties involved. Under contract farming of organic produce, poor farmers who naturally have a comparative advantage in terms of less polluted land in developing countries are linked to consumers who want safe and healthy food produce. Not only do the parties involved benefit, but the productive resource bases are also enhanced in the process. Table 2 provides a brief overview of the potential and realized benefits of organic agriculture in achieving the 17 Sustainable Development Goals.

Table 2: Summary of Potential and Realized Benefits of Organic Agriculture in Relation to the Sustainable Development Goals

Goal	Potential Contributions
SDG 1: No poverty	<ul style="list-style-type: none"> • Provide incomes to poor and marginal farmers • Low cash costs suitable to poor and marginal farmers • Sustainable production • Higher incomes from premiums of organic produce • Labor-intensive nature can help absorb excess rural labor and can lower rates of rural–urban migration for work
SDG 2: Zero hunger	<ul style="list-style-type: none"> • Diversified cropping system mitigates risks of crop failure • More nutritious food • Improved productivity and sustainability of productive bases • Helps protect genetic resources
SDG 3: Good health and well-being	<ul style="list-style-type: none"> • Nonexposure to chemicals improves health and promotes healthy lifestyles
SDG 4: Quality education	<ul style="list-style-type: none"> • Effect of spending more for children’s education
SDG 5: Gender equality	<ul style="list-style-type: none"> • Providing more avenues for employment of women, empowering them by way of added incomes • Its labor-intensive nature provides safe local employment for women, thus avoiding migration to urban areas for work
SDG 6: Clean water and sanitation	<ul style="list-style-type: none"> • Less fertilizer leaching, which reduces pollution of water bodies • Indirect effect of improved access to safe water and sanitation
SDG 7: Affordable and clean energy	<ul style="list-style-type: none"> • A possible source of energy are the animals in integrated farms that incorporate organic principles
SDG 8: Decent work and economic growth	<ul style="list-style-type: none"> • Organic agriculture provides a safer and healthier working environment by way of nonexposure to chemical inputs
SDG 9: Industry, innovation, and infrastructure	<ul style="list-style-type: none"> • Modernization of the organic agriculture sector could provide training and facilities for farmers, particularly in the areas of certification, traceability, marketing, and harvest and postharvest technologies and knowledge
SDG 10: Reduced inequalities	<ul style="list-style-type: none"> • The steady incomes from sustainable practices can only improve over time, hence has the potential to bridge gaping inequalities
SDG 11: Sustainable cities and communities	<ul style="list-style-type: none"> • The growth of ethical consumerism has increased the support of consumers for crops produced in environmentally and socially responsible production

continued on next page

Table 2 continued

Goal	Potential Contributions
SDG 12: Responsible consumption and production	systems, such as community-supported agriculture, many of which are organic operations
SDG 13: Climate action	<ul style="list-style-type: none"> Organic farming practices mitigate climate change and help farms become resilient to extreme weather patterns and events
SDG 14: Life below water	<ul style="list-style-type: none"> As synthetic chemicals are not used in organic farms, agriculture's negative externalities in water bodies are minimized
SDG 15: Life on land	<ul style="list-style-type: none"> Organic practices promote the health of soil to produce healthy food. Healthy soils are also a major carbon sink.
SDG 16: Peace and justice, strong institutions	<ul style="list-style-type: none"> Under organic contract farming, international agribusiness firms can provide sustainable livelihoods to small farmers in developing countries, making these firms key partners in rural development and agricultural modernization
SDG 17: Partnerships for the goals	

SDG = Sustainable Development Goal.

Source: Authors' summary.

III. CONCLUSION

50. Until now, productivity gain has been the key indicator to measure agriculture growth and its contribution to overall economic growth. However, serious concerns are being raised about the need to address negative externalities on health and the environment, and the GHG emissions of agriculture systems. In addition, the potential of agriculture in reversing climate change through enhancing soil as carbon sink remains to be supported. In the context of the SDGs, this paper describes and provides evidence on the multifunctional nature of agriculture, particularly organic agriculture, which is regenerative and climate-friendly.

51. While agriculture is generally seen to be important in contributing especially to SDG 2 and SDG 1, which are to end hunger, achieve food security and improved nutrition; and to end poverty in all its forms everywhere, organic agriculture contributes to almost all aspects of the SDGs. Evidence presented in this paper shows that organic agriculture contributes significantly to many other SDGs, including SDG 3 on health, SDG 5 on gender, SDG 6 on water, SDG 11 on sustainable community, SDG 12 on responsible consumption and production, SDG 13 on climate action, SDG 14 on life below water, SDG 15 on life on land, and SDG 17 on partnership for the goals.

52. Conventional agriculture, on the other hand, while producing higher quantity of food per unit land, is associated with high levels of negative externalities including herbicide, pesticide, and antibiotic residues in food, which are harmful to health, contribute significantly to GHG, pollute soil and water, and reduce biodiversity and life below water and on land, etc.

53. As we are now in this period of climate change with increased climatic extremes, fatal outbreaks of pests and diseases, and disruptions of input and output global food supply chains, there is an urgent need to lessen, if not eradicate the pollution of air, land, and water, which exacerbates the state of our planet, directly or indirectly because of human actions. Unsustainable levels of GHG emissions and overuse of chemicals on land and water continue, despite the alarming signs of stress shown by the environment.

54. The task of mitigating climate change is indeed formidable, but many measures can be undertaken to help saving the future by supporting endeavors that favor preservation. Supporting 500 million smallholder farmers as forerunners in the fight against climate change is a multiple win solution. Many of these farmers are currently providing ecosystem, climate, and health services for free.

Incentives are necessary for them to continue and flourish. Moreover, in small farms, women have the main responsibility of ensuring the well-being of whole households especially the children. Under organic agriculture, sustainability of productive bases is enhanced, which improves lives of small farming households, giving them incomes from higher yields and more food, as well as timber, fodder for animals, and more nutritious crops resilient to severe weather conditions. Taken together, these small farmers in marginal areas who often have agriculture systems based on agroecological principles, such as organic agriculture, will have a positive impact on environmental and food security while promoting biodiversity and inclusive growth.

55. The fight against climate change is now increasingly incorporated in market mechanisms. Consumers now are more aware of the negative externalities of conventional agriculture. Demand for safe and sustainably produced crops is on the rise. As organic products have recognized certification systems and production standards, these are increasingly favored in the international development community as a market-based solution to help address the multiple goals of SDGs, in terms of poverty eradication by way of sustainably higher incomes. As evidenced in the case studies, more cash in the hands of farmers help them improve their health, nutrition, and education status. Organic agriculture brought these farmers myriad benefits while increasing biodiversity and enhancing the environment, thereby mitigating and potentially reversing climate change.

56. Importantly, organic agriculture as development strategy requires low cash investment on the part of farmers, making it an attractive development strategy for extreme poverty eradication, environmental protection, and sustainable economic development that strategically include poor women in rural areas. Lessons can be extracted from the organic agriculture subsector as a market institution that is well in place, for mainstreaming climate-resilient agriculture development. With increased global awareness that the toxicity in our food is deteriorating our health, and that GHG emission from agriculture will surpass the energy sector in the near future, greening agriculture is among the most urgent tasks to lay the foundation for new green growth.

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Achieving Sustainable Development Goals through Organic Agriculture: Empowering Poor Women to Build the Future

Organic agriculture has been an attractive development strategy in achieving the Millennium Development Goals for developing countries, particularly owing to its low capital requirements. As evidenced in 11 studies financed by the Asian Development Bank Institute in 2005–2006, organic agricultural practices in selected Asian countries showed positive impacts on environment, biodiversity, and in particular on incomes and health for women farmers. In the Sustainable Development Goals era, organic agriculture remains relevant to help countries achieve their sustainable development goals.

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