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Discussion Paper:

Organic Agriculture: The logical sequence to modern chemical agriculture in the Philippine context

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ABSTRACT

Organic agriculture, which is also described as less fossil fuel-dependent and agrochemical-free agriculture, is now perceived as the logical sequence to the food production systems which are dependent on agro-chemical inputs from production to processing. This paper discusses the situations and factors that should be considered in the crucial process of shifting approaches to food production systems to achieve food security in the new millennium.

In the past, farmers shifted with government support to chemical agriculture to produce the food requirements of the burgeoning population. Soils are badly degraded from the use of chemical fertilizer and pest populations are so complex and crop failures associated with no application of pesticides are widely known. Withdrawal from agro-chemical use will mean huge yield reduction without soil fertility restoration and any further yield decline is unacceptable both to the farmers and the consumers. The shift to organic agriculture requires soil fertility restoration, breeding/selection of seeds for organic agriculture, adoption of cultural management practices and shifting monocropping to diverse planting, integrated nutrient management and ecological pest management systems, among others.

Farmers need full government support to shift to organic agriculture. Moreover, the society or the consumers need to realize that the shift to organic agriculture is for

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their own benefit, hence, they need to appreciate, understand, cooperate, patronize and put premium value to organic agriculture products. The superior quality of organic products should be appreciated and should be translated to higher price. Organic agriculture production should be complemented with a change in consumer preferences or consumption patterns. It should be translated into a demand that will lead to changes in the supply side thereby changing the agricultural production systems that our Filipino farmers currently adopt.

INTRODUCTION

Modern agriculture or "green revolution agriculture" is fossil fuel-dependent from production (i.e. cultivation, fertilization, pesticide application, irrigation, and harvesting) to the hauling, cold storage, and processing of farm products (Pimentel *et al*., 1995; Mclaughlin *et al*., 2000; Pfeiffer, 2003). Although crop yields increased and food supply became abundant, modern agriculture caused many direct and indirect costs or negative impacts which include soil erosion, pesticide and nitrate contamination of surface and groundwaters, increased pest resistance, and loss of biodiversity (National Research Council, 1989; Pimentel *et al*.,1995; Pimentel, 1996; Tilman,1999; Heller and Keoleian, 2003; Relyea, 2005). In addition, the energy flow to agriculture increased 50 to 100 fold or more (Pimentel *et al*., 2005). This happened at a time when fossil fuel reserves continue to decline and its extraction and exploration have become more difficult and expensive. With the ever increasing demand (at 87 million barrels/day) (Rodolfo, 2008) and unstable situation in the Middle East, oil- producing countries have propelled fossil fuel price increases. Consequently, the prices of agrochemical increased mainly because of the increase in oil price (Lucas *et al*., 2006; Pfeiffer, 2003; Goodchild, 2007; Rodolfo, 2008; Mclaughlin *et al*., 2000; Vidal, 2007). This in turn led to higher food prices as production of cereals are also declining. Although agricultural production has continued to increase, the rate of yield increase per hectare has started to decline. World wheat stores declined 11 percent in 2007, its lowest level since 1980. It corresponds only to 12 weeks of the world's total consumption - much less than the average of 18 weeks consumption in storage during the period 2000-2005 (Rosenthal, 2007).

Worldwide, agriculture is worsening the global ecological crisis (Lucas *et al*., 2006; Tilman *et al*., 2001; Vidal, 2007). Like the Hindu god Shiva,

today's agriculture is both a creator and a destroyer, partly as the consequence of conscious decisions taken by farmers, agribusiness executives, government officials, and food buyers (Cox 2008). Unknown to many, the greenhouse gases causing the global warming crisis, are emitted primarily by the food that we eat. From production to the time it is eaten, our food emits about 44-57% (Grain, 2009) of all greenhouse gases causing global warming and climate change as follows: agricultural activities- 11 to 15%; land clearing and deforestation - 15 to 18%; food processing, packing and transportation - 15 to 20%; and decomposition of organic waste - 3 to 4%.

The huge greenhouse gas (GHG) contribution (44-57%) of the food system is primarily because our agriculture has been mechanized and made chemical inputs dependent, specialized (monocropping to suit machines using oil), de-localized and globalized (requiring huge energy costs in packaging and transport). The indiscriminate use of chemical fertilizers, hybrid seeds and pesticides has resulted in various environmental and health hazards coupled with socio-economic problems (Pimentel, 1996; Pretty & Hine, 2001; Pretty *et al.*, 2003). But the causes of the environmental crisis were mainly attributed to the materialistic paradigm which promotes high input technologies and practices in all sectors (domestic, agriculture, industrial, service) which led to soil erosion, salinisation, all types of pollution, desertification and loss of biodiversity (Relyea, 2005). Many of our soils are degraded requiring fertilizer application in order to get high crop yields. This happens at a time when the prices of chemical fertilizers are so high which is the consequence of the oil price surge (McLaughlin, 2000; Pfeiffer, 2003; Vidal, 2007; Goodchild, 2007; Mendoza, 2008; Clark, 2009;). Then, there is also the imbalance between pest populations and their predators, making pesticide use by farmers necessary. Farmers are enhanced to mix pesticide cocktails to increase its toxicity.

Today, the presence of pesticide residues in the food chain is well-known. The hazardous effects of pesticides on human health, including their effects on the endocrine systems in the form of sex reversals are now well documented. Cancer, a rare disease during pre-modern agriculture, is now a dominant illness. The incidence of breast and prostate cancer had increased phenomenally (Sever, 1997; Kristensen, 1996; Kristensen *et al*., 1995; Wolff *et al.*, 1994; Alavanja, 2003).

World population was only 1.6 billion in 1900, it is about 6.7 billion now (UNFPA 2008). As Gordon and Suzuki said "more people have been added

to the Earth during the past 40 or 50 years than in any period since the dawn of man (Goodchild, 2006). In the Philippines, from about 7 million in the 1900s, our population has increased by 90 million or almost 13 times. Estimates showed that ideally, the Philippines could only support 27 million people. It means, the Philippines exceeded its carrying capacity threefold (Mendoza, 2008). With overpopulation, the amount of grain per person is declining (Goodchild, 2006). There is more grain, but there are more mouths to feed (Smil, 2000). "The Green Revolution" was mainly focused on rice in the humid tropics of Asia. Soon, this strategy was expanded to all crops and livestock including aquaculture. Agricultural crop/livestock yields increased, averting the Malthusian forecast of food crisis. The irony is that the world produces enough food for everyone, yet more than 800 million people go hungry. Food is cheaper and diets are better than 40 years ago, but malnutrition and food insecurity threaten millions (Badgely *et al.*, 2006). The challenge shall intensify as world population expands from 6.7 billion to 9.2 billion by 2050 (IAASTD, 2008). It is cheap oil that cheapens food price nominally and it artificially supported our huge population. But the era of cheap food is over as the price of oil zooms up.

The logical sequence is for farmers to change or shift their production systems from agrochemical-intensive to minimal or even zero use of agrochemicals (chemical fertilizers and pesticides) and for them to adopt farm practices that rebuild the soil leading to balanced agroecosystems, or minimal agroecological stresses that optimize the health and productivity of plants, animals and people (Rigby & Caceres, 2001; Willer &Yussefi, 2001; Badgely *et al.*, 2006; Magdoff & Weil, 2004), otherwise known as organic agriculture.

The benefits of organic agriculture

Organic agriculture is a traditional food production system which combines modern science and indigenous knowledge. It is less dependent on fossil fuel and thrives on locally available and less expensive inputs (Scialabba *et al.*, 2002). The logical thinking is that more sustainable methods of food production are essential over the long term (Pretty *et al.*, 2003; Tilman *et al.*, 2002; Magdoff & Weil, 2004; Ohlander *et al.*, 1999). Organic agriculture can feed the world (Leu, 2007). It is a vision for ecologically sound and energy efficient agricultural systems (Ohlander, 1999; Pretty, 1996; Rigby, 2001;

Mendoza, 2005). Hamer and Anslow (2008) listed 10 reasons why organic agriculture can feed the world. More researchers have investigated organic agriculture and its influence on global food supply (Badgely *et al*., 2006). Stanhill (1990) made a thorough study comparing the productivity of organic agriculture to that of conventional agriculture. Considering the totality of situations (i.e., diminishing oil, green house gas emission attributed to using so much oil, and continuous soil deterioration) the way to go is through organic agriculture (Mae-Wan Ho, 2008; Leu, 2007; Goodchild, 2007; Vidal, 2007; Tilman *et al.,* 2002; Pretty *et al.*, 2003; Lampkin, 1994; Pretty and Hine, 2001; Lopez *et al*., 2007; Mendoza, 2005; Pretty, 1996; Ohlander *et al*., 1999). Agricultural science should place greater emphasis on safeguarding natural resources and on agroecological practices. These include using natural fertilizers and traditional seeds, intensifying natural processes and reducing the distance between agricultural production and the consumer (IAASTD, 2008). Farmers should adopt ecologically sound and organic-chemical-free methods of cultivation as the remedial measure to soil degrading, farmer impoverishing, excessively greenhouse gas emitting heavy-oil dependent food systems.

The farmers' role in the adoption process

A closer and deeper look on the above logic of farmers' adoption of ecologically sound methods of cultivation revealed that it is not as straightforward and simple. First, farmers are again the focus of the need to change the agricultural production systems. This is because they are the ones who decide what crops to grow, when to plant, what inputs to apply, what cultural management practices to employ. While the farmers are the focus of the change process, it should be asked whether it is fair, just, realistic, or practical. It can be recalled that it was not the farmers per se who started the process of shifting what was previously agrochemical-free indigenous/traditional agriculture into an agrochemical-intensive agriculture system. Massive government support was given to the farmers to promote the rapid adoption of modern-agrochemical dependent agriculture.

Malthus' scenario in the late 18th century that population was growing exponentially and food production increasing arithmetically, clearly pictured a grim food deficit situation in the future. However, the technological advances propelled by the discovery of oil extraction and processing which had provided

cheap energy to mass produce inputs (Pfeiffer, 2003; Goodchild, 2007; Ho, 2008) prevented this grim scenario. The manufacture of production inputs that were used to produce cheap foods sustained industrial progress. Supplying adequate food needs of the exponentially rising world population was adequately satisfied for a while.

The organic agriculture promotional strategy

Even before the oil crisis-propelled increases in the prices of agrochemical inputs happened, there had been earlier attempts to promote organic farming in the country (Mendoza, 1994). The main promotional strategy included the following: inform and train farmers on the ill-effects (environment-health-financial) of modern agro-chemical intensive agriculture; and organize farmers and form cooperatives to produce "organics" and assist farmers in marketing their organic produce. Non-government organizations (NGOs) and private individuals were able to provide soft loans and other incentives to the farmers-converts. Three decades after, it was estimated that there were approximately 30,000 Filipino organic farmers (http://www.masipag.org/news_india.htm). It has been estimated that 36% of the approximately 35,790,000-strong Filipino labor force are in the agricultural sector for a total of 12,884,400 (CIA, 2006). Numerically, 30,000 looks like a lot, but proportionally their numbers are a miniscule at 0.23% or 23 out of 10,000 farmers. Their numbers are hardly increasing!

Reasons why only few farmers adopt organic agriculture

There are two possible explanations why only few farmers adopt organic agriculture. These are as follows: 1) the promotion of organic agriculture was focused only on the supply-side, the farmers. Only a miniscule effort was exerted on the demand–side or the consumers, and 2) that the farmers are receiving little support or none at all in their shift or conversion process to organic agriculture.

Concerning the first reason, there may be nothing wrong with this approach. But upon closer scrutiny reveals that: a) Farmers farm for livelihood to generate income for their families, and to produce food (Buringh, 1989; Mendoza, 1994). They adopt systems and practices that will enable them to

achieve their goals in farming, or those systems and practices that will lighten the burden of farming such as the use of machines to facilitate land preparation, threshing, and milling; the use of herbicides to control weeds; the use of pesticides to eliminate, if not minimize, the risk of crop failure and possible yield reduction; b) The shift from modern to organic agriculture is not mechanical. It is much more complex than it appears to be. It is not uncommon to hear farmers tell a farm extension worker, "You were the ones who propagated modern agriculture through the use of fertilizer and pesticides. Why are you telling us now to stop using them?" This comment simply reveals a deep-seated feeling among our farmers (Mendoza, 1994). Farmers were not the one who started these agricultural systems. Now, that the effects of the introduced modern systems have already been recognized, why should the burden of change and the attendant risks be *solely* on them? These lead to real and practical aspects of farming. Farmers are not as impractical as they are portrayed to be if they do not shift to organic agriculture as they are portrayed laggards, conservative and tradition-bound before if they do not adopt modern agriculture. Soil fertility ranges from bad to worse in different places. How would they farm organically without encountering yield declines? A 20% or more decline in yields of rice in the first two croppings after shifting to organic agriculture methods of planting had been observed (Mendoza, 1994).

Farmers are receiving little support in their shift or conversion to organic agriculture. During the early years (1960's) of massive promotion of modern agriculture to accelerate its adoption, farmers were organized into "*Samahang Nayon*" or village associations and supported by the government. This was through sponsored training and credit programs designed to extend loans to the farmers to enable them to buy agrochemicals and small farm machinery. What about organic agriculture? At this point, to facilitate massive adoption of organic agriculture by our farmers, coherent and comprehensive program must be designed.

Consumer or demand–led promotion of organic agriculture

The huge demand for food due to the increasing population justified the massive and rapid adoption of modern agriculture. Simply stated, it is The Law of Supply and Demand that governs. Can a parallel or similar pattern influence organic agriculture adoption by many, if not all, Filipino farmers? The

consumers comprise the demand side of the production to postproduction linkage. Farmers follow the economic logic in production in that, what is demanded by consumers will be produced. Following this logic, if consumers demand chemical-free agricultural products, then farmers shall simply follow that signal. Demand in this case can be interpreted to mean that consumers are willing to support farmers in producing chemical-free agricultural products and they are willing to pay a premium.

How can consumers demonstrate their willingness to support farmers in producing chemical-free agricultural products? Consumers should motivate farmers to grow crops and animals the organic way. Since organic production systems are different from the agrochemical dependent systems, consumers must also be familiar with the organic production system. Basic in organic production system is soil building or natural soil fertility restoring activity (Magdoff & Weil, 2004). How can a consumer-supported soil building? Let us first trace how natural soil fertility is lost. Products (crops and animals) consumed represent off-farm losses of nutrients. The production of crops and animals has a corresponding loss of nutrients through soil erosion, especially in sloping lands. The use of agrochemicals has soil degrading effects. Specific farming practices like burning crop and weed residues contribute to soil organic matter loss.

Listing the four (4) major causes of natural soil fertility losses leads us to the more complex task of avoiding soil fertility losses and devising measures to mitigate them. There are several time-tested and proven approaches of rehabilitating, regenerating, and rebuilding the soils (Magdoff &Weil, 2004; Hendrix *et al*., 1990; Pimentel *et al*., 1994; Giller *et al*., 1994). These include recycling wastes as nutrient source, using nitrogen-fixing plants, improving cropping systems and landscapes, avoiding synthetic pesticides, integrating crops and animals into a single farm production sector, avoiding nutrient losses, and covering the soils permanently with crops (Niggli *et al.*, 2009).

The trade-offs of organic agriculture

Shape and size of produce

The soil and pest aspects of organic production are complex to deal with at present. Although they are interrelated as viewed in organic production

systems, pest ecosystems must be well understood. Farmers' overuse of pesticides is not simply because they fear for yield decline or quality loss. Producing and harvesting pest-free crops is equally important. Consider pechay production. In the summer, pechay is sprayed daily (early in the morning) to preempt insect bites so that leaves are unblemished and do not form irregular sizes and shapes. Organic agriculture requires that consumers are willing to buy agricultural products with irregular sizes or shapes, including those that have insect bites.

Crop seasonality

A compounding factor to pest damage arise from the production of off-season fruits and vegetables. Nature designs crop seasonality but due to agrochemical use, crops can now be grown the whole year round. Tomatoes can be grown during the wet season in elevated/high altitude areas. Insect infestations and fungal infection are prevented by spraying insecticides or fungicides. A farmer growing tomatoes during the wet season claimed that it was useless to grow tomatoes during the rainy season if they were not sprayed regularly with chemicals. Knowing that tomatoes grow seasonally, off-season production means pesticide spray for farmers to successfully harvest fruits. Thus, consumers must learn how to preserve tomatoes so they have the commodity during off-season or they forego eating tomatoes, look for alternative or substitute for the crop.

Another example is mango. Mangoes can now be produced off-season by using flower inducers. To hasten maturity of the leaves, farmers spray chemicals before applying flower inducer. As the leaves are forced to mature, their photosynthetic functions are impaired. Chemicals are sprayed again to enhance photosynthesis so that the increasing demand for photosynthates of the growing fruits could be met. July and August are rainy months which are also characterized by the population build-up of pests and fungi that attack the flowers. Producing mango fruits during the rainy season of September to November is conducive to insect and fungal pest population build-up due to high moisture. To protect the flowers and small fruits later, pesticide spraying is a must in order for flowers to develop into fruit and small fruit into bigger fruits. The farmers invest in chemicals to make the mangoes flower, and they continue to spend some amount until harvest time to make their venture

financially successful. If there are typhoons or heavy rains prior to harvesting, these investments are wasted. The farmers are in a bind. Meanwhile, consumers are more than willing to buy mangoes in October or November. Before, consumers had to wait until April or May to buy mangoes. Thus, consumers who are willing to support organic agriculture production should understand crop seasonality so they are prepared to forego consuming them during the off-season. This also means that they must be willing to learn how to preserve fruits and vegetables during peak season since these are cheaper during this period.

The price of the produce

Organic products sold at premium price are a big concern among consumers in Third World countries who already consider the current food prices to be too high. Approximately 85% of the Philippine population lives on less than US$2.00 per day (CIA, 2007) and more than 51% of the rural population lives below the subsistence threshold as defined by the World Bank (http://www.masipag.org/news_india.htm). The current retail price of ordinary rice in the common markets ranges from PhP26 to PhP40/kg (US$0.53 – US$0.82/kg). Supermarket retail prices of organic rice range from PhP48/kg (US$0.98/kg) for ordinary varieties to PhP80 (US$1.66/kg , 1USD= PhP 48) for fancy varieties (red, black, glutinous or aromatic rice). The current high price of organic rice reduces its consumption and demand and retards the growth of organic rice production. Consumption of organic rice is thus limited to those who can really afford to pay – well-off cancer patients who are advised to eat organic products; those who have undergone heart surgery; and the few environmental and health conscious sectors of the society who can afford it.

The main issue then is price. Why pay a high price? Or, is a higher price for organically grown products just and fair? One of the main drivers of organic agriculture adoption by farmers is consumers' willingness to pay a premium price. But because there are few buyers who are willing to buy, the demand is low and it is simply treated as niche market. There is a need to clarify, however, what consumers are paying for (Lampkin & Padel, 2000). The consumers are simply paying for the market price of what they buy. The financial price that is currently paid for chemically produced crops or animal products does not truly reflect the true value of the product since not all of the costs of production

are included. The total costs should include: (1) financial - the costs of purchased inputs - seeds, fertilizer, pesticides, fuel, machineries, cost of money, labor, storage, packaging, marketing, and distribution; and (2) ecological - soil quality deterioration due to the inputs and farming methods applied and all other environmental and ecological costs (Mendoza, 2004; Lopez *et al*., 2007, Lampkin & Padel, 2000). What is paid for is simply a small fraction of the total cost. It has been estimated that the true cost of a beef burger in the US is about US$100 /kg if the ecological costs are counted (http://www.spirulinasource.com/earthfoodch7a.html). But it is sold only at US$2.00–US$3.00/kg. The current market price is so low because of government subsidies and the ecological costs of raising beef are not included. It means that future generations will pay dearly for these unseen costs. Even now, we are already starting to pay the price as reflected in the rise of lifestyle-related illnesses, soil erosion, deforestation and global warming.

The financial costs of growing crops and animals using industrial methods like specialized cropping or monocropping + mechanization reduce the unit financial cost of production considerably. It does appear that larger farmers/producers are earning as they obtain a higher financial profit margin due to industrialized farming. With pricing based on the true or total cost accounting (financial + ecological), conventionally grown products are under-priced or even incorrectly priced. Their price tags are way below their actual costs if the true costs of production and profit margin in the market channels are included. Because of this, the market price of organic agriculture products (which appears to be more expensive as they are generally priced 20-30% higher) is still very low. But this is not acceptable! If the true price tags of conventionally grown crops and animals are to be considered, then organic agriculture products should be sold at a considerably lower price. The general consuming public who are already financially hard-up will not understand or will simply refuse this logic. What they would appreciate, considering their currently shrinking purchasing power, is the low prices of products that they buy in the market.

In effect, what is being presented is that the 20-30% higher price of organic agriculture products is not really high or a premium price after all. This is because organic agriculture-grown vegetables have higher quality and nutritional value with more vitamins and lower water content. Thus, they keep longer (they do not wilt) even at ordinary room temperature; and they taste better, in fresh salads or in cooked form. Organic agriculture-grown rice tastes

better and stores longer. A common observation is that cooked organic agriculture rice does not spoil in 24 hours (Mendoza, 2004).

The health benefits of organically-grown products

What is not appreciated by many consumers is that eating organic agriculture-grown crops is consuming nutritional and medicinal food at the same time. This is in addition to the lower greenhouse gas emission associated their production (Niggli *et al.*, 2009). Organic agriculture-grown crops are medicinal food. More and more findings and testimonies indicate that organically grown crops heal cancer patients who have already received death sentences (6 months to 1 year) from the medical doctors treating them (Alavanja *et al.*, 2003). However, the healing power or contribution to good health of organic agriculture food is still vaguely understood. What we know about organic agriculture food is that they are rich in vitamins, minerals, and anti-oxidants which are useful as precursors in enzyme formation or activators of immune/ repair systems inside the human body (Worthington, 2001). Patronizing organic agriculture-grown crops consumes nutritional and medicinal food at the same time. Everybody should put a premium (premium price is not correct) on health because there is no price tag on one's body. This explains why poor farmers sell their valuable land and possessions to send their sick family members to a hospital. "Health Banking" is unusual. What is common is money banking. Consuming organic agriculture-grown healthy food is a sure and gradual way to health asset build-up and accumulation or health banking. Consider the health care bills - medicines, doctors' fees, and laboratory fees that accumulate once a person begins to suffer heart disease, hypertension, arthritis, gout, diabetes, or cancer, among others. These are known as "lifestyle diseases" which were mostly unheard of in the days of pre-modern agriculture. Consuming organic agriculture health foods offers the body built-in protection against impaired immune systems triggered by the bio-accumulation of pesticides and other agro-chemicals in the food chain that ultimately end up at the top of the food chain - in the human body.

An additional 20-30% in the market price of organic agriculture-grown crops is a drop in the bucket if the numerous interrelated benefits to human health and the cost to our planet's ecosystem have to be considered. Imagine the lost productivity and income of an individual who is ill and the medical

costs incurred in the prophylactic treatment of the illness. It is a rather lengthy process to audit the ecological costs - greenhouse gas emissions of manufacturing fertilizer, pesticides, and the machineries and fossil fuels involved in transport, hauling, processing/storage and repair costs - to the soil and ecosystem brought about by the use of resource degrading inputs. But this must eventually be done if we want to arrive at the true value of the food we eat.

The point of this discussion is that the farmers will simply uphold the economic dictum. Whatever consumers demand will be the products in a form and scale that farmers will produce. If the consumer is apathetic, indifferent, unaware, or unconcerned with the way crops/animals are grown and food is looked at as simply stuff to fill an empty stomach once the digestive enzymes signal hunger, the consumer will get what he or she wants – a full stomach with minimal nutrition and health benefits.

CONCLUSION

Consumers must recognize the need for nutritional and medicinal foods and they must be made conscious of the costs to our planet's ecosystem that modern agriculture has brought about. This knowledge must then be translated into a demand that will lead to changes in the supply side thereby, changing the agricultural production systems that our Filipino farmers currently adopt.

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