ORGANIC AGRICULTURE AND THE LAW

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ABSTRACT
This review discusses the differences between organic foods and conventional foods with respect to food safety and nutritional composition and makes clear that several qualitative differences exit. This paper attempts to bring together different laws of countries in the light of recent developments in organic farming. The purpose is to review previous studies that investigated the main factors and challenging the adoption of organic agriculture. Recent food crisis such as mad cow disease have lessened consumer confidence in foods in general and especially in conventionally produced foods that may use pesticides, antibiotics, and other chemicals in food production. The results show that organic fruits and vegetables possess fewer pesticide residue and lower nitrate levels than do conventional fruits and vegetables. Because organic fruits and vegetables do not use pesticides or synthetic fertilizers, they have more biochemical energy to synthesize beneficial secondary plant metabolites such as polyphenolic antioxidants as well as naturally occurring toxins. The key issues emerging in organic farming include yield reduction in conversion to organic farm, soil fertility enhancement, integration of livestock, certification constraints, ecology, marketing and policy support. In the course of these projects, one of the main problems identified, however, has been limited information available to countries regarding best practices and issues to consider in the design of appropriate regulatory frameworks for organic agriculture.

Keywords: organic, conventional, pesticide, law, chemicals

Introduction

This rapid growth of the organic foods industry may be traced to increased consumer confidence in organic foods as well as to concern about possible health risks and environmental impacts of conventional food production methods. Recent food crises such as mad cow disease and foot-and-mouth disease have lessened consumer confidence in foods in general and especially in conventionally produced foods that may use pesticides, antibiotics, and other chemicals in food production. Surveys indicate that many consumers purchase organic foods because of the perceived health and nutrition benefits of organic products. In one survey, the main reasons consumers purchased organic foods were for the avoidance of pesticides (70%), for freshness (68%), for health and nutrition (67%), and to avoid genetically modified foods (55%) (Whole Foods Market 2005). Such consumers appear to be willing to pay the typical 10% to 40% price premium that organic products. Organic production can be defined as an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain, and enhance ecological harmony. U.S. regulations require that organic foods are grown without synthetic pesticides, growth hormones, antibiotics, modern
genetic engineering techniques (including genetically modified crops), chemical fertilizers, or sewage sludge. (Winter and Davis 2006)

**Organic legislation and regulation**

Production and handling standards address organic crop production, wild crop harvesting, organic livestock management, and processing and handling of organic agricultural products. Organic crops are raised without using most conventional pesticides, petroleum-based fertilizers, or sewage sludge-based fertilizers. Animals raised on an organic operation must be fed organic feed and given access to the outdoors. They are given no antibiotics or growth hormones.

USDA regulations prohibit the use of genetic engineering, ionizing radiation, and sewage sludge in organic production and handling. As a general rule, all natural (non-synthetic) substances are allowed in organic production and all synthetic substances are prohibited. The National List of Allowed Synthetic and Prohibited Non-Synthetic Substances, a section in the regulations, contains the specific exceptions to the rule.

**Organic food production in the world**

In 2013, over 43 million hectares, in 170 countries around the world, were cultivated organically. The continent with the largest organic agricultural area is oceania with 17.3 million ha, followed by Europe (11.5 million), Latin America (6.6 million), Asia (3.4 million), North America (3 million) and Africa (1.2 million). Over the past 30 years, international sales of organic have grown from almost nothing to over, € 66 billion in 2013.

Demand is mainly concentrated in two regions: North America and Europe. The largest single market for organic food is the USA (€ 24.3 billion) followed by the EU (€ 22.2 billion) and China (€ 2.4 billion). The countries with the most producers are India (574,591), Uganda (188,625), Mexico (169,570).

The growth of the organic foods industry in the United States has been dramatic in the past 2 decades. It is estimated that organic sales have increased by nearly 20% annually since 1990, with consumer sales reaching $13.8 billion in 2005. While initial organic food production primarily involved small farms and local distribution of fresh produce, today's organic food system is a complex combination of small and large food producers, local and global distribution networks, and a wide variety of products, including fruits, vegetables, meats, dairy, and processed foods.

**Current status of organic farming in Asia**

The total organic agricultural area in Asia is nearly 2.8 million hectares. This constitutes seven percent of the world’s organic agricultural land. There were almost 0.5 million producers in Iran. The leading countries by area are China (1.4 million hectares) and India (0.8 million hectares). (FAO, 2013)
Expect Japan, Republic of Korea (ROK), and China (ROC), efforts to adopt organic in Asia are scattered/individual, and many of the countries are in the process of farming national policies and strategies. Institutional capacities (regulation, research, extension, human resources, and physical infrastructure, etc.) for organics are still poor. There is a general lack of knowledge and information about organic farming, which is an impediment to promoting better understanding of organic farming in the region. There is a general lack of harmonization of standards for organics across Asian nations, which will limit trade and sharing of experiences on regulations and standards. (Asadollahpour et al. 2013)

Asian countries are at different levels of organic development and promotion, and therefore, there is much scope to learn from experiences of Japan, ROK, ROC Sri Lanka, etc.

**Organic farming in Iran**

Organic farming can be found in 11 out of Iran’s 31 provinces. More than half of the organic agricultural land in Northern (Qom, Golestan, Tehran and Mazandaran) provinces, 5 percent of the organic are located there. This means that the average farm size in this part of the country is 30 to 40 hectares. The remaining 95% of the organic farms are concentrated in the Southern provinces but with an average farm size of only 1.2 hectares. Main products are wild pistachio, herbs and licorice.

Animal production is all concentrated in the province of Khorasan in Northeast Iran with 13000 sheep, 500 cows, 140 turkeys and 50 geese. Poultry is often kept on wheat farms, which is a major organic product in terms of area. (Kledal, 2012)

The “organic committee” under the agricultural ministry and the “Iranian standard and industrial research institute” are responsible for the organic legislation. In 2008, the latter passed the Iranian national standard: ISIRI-11000. However, there are no overall policies or direct support schemes for farmers to convert. Hence, some private market initiatives like the ‘Iran Association of saffron’ is trying to develop the first national standards for organic saffron production and processing. More than 95% of organic production in Iran is being exported.

**Permitted substances**

Accordingly organic operators will have to limit the use of inputs to those included in the approval list. List usually cover soil fertilizers; plant pest and disease control products; nutritional elements, feed materials, feed additives and processing aids and products for cleaning and disinfection of buildings and installations. Lists may also differentiate between inputs for plant production (fertilizers, pesticides, pheromones, etc.), for veterinary production (veterinary drugs, feed substances, pesticides, etc.) and for processed products (additives, etc.). (Winter and Davis, 2006)

Countries may decide to establish a list of permitted active substances or a list of formulated products (i.e. products used as inputs for organic production and processing).
Control pests, diseases and weeds

**Argentina**: plant pests, diseases and weeds should be managed through measures including the increase and conservation of diversified ecosystem; the choice of appropriate species and varieties; appropriate rotation programmes; mechanical cultivation; and the protection of natural enemies of pests and diseases. **Japan**: only in the cases of imminent or serious threat to plants and where the aforementioned methods are ineffective, may recourse be had to listed chemical substances. **The Philippines**: synthetic growth regulators and dyes are prohibited, but products used to regulate growth and development of plants prepared on the farm itself, and made with local products, are allowed. (FAO, 2012)

**South Africa**: recourse to listed substances is limited to cases of immediate threat to crops and where control through the preventive measures is not effective and may be further restricted if the use of listed substances risks having detrimental effects on the environment, soil organisms and the quality and safety of the final product. **India**: physical methods (including thermal sterilization of soil) and the products listed are permitted for purpose of pest and disease control. Conversely, the use of synthetic regulators, synthetic and genetically engineered organisms or products is prohibited. (FAO, 2012)

**Pesticides**

According to a recent survey, 70% of consumers said that they purchased organic foods to avoid pesticides. Among the types of synthetic substances approved for use on organic crops are based herbicides; water disinfectants such as calcium hypochlorite, sodium hypochlorite, Copper sulfate, Boric acid, Lime sulfur, Elemental sulfur, Copper sulfate and oils. Such limitations in available pesticides and the restrictions on their use should intuitively result in fewer pesticide residues in organic crops relative to conventional crops. The levels of pesticide residues in organic foods appear to be lower than those in conventional foods. (Winter and Davis, 2006)

**Nitrates**

Nitrates (NO$_3^-$) and nitrites (NO$_2^-$) are naturally occurring inorganic ions that are part of the nitrogen cycle. Microbial action in soil or water decomposes wastes containing organic nitrogen into ammonia, which is then oxidized to nitrite and nitrate. Because nitrite is easily oxidized to nitrate, nitrate is the compound predominantly found in groundwater and surface waters. Contamination with nitrogen-containing fertilizers (e.g. potassium nitrate and ammonium nitrate), or animal or human organic wastes, can raise the concentration of nitrate in water. Nitrate-containing compounds in the soil are generally soluble and readily migrate with groundwater.
Studies indicate organic production of food results in lower nitrate levels. An analysis of over 18 independent studies showed the following results in nitrate levels of organic and conventional foods:

It appears that organic production of food results in lower nitrate levels, most likely because nitrates are not allowed in organic food production.

A study conducted by Baker et al, in 2002, summarized the results of 18 studies comparing nitrate levels of organic and conventional foods and found 127 cases where nitrate levels were higher in conventional foods, 43 cases where nitrate levels were higher in organic foods, and 6 cases where no difference was noted. The Baker study demonstrates that organically produced foods have lower detectable nitrate levels, which is not surprising given that nitrates aren’t used in conventional farming. (Baker et al. 2002)

Water management and fertility of soil

**Turkey:** neither industrial and urban wastewater nor water from drainage systems can be used in organic farming. Irrigation should not produce environmental pollution, destroy the soil structure or cause erosion.

**Croatia:** prevent erosion by water, salination, improper use of water and the pollution of soil and surface water. All relevant measures must be taken to minimize the contamination of soil and plants by conventional chemical products carried by water.

The location of The unit of production must take place in an area where industrial pollution is reduced to the minimum and at a certain distance from roads depending on the intensity of road traffic.

**Argentina:** improve the fertility through a number of cultivation methods. These include the cultivation of legumes, green manures or deep-rooting plants. The adoption of appropriate multi annual rotation programs.

**Canada:** producers must not use burning to dispose crop residues on the operation, except when used to suppress the spread of disease or to stimulate seed germination.

**United states:** there is a clear prohibition on the use of sewage sludge and of any fertilizer or composted plant, and animal material containing synthetic substances not included in the US list are all prohibited.

**Japan:** fertility of soil shall be maintained through the use of compost from residues of plant products growing in the field. Only to the extent that these techniques prove insufficient, it is permitted to use fertilizers and soil conditioners (FAO, 2012).

Conversion period

The time period needed to produce according to organic procedures before the crop can be certified as organic.
In many countries (India, South Africa, Tunisia, Turkey), the requirement is similar to the EU minimum of “at least two years” for annual crops and “at least three years” for perennial crops. In Canada and Croatia, the conversion period is “at least one year” for annual crops and “at least three years” for perennial crops, but prohibited substances must not have been used for at least three years before the first harvest of either type of crop. In United states, the law requires that no prohibited substances are applied to the land for a period of three years immediately preceding the harvest of the crop.

In Japan, conversion periods requires at least two years before the planting of crops and at least three years before the first harvesting in the case of perennial plants. In Argentina, livestock products can be sold as organic only if derived from a farming system that has been under active organic management for at least two years, without however specifying the exact length of conversion periods applicable to different animal species.

Parallel production

Organic production alongside non-organic production:

In Turkey, conventional and organic production can coexist, but only with respect to perennial crops and only if four conditions are met: the operator undertakes to convert the whole farm to organic production within five years; measures are separately store products harvested from each type of production; the certification body is informed of the harvest at least 48 hours beforehand. The operator obtains an authorization from the authority to carry out parallel production.

In Croatia, parallel production is allowed, where clear separation of two parts, non-use of GMOs even in the conventional part, inspection of the organic part and good record-keeping are required.

In Argentina, organic producers must notify other producers in neighboring areas of their organic activities so that the latter can adopt the necessary to prevent contamination.

In Japan, farmers must protect organic crops from drifting and flowing of prohibited substances from “surrounding areas”.

In United States, allows the parallel production of organic and non-organic livestock within the same farm but requires that physical barriers, including buffer zones, be established to prevent co-mingling of organic and conventional products as well as unintended prohibited substances.

In Tunisia, simultaneous production of organic (or in conversion) and conventional products is permitted insofar as farm units are clearly separated. Unlike in the Codex guidelines, there is no prohibition of the alternation between organic, in conversion and conventional production methods (FAO, 2012).

Microbiological safety
University of Minnesota study measured E.-coli contamination in fields using animal manure as fertilizer. In this study 476 organic produce samples and 129 conventional produce samples were collected and analyzed for Escherichia coli, Salmonella, E.coli 0157:H. The results showed that no samples contained the pathogen E.coli 0157: H. 1 from organic lettuces and 1 from organic green peppers contained Salmonella. Certified organic lettuce did not show any generic E.coli in the 10 samples while non certified organic lettuce had 12 positive results out of 39 samples and 1 of 6 conventional lettuce samples (16.7%) was positive.(Johannessen et al.2004)

The prohibition of antibiotic use in organic animal production also appears to be responsible for the lower incidence of antimicrobial resistance in bacterial isolates from organically raised food animals compared with conventionally raised food animals. Organic animal producers are generally prohibited from using antibiotics and there is an argument that this prohibition could theoretically result in increased pathogen levels and elevated microbiological safety risks. However, research findings in this area are inconsistent. In a Wisconsin study, the incidence of Campylobacter spp. isolates from bovine faces was 26.7% in organic farms and 29.1% in conventional farms.(Winter and davis., 2006)

**Naturally occurring toxins**

A few studies showed increases in naturally occurrence toxins after pesticide application. Levels of the mycotoxin nivalenol increased after the treatment of winter wheat with fungicides, although the incidence of Fusarium was reduced, suggesting that the fungus may itself respond to stress by increasing its synthesis of mycotoxins. The application of herbicide to a variety of plants increased the production of several plant defense chemicals in brad beans, peas, celery and cotton; in these cases, sublethal doses of herbicides appeared to stimulate the synthesis of certain plant secondary metabolites (Komives and Casida 1983).

**Organic health care of animal**

In Canada, hormonal treatment is generally allowed for the therapeutic reasons and under veterinary supervision, while synthetic compounds used for the purpose stimulating are prohibited. In Switzerland, Products coming from animals that have been treated with conventional veterinary drugs or antibiotics more than two or three times a year cannot be sold as organic products.

In Australia, animals treated with conventional drugs can not be sold as organic products. If any conventional drugs are used which contain GMO or GMO-derived substances, neither the animals nor products derived from it can regain their organic status. In India and South Africa, treatments may include GMOs and their derivatives or products, contrary to the Codex guidelines. conventional veterinary drugs or antibiotics may only be administered under the responsibility of a veterinarian.
Rules on animal production

Rules on animal production also address nutrition.

In Argentina and European Union, the majority of the animal feed should come from the same organic farm. In Argentina, a maximum of 20 percent can be sourced from other organic farms.

In Canada, in case of emergency, upon the request of an organic producer the competent certification body must set lower maximum percentage of allowable non-organic feed, not contain GMO ingredients.

In Japan, a maximum of 30 percent of in-conversion to organic feed is allowed, but non-organic feed may nonetheless be provided up to maximum 50%. In Australia, five percent non-organic feed can be used. In The Philippines, Percentage of conventional fodder tolerated in the case of low availability of organic fodder are set (40% during first year, 20% during the second year and 10% during the third). Tunisia, The amount of in-conversion to organic fed that may be used in animal feed depends on whether it is obtained from the same farm (60%) or other organic operations (30%). (FAO, 2012)

Livestock, poultry living conditions and health care

Producing organic beef has three phases. The first is cow-calf, which is the period from birth to weaning, when the calf weighs approximately 500 pounds. The second phase is back grounding, or the period between weaning and the time the calf weighs 900 pounds. The finishing phase, done in feedlot for conventionally produced beef, is a 3-month period prior to slaughter, by which time the calf weighs between 800 and 1200 pounds.

Poultry and layer hens must be under continuous organic management from the second day of life. Some farmers purchase chicks from a certified organic hatchery while others being raising the chicks organically when they arrive on the farm. Livestock intended for meat products must be raised organically from the last third of gestation. Livestock used as breeder stock can be brought from a conventional operation provided that the animal is raised organically for the last third of gestation and the offspring is raised organically from birth. Must allow for natural behavior for the species:

Direct access to sunlight, Outdoor access, including poultry, Cannot allow an animal to suffer, Must not withhold treatment to preserve organic status of the animal, Once treated with prohibited substance, animal must leave herd, No rotation between organic & non-organic production. (Dimitri and Greene, 2000)

Argentina and Canada follow the codex guidelines in prohibiting embryo transfers, techniques and mutilations (including physical castration and dehorning). In Argentina although reproduction through natural methods is generally preferred, artificial insemination is permitted (this is also the case in South Africa, Switzerland and Turkey).
European Union: reproduction through natural methods (albeit artificial insemination is permitted) and prohibits cloning, embryo transfer and hormonal treatments, in line with the Codex Alimentarius Guidelines. Any suffering, including mutilations, shall be kept to a minimum during the entire life of animal, including at the time of slaughter. Duration of transport of organic livestock must be minimized.

Australia: artificial insemination is not recommended. (FAO, 2012)

Processing methods

According to the Codex Alimentarius Guidelines, national legislation generally requires that the organic integrity of products should be maintained during any handling, storage and processing operation by preventing co-mingling with products from conventional farming. National laws also generally prohibit the use of ionizing radiation in the processing of organic food.

South Africa: permits smoking, extraction, precipitation, filtration (insofar as it does not contain asbestos or other substances negatively affecting the organic integrity of the product), distillation; and microwaving.

East African: Organic Products Standard provides that synthetically produced minerals, vitamins, amino acids and other nitrogen compounds may be used for food fortification purposes only where legally required, or in cases in which dietary or nutritional deficiency can be demonstrated.

Canada: a requirement is in the place to minimize reliance on non-agricultural ingredients, food additives and processing aids authorized for use in Canadian list. Food additives and processing aids must be of organic origin only and used to maintain nutritional value, food quality and stability and product composition and appearance provided they are not misleading to the consumer concerning the nature of the product.

Australia: the use of additives and processing aids is permitted, but only where there is a demonstrated technological need. Where they are essential for the safety, preparation or preservation of the product. Where they minimize physical or mechanical effects on a product.

Tunisia: there is no general prohibition on the use of ionising radiation on organic products. (FAO, 2012)

Packaging, storage and transport

The Canadian organic standard generally requires a physical separation of organic products to prevent contamination or substitution of the content with non-organic products or prohibited substances. More specially, storage sites and transport containers must be cleaned using substances allowed under the Canadian List and transport equipment must be free of non-organic residues and pests.
In Argentina, the legislation requires packaging materials to be chosen from biodegradable sources with no negative impact on the environment and forbids the re-use of packaging materials that have previously contained products from conventional farming.

In India the NPOP generally favors the use ecologically sound materials that for the packaging of organic products. In addition, packaging materials must not affect the organic integrity and quality of the product, nor transmit to it that may be harmful to human health.

It is forbidden to use PVC and packaging needs to be recyclable and environmentally friendly. Aluminum is permitted but only if the inspection body authorizes it. Storage areas must be protected from sunlight, must be kept dry and if possible cool with recommended humidity levels at 60% and temperatures at 19°C. Organic products must be transported together with other products.

In Australia, transport vehicles should be exclusively dedicated to the transport of organic animals or be cleaned before loading animal.

In South Africa and India’s legislation, permitted conditions of storage are also specified, such as controlled atmosphere, cooling, freezing, drying and humidity regulation. In South Africa, a list is also provided of the cleaning, disinfecting and sanitizing agents allowed for use in facilities.

In United States, legislation prohibits the use of packaging materials, storage containers or bins containing synthetic fungicides, preservatives, or fumigants, as well as the use or re-use of any bag or container that has previously been in contact with substances that risk comprising the organic integrity of a product. (FAO, 2012)

**Labelling**

**European Union Regulation** 834/2007: reference to organic agriculture on labels is only allowed for products that satisfy production and processing requirements established under the legislation. In addition, the regulation prohibits terms or practices in labelling and advertising that are liable to mislead consumers, such as “bio” or “eco”.

**Canada:** the legislation provides that the use of “biodynamic”, “biological”, “ecological” or “organic” on labels or in advertising means that the product has been labelled as “organic”.

**United States:** raw or processed products that contain 100 percent organically produced ingredients can be labelled “**100 percent organic**” those with at least 95 percent organically produced ingredients can be labelled “**organic**” and those with 75 percent can be labelled “**made with organic**”.

**Argentina:** single-ingredient 100 percent organic products can be labelled “**product of organic agriculture**” or “**ecological products of animal origin**” on the sales display; multi ingredient products with at least 95 percent organic ingredients can bear the same label but need to specify which ingredients may only contain an indication in the ingredients list for the ingredients used that are organic.
India: single ingredient 100 percent organic products can be labelled “product of organic agricultural”; multi ingredient products with at least 75 percent organic ingredients can be labelled “made with organic ingredients”; and multi ingredient products with less than 75 percent organic ingredients may only contain in the indication in the ingredients used that are organic.

Canada, the Philippines and South Africa, multi ingredient products with at least 95 percent organic ingredients may be labelled as organic; multi ingredient products with 70-95 percent organic ingredients can be labelled with the statement “contain X percent organic” or “made with organic ingredients”; whereas products with less than 70 percent organic ingredients may only contain an indication in the ingredients list for ingredients that are organic. (FAO, 2012)

Additional requirements

Canada: it is clarified that all labels must specify the name of the certification body that certified the producer as organic, and for imported organic products it is necessary to include the statement “product of... (country)” or “imported”.

European Union: legislation spells out a number of requirements for organic labels and claims, such as the need to include the code number of accredited certification body. References to organic agriculture methods for in-conversion products are prohibited.

India: the label should identify the person or company responsible for the production and processing of the organic product, including additives, should be listed on the label by their percentage of the product’s weight.

Turkey: the label must include the name of the product and information about its certification; the fact that the product has been produced in accordance with relevant legislation; the name, code number, certificate number and logo of the competent certification body; information on the ingredients; the origin of the product; even imported products must be labelled in Turkish.

Australian law addresses the size of the wording on organic labels: organic ingredients must appear in the same color, style and size as other listed ingredients.

Japan: in-conversion organic products (except for animal products) can be labelled as “organic under conversion period” if they have been under organic management for at least 12 months.

Use of marks

Organic agriculture legislation regulate the use of the word “organic” and associated terms. Some legislation includes the use of a pictogram (mark or logo). Use of such a mark can be compulsory or optional.
Inclusion of the official logo on the label is compulsory for all pre-packaged organic food produced in the **European Union**, whereas for imported products the use of the logo is optional.

In **India**, the use of the logo is mandatory for all certified products originating in the country.

In **Japan**, the use of the logo is voluntary, but when it is used, there are a number of compulsory indications that should accompany it.

In the **United States**, inclusion of the logo of the competent authority or certification body is voluntary for products labelled as “100 percent organic” or “organic”. (FAO, 2012)

**Conclusion**

1. Organic farming is being promoted in different countries to address environmental problems resulting from the use of chemical materials in agriculture. The popularity of organic foods continues to grow dramatically: organic foods now constitute more than 2% of all food sales, and sales of organic foods in the United States surpassed $13.8 billion in 2005. Consumers purchasing organic foods may do so for different reasons, including benefits to the environment, animal welfare and the perception that organic foods are safer and more nutritious.

2. Recent food crisis such as mad cow disease have lessened consumer confidence in foods in general and especially in conventionally produced foods that may use pesticides, antibiotics, and other chemicals in food production. The results show that organic fruits and vegetables possess fewer pesticide residue and lower nitrate levels than do conventional fruits and vegetables. Because organic fruits and vegetables do not use pesticides or synthetic fertilizers, they have more biochemical energy to synthesize beneficial secondary plant metabolites such as polyphenolic antioxidants as well as naturally occurring toxins.

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