# Organic Dairy Farming – An Overview

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## Abstract

Organic Dairy farming means raising dairy animals on organic feed and providing them the access to pasture, along with the restricted usage of antibiotics and hormones. Whereas organic fruits, vegetables, grains, and some livestock have long been mainstays of the organic movement, organic dairy is a relative newcomer. Organic dairy surged into the organic marketplace in the 1990s, establishing itself as a major category. With the increase in the awareness and health consciousness among consumers, demand for organic products including milk is increasing. The fact that most organic markets and consumers are in developed countries and are prepared to pay a premium for organic products makes organic farming a niche area with excellent prospects for exports. This article provides an insight into the various aspects of organic dairying including the benefits and authenticity determination of organic milk along with the relation of organic dairying with the green house gas emissions. Potential, constraints and opportunities in the development of organic dairy farming have also been discussed.

**Keywords:** organic; dairy; farming; milk

# Introduction

The food production and supply has increased by the use of fertilizers, antibiotics, drugs, agrochemicals and improved feeds but now-a-days, consumers have become quality-conscious and are increasingly seeking environmentally safe, chemical-residue free healthy foods, along with product traceability and a high standard of animal welfare, which organic production methods are said to ensure (Chander et al., 2011). Organic production is not only a challenge for producers in developing countries but it offers new export opportunities as well.

According to the Codex Alimentarius Commission, 'Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfill any specific function within the system' (Codex Alimentarious, 2007).

Organic production is knowledge and management-intensive. Producers must be well versed in organic production standards, principles and practices, which require a high degree of knowledge and skill. In organic production, it is not simply the final product but the whole production process that must be inspected and approved by the accredited certification bodies. Organic livestock farming is still evolving, and further research is needed to make it sustainable.

The organic farming movement is commonly agreed to have begun in the 1940s in England with the writings of Sir Albert Howard, who learned about organic practices in India during the 1920s. In the U.S., the birth of the organic movement is commonly credited to J.I. Rodale. The reasons for producing and purchasing organic food are individual and can be complex. However, most will fall into three categories: health, community, and environment. The organic movement is built on a fundamental principle: healthy soils lead to healthy crops, healthy animals, healthy humans, and a healthy planet (Pierce and Tilth, 2014). Organic crop and livestock production focuses on building soil organic matter and biology to create a sustainable, dynamic environment for producing healthy food and feed. Organic agriculture is also seen as a way to sustain and support family farms in preference to faceless, ever-expanding mega- and corporate farm models.

Farmers in resource-constrained countries traditionally use few external inputs, such as allopathic medicines and antibiotics, and follow grazing-based extensive or semi-intensive production systems. In many ways, they are thus closer to organic farming systems, though largely by default. However, a lack of appropriate agro-ecological knowledge means that they fail to gain most of the environmental, social and economic benefits of organic management, which translate into ecological intensification (i.e. sustainable farming). Nevertheless, developing countries are becoming important suppliers of organic foods, since organic practices tend to suit the conditions under which their producers farm, especially in the case of smallholders living in rainfed areas. The fact that most organic markets and consumers are in developed countries and are prepared to pay a premium for organic products makes organic farming a niche area with excellent prospects for exports. Organic farming is practised in 160 countries and 37.2 million hectares of agricultural land are managed organically. Global sales of organic food and drink reached US$54.9 billion in 2009 (Willer and Kilcher, 2011). Forty percent of the world's organic producers are in Asia, followed by Africa (28%) and Latin America (16%). The countries with the most producers are India (677,257), Uganda (187,893) and Mexico (128,862). Yet animal products are still a small share of the organic market, compared to fruits, cereals and herbs, and, in terms of exports, are almost negligible in developing countries (Willer and Kilcher, 2011).

Organic Dairy farming means raising animals on organic feed (i.e. pastures cultivated without the use of fertilizers or pesticides), have access to pasture or outside, along with the restricted usage of antibiotics and hormones (Oruganti, 2011). Products obtained from organic dairy farm are the organic dairy products. Whereas organic fruits, vegetables, grains, and some livestock have long been mainstays of the organic movement, organic dairy is a relative newcomer (Pierce and Tilth, 2014). Organic dairy surged into the organic marketplace in the 1990s, establishing itself as a major category. The success of organic dairy can largely be attributed to several critical events, including a response to Monsanto's introduction in 1994 of genetically modified or recombinant Bovine Growth Hormone (rBGH). The proliferation of rBGH use, coupled with increased consumer awareness of genetically modified corn, soybean, and other crops treated with an array of synthetic pesticides being fed to livestock; the feeding of slaughter by-products to ruminants and concerns about mad cow disease; and the increased use of synthetic medications including hormones, antibiotics, and steroids have encouraged many consumers to seek organic dairy products. These consumers have come to rely on the assurances of certified organic dairy as a trusted source of unadulterated dairy products.

## Standards for organic milk production

To produce organic milk farm must be registered with an organic control body and production system adopted must meet the organic standards. Five organic standards are important and have a worldwide acceptance, viz. European Union Regulation (1804/ 1999), Organic Food Products Act (OFPA) of USA, Draft Guidelines of Codex/WHO/FAO, United Kingdom Register of Organic Food Standards (UKROFS) of UK and the International Federation of Organic Agricultural Movements (IFOAM) basic standards. It has been reported that there are 468 organizations worldwide which offer organic certification services (Yadav, 2008). Most certification bodies are in Europe (37%) followed by Asia (31 %) and North America (18%). The countries with the most certification bodies are US, Japan, China and Germany. Forty per cent of the certification bodies are approved by the European Union, 32% have ISO 65 accreditation and 28% are accredited under the US National Organic Program. Steps involved in certification include registration of producers and the processing industries, provision of basic information on the crops and farm, and inspection and verification of farm, processing unit, production methods, and production practices by the inspector appointed by the certifying agency like APEDA (Agricultural Products Export Development Agency), NSOP (National Standards for Organic Products), USOCA (Uttrakhand State Organic Certification Authority) appointed by Government of Uttrakhand, ECOCERT appointed by Ministry of Agriculture, Govt. of India etc. For the production of organic milk the following recommendations (Alexander, 2010) should be considered:

a) *Conversion to organic from conventional farming***:** For progressing from conventional to organic production, conversion planning is very important. Either the whole farm will be converted in one block or the conversion may be phased over a number of years. A minimum of two years are required to convert the land to organic status. Organic milk can be produced from the day when land attains full organic status. For achieving organic status, herd must have started nine months and feeding six months prior to the intended organic milk production date.

b) *Feeding:* All feedstuffs used on the farm must be produced and certified to organic standards from the start of conversion. All the feed required should be produced on the farm and maximum use of grazing should be made. At least 60% feed should be obtained from the farm or from linked organic farms and up to 30% may come from in-conversion sources. The balance of the ration should meet full organic standards. Compound rations and purchased blends must be 100 percent organic. Mineral supplementation is only permitted where trace element requirements cannot be met by the practices of organic husbandry. Some synthetic vitamins may be used, but subject to permission being granted by the control body. Clover-based fodders are crucial for the success of organic dairy farms as they are the main source of nitrogen. Molasses if used must also be organic.

c) *Soil fertility:* Soil fertility can be maintained by appropriate rotations, alternating silage and grazing ground where possible and the careful usage of recycled manures and slurry. Synthetic fertilisers are not permitted for use in organic agriculture but the use of lime or some natural sources of nutrients is permitted.

d) *Livestock manures:* Manure may be brought in from other farms that are organic too. The maximum applied to any one area should not exceed 250 KGN/ha/yr. Poultry litter from registered organic farms may also be used. For the use of manure produced on conventional farms permission may be sought from the concerned authorities.

e) *Housing:* Space requirements may differ between different control bodies. Cows must be provided a comfortable, dry bedded lying area. Well bedded loose housing is preferred. Dairy cows should be provided a minimum of $6m^2$ per animal. Space requirements for young stock should range from 1 to$1.75m^2$ per 100 Kg live weight. Slats used should not be more than half of the floor area available to each group of stock.

f) *Animal health:* All cohorts and progeny of Bovine Spongiform Encephalopathy cases must be removed from the herd before starting conversion. Preventive management and homoeopathic remedies are always encouraged. Veterinary medicines and antibiotics must not be used as a preventive medicine but may be used to prevent distress in the event of illness or injury with the withdrawal period at least twice the stated withdrawal period. Control of mastitis can be done by good management practices including teat dipping, and culling cows with high cell counts. Parasitic control may be achieved through careful grazing management practices to minimise exposure to infection. Some anthelmintics which have been agreed with the control body, may be used as part of a control programme, and to treat animals where clinical symptoms occur. Vaccination is permitted, under derogation, in cases where there is a known disease risk. Organic status is lost if animals receive more than three courses of treatment within one year with the exception of vaccination, treatment for parasites and any compulsory eradication schemes. Livestock which lose organic status then have to go through a further conversion period to regain it. If organophosphorus products are used, organic status forever.

g) *Sources of stock:* Purchased cattle must not come from herds which have had a case of Bovine Spongiform Encephalopathy in the previous six years. When a farm is converted to organic production the existing livestock can be retained but can never be sold as organic but the milk from these cows and their progeny can be sold as organic following the required conversion periods. Up to 10 % of the breeding herd can be replaced each year from conventional herds. For feeding calves upto the age of 12 weeks whole organic milk should form at least 51 percent of the overall ration. Surplus calves may be sold to other organic or conventional producers. Stock

bulls can be purchased from conventional farms or hired bulls can be used provided they are managed to organic standards when they come onto the organic farm. Artificial insemination is also permitted.

h) *Selling of organic milk:* To access premium prices for organic milk it is necessary to sell milk through an organically registered processing outlet. Marketing should always be considered before starting production. Approved sterilants may be used in milking parlours and dairies.

i) *Dairy bred beef calves:* If there is no beef enterprise on the dairy farm it is worth considering making links with organic beef rearers and finishers who might be interested in purchasing weaned calves. Choice of bull breed should also be given consideration.

## Benefits of organic milk

Organic milk has more beneficial Omega-3 (Lairon and Huber, 2014), less damaging Omega-6 (Benbrook et al., 2013). Omega-3 is an essential fatty acid which is required for healthy growth and its deficiency leads to various health problems that have seemed to increase in recent years. Regular intake of omega 3 fatty acids protects from various diseases and helps to reduce the incidence of heart disease, inflammation (in skin diseases like eczema), cancer, and arthritis (Annon, 2014). The organic milk also contains greater amounts of conjugated linoleic acid (CLA) (Mercola, 2014). Conjugated linoleic acid (CLA) increases the body's metabolic rate, immunity to disease, and muscle growth. It also reduces abdominal fat, cholesterol, and allergic reactions (Annon, 2014).

Organic cows are grazed on pastures that are grown through organic means. Therefore, their milk is not contaminated with harmful chemicals such as the residues of pesticides, fertilizers and hormones (Singh et al. 2011). Furthermore, this nutrient-rich organic milk does not contain traces of antibiotics, GM feed, urea, or fertility hormones, as these are not fed to the cows to increase their milk production.

Organic milk has a two to three times higher concentration of antioxidants like lutein and zeaxanthin than non-organic milk (Mercola, 2014). Lutein is extremely important for eye health and is effective in preventing numerous eye diseases such as macular degeneration and cataracts. Zeaxanthin is also important for good eye health. It protects the eye from UV damage and the impact of free radicals. It is very helpful in preventing cataracts, diabetic retinopathy, glaucoma and macular degeneration.

Organic milk has a higher concentration of vitamins such as Vitamin A and Vitamin E than conventional milk. Since organic cows graze on fresh grass and clover, the milk they produce has about 50% higher Vitamin E and 75% higher beta carotene (Nielsen and Nielsen, 2004).

## Determination of organic milk authenticity

Natural stable isotopes of carbon and nitrogen (12C, 13C, 14N, 15N) have abundances unique to each living creature. Therefore, measurement of the stable isotope ratio of carbon and nitrogen ($\delta 13C = 13C/12C$, $\delta 15N = 15N/14N$) in milk provides a reliable method to determine organic milk (OM) authenticity. Chung et al (2014) determined the authenticity of organic milk by using $\delta 13C$ and $\delta 15N$ and concluded that mean carbon isotope ratio ($\delta 13C$) was higher in organic milk (OM) than in conventional milk (CM); mean nitrogen isotope ratio ($\delta 15N$) was lower in the OM than in the CM, and the combination of $\delta 13C$ and $\delta 15N$ was more effectively distinguished between OM and CM.

## Energy use and green house gas emissions

Organic milk production inherently increases methane emission and, therefore, can reduce global warming potential only by reducing emission of carbon dioxide and nitrous oxide considerably (Boer, 2003). Bos et al. (2014) calculated energy use and greenhouse gas emissions in Dutch organic and conventional farming systems and reported that energy use and greenhouse gas emissions per unit milk in organic dairy are approximately 25% and 5-10% lower than in conventional dairy. The study conducted by Kimming et al. (2014) reveals that organic milk producers can become self-sufficient in energy and reduce total GHG emissions from milk production by 46% in the Biogas system.

**Potential of organic dairy farming in India**

India has a huge potential of organic milk production. The dairy production practices in India are not highly intensive as is the case with other developed countries in dairying. Some of the agro-climatic regions of the country are best suited for organic milk production. These areas include the rain-fed areas of Rajasthan, Gujarat, Madhya Pradesh, hilly areas of Himachal Pradesh, Uttaranchal, Jammu and Kashmir, Tamil Nadu and whole of North-Eastern region. In fact the production practices followed in many of these areas are very natural and the milk presently being produced is almost organic. There are some areas in the country (especially mountain areas) and communities (certain tribes) where the green revolution technologies have so far not reached and did not adopt the use of agro-chemicals. These areas have been classified as "organic zones" (Singh, 2007). The North Eastern region of India provides considerable scope and opportunity for organic

farming due to least utilization of chemical inputs where it is estimated that 18 million hectares of such land is available which can be exploited for systematic organic production (Ghosh, 2006). The small farmers of these areas producing a few litres of milk daily are not in a position to market it as organic milk due to ignorance and due to unavailability of local market for organic produce. The Trans-Gangetic plains region of Punjab, Haryana, Western U.P. and parts of Rajasthan have witnessed the most intensification of crop husbandry by way of intensive crop rotations and the heavy use of inorganic fertilizers and agro-chemicals. However, even in this region, dairy farming has not received much intensification as has been the case with advanced countries and, therefore, is amenable to conversion to organic with little effort. The organic dairy farming has a good scope in the country as it is the small holder's low input, crop residue fodder based production system contributing 70% of total milk production of the country (Kumar et al., 2005). They recommended that in order to tap the organic milk produced in interior rural areas; the cooperative organization should come forward for certifying, procurement, processing and marketing of organic milk.

## Constraints in the development of organic dairy farming

Some of the constraints in the development of organic dairy farming have been enlisted by Kamboj and Prasad (2013) include lack of knowledge and awareness, restriction on landless organic dairy farming not permitted as per the National Standards of Organic Production (NSOP), limited availability of organic feed ingredients for formulating compound organic feed, problem of maintenance of proper records, limited reach of certification services and lack of proper procurement, processing and marketing infrastructure and network.

## Opportunities

Demand for organic livestock products is growing in the USA, EU, Japan, Argentina and Brazil. Belgium, Luxembourg, the Netherlands and the UK import significant amounts of organic produce. Consumers pay a large price premium for organic food in Austria, Belgium, Germany and the UK. Native breeds of livestock, which predominate in tropical countries, are less susceptible to stress and disease, and so the need for allopathic medicines and antibiotics is much lower. Grass-based, extensive production systems and forest-based, animal production systems that are prevalent in many areas of these countries have considerable potential for conversion into organic animal husbandry. Literacy is on the rise and the media are making consumers more aware of and concerned about animal welfare issues and healthy foods. This may well boost the domestic consumption of organic foods.

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