

A part of sustainable agricultural sector: biodynamic agriculture

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Abstract

Biodynamic agriculture is the oldest environmental farming culture. It is the most sustainable farming method that can be applied in all climate zones. The founder of biodynamic agriculture; Rudolf Steiner was a philosopher, scientist, educator, artist and founder of anthroposophical school, who was born in Austria in the second half of the 19th century. As a result of researches and observations about the human spirit; Rudolf Steiner has developed a new perspective in the field of agriculture as in other fields. The impact of nature, humanity and the environment on the continuation of life on the cosmos and distant planets is the basic philosophy of biodynamic agriculture. Thus, the concept of ecological-organic agriculture has begun to be introduced again. For this purpose, "Biodynamic Agriculture" came to life with the information given to farmers under the title of "Agricultural Courses" in 8 different seminars at Koberwitz in 1924. In Turkey, the first biodynamic agriculture applications started in 1991. Then, it continued with 101 farms. In 2017, 1 handler and 163 farms were registered. In addition; Turkey's first integrated Biodynamic Agriculture farm was established in 2014. Likewise, "Turkey Demeter Biodynamic Agricultural Association" was founded in 2018. Nowadays, continuing education and social projects in Turkey, the development and spread of biodynamic agriculture will continue to increase.

Keywords: Biodynamic Agriculture, Organic Agriculture, Ecology, Anthroposophy.

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INTRODUCTION

Until the 20th century, agricultural production in the world's history was carried out using traditional methods, which were completely dependent on natural conditions, precipitation and climates with low productivity (Mithunesh et al., 2015; Dung and Hiep, 2017). At the beginning of the 20th century; the aim was to provide enough agricultural production to feed the rapidly growing world population. Therefore, in addition to traditional agricultural methods, synthetic materials, herbicides, pesticides, and inorganic fertilizers were used (Çetiner, 2005). However, the greenhouse gases produced due to unconscious use of synthetic chemicals, inorganic fertilizers and pesticides have contributed to the warming of the atmosphere. So climate changes have occurred, the intensity and intensity of extreme natural phenomena have started to increase and caused difficulties in agricultural operations (tillage, irrigation, spraying, etc.), making it difficult to control diseases and pests. Thus, the yield and quality of agricultural products were adversely affected, the environment and human health were damaged (Çetiner, 2005; Demir 2009; Akalın, 2014; Başoğlu and Telatar, 2013; Kanat and Keskin, 2018). In the face of the adversity experienced in this period, the

search for alternative production systems has been started to protect human health, environment and to recover the productive soil that is about to be lost. The concept of agroecology emerged in this process. With agroecology, natural production methods have been put into practice by using less or no use of fossil fuels and synthetic inputs and thus, sustainable agricultural management has started to be established (Bilgin and Akyüz 2008). Sustainability of agroecology is in a specific area leading to the production of a wide variety of products, it is achieved by utilization of the creation of multi-cultural and natural systems. In this context; good agricultural practices and multiple organic farming methods (normal organic farming and biodynamic organic farming) have been developed and came into prominence (Ponzio et al., 2013).

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Development of Biodynamic Agriculture in the World

In light of ecological principles, it is not recommended to use inorganic fertilizers, pesticides, and herbicides, etc. Biodynamic agriculture is a form of agricultural production that does not allow the use of chemicals and provides psychological rehabilitation for producers (Kurtuluş, 2019). Therefore, biodynamic agriculture is the oldest environmental culture of agriculture and the most sustainable form of processing that can be applied in all climatic zones. For centuries this ancient knowledge of agriculture has been passed on from generation to generation. In the 19th century, the chemist Justus von Liebig (1803-73) changed the direction of agriculture. As a result of his work in Liebig he suggested that mineral salts "especially nitrogen" are essential nutrient sources for the development of plants and can be completely substituted as fertilizer. Same way; he discovered the "Minumum Law", which determines the effects of mineral salts on plants. When it comes to the 1910s; chemists Fritz Haber and Carl Bosch have found a new ammonia synthesis process using nitrogen in the atmosphere. With this discovery; the new form of ammonia has been used for fertilizer purposes (Önalı, 2014). This approach has been widely accepted, but over time the soil quality has declined due to the excessive use of synthetic chemical agricultural inputs in these applications and soils have become insufficient for production. Due to this trend in the agricultural field; In 1910, Albert Howard's "Agricultural Testament" was expressed in England to counteract negative problems. In 1924, in Koberwitz, Dr. Rudolf Steiner was a philosopher, scientist, educator, artist, esoteric, author and founder of the anthroposophical school, organized a course on "Biodynamic Agriculture Method" in 8 different seminars. With the information he gave under the title of "Agriculture Courses" he founded the Biodynamic Agriculture Institute in 1928 (Deviren and Çelik, 2017). According to Rudolf Steiner; when a farm is considered as a self-sufficient independent entity, a unique enterprise, it means that it has fully found itself and has attained its essence. If an agricultural enterprise is based on these principles, the viability of the soil, the development of the plants and the ability to establish its resources for livestock breeding in favorable conditions, then it is possible to talk about the farm organism (Adams, 2004; Bayturan, 2018). The main objective of a biodynamic farm is to produce by combining the natural and ecological production experiences obtained since ancient times with the cosmic effects of sun, stars, planets, and moon. Same way; to develop the criteria related to natural sciences used in production and to see the effect of spiritual realities. The experiences gained during the production stage are applied in many fields such as education and social life. They give importance to nature, people, environment and protect the balance and cleanliness of nature within the scope

of Anthroposophical view which is defined as "spiritual development path" (Thun, 1994; Reganold, 1995; Çakır et al., 2018).

Biodynamic agriculture shows rapid growth worldwide. Consumers quest for healthy food increases the demand for biodynamic agricultural products. Biodynamic products, which have been promoted worldwide by various organizations, attract great attention, especially in the European market. As of 2019, biodynamic cultivation is carried out on 202000 hectares of land and 150000 hectares of these areas are located on the European continent. There are 5918 certified farms in many different regions of the world and 3806 farms are in the European continent (Anonymous, 2019).

Biodynamic agricultural products are marketed under the "Demeter" brand name worldwide. The Demeter brand can be used by certified manufacturers. Products that undergo a thorough inspection and verification process can be monitored and controlled at every stage. Holistic Demeter requirements exceed the requirements of states (Aschemann et al., 2007; Velcovska et al., 2012).

Biodynamic Agriculture in Turkey

In Turkey since the early 1980s, organic agricultural products, which are considered to be commercial, have been produced without a system. As a result of the demands from abroad, the certified production method has been started since 1985. In parallel with the increase in the consumption of healthy foods in the world, demand and production have increased in Turkey throughout the process. In parallel with this development, the first biodynamic production applications were observed in 1991. To control the production in this rapidly developing field, the Ministry of Agriculture and Forestry issued the regulation on "Production, Processing and Marketing of Vegetable Animal Products Produced by Organic Farming Methods" in 1994. Then production was accelerated by the "Regulation on the Principles and Application of Organic Agriculture" issued in 2002 and the "Agricultural Organic Agriculture Law" which came into force in 2004. In the process to date, changes have been made in this law and regulation. These amendments have been finalized by attunement with EU regulations. As a result; in 1985, 8 kinds of organic product labels can be hit, today up to 213 kinds of organic production permits have been issued. As of now, a total of 2.2 million hectares of land in organic agricultural products are produced in Turkey (Anonymous, 2018).

In parallel with organic agriculture, Biodynamic Agriculture was produced in 101 farms in 485 ha area in 2008 and according to 2017 data, it is carried out in 163 farms in 1019 ha area. Also; for the first time in Turkey, "İstafil Farm" integrated under the name of Biodynamic Agriculture farm was established in Istanbul and in 2018 the "Demeter

Turkey" was established as an association. Biodynamic agriculture in Turkey, is being expanded with educational and social projects that organized by civil society organizations, volunteers and some companies (Sayın et al., 2005; Karadağ, 2018; Anonymous, 2019).

Distinctive Features of Biodynamic Agriculture Preparations

Although Biodynamic agriculture is similar to organic farming, both methods are different in terms of practices. The biodynamic farming system has solid rules than organic agriculture. A distinctive feature of biodynamic agriculture is the use of nine biodynamic preparations described by Steiner to improve soil quality and increase plant life. In biodynamic agriculture; special preparations containing natural and organic substances are applied according to a certain application schedule and thus separated from organic agriculture to increase the energy density of soil and plant. Thus applications add vitality to the system. Therefore; every biodynamic agricultural product is an organic agricultural product but not every organic agricultural product is a biodynamic agricultural product (Babita and Thakur., 2015; Çakır et al., 2018).

After dilution and mixing procedures called diluents, it usually consists of small amounts of composting, fertilizer, mineral, plant or animal manure extracts fermented and applied directly to plants.

Cosmic effects are also taken into account when preparing and using biodynamic preparations in agriculture and take place in three stages.

- a- Preparation of plant parts which are the essence of the preparation.
- b- The use of organs of animal origin which are also spiritually evaluated for the fermentation of plant parts.
- c- The preparation is applied at the most appropriate time determined by the evaluation of environmental and cosmic effects (Babita and Thakur., 2015; Çakır et al., 2018).

The preparations obtained are prepared for administration under three different conditions. These; field preparations, preparations used for composting and used against diseases.

Field preparations; BD 500 (Horn Manure) and BD 501 (Horn Silica). These preparations are applied to the field by mixing with water and spraying. BD 500 (horn manure preparation), the "prime starter of biodynamic". It is obtained by placing cow manure in the cow horn and providing fermentation. It is prepared by stuffing the dung of a lactating cow into a horn and buried in the soil during the autumn equinox (September) and taken out during the spring equinox (March). The humified dung from horn is stored in an earthen pot away from sunlight (Sharma et al., 2012)

BD 501 "cow horn silica"; It is prepared with quartz crystals powder which is prepared under the

soil inside the cow horn. It is buried during spring equinox, and taken out during autumn equinox. The material, stores in glass bottle (Sharma et al., 2012; Giannattasio et al., 2013).

Compost preparations; BD 502 Yarrow blossoms (*Achillea millefolium L.*), BD 503 Chamomile blossoms (*Matricaria recutita L.*), BD 504 Stinging nettle shoots (*Urtica dioica L.*) BD 505 Oak bark (*Quercus robur L.*), BD 506 Dandelion flowers (*Taraxacum officinale L.*), BD 507 Valerian flower extract (*Valeriana officinalis L.*) and these preparations are catalyzed in animal organs and applied into compost heaps (Reeve et al., 2010).

For diseases, the preparation prepared with code BD 508 Horsetail (*Equisetum arvense*) is applied. It can be used as a tea to control fungus in the early season. It should be sprayed at full Moon (2-4 days before) and at Moon opposition Saturn.

The preparations are used in homeopathic amounts, which means, they affect even in extremely diluted amounts (Carpenter-Boggs et al., 2000; Giannattasio et al., 2013; Ram and Pathak, 2016).

Biodynamic Compost

Biodynamic compost is an essential component of the biodynamic method. It is used as a way of recycling animal manure and organic waste, stabilizing nitrogen, forming soil humus and improving soil health. Biodynamic compost acts as a source of humus in the management of soil health, and biodynamic compost emits energetic frequencies to stimulate the farm (Turinek et al., 2009).

The traditional method of making biodynamic compost is very meticulous. After compost scanning, preparations 502–506 are strategically placed in the holes which are 150 cm to 215 cm away, drilled into the cluster at a depth of about 50 cm. Preparation No. 507 or liquid valerian is applied by spraying or manually watering the outer layer of the compost (Diver, 1999). On larger farms with large amounts of compost raw materials, bulks are usually managed by a compost turner, so the ripening time of the compost is shorter (Brinton and York., 1993; Ram and Pathak, 2016).

Biodynamic calendar

In biodynamic agriculture, a guide lunar calendar is used which shows the days and even hours when biodynamic preparations can be used, planting, harvesting, irrigation, pruning, animal care, pest control, natural changes. This calendar was developed by Maria Thun based on the relationship between cosmic forces and the development of plants and is still in use today by many farmers engaged in biodynamic agriculture all over the world. (Thun, 1994; Anonymous, 2019).

RESULTS

Biodynamic agriculture is a form of production that includes not only material but also the

strength of the universe and anthroposophical, heals the soil in natural ways, ensures the balance of nature and the spiritual development of human. Therefore, it is the most environmentally and sustainable agricultural method.

Due to the problems seen in the environment, soil, plant, human and animal health and because of inorganic chemicals used uncontrolled in conventional farming methods; biodynamic farming practices are rapidly becoming widespread due to the need to return the production system that protects nature and living things we have known for a long time.

Biodynamic agricultural products are healthier with their higher dry matter, better quality and color values than conventional agricultural products. Although the fact that yield factor is lower than conventional production is in line with the logic that biodynamic farming, it is seen as a philosophy of life that protects the environment and living things rather than a commercial point of view and provides balance.

The increase in demand for biodynamic farming products is a great opportunity for Turkey because of suitable climatic and ecological advantages of Turkey for Biodynamic agriculture system. Moreover, being close to the European market will provide economically high income for producers, especially by adding high value-added products to production. The general location of Turkey, geographic conditions, unpolluted structure, the diversity of plant and animal products, in conditions very well adapted to the native fauna is rich in care. It has great potential for organic agriculture in terms of having natural meadows and pasture areas in livestock regions and having sufficient labor force (Bayram, 2007). Turkey's east transition to organic farming is easier compared to other industrialized regions (Demiryörek, 2011).

Products produced by biodynamic farming methods are offered to fresh consumption and also used especially in cosmetic and health sectors. These raw materials have high added values and many companies supply them from Turkey. In order to spread biodynamic agriculture as in developed countries, first of all, the importance of the subject should be understood both in scientific and practical terms, and the demand should be created by transferring the results to producers and consumers.

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