ALTERNATIVE PRODUCTION SYSTEMS IN THE AGRICULTURAL SECTOR AND DEVELOPMENTS IN TURKEY

Ö. C. Niyaz[1], N. Demirbaş[2], İ. H. İnan[3]

Review paper

Summary

It is apparent that throughout history farmers have slowly learnt to develop manuring or tending practices to grow plants and manipulate their agricultural systems and at one time the organic approach using crop rotation, manures and some mineral fertilizers, appeared to be the only dominant method. After the Second World War, poverty and famine had been experienced, and Green Revolution period which was to gain maximum fertility out of one unit area was run through. Subsequent to this period, a number of negative events like soil and water contamination and incremental costs emerged. However, during the last two hundred years a number of other approaches to assist in growing and fertilising plants have emerged.

Alternative agriculture systems such as organic agriculture, good agricultural practices, greenhouse production and soilless agriculture are also applied in Turkey. Even though Turkey's legal background for these issues is relatively young, it is one of the pioneering countries in alternative agricultural systems. Particularly, some alternative production systems are extensively used in Turkey. In fact, Turkey is among the top four countries in the world, and one of the best two countries in Europe in the aspect of greenhouse production areas. The aim of this study is to review literature about alternative production systems and to discuss the developments that occur within these systems in Turkey. This study is based on literature survey.

Key words: *Sustainable Agriculture, Alternative Production Systems, Organic Agriculture, Good Agricultural Practices, Greenhouse Production*

INTRODUCTION

Global agricultural production increases in parallel with population growth in the world. Natural resources are being irreversibly damaged by the struggle to increase production with limited resources. As a consequence of this, alternative agricultural systems that meet the requirements of constantly growing population while preserving natural resources have recently become important.

Despite this, the fact that there are very few studies related to this issue, and contradictions in terms are visible in almost every data source. As the alternative agricultural systems were examined separately in most sources, this study interprets as a whole.

Alternative agriculture is usually based on sustainability, and terms relating to sustainable agriculture and alternative agriculture are used in place of each other in most sources. However, while most sources use these terms interchangeably, (Reijntjes et al,1992; Reganold, 1993; Smolik et al., 1995; Jhamtani, 2007; Benbrock, 2010; Conway and Barbier, 2013), other sources differentiate between them (Parr et al, 1992; Claxton, 2012). Furthermore, in some other sources, each of these terms is said to encompass the other (Parr and Hornick, 1989; Lasley et al.,1993). Some papers avoid defining the terms altogether because of the confusion (Rigby and Caceres, 1997; Feurer, 2008). Only a limited number of sources define almost all the terms related to the topic (Benbrock, 2010; Anonymous, 2011).

According to the United States Environmental Protection Agency, "sustainability is based on a simple principle: everything that people need for their survival and well-being depends, either directly or indirectly, on their natural environment," and "sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, that permit fulfilling the social, economic, and other requirements of present and future generations" (Anonymous, 2013d). The term *alternative* simply means different from the conventional.

Judging from this, it can be said that alternative agriculture differs from a conventional agriculture system and usually complies with principles of sustainability. Sustainability is a three dimensional concept, consisting of economical, environmental, and social dimension. Alternative agricultural systems may not cover all of these

[1] Canakkale Onsekiz Mart University, Faculty of Agriculture, Department of Agricultural Economics, 17100, Çanakkale, Turkey.
[2]Ege University, Faculty of Agriculture, Department of Agricultural Economics, 35100, İzmir, Turkey.
[3]Namık Kemal University, Faculty of Agriculture, Department of Agricultural Economics, 59100, Tekirdağ, Turkey.
Correspondence: Özge Can Niyaz, ozgecanniyaz@comu.edu.tr

three dimensions at the same time. For instance despite being an alternative agricultural systems, greenhouse farming enables the intensive use of pesticides and fertilizers. The purpose of this study is to review literature of three alternative agricultural production systems (such as organic agriculture, good agricultural practices, and greenhouse production) and to discuss the developments that occur within these systems in Turkey. In this context, relevant articles, papers, books and publications of Government Agency reviewed.

ALTERNATIVE AGRICULTURAL SYSTEMS

The general purpose of alternative agricultural systems is to minimize the environmental damage caused by intensive agricultural production and to support the continuation of agricultural activities that are sustainable from all aspects. The most-practiced alternative agricultural systems are organic agriculture, good agricultural practices, and greenhouse production.

● **Organic Agriculture:** Organic Agriculture is a production system that sustains the health of soils, ecosystems, and people. It relies on ecological processes, biodiversity, and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation, and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved (Demiryürek, 2011; Anonymous, 2013d). It aims to preserve both environmental and human health during agricultural production. It supports nature-friendly production that is harmless to human health.
Scope: It includes a wide range of products, from herbal to animal ones. In this system, natural methods are used instead of chemical methods of fighting against disease and pest control. Certified production is possible. It can be practiced in places where the soil structure has been rehabilitated to its natural form after serving as conventional agriculture land in past. Additionally, there must be no factors that damage the environment around the production area, such as factories, mines, highways, etc.
Pros and Cons: The basic benefit of this system is production that is friendly to the environment and human health. Other basic benefits include higher product sales prices (compared to those in conventional production) and production quality that is oriented toward exporting. The cons are the very high certification costs, the higher price paid by consumers, and an insufficient domestic demand.

● **Good Agricultural Practices:** These are the procedures that must be practiced in order to make an agricultural production system a socially livable, financially profitable, fertile, human-health friendly and environmentally sensitive one (Anonymous, 2010a; Hasdemir and Bayaner, 2012). Good agriculture practices aim to create phases oriented toward a reliable product supply via production that is healthy for the environment, humans, and animals, which is determined and controlled though risk analysis. It also aims to preserve natural resources and to develop accountability and sustainability in agriculture (Anonymous, 2010c).
Scope: Good agricultural practices can be practiced in annual and perennial crops production. It also covers livestock production. Agricultural products produced within this system have to be certified by specific certification groups.
Pros and Cons: The basic benefits of this system are production that is both environmentally and human-health friendly, higher product sales prices (compared to those in conventional production), and a production quality that is oriented toward exporting. If the certificates are obtained by a group, there may be a cost advantage. The cons of this system are its detailed and trouble some production process, the high certification expenses, and some problems that arise in exportation practices.

● **Greenhouse Production:** Global warming has most affected the agricultural sector known as the "Outdoor Factory." Climate is one of the most important factors in agricultural production. Since controlling the climate is impossible, greenhouse production enables increased production opportunities in controlled conditions.
Greenhouse production enables small areas to be utilized marginally, increasing the efficiency of each unit area. This makes it one of the most important agricultural activities because it secures regular, yearly production and labor (Sevgican et al., 2000).
Scope: Greenhouse agriculture covers production within greenhouses and low plastic tunnels. Greenhouse agriculture also includes soilless agriculture.
Pros and Cons: Greenhouse production uses techniques that eliminate climatic effects and enable a high-level of efficiency for each unit area. Human health and environmental factors must be considered in greenhouses where organic agriculture or good agriculture practices are practiced. In greenhouses where conventional production occurs, a higher-than-normal chemical use is implemented to further increase production efficiency.

Also, the extensive power consumption of greenhouses hastens environmental damage in situations where alternative power sources (such as solar power or geothermal power) are not utilized. The most important and unusual example of greenhouse production is soilless agriculture. In contrast to other greenhouse production systems, no soil is used in this method.

● **Soilless Agriculture:** This is the agricultural system in which materials like volcanic rocks, water, rock wool, and cocopeat are used in place of soil, while the elements (minerals and vitamins) required by plants are dosed by computers (Anonymous, 2013b). Soilless agriculture was implemented in response to the sterilization of the soil, the most important factor of agricultural production, which was a result of the intensive use of chemical input. Soilless agriculture provides a higher efficiency from each unit area compared to conventional production, depending on the product. It aims to both raise the fertility of and preserve the soil.
Scope: Soilless agriculture is a system that can be practiced in greenhouses by means of special technologies. It can be applied to plant production, especially annual and perennial crops. When compared to other production systems, the distinctive feature of this production system is its lack of soil use.
Pros and Cons: This system prevents damage to the soil since soil is not utilized in production processes. Its efficiency can be higher than that of soil agriculture. It enables resources to be used properly if geo-thermal power or solar power is used. However, greenhouses that use coal can cause extensive power use and exploitation of coal mines, and coal use simultaneously causes air pollution. Additionally, crops that threaten human health can be produced if pesticide and fertilizer use is increased.

DEVELOPMENTS IN ALTERNATIVE AGRICULTURAL SYSTEMS IN TURKEY

● **Organic Agriculture:** As of the year 2012, the number of organic agriculture producers in Turkey was 54.635, the number of organic crops produced was 204, the total area farmed was 702.909 ha, and the total organic production amount was 1.750.127 tons (Anoymous, 2013c). In animal production, the total number of producers was 151, the number of animals was 253.783, the amount of organic meat produced was 480.690 tons, the amount of organic milk produced was 17.627.06 tons, and the amount of organic eggs produced was 36.105.556. In apiculture, 355 producers worked with 47.065 hives with a 516.815-ton honey-production capacity. (Anonymous, 2013b; Anonymous, 2013c). In Turkey, there are several government promotions to benefit theses systems, such as the Government Promotion for Preserving Rural Areas (GPPRA), Environmentally Friendly Agricultural Promotions ($668/ha), and promotions based on area ($173/ha for fruits and vegetables, $49.5 /ha for crops), and promotions providing loans with interest discounts (Anonymous, 2013a).[2] The Law on Organic Agriculture (5262) was adopted on 01.12.2004 in Turkey. Later, a directive on the Basics and Practice of Organic Agriculture, which was based on this law, was prepared and published on 18.08.2010. In this directive the basics of organic agriculture, procedures about starting organic agriculture, and required actions and rules about organic agriculture are clearly stated (Anonymous, 2010b).

● **Good Agricultural Practices:** As of the year 2012, a total of 3.676 producers have realized 1.538.556 tons of agriculture on 83.717 ha of area within the scope of good agricultural practices. In Turkey, good agricultural practices are usually applied in plant productions. A government promotion for good agricultural practices that is being practiced in 47 Turkish cities has been provided as follows: $124/ha for fruit and vegetables production, $495/ha for greenhouse production (Anonymous, 2013a). Even though there is a Law of Good Agricultural Practices in the European Union, such a law does not yet exit in Turkey. In Turkey, the Directive of Good Agricultural Practices was published on 07.12.2010 as a result of changes made in the 4th, 5th, and 6th articles of the Law on Agriculture. In this directive, control and certification procedures are explained in detail.

● **Greenhouse Production:** Turkey's greenhouse production is one of the top four in the world and one of the top two in Europe (alongside Spain). As of 2011, a 6.139.000 tons production level was realized on 60.000 ha of land in Turkey. In total, the greenhouse areas are grown on 95%, fruits on 4% and cut flowers on 1% (Anonymous, 2013a; Anonymous, 2013c). A great deal of the greenhouse production pertains to soilless agriculture. Greenhouse production is promoted in two separate ways: through investment processes and in production processes. In investment processes, loans under more favorable conditions are provided, especially to producers who use alternative power sources (solar power, geo-thermal power). In the production phase, promotions such as a fuel promotion of $19.8/ha, a fertilizer promotion of $24.75/ha, a soil-analysis promotion

[2] Promotion amounts have been exchanged to USD in accordance with 2013 Exchange Dollar Currency of Turkish Central Bank.

of $12.37/ha, a greenhouse good-practices promotion of $49.5/ha, an agricultural publication and consultancy promotion of $297/ha, and a biological and biotechnical fight promotion of $2129/ha are provided. Except for the greenhouse good-practices promotion, all of these promotions extend to other production branches (Anonymous, 2013a). The "Directive on Recording the Greenhouse Production," prepared with the purpose of improving, promoting, recording, tracking and reporting the greenhouse production, was published in the Official Journal of 25.08.2012 No. 27683. Primary purpose of this directive is to promote producers to maintain recordings (Anonymous, 2010a).

CONCLUSION

Alternative production systems in the agricultural sector aim to increase fertility without harming natural resources by making optimal use of soil and water resources along with organic agriculture, good agriculture practices, greenhouse production, and soilless agriculture. Alternative production also includes benefiting from geothermal and solar energy for agricultural production.

These production systems have increasingly implemented in the Turkish agricultural sector as well as all over the world. The most important systems are organic agriculture, good agricultural practices, greenhouse production and soilless agriculture in Turkey. The numbers of organic agriculture producers, the number of organic crops, total area organically farmed and the total organic agriculture production amounts have consistently increased over the past decade. Although good agricultural practices are less widespread than organic practices in Turkey, these practices have much paid attention recently. Both organic agriculture and good agricultural practices have been supported by the government for a long time. Greenhouse production has already developed particularly some agricultural regions in Turkey for lots of fruits and vegetables which are exported to many countries.

It is clear that alternative production systems are not limited to these systems. Turkey also has other some alternative production systems such as geothermal, wind energy and solar energy. But, these systems need to be supported to improve and to extend in the Turkish agricultural sector.

In the 10th Development Plan, which covers 2014-2017, gives an important place to the term "green growth," and says that green growth is the aim in all sectors, including agriculture. Also, in the Strategy Plan published by the Ministry of Agriculture and Stockbreeding (2013-2017), the aim of extending alternative power sources was shared with public. To quicken all these developments, Turkey's legal background should be improved, investments should be oriented toward these sectors, practicable policies should be adopted, and these practices should be examined properly.

REFERENCES

Anonymous (Turkish Rebuplic Official Journal) (2010a): Directive on Recording the Greenhousing Production, No: 27638, http://www.resmigazete.gov.tr/ , Accessed: 25.08.2013.

Anonymous (Turkish Rebuplic Official Journal) (2010b): Law of Basics and Practice of Organic Agriculture, No: 27676, http://mevzuat.basbakanlik.gov.tr/ , Accessed: 25.08.2013.

Anonymous (Turkish Rebuplic Official Journal) (2010c): Law of Good Agriculture Practices, No: 27778, http://mevzuat.basbakanlik.gov.tr/ , Accessed: 25.08.2013.

Anonymous (United Kingdom Cooperative Extension Service) (2011): Glossary of Alternative Farming Production and Marketing Terms, University of Kentucky, College of Agriculture, Kentucky, USA, pp.1-6.

Anonymous, (2013a): Statistics, http://www.tarim.gov.tr/, Accessed: 20.08.2013.

Anonymous (Ministiry of Food Agriculture and Livestock) (2013b): Information about Soilles Agriculture, http://www.bahcebitkileri.org, Accessed: 25.08.2013.

Anonymous (Turkish Statistical Institute) (2013c):Statistics, http://www.tuik.gov.tr/ , Accessed: 25.08.2013.

Anonymous (United States Environmental Protection Agency) (2013d): What is Sustainability, http://www.epa.gov/ , Accessed: 22.08.2013.

Anonymous (International Federation of Organic Agriculture Movements) (2013e): Defination of Organic Agriculture, http://www.ifoam.org/ , Accessed: 21.08.2013.

Benbrock, C. (2010): What Does Sustainable Agriculture Have to Offer? Conclusions and Reccomendations in Two NAS/ NRC Reports, Washington, USA, pp.1-17.

Claxton, M., 2012, Climate Change + Inappropriate Agricultural Practices = Environmental Disaster, http://alainet.org/ , Accessed: 25.08.2013.

Conway, G. R., Barbier, E. B. (2013): After the Green Revolution: Sustaniable Agriculture for Development, Abingdon, UK, pp.1-210.

Demiryürek, K. (2011): Concept of Organic Agriculture and Status of Organic Agriculture in Turkey and Around The World, Gazi Osmanpaşa University, Journal of Agriculture Faculty, Vol.28, No.1, pp. 27-36.

Feurer, H. N. (2008): Sustainable Agriculture Techniques and Performance Oriented Empowerment: An Actor Network Theory Approach to CEDAC Agricultural and Empowerment Programmes in Cambodia, Thesis, University of Oxford, Master of Philosophy in Develeopment Studies, UK.

Hasdemir, M., Bayaner, A. (2012): Good Agricultural Practices, TEPGE, Vol.14, No. 9, Ankara.

Jhamtani, H. (2007): Putting Farmers Firts in Sustaniable Agriculture Practice, Penang, Malaysia, pp.1-31.

Lasley, P., Hoiberg, E., Bultena, G. (1993): Is Sustainable Agriculture an Elixir for Rural Communities, American Journal of Alternative Agriculture, Vol. 8, No. 3, pp. 133-139.

Parr, J. F. and Hornick, S. B. (1989): Recent Developments in Alternative Agriculture in the United States.In: The First Internatl. Conf. on Kyusei Nature Farming, Khon Kaen Univ., Khon Kaen, Thailand, pp. 1-8.

Parr, J. F., Papendick, R. I., Hornick, S. B., Meyer, R. E. (1992): Soil Quality: Attributes and Relationship to Alternative and Sustaniable Agriculture, American Journal of Alternative Agriculture, Vol.7, Special Issue 1-2, pp. 5-11.

Reganold, J. P. (1993): Effects of Alternative and Conventional Farming Systems on Agricultural Sustainability. In J. Bay-Petersen (ed.) Sustainable Agriculture for the Asian and Pacific Region. Food & Fertilizer Technology Center, Taipei, Taiwan. pp. 1-5.

Reijntjes, C., Haverkort, B., Waters, B. A. (1992): Farming for the Future: An Introduction to Low-external-input and Sustainable Agriculture, London, UK, pp.1-272.

Rigby, D., Caceres, D. (1997): The Sustainability of Agricultural Systems, , University of Manchester, Schools of Economic Studies, & National University of Cordoba, Department of Rural Development, Working Paper No:10, Argentina, pp.1-39.

Sevgican, A., Tüzel, Y., Gül, A., Eltez, R. Z. (2000): Agriculture in Greenhouses in Turkey, In:V. Technical Congress of Turkish Agriculture Engineering, pp.679-707.

Smolik, J. D., Dobbs, T. L., Rickerl, D. H. (1995): American J. of Alternative Agriculture, Vol. 10, No.1, pp.25-35.

TRCB (TR Central Bank) (2013): Dolar Value of 2013 , http://tcmb.gov.tr, Accessed: 03.09.2013.

TRMD (TR Ministiry of Development) (2013): 10. Plan of Development, http://dpt.gov.tr, Accessed: 29.08.2013.