"ION IONESCU DE LA BRAD" UNIVERSITY OF AGRICULTURAL SCIENCES AND VETERINARY MEDICINE, IAŞI
DOCTORAL SCHOOL OF AGRICULTURE,
HORTICULTURE AND ZOOTECHNICS

Doctoral research student,

Eng. IOAN SEBASTIAN BRUMĂ

RESEARCH ON THE ECONOMICS OF ECOLOGICAL VEGETABLE PRODUCTION IN PRIVATE AGRICULTURAL HOLDINGS IN THE VEGETABLE PRODUCTION AREAS OF MOLDAVIA

RESEARCH COORDINATOR,

Professor NICOLAE VASILESCU, PhD

Abstract

Key words: ecological culture of vegetables, localities with potential, cultivable areas, plausible productions, economic efficiency, the perception of the consumers.

The doctoral thesis with the title "*Research on the economics of ecological vegetable production in private agricultural holdings in the vegetable production areas of Moldavia*" consists of seven chapters, an introduction, annexes and bibliographical references.

The doctoral thesis comprises 266 pages which include 86 tables and 53 colour diagrams, figures and photos.

Bibliography comprises a number of 179 specialized titles from the country and abroad by making reference at the same time to internet addresses and links.

The introduction presents in brief the major definitions of ecological agriculture, the evolution of certified ecological cultivated areas in Romania, references to the situation of

domestic ecological vegetable farming, the market for ecological products in Europe and the quantities of Romanian ecological products destined for export in 2007 and 2008; furthermore, the main objectives of the present doctoral thesis are outlined.

The work consists of two parts, the first stage includes national and international knowledge, and the second contains the results obtained in their research and conclusions and recommendations of the author.

In the first chapter, titled *"The current state of research",* we have explored aspects related to studies and research in the field of the economics of ecological production conducted worldwide and in Romania. We considered it worthwhile to present the research projects in the field of ecological agriculture in general and of ecological vegetable production carried out in recent years in Moldavia, projects in which I was involved as an consultant or researcher.

With respect to the current state of research at global and national level, one can argue that economic research in the field is rather limited, with few published scientific papers. The large majority of publications on ecological agriculture present technical aspects, while economic aspects are dealt with only tangentially and without a clear final purpose, being mostly presented as arguments for various opinions on increasing ecological agricultural production.

Worldwide, the proponents of economic research on ecological agriculture have included the members and collaborators of the organisations IFOAM (International Federation of Organic Agriculture Movements) and FiBL (The Research Institute of Organic Agriculture).

Starting with the year 2000, FiBL and IFOAM have been implemented a joint research project, releasing the yearbook *"The World Organic Agriculture".* This publication, in addition to the statistical data collected as part of the study of ecological agriculture worldwide, provides information on recent evolutions and trends in ecological agriculture.

The renowned researchers Helga Miller and Minou Yussefi in the paper "*The World of Organic Agriculture. Statistics and Emerging Trends"* published in 2005, provide a detailed analysis of the situation of ecological/organic agriculture worldwide.

In Romania, research on the economics of ecological crop production has been conducted at the National Institute of Economic Research (INCE), the Institute of Agricultural Economics (IEA), the Romanian Academy in Bucharest and the Rural Economics Research Group at the *Gh. Zane* Institute of Economic and Social Research, part of the Romanian Academy, Iasi branch and at *Terra Nostra* Academic Foundation for Rural Progress in Iasi.

The journal *Economie Agrară şi Dezvoltare Rurală* [Agricultural Economics and Rural Development] published by the National Institute of Economic Research (INCE), the Institute of Agricultural Economics (IEA) belonging to the Romanian Academy in Bucharest, includes a

series of outstanding research papers in the field of the economics of ecological agricultural food products.

The researchers members of the Rural Economics Research Group at the *Gh. Zane* Institute of Economic and Social Research, part of the Romanian Academy, Iasi branch have also published regularly scientific papers on ecological agriculture in the series "Studies and Research on Rural Economics".

The second chapter, titled "*Ecological agriculture – an environmentally-friendly practice*" is structured into three subchapters.

The first part of chapter II presents the main features of the various types of unconventional farming systems, referring to biodynamic agriculture, organic agriculture, biological agriculture, LEISA agriculture, and sustainable agriculture.

The second part of the chapter explores in detail certain aspects related to ecological agriculture. Ecological agriculture is defined as the production system that avoids the use of synthetic materials and aims to capitalize on and preserve productive ecological systems.

The principles of ecological agriculture rely on the maximum utilisation of local resources and on the reduction to a minimum of economic and ecological risks. Ecological agriculture is not a "do-nothing" type of agriculture, without fertilisers and without treatments. The ecological production method differs from the conventional one in that it avoids the utilisation of chemical fertilisers and pesticides. The fundamental rule of ecological agriculture states that natural inputs are allowed while synthetic inputs are forbidden.

The current importance of ecological agriculture stems from the following advantages of this cultivation system: less contaminated air, water and agricultural food products; safe working conditions for farmers; biodiversity; fertile and healthy soul; reduction of the loss of nutrients due to leaching; reduction in soil erosion; efficient use of water resources; nutrient quality of ecological products; environmental protection; less extensive use of non-renewable resources; reduction of risks for farmers; protection of the future generations; and economic advantages.

Ecological agriculture has been constantly developing in recent years across all the continents. Certified ecological farmland, according to the latest international statistical data released by IFOAM and FiBL, increased two and a half times during the period 2000 – 2007 [62]. In the year 2007, according to data provided by FiBL and IFOAM, the area occupied by ecological agriculture worldwide reached 32 million ha. The largest farmed land belong to Oceania (12.1 mil. ha), Europe (7.6 mil. ha) and Latin America (6.3 mil. ha) [151].

Worldwide, certified organic arable land accounts for 14.40% of total certified land. The largest arable land areas are located in Europe, i.e. approximately 3.4 million hectares or 72.1% of certified arable land. In 2007, the European Union Member States (EU 27) managed

approximately 21.9% of the global ecologically certified land and 92.16% of ecological farmland in Europe.

The technical and organisational framework for the production, processing, import/export and/or sale of ecological agricultural food products in Romania has been regulated by specific legislation since the year 2000, the year when collection of statistical data on domestic ecological agriculture was also launched. In Romania, ecologically farmed land has grown constantly, from 17,388 ha in the year 2000 to 131.401 ha in the year 2007, with the largest share going to grazing land and meadows. Within the EU, in 2007, Romania ranked 15 as regards the certified ecological agricultural land area, with 131,401 hectares, accounting for 1.87% of organic farmland in the European Union [151].

The analysis of data available on ecological vegetable production in Romania clearly shows that the sector is an insignificant segment of the national ecological production economy, with farmland areas in Romania cultivated with vegetables based on the ecological system varying considerably in the period 2000-2009, with a peak of 700 hectares in the years 2002 and 2006, while in the period 2007 – 2009 the figure was around 300 hectares.

This section of chapter II also presents a range of technical and organisational elements related to the practice of ecological agriculture, providing a summary of legislation in the field regarding: the conversion from conventional to ecological production; the registration of ecological agriculture operators; inspection and certification; labelling of ecological products; export; the import of ecological products in Romania; and technological aspects related to vegetable farming in compliance with the ecological system.

The last part of the chapter presents the market for ecological food products across the continents, highlighting the fact that demand for ecological products remains concentrated in Europe and North America, even though ecological agriculture is nowadays present in most countries. The typical distribution channels for ecological products include: local markets specialised in ecological products; specialist stores selling ecological products in rural or metropolitan areas; street stalls in rural areas; sourcing direct from the farm where the products were obtained; delivery to the consumer's residence or to a collection point for online orders and/or mail orders.

The domestic market for ecological agricultural food products is extremely limited, the few specialist stores selling mainly imported products.

Domestic ecological production is mainly destined for export, exports of ecological products in 2007 totalling 99,356 tonnes, of which 54% cereals, 22% oleaginous plants, 20% fruits and mushrooms, 1% processed milk products, only 0.94% honey, and other ecological

products 2.06%. In 2007, the value of exports of ecological products reached 80 million Euros [142].

In the year 2008, ca. 180,000 tonnes of ecological products were destined for intra-EU trade, with a value of around 100 mil. Euros, which represents an increase of ca. 20% compared with the year 2007. The main products on the EU market were: oleaginous and protein crops, cereals, forest fruits and mushrooms, processed milk products, honey and honey-based products, sunflower oil. Romanian products were marketed in Germany, Italy, Greece, Switzerland, the Netherlands and France [142].

The second part, entitled *"Own researches",* is structured in five chapters, *Chapter III - Objectives and research method, Chapter IV - The environmental, social and land conditions in Moldavia, as premises for ecological agriculture, Chapter V - Estimations on ecological vegetable production in Moldavia, Chapter VI - Research on consumer perception of ecological vegetables – Case study conducted in the municipality of Iasi* and *Chapter VII - Conclusions and recommendations.*

In Chapter III, entitled *"Objectives and research method"* are the main objectives of the thesis and describes all the stages of the present research, from gathering reference information and collecting data to carrying out estimations of the maximum development potential of ecological vegetable crop production in Moldavia, and presents the key methods used in the analysis.

Chapter IV, "*The environmental, social and land conditions in Moldavia, as premises for ecological agriculture*", explores the current situation in the region of Moldavia, in each county, in terms of the natural, social and land factors.

The first part of the chapter presents the pedological and climatic conditions in the eight counties of the region, highlighting the characteristics of the relief, hydrographic network, temperatures, precipitation and soils.

In the second part of the chapter, we introduce and analyse a series of statistical data on population, agricultural land and irrigation in Moldavia.

The individual analysis of each county has indicated that the most populous county is Iaşi, followed by Bacău, Suceava, Galați, Neamț, Vaslui, Botoşani and Vrancea. Viewed dynamically, Suceava county is the only one that has registered an increase in the number of residents in the period 2005 – 2008.

Approximately 45% of the total population of the region lived in the urban areas of Moldavia in 2008.

At county level, the highest level of urban agglomeration is observed in Iaşi, followed by Galați and Bacău, with Vrancea county at the opposite end of the spectrum.

Based on a broad analysis of population data we can argue that in the urban areas of the counties of Iaşi, Bacău, Suceava and Galați, owing to the larger number of residents, higher demand for ecological vegetable products may emerge compared with the other counties in Moldavia; as regards the opportunities for the development of ecological vegetable production, the counties of Iaşi, Bacău and Suceava are in a favourable position considering labour demand.

The historic region of Moldavia, consisting of the counties Bacău, Botoşani, Galați, Iaşi, Neamț, Suceava, Vaslui and Vrancea occupies an important place and role in the country's agriculture. Moldavia accounts for 19.37% of Romania's total area and 18.6% of agricultural land. Arable land in the region make up 19.36% of the total for the country, while the land actually cultivated represents 20.2%. The counties of Moldavia have significant farmland, with Vaslui county ranking first, with an area of 401,231 hectares, followed by the counties of Botoşani, Iaşi, Galați, Suceava. Farmland areas declined in Bacău, Neamț, Suceava, Vaslui and Vrancea counties over the period 2000 – 2007. While the same trend was also observed in the other counties (Botoşani, Iaşi, Galați), there an increase in cultivated areas has been observed.

The vegetable growing areas in Moldavia account for around 24% of the total vegetable production areas in Romania.

Irrigation plays a key role among the cultivation technologies for the large majority of vegetable plants. The establishment of vegetable crops in areas equipped with irrigation facilities is a priority for the development of ecological agriculture.

In 2007, according to statistical data, the farmland equipped with irrigation facilities in Moldavian counties totalled 291,909 hectares.

In chapter V, titled "*Estimations on ecological vegetable production in Moldavia*" we attempted to identify certain areas (localities) presenting the potential for ecological vegetable production, and based on personal calculation algorithms we estimated the maximum areas that are likely to be suitable for growing vegetables under the ecological system in the counties of Moldavia and additionally the likely average yields of ecological vegetable crops in the areas with potential for ecological vegetable production in Iasi county.

The global analysis of the information on scores of soil quality assessment for all the localities of Moldavia shows that there is a number of 147 communes with scores that indicate high potential for thermophilic and cryophilic vegetable crops, of which 101 for all categories of vegetables, 23 for thermophilic vegetables only and 23 for cryophilic vegetables only.

The findings of the calculations indicate that farmland areas that are suitable for ecological vegetable crops in Moldavia cannot exceed 2,175 hectares over the next 10-15 years. Farmers in the counties of Galați and Iasi may act as the key players in Moldavia in this field, with maximum areas suitable for ecological vegetable crops reaching up to 1,199 hectares,

accounting for 55% of the total area that may be cultivated with ecological vegetables in the region.

In the medium to long term (10-15 years), areas cultivated with ecological vegetable crops in Iasi county can reach a maximum potential level of 550 hectares.

Based on the current scores of soil quality, nine localities in the county of Iasi were identified as presenting the maximum potential for vegetable production, namely: Bălțați, Bivolari, Butea, Hălăuceşti, Heleşteni, Podu Iloaiei, Ruginoasa, Stolniceni Prăjescu and Victoria.

Using a personal calculation algorithm, factoring in soil quality assessments and the levels of crop yields for the year 2011, we have made a series of estimations on the likely average yield of vegetable crops for six species of vegetables in eight localities in Iasi county. Thus, the potential average yield of autumn tomatoes grown using the ecological system ranges from 27,000 kg/ha to 14,300 kg/ha; the potential average yield of green peppers grown using the ecological system ranges from 18,000 kg/ha to 19,700 kg/ha; the potential average yield of carrots grown using the ecological system ranges from 26,700 kg/ha to 13,700 kg/ha; the potential average yield of green peas grown using the ecological system ranges from 3,600 kg/ha to 2,700 kg/ha; the potential average yield of green beans grown using the ecological system ranges from 5,000 kg/ha to 3,300 kg/ha; the potential average yield of aubergines grown using the ecological system ranges from 22,500 kg/ha to 12,300 kg/ha.

Of the eight communes under review, in Butea commune the maximum average yields for ecological vegetable crops can be obtained for autumn tomatoes, green peppers, green peas, green beans and aubergines, while the maximum potential for carrot crops exists in Hălăuceşti commune.

Chapter VI of the thesis, "*Research on consumer perception of ecological vegetables – Case study conducted in the municipality of Iasi*", presents the results obtained following field research carried out in four farmers' markets in the city of Iasi, a research that aimed to survey public opinion on ecological vegetable farming.

The study of consumers' perception of ecological vegetables involved the development of an appropriate questionnaire and conducting the questionnaire-based interview, the collection and statistical processing of the gathered data. A number of 140 interviews were conducted based on the questionnaire, distributed as follows: 40 interviews in Alexandru cel Bun Market, 40 in Nicolina Market, 30 in Hala Centrală Market and 30 in Independenţei Market.

The analysis of the answers to the questionnaire highlighted the following:

- The public promotion of ecological products seems to have had an effect on consumers in the city of Iasi too, in addition to the information campaigns on genetically modified foods, as consumers view two types of products as opposites. Consumer awareness of

ecological vegetables is high, 86 respondents declaring that they have very good knowledge of ecological vegetables and only one respondent saying that they do not know anything about this issue.

- Ecological vegetables are a category of agricultural food products that 90.7% of respondents declared they would buy, as they are aware of their superior qualities. Only 9.3% of the respondents were not interested in purchasing this type of products.
- The purchasing power of the inhabitants of the city of Iasi is rather low, which is reflected in the willingness to offer a higher price for ecological vegetables. A percentage of 17.86% of the respondents were not willing to pay more for ecological vegetable products, only 3.57% can pay 100% more for such vegetables, while the large majority, 63.57% would pay 25% more.
- The intention to purchase ecological vegetables occasionally or always was stated by 127 persons of the total respondents, of which 77 were female, which shows that women are more interested in healthy nutrition than men.
- Respondents aged 26 to 65 showed considerable interest in buying ecological vegetables. Twenty-five respondents in the 26-40 years category and 37 respondents in the 41-46 years category declared that they would always like to buy such products. Fifty-three persons declared that they would purchase ecological vegetables occasionally (sometimes), 41 of these respondents belonging to the 25-65 years age group.
- The marital status obviously influences the intention of buying ecological vegetables. Of the 97 respondents who declared they were married, 58 stated their intention to always buy ecological vegetables and 32 only occasionally, which demonstrates that married persons are more responsible regarding their nutrition.
- The point of sale of ecological vegetable products is a very important criterion in the buying decision for this product category, as of the 74 persons who declared that they always buy ecological vegetables, 37 prefer to purchase directly from the producer, 27 from the farmers' market, seven from specialist shops and only three persons from the hypermarket. The same trend is observed among the 53 respondents who declared that they buy ecological vegetables occasionally. These findings demonstrate that the large majority of prospective consumers of ecological vegetable products are interested in the point of sale, favouring producers over retailers.
- As regards the outlook for the ecological vegetable products market, a significant percentage of 61.4% of the respondents believe that these products will be moderately successful, while 21.4% think they would have be very successful, 6.4% consider that they would not be successful, and 10.7% answered I do not know/I am not interested. The high

percentage of respondents who declare that ecological vegetables would be moderately successful is justified, considering that in recent years this sector has seen limited development in Romania, while certified ecological vegetables are effectively absent from the market, which causes consumer expectations to be reserved.

Chapter VII of the doctoral thesis comprises the conclusions, recommandations, own scientific contributions and elements of novelty.