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HUMAN RESOURCE DEVELOPMENT CENTRE

Promoting organic farming by training in bio-fertilizers

National case study – Hungary

Prepared by:
P6: Kék Tenger Business Network Kft. Ltd.

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1. Organic agriculture and research in Hungary

1.1 High potential, but current stagnation

Hungary is one of the countries in Central-Eastern Europe (Fig. 1) that became member of the European Union in 2004. The country has a population of about 10 million people, and the agricultural sector is important. About 65 % of the land area is suitable for agriculture, and out of this, 3/4 is arable land. Hungary offers good conditions for organic production. Its constitution bans the use of GMOs. Many of its low-intensity agricultural areas (mostly pastures, meadows and fallows) have not been impacted by the use of agro-chemicals. There are currently 130,609 hectares of certified organic land, which comprises 2.3 % of the total agricultural area.

More than 1900 enterprises produce certified organic food, with a value approximating € 25 million annually. However, the country's organic sector has not yet reached its potential, and there are numerous unexploited opportunities. While the sector grew quickly between 1996 and 2004, it has since been stagnating (Fig. 2). The percentage of organic land in Hungary is just over half of the European Union average.

The stagnation is partly due to a lack of effective policy incentives,such as suitable subsidies or administrative support, a lack of coordination of export marketing initiatives and of any broad awareness-raising campaign for domestic consumers. A large part of organic produce is still sold as conventional. Better cooperation bet- ween stakeholders is required for the sector to move forward.

1.2. National strategy to foster organic agriculture

In 2012, the Hungarian Government approved a National Rural Strategy that aims to generate de- mand for high-quality, GMO-free, locally produced food. The document considers organic agriculture as a strategic sector that deserves strong support. The strategy sets very ambitious objectives for the future development of organic agriculture in Hungary. It aims to have 300,000 hectares of certified organic land by 2020, which will imply a 230 % increase of the current area. It is anticipated that subsidies for organic conversion and for annual certification costs will play a major role in achieving this. Organic pro- ducers will also receive priority in future calls from the Rural Development Ministry for diverse support programmes, such as the young farmers' initiative. Organic animal husbandry and apiculture will receive particular support, as these are priority areas within the Ministry's agricultural development policy. The National Rural Strategy also foresees the creation of an Organic Action Plan.

Work on this document commenced in 2013, and a first draft was published for public debate in late September. The Organic Action Plan aims to set out a detailed programme for the sector's development.

1.3. Grassland, but few animals

Grasslands make up the majority of registered organic land in Hungary (52 %), followed by arable crops (40 %), perennial crops (4 %), fallow (2,5 %) and vegetables (1,5 %). Although more than half the organic area is grassland, organic animal hus- bandry is relatively insignificant compared with crop production. In 2012, less than 10 % of the organic producers, about 100 farms, kept certified organic livestock. Most of the animals grazing on organic fields are not certified, since the farmers consider the certification costs to be too high and the existing regulations allow for non-certified animals to be kept on organic grasslands. As a result, organic grasslands receive substantial subsidies without creating any substantial organic products, showing the inadequate structure of the 2007-2013 support scheme.

1.4. Organic for export, and imported organic foods

Today, organic products in Hungary have a small market share. About 85 % of the total production is exported, mostly as raw materials or products with low degree of processing. The main customers for Hungarian organic food are Germany, Austria, the Netherlands and Switzerland. At the same time, the majority of the (modest) organic assortments in Hungarian food stores are processed imports. Some estimates suggest that 90 % of the domestic organic consumption is made up of imports. There is a significant lack of organic processing capacity in Hungary, and this could provide interesting potential market opportunities for organic food processing companies. Hungary's proximity to countries with large organic markets contributes to this opportunity.

Supermarket chains are playing an ever-increasing role as distributers of organic products, selling about 60 % of the organic food consumed in Hungary. Spe- cialized shops sell about 20%, organic markets, fairs and events comprise 6-10%, on-line sales 6-7% and farm sales 2-3%. As elsewhere, it can be assumed that the supermarkets will play a major role in expanding the domestic organic market. However, only few Hungarian organic producers can currently meet the volumes, quality standards and the regularity of deliveries demanded by the supermarket chains. Pilot projects for product development, quality assurance and cooperation in production are needed to help domestic producers tap into this market.

The formation of farmers' production and marketing groups, organic farmers' markets and local producer- consumer networks can also be important vehicles for distributing certified local organic products and expanding the domestic market.

1.5. Organic consumption for better health

Hungarian consumers show a positive interest in organic products (Fig. 3). They would be willing to pay a premium price of about 30 % for organic products, and the same for products free from GMOs. In contrast to West-European countries, Hungarian consumers are mainly motivated to buy organic by health considerations. Studies have shown that organic products are favoured because they are free from GMOs, toxic chemicals, additives, artificial flavourings and colourings, preservatives, and are perceived as having a higher quality. Taste, nutritional value and price are less important motivating factors, and ecosystem protection plays a minimal role for most Hungarian consumers.

Although demand for organic products is growing, a large percentage of the population, even some of those who regularly purchase organic products, cannot define what organic means, and the difference from non-organic products. Effective outreach programmes and reasoned marketing campaigns are needed to disseminate credible information and to develop consumer awareness. Dissolving the misconceptions about organic production is crucial for increasing domestic consumption.

Future trends

The future development of organic agriculture in Hungary depends a lot on the EU's Common Agriculture Policy and the national implementation, and not least on the realization of the National Rural Strategy and the Organic Action Plan. Hungarian organic production needs a stronger practice- oriented research basis, there needs to be more dissemination work underpinned by local scientific evidence, and efforts are needed to increase con- sumer awareness. Cooperation and communication between organic stakeholders is crucial for effective lobbying work. The organic sector has an important role in assisting Hungarian agriculture to face global challenges, such as climate change and water and oil scarcity. It is anticipated that market demand will increase, and that some organic farming methods will soon become mainstream agricultural practice. The development of organic agriculture could play a key role in maintaining Hungary's competitiveness on agricultural markets.

1.6. Organic agriculture research

The Hungarian Research Institute of Organic Agriculture (ÖMKi) is a private non-profit research Centre, founded by the Swiss Research Institute of Organic Agriculture (FiBL) in 2011. The aim of ÖMKi is to advance science and innovation in organic agriculture in Hungary. ÖMKi's motivated team works closely with many stakeholders in the Hungarian organic movement, initiating, coordinating and implementing innovative research projects, as well as providing training and extension services. In 2012, ÖMKi started to establish an on-farm experimentation network that has engaged many organic farmers. ÖMKi regularly organizes workshops and vocational trainings for farmers and other stakeholders, often in partners- hip with other organizations. It has also established a popular PhD and Postdoctoral scholarship programme in order to foster the development of a new generation of Hungarian scientists, who will be deeply involved researching organic agriculture and sustainable production methods. Thus, ÖMKi is striving to support the development and competitiveness of Hungarian organic agriculture and food production in the long run.

ÖMKi is acknowledged as consultancy centre by the state. In October 2013, the institute realized the big event of the International Conference on Organic Agriculture Sciences in Hungary (ICOAS 2013), as described in a separate paper in this newsletter. Cur- rently, almost all agricultural universities and state research centers of Hungary are involved in organic agriculture research. However, only two universities have dedicated independent departments to orga- nic agriculture. These are the Corvinus University of Budapest and since 2013 the Szent István University of Gödöllő. There is only one research institution where the focus is entirely on organic farming, namely the Hungarian Research Institute of Organic Agriculture (ÖMKi).

In 2013 ÖMKi was awarded the title of external Department of Agro biodiversity and Organic Agriculture of the University of Debrecen, which raises the number of organic agriculture university departments to three. So far, Hungary has not been a partner in the CORE Organic ERA net. International cooperation is supported, besides other means, by the close cooperation with FiBL institutes in several countries.

References:

Hungarian Research Institute of Organic Agriculture (ÖMKi)
dora.drexler@biokutatas.hu www.biokutatas.hu, www.omki.org
www.isofar.org

Presentation on theme: "The beginnings of agricultural education in Hungary Szarvas: 1779, first agricultural school in Europe (founder: Tessedik Sámuel) Keszthely: 1797, Georgikon,"— Presentation transcript:

1. The beginnings of agricultural education in Hungary Szarvas: 1779, first agricultural school in Europe (founder: Tessedik Sámuel) Keszthely: 1797, Georgikon, first agricultural college in Europe (founder: Festetich György) 1789 Pest Állatgyógyintézet (Veterinary Institute) 1799 Nagy-Szentmiklós, Little Agricultural School 1902: There were 81 agricultural schools in Hungary

2. The number of certifiates issued between 1960 and 2015 is 1322183.

3. Vocational school skilled worker training school after eight years at primary school (30 %), Target group: those who cannot or do not want to study at secondary technical schools, the interest of society and economy is proper general education and vocational qualification, basic educational examination at the end of the 10th grade, until the age of 16 academic subjects have priority, in the 9th grade career orientation, in the 10th grade vocational

preparatory training, teaching academic subjects extended by 2 years recently, academic subject stage is followed by vocational training (2-3 years).

4. Secondary technical school 4 years of general education, with vocational preparation two stages: –1st stage (9-10th grade, age 14-15): career orientation max. 15 % (no

practical training), 4-5 lessons/week –2nd stage (11-12th grade, age 17-18): 21 kinds of vocational preparation, general vocational knowledge 35-40 % (short time for practical training) main objective: preparation for the GCSE, vocational preparation is of secondary importance

5. Vocational training after the GCSE 13-14th grade (age 19-20) with the GCSE the academic education ends, concrete, real vocational training starts here, time of career orientation and vocational preparation is deducted from the time of the vocational training, after the broad preparation comes the specialized training, the module system is being extended, acquiring more than one qualification is possible, apart from vocational training, students may apply for university, college or higher level vocational training.

6. Higher level vocational training after the GCSE, Duration: 2 years, initiated by a higher educational institute, Place: in higher educational institute, or in secondary school inspected by a higher educational institute, manifold accreditation (for the requirements and the place of training), high theoretical requirements, If the student achieves good results, the higher educational institute may grant favours (at the admission, examination, duration of course)

7. Agricultural adult education In-service training for farmers takes place in secondary vocational schools, colleges, universities, and also in other organisations legally entitled to provide such service. It plays a crucial role, since the average level of the farmers' qualification is rather low. Training providers can apply for support (between 50 and 100% of the costs) from national and EU (structural) funds.

8. Control and inspection of agricultural education Parliament (laws) Ministry of Agriculture and Rural Development (regulations) Ministry of Education (regulations) Agricultural colleges, universities MARD Educational and Advisory Institute (operative tasks) Organizations of stakeholders e.g. Agricultural Chambers, National Vocational Training Council, etc. (taking part in decision making) Agricultural Vocational Schools Ministry of Labour (with regards to adult training)

9. Management of schools Most of the 160 mixed profile schools (including agricultural

training), out of which approx. 100 schools are equipped for agricultural training as such, are run by - local or county governments, - 21 of them by the Ministry of Agriculture and Rural Development, - a few by private entities or churches. Many schools have mixed profiles – sometimes training just a few agricultural students (1 group). About a 100 secondary vocational schools have pure agricultural, food-industrial or forestry profile (several groups in one year).

10. Development of agricultural education Main objectives of development: -to create the module system of agricultural qualifications, -to increase the proportion of practical training vs. theoretical, -to develop the facilities and infrastructure of practical training, -to work out the conditions for competence based learning (through carrying out analyses of relevant jobs), -to put more emphasis on teaching farm management skills, -to enhance students' foreign language and IT skills, -to develop international relations to agricultural schools and organizations of other EU member states.

11. Mobility possibilities Via student exchange programmes (Leonardo da Vinci projects) Via farm trainee programmes for students or young professionals (organised e.g. by the Educational and Advisory Institute of the Ministry of Agriculture and Rural Development) there is no programme for apprentices as there is no such phenomenon as „apprenticeship" in Hungary

12. Regulations for foreign apprentices in Hungary I. at companies apprentices have the legal status of normal employees, with regard to 1612/68/EGK regulation the following Hungarian regulations are relevant: –IV. Act 1991 –8/1999.(XI.10.) SzCsM reg. –93/2004.(IV.27.) Gov. decr. –the Labour Code –and the company's own rules.

13. Regulations for foreign apprentices in Hungary II. at training institutions apprentices have the legal status of students, the governing law is the LXXVI. Act 1993. on vocational training, and the training institutions's own rules

2. The index of food relocalization in Hungary

2.1 Organic agriculture is the new paradigm for diversity

When organic agriculture is described, farmers and consumers often do it with a list of limits and restrictions. For scientists as well, organic is often perceived as being restrictive. However, organic agriculture represents the most advanced example of ecological or eco- functional intensification. Among agro-ecological scientist, ecological intensification is the only viable strategy to feed the world (Tittonell, 2013).

Eco-functional intensification requires diversity across all its dimensions. At the landscape level, diversity results from a mix of natural, semi-natural, intensively and extensively farmed land. On farm land, it is characterized by genetic diversity, species diversity and diversity of farm activities. Beyond the farm gate, diversity includes processing, distribution, consumption and disposal of food. It can be the variety of tastes, the qualities of foods, the variety of food processing technologies, the diversity of relationships between companies, producers and consumers and the variety of purchasing and eating habits.

Uniform production goals, high input levels and the pressure of the economy of scale have harmed diversity on all possible levels. Diversity in all dimensions is the playing field for organic scientists. It will require different strategies of innovation. Social innovation in the form of mutual learning between farmers and novel ways of communication with consumers, both enabled by novel media is one field of research. Ecological innovation is another; encompassing soil fertility building, crop rotation and crop mixture improvements and functional biodiversity and others. It also includes breeding innovation in crops and livestock as this can broaden genetic diversity and enhance resilience. Research on novel technologies that help to manage diverse systems will become relevant. And finally, research is needed on the interdependence between farm and farmstead diversity, food diversity and human health.

References:

Tittonell, P. A. (2013) Farming Systems Ecology. Towards ecological intensification of world agriculture. Inaugural lecture upon taking up the position of Chair in Farming Systems Ecology at Wageningen University on 16 May 2013. Wageningen University. ISBN 978-94-6173-617-8, 40 pages.

3. On-farm research program for varroa control in organic beekeeping

Varroatosis as the current bane of the beekeepers is causing the biggest economic damage in the apicultural sector. Varroa mites have a vector role, distributing viruses and weakening bees that become more susceptible to other pathogens as well. Disorientation, robbing, and frame exchanging may transport mites from one colony to another (Oliver, 2011). There are no colonies without mites in Hungary. The infection level increases over time in colonies that are untreated or not managed regularly. The infection level should be kept as low as possible for a sustainable production. Consistent control of varroatosis should be provided without harmful effects such as the occurrence of toxic residues in the hive products. In the technology of organic beekeeping only natural materials are allowed to be used such as essential oils and organic acids. In 2013 within the beekeeping on-farm research program, ÖMKi is collaborating with beekeepers throughout Hungary in comparative trials for testing the efficacy of different types of varroa control treatments and management. The trials are set up in market operations. One essential task of the program is to monitor the infection level systematically with different mite-counting techniques. Throughout the season the different techniques are chosen that are matching with colonies' biological state and environmental conditions such as brood period, temperature, etc. Most of the treatments affect only the foretic mites. Therefore during the season some operations -

where it is possible - they generate capped brood less state for treatments. The major part of the mite control is good timing of the closing treatment in the end of the beekeeping season in the brood less period.

References:

Randy Oliver, 2011: Miticides 2011, American Bee Journal February 2011

4. Suitability of old apple varieties in ecological orchards, based on their resistance to apple scab and powdery mildew

A resistance breeding program was started in the 90's by the Department of Pomology of the Corvinus University, with the aim of producing new varieties with excellent fruit quality and resistance against several diseases. As part of the program many old apple varieties originating from the Carpathian basin has been collected and the gene bank of fruit varieties located in Soroksár was established. Several varieties have been collected which could be useful not only for the breeding but also for ecological farming due to their good disease resistance.

Considering that the pesticides permitted in ecological farming have low efficiency compared to the chemicals usable in conventional growing, multiresistant varieties should be highly preferred in bio production. To evaluate the disease resistance of 10 old varieties against apple scab and powdery mildew, field evaluations were carried out 3 times per year for 4 years. Molecular marker analysis was also carried out, 6 different markers were used for the detection of 3 major scab resistance genes (Rvi2, Rvi4, Rvi6).

The results are suggesting that many old varieties have good field resistance against apple scab and powdery mildew, however the scab resistance could not be explained with the presence of major resistance genes in many cases. This suggests that

a few varieties might possess polygenic resistance. The resistance gene Rvi6 could not be found in any old variety while the resistance genes Rvi2, Rvi4 were often detected.
On the basis of the promising results, we hope, following the previous recommendations in our later works, new suggestions can be made in the future concerning to the usability of the old varieties in ecological orchards.

4.1 Managing data quality in on-farm research: the added value of multiple variables

Practitioners of on-farm research must quantify the larger setting of their studies to maintain validity or risk questioning of the scientific value of results. Although initially considered a cost and burden, the need to validate results provides opportunity for descriptive and scientific study beyond that of the original research goals. When properly managed, these data streams provide added scientific value and an extra benefit for the research institute.
Skeptics of laboratory and even controlled and replicated small plot experiments argue concepts tested or discovered in these conditions cannot work in the real world. This criticism has value, as many solutions to practical problems, effective in controlled conditions are known to loose effectiveness or have unpredicted adverse effects when scaled or exposed to natural conditions.
Farmers require greater proof before choosing to test or adopt new management practices, control measures, species or varieties, or even marketing channels. In response to this “seeing is believing” attitude in situ or on-farm research holds promise to both demonstrate and investigate viability of proposed practices in real life conditions.

On-farm research allows for demonstrating efficacy of practices by direct use in production fields under typical management in farm conditions. Production of meaningful data from these trials requires rethinking our ideas about conducting research. On-farm research occurs in rich information and knowledge spaces but this is also the weak point of the research. Lacking laboratory control of variables, researchers must standardize quantification of variables to establish comparable results between trials. We explain how this testing promotes greater understanding of the total farm context leading to new marketable opportunities.

4.2 A comparison of biodiversity on organic and conventional fields in central Hungary

Organic farming was introduced to improve food safety and mitigate environmental pollution caused by agricultural activities. The area of farms under organic management is considerable both in Europe and elsewhere. It is often highlighted that as a „side effect", organic farming promotes biodiversity, with usually more species and individuals on organic than on intensively managed fields. Most of these studies, however, were conducted in the intensive agricultural landscapes of Western and Northern Europe. Recent papers showed that farmland biodiversity is significantly different in Central Europe due to different socio- economic history and context. In this presentation we show that organic farming practice is rather similar to the widespread low intensity management in the extensive region of Central Hungary. This is a consequence of low productivity farming and also the lack of resources of farmers to obtain certification as organic farms. The negligible difference in farming is reflected by similar biodiversity of bee, spider and earthworm assemblages in organic and low-intensity fields in this Central European study landscape. Therefore, organic farming is beneficial for biodiversity in the intensive European farmland's landscape and provide „biodiversity islands", however, in the extensive farmlands of Central Europe, organic farming promote similar biodiversity to that by the widespread agricultural management in the region. There is one crucial difference between organic and non-organic farms, however, that products from official organic farms can be sold at the international markets, resulting in more income for farmers. Thus, organic farming may be beneficial in Central Europe to maintain low-intensity farming, however, more effective promotion and support to small family farms to gain organic label are needed.

4.3 Comparison of species-rich cover crop mixtures in Hungarian vineyards

Intensive agricultural practices of past decades – like mechanical cultivation on steep vineyard slopes – can endanger vineyards. In addition, climate change scenarios predict heavier rainstorms, which can further accelerate soil degradation. Therefore, the use of cover crops in the inter-row has a special importance, particularly on steep slopes. A species- rich cover crop mixture helps not only in preventing erosion and providing easier cultivation, but also has a positive effect on soil structure, soil fertility and ecosystem functions. We began to compose, develop and apply several species-rich cover crop mixtures in the spring of 2012. During the experiments, three species-rich cover crop mixtures (Biocont-Ecovin mixture, mixture of legumes, mixture of grasses and herbs) were compared in vineyards of the Tokaj and Szekszárd wine regions. Each mixture was sown in three inter-rows at each place of the experiment. Besides botanical measurements, yield, must quality, and pruning weight was studied in every treatment. The botanical survey showed which species of the mixtures established successfully and survived the dry year of 2012. We found that cover of weeds was lower in every treatment compared to the unsown control plots, thus, cover crops suppressed the weeds of the inter-rows effectively. Most examined indices of grapevines were not significantly affected by the applied cover crop. However the results show that in our drier climate, every second inter-row sowing is more optimal provided erosion control is not required. The interest of winegrowers shows the importance of the topic, thus we involved other wine regions of Hungary in the experiment in 2013.

4.4 Agriculture supported communities: consumer-producer relations in organic box schemes - experiences from Hungary

This article presents the case study of organic box schemes (often without certification) from Hungary, a relatively new sector which gained substantial recognition in recent crisis driven times. Although the new rural development policy has clearly recognized the beneficial existence of community supported agriculture (CSA) and several other short food supply chains, their socio-economic performance is mostly regarded as insignificant. Initiated by the Association of Conscious Customers, the Research Institute of Organic Agriculture and the Environmental Social Science Research Group this study examines the characteristics of farmer-led organic CSAs in Hungary to understand the economic, environmental and social motivations behind running or joining a box scheme. Our findings are based on qualitative interviews with CSA farmers and consumers as well as data from stakeholder meetings where we facilitated a structured vision to action workshop to identify the main mechanisms and strategies of building such alternative food networks. The article presents results on the shaky, non-self-sustaining foundations of CSAs to analyze how they catalyze socio-cultural change to enhance consumer-producer cooperation and regain control over the ways in which food is produced. Previous studies compared retail prices for organic produce with CSA share prices and recorded substantial cost savings for the CSA consumers. Our research found that current share prices of CSA farms do not reflect all of the costs of production, and hence might not be an economically viable approach to sustainable agriculture if CSA farms continue their current pricing strategy. This aspect has not received any attention from scholars and local food advocates who seek examples of sustainable food systems (Hinrichs 2000). The study concludes by pointing at what role box schemes could play in the democratization of the Hungarian food system by providing a model for more profound social transformation.

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Hinrichs, C. C. (2000) Embeddedness and local food systems: notes on two types of direct agricultural market, Journal of Rural Studies, 16/3, 295-303.

5. The index of food relocalization in Hungary

Local and organic food systems are closely intertwined. Many organic farmers use short food supply chains (SFSCs) to market their produce and also, many SFSC farmers adopt organic techniques (usually without certification). Thus, study of local food systems is needed to fully understand impacts, drivers and further potential of organic production. Local food initiatives are often considered as tools for rural development that may also contribute to food security and sustainability. In spite of a growing body of literature; knowledge on geographical distribution is still sparse. Study of SFSCs has traditions in certain countries, such as US, Australia, UK, Italy, but patterns and processes in Central and Eastern Europe are still mostly unknown. The Index of Food Relocalization (IFR) introduced by Ricketts et al. (2006) is a complex and objective measure to quantify patterns and compare territorial differences. Most components of IFR can be interpreted only within the UK context; therefore we adapted the index for Hungarian application. We focused on indicators of local food production (such as the number of small-scale producers, the ratio of organic producers; number of local food labels, etc.) in all the 19 counties and Budapest to reveal the potential for further development of the local food sector.

Results show that the demand and supply is spatially separated; regions with less favourable conditions for production (such as Budapest region) enjoy the benefits of high consumer demand and also, flourishing NGO activity seems to be important in the development of local food systems. Research outputs may help shape policy in light of the National Rural Development Strategy. International comparison is limited due to local relevance of the composite indicators.

References:

Ricketts Hein, J. et al. 2006. Distribution of local food activity in England and Wales: an index of food relocalization. Reg. Stud. 40, 289-301.

6. Emergence of community supported agriculture in Hungary: attributes of sustainable rural enterprises

Community Supported Agriculture (CSA) gained increasing attention and experienced rapid growth in the US and Western Europe over the past 25 years as a special form of direct marketing where producers and consumers form an alliance in a relationship based on mutual trust, openness, shared risk and shared rewards. This paper focuses on the development, state and opportunity of CSA in Hungary. In the Central Eastern European (CEE) region socio-economic conditions significantly differ compared with the countries CSA has already spread within, and, as a result, the adoption of CSA principles have led to special characteristics. Using interviews, participant observation and data from stakeholder meetings the paper evaluates Hungarian CSA farms as successful, small-scale mixed horticultural enterprises following organic production practices.

The necessary attributes of success as elements of human and social capital are analyzed in the paper. The findings suggest that creative enterprises such as CSA can bring people together through food production and contribute to the emergence of stronger communities. As early adopters and leaders of the paradigm change in the agro-food sector, the interviewed CSA growers are often challenged as they are following not-yet-walked paths, but they have certain attributes which make them distinctive compared with other farmers and enable them to overcome difficulties and become financially viable. However, according to the international literature high profitability of the operation is often not an important priority for CSA farmers relative to other values (Ryan 2013) which stands for the Hungarian stakeholders as well. The conclusion notes that although CSA is not for every producer or consumer, it offers a sustainable opportunity for organic growers with strong communication and community building skills to employ a special niche market.

6.1 Qualitative and quantitative analysis of potato varieties in organic farming

An essential step in organic potato production is to choose the right varieties that are suitable for organic farming. So far the organic farmers have been trying to meet the customers' need mainly with organic production of common varieties. The varieties grown under conventional conditions may not always be suitable for organic farming though. From the farmer's point of view resistance is important as well to avoid the risk of viral degradation when re-using the potato seed tubers for coming years' cultivation. Therefore ÖMKi initiated a potato on-farm research program in 2012 to examine the appropriate variety choice and parts of the cultivation technology, which essentially determine the quality. In the first year quantity and quality parameters were examined for six, Hungarian bred resistant varieties (Balatoni Rózsa, Démon, Hópehely, Katica, Vénusz Gold, White Lady, with control: Desirée) from 12 cooperating eco-farms, which represent 20% of the total eco- potato cultivation area of Hungary. The minimum size of the test parcels was 12 m2 for each variety. The plantation and treatment methods were according to the farmer's own method. Quantity and quality assessments were done at the harvest. According to the results, the eco-farms reached the average of 2,78 kg/m2 yield in 2012. Out of the nine assessed quality problems Streptomyces, Rhizoctonia and mechanical damages were the most frequently reported ones. The research is continued in 2013 and the goals are based on the results of the trials in 2012.

6.2 The international society of organic agriculture research (ISOFAR)

The International Society of Organic Agriculture Research (ISOFAR) promotes and supports research in all areas of Organic Agriculture by facilitating global co-operation in research, methodological development, education and knowledge exchange; supporting individual researchers through membership services, publications and events and integrating stakeholders in the research process.

ISOFAR pursues its mission by:

- Supporting individual researchers, from generalist organic systems to specialist disciplinary backgrounds, through membership services including events, publications, and relevant scientific structures;
- Facilitating global co-operation in research, education and knowledge exchange;
- Encouraging conceptual, methodological and theoretical development respecting the ethos of organic agriculture in a systems/inter-disciplinary context;
- Encouraging active participation of users and stakeholders, with their accumulated knowledge and experience in prioritization, development, conduct, evaluation and communication of research;
- Fostering relationships with related research associations including joint events and publications.

12 sections and 6 working groups are currently organized within ISOFAR covering the range of contemporary action and interest areas of Organic Agriculture and research.

ISOFAR organizes local and international level scientific conferences including cooperating with IFOAM and local organizers to arrange the scientific tracks of the organic world congresses, publishes the scientific journal Organic Agriculture, scientific books, textbooks and proceedings of scientific conferences, and publishes the quarterly ISOFAR e-newsletter. ISOFAR's organized exhibitions include Korea 2015 with examples of organic farming and processing as well as lifestyle. ISOFAR is formed of personal memberships from the scientific community of Organic Agriculture that include free access to Organic Agriculture. The ISOFAR e-newsletter along with several proceedings and reports are also freely available for ISOFAR members on our website, www.isofar.org

6.3 Development of a vocational training curricula for organic fruit and vegetable production in Hungary

In response to the lack of vocational training opportunities in organic production in Hungary, colleagues at SZIE-MKK developed vocational training curricula for organic vegetable and fruit production. The work took place within the framework of the ECOVOC project, an innovation transfer project within the EU Leonardo da Vinci programme. The outcome was a curriculum for a potential 2000-hour, 2-year higher educational vocational training, and two 300-hour adult educational courses in practical organic horticulture (vegetable production and fruit production). The project took place over two years and involved 6 partners from 5 EU countries. The curricula will provide the basis to launch practically-based vocational training courses in organic fruit and vegetable production in Hungary to the target of secondary educated learners (school leavers, career changers and unemployed adults). Focus was on developing training courses with a practical bias as this was seen to be essential for this level of training and for the organic agricultural sector. Partner institutions involved all have experience in teaching ecological agriculture and horticulture at various levels. Countries involved in the project were: Hungary, Netherlands, Spain (Catalan), France and the UK.

6.4 External risks, practical implications and pitfalls of ecological agricultural practices and their relation to food safety

Ecological (organic) agriculture offers produce with no content of synthetic pesticides/metabolites or genetically modified organisms (GMOs) by avoidance of such pesticide preparations and zero tolerance to GMOs. Nonetheless, such drastically reduced content of organic micro contaminants and GMO-free status may be jeopardized by various agro-environmental conditions, including (i) widespread environmental pesticide contamination; (ii) possible effects of application of biocides for hygienic use; (iii) assumed occurrence of natural organic microcontaminants (e.g. mycotoxins); (iv) parallel application of organic agricultural practices and genetically modified (GM) crops. Worldwide occurrence of persistent pesticide residues (e.g. chlorinated hydrocarbons) in soil and of water-soluble or leaching pesticide residues (e.g. triazine, choloacetamide and phosphonomethylglycine herbicides) in surface waters may corrupt produce quality in affected regions through micro contaminant adsorption by crop cultivation and irrigation, respectively. Assessment of the possible local or regional role of such residues and their potential effects on food safety requires systematic monitoring of these contaminants in environmental matrices. Environmental or urban application of biocides may affect neighboring agricultural fields. This is of particular importance for organic agriculture as biocide substances, e.g. in mosquito control, may be identical to synthetic agricultural insecticide active ingredients. Mycotoxin contamination appears to be a minor problem in the European Union in organic produce: a recent survey of the European Rapid Alert Systems for Food and Feed indicated only a 0.2% incidence of mycotoxin related cases in organic food in an 8-year sampling regime. In contrast, co-existence of organic agriculture and cultivation of GM crops is crucial and occurs practically impossible due to hybrid formation by cross-pollination affecting produce quality already in the year of cultivation, as indicated in our experiments with insect resistant GM crops producing transgenic Cry toxins related to microbial endotoxins of Bacillus thuringiensis varieties, with up to 35% of unintended transegene expression. In addition, a key element in assessing true sustainability of organic agricultural practices is the application rate of fossil fuel.

6.5 Weed infestation in organic croplands in the surroundings of Tarna stream

For more than 10 years our institute has been carrying out weed surveys in organic arable fields in several regions of Hungary. This paper is based on studies in the surroundings of Tarna stream, on areas of the Tarnamenti-2000 Ltd. ecological farm in spelt, sunflower and corn. The purpose was to obtain an overall view about the weed conditions, the species composition and the weed covering of the examined ecological farm.

This study was started in 2010. We examined 8 fields in this area, 4 spelt, 2 sunflower and 2 corn fields. In every survey, 8 pieces of 1m2 examination areas were assigned randomly three times a year. The average weed covering, the average number of species and total covering were used as parameters. Weed species were classified into the following life cycle categories: winter annuals, summer annuals, biennials, erect perennials and creeping perennials. Statistical analyses were done by SPSS program with 95% confidence level.

On the basis of the results, the average weed covering was around 5% by using single weed harrowing in spelt before harvest, while this value exceeded 10% on the stubble. In the cornfields the weed cover was higher than spelt fields. The average weed covering exceeded the critic level (10%). The most species was observed in the sunflower fields. The average level of the covering exceeded the critic level there, like in the maize.

The most dominant weeds were members of summer annuals (eg. *Ambrosia artemisiifolia*, *Echinochloa crus-galli*) in the maize and sunflower fields. The *Capsella* bursa-pastoris, *Veronica hederifolia*, *Consolida regalis*, *Tripleurospermum inodorum*, and *Ambrosia artemisiifolia* were important species in spelt fields. Some interesting and uncommon species were also found in these areas e.g. *Chorispora tenella*, *Epilobium hirsutum* and *Potentilla supina*. This study is a part of a long-term experiment for studying the weed composition of organic farming. This knowledge is essential for planning a good organic management.

6.6 Diversity of microbial symbionts under organic and conventional agricultural systems

Soil microbial community is a key component of soil functionality and resilience. Soil management can either support or limit the diversity and activity of soil microorganisms. Our aim was to compare the effects of organic and conventional agricultural practice on the diversity and functioning of symbiotic nitrogen fixing bacteria and arbuscular mycorrhizal (AM) fungi.

A pot experiment was designed to compare diversity of symbiotic microbes to host plant and agricultural practice. Soil samples were collected from the organic and conventional plots of a long term field experiment in Martonvásár (Hungary). Soil samples in a 5 dilution MPN (Most Probable Number) method were tested with pea, (*Pisum sativum*) host plants. Pumice as a control media was used. Nodule number of pea plants were determined, *Rhizobium* bacteria were isolated and genetic diversity of isolates were determined by BOX-PCR method. Diversity indexes of isolates (Shannon index, Margalef index and Pielou index) were counted. The parameters of AMF root colonisation were investigated by staining the roots and microscopic analysis using the five class system method.

Pea plants were infected by *Rhizobium* bacteria both from organic and conventional soil samples and from seed surface as well. There were no significant differences in nodule number of different treatments comparing to the control and all of the nodules were active. Diversity indexes (Shannon; Margalef and Pielou) of *Rhizobium* isolates from pots with organic soil samples were higher, comparing to the conventional. Number of AMF infective propagules in organic soils was one order of magnitude higher than in soils from conventional tillage. Fungi with the morphology of DSE (dark septate endophyte) were determined only in the soils of conventional farming system. The DSE may indicate an unbalanced status of soil microbiota.

We have concluded that organic agricultural practice may increase abundance and diversity of indigenous symbiotic soil microbial populations. This research was financially supported by Hungarian Research Institute of Organic Agriculture (ÖMKi).

6.7 Application of Arbuscular Micorrhizal Fungi (AMF) and Dark Septate Endophytes (DSE) in cultivation of vegetable

Alena F. Lukács, Gábor M. Kovács Eötvös Loránd University, Institute of Biology, Department of Plant Anatomy, Budapest, Hungary

A majority of terrestrial plants live in mutualistic symbiosis with root-colonizing fungi like arbuscular mycorrhizal (AM) fungi and the so-called dark septate endophytes (DSE). AM fungi e.g. improve the nutrient and water uptake capacity of the plants and increase drought-tolerance. Several important vegetable crops (e.g. pepper, tomato) establish AM. DSE–plant interactions are not as well understood as mycorrhizal interactions, however there are several results showing the positive effect of DSE on host plants. This potential could have especial importance in non-mycorrhizal vegetable crops (e.g. cabbage).

The main aim of our work was to study how inoculation with AMF and DSE affects the biomass of vegetable crops. The effect was tested in potting experiments. A generalist DSE (Cadophora sp.) isolate was chosen to test the effect on cabbage and cucumber. A commercial AM fungal inoculum was used to test the effect of AMF inoculation using pepper and tomato as host plants. The plantlets were grown on plant trays. After harvesting, the dry biomass was measured and the data were analyzed with ANOVA.

There was no significant effect of DSE inoculation on cabbage while the shoot biomass of the inoculated cucumbers was lower than the control. AMF inoculation had negative effect on total biomass of pepper and tomato during the early stage of cultivation. Although these results suggest that the inoculation with DSE or AM fungi had no or negative effect on biomass of the vegetable crops tested, the effect during later developmental stages and on other factors like drought tolerance cannot be excluded. These will be tested in future experiments.

The work is supported by the Hungarian Research Institute of Organic Agriculture (ÖMKi).

6.8 Effects of biofertilizers on yield and quality of 'Bluefrankish' grapevine

Nowadays, the main task of growers and scientists is to find natural ways of plant breeding and lead environmental friendly agriculture. Biofertilizers have a great potential to achieve this aim but unfortunately there is little information about its application, especially in Eastern Europe and Hungary. For this reason, a foliar nutrition experiment was made to investigate the effect of different biofertilizers (algae product and a biostimulator, contained amino acids) on yield, nutrient uptake and quality parameters of grapevine (Vitis vinifera L.). The study was conducted in 2012 at Noszvaj in North-East Hungary in a 24 years old integrated grapevine plantation cv. 'Bluefrankish'. All the grapevines received uniform management practices including pruning, fertilizer, insecticide and pesticide applications without irrigation and nutritional management. The grapevines were only sprayed with aqueous solutions of Activator Plus (AP) (a mixture of amino acids (1l/ha) and Organic Green Gold (OGG) containing living microorganisms (Chlorella vulgaris algae) ((10l/ha) and unsprayed grapevines were kept as control. Treatments (application time and doses) were adjusted to the phonological phases of grapevine. Time of application were: at flowering stage (April 30, 2012); fruit setting stage (May 24, 2012); veraison stage (June 18, 2012) and cluster closing stage (July 17, 2012). All the grapevines were thoroughly sprayed using hand held knapsack sprayer. 0.1 hectare was taken as the experimental unit to record the data with three replicates. In the trial, soil and leaf diagnostic, grape quality measurements and field observations were made to study the effectiveness of applied products in the very droughty conditions in 2012. Our results pointed out that the applied treatments increased the yield, growing parameters and improved the qualifying inner parameters compared to the control. Used products significantly increased the bunch weight and size.

Our leaf diagnostic results also confirmed that the applied biofertilizers had a favorable effect on nutrient uptake of grapevine and resulted vigorous development, greener and healthier leaves despite the unfavorable climatic conditions.

6.9 On farm research on the management of organic apiaries and comparison of control tools against varroa destructor

In Hungary the apicultural sector has a long tradition, there are over one million conventional colonies in the country, that means the highest colony density per square km in Europe. Transition to organic beekeeping has started in the mid-nineties, however only one percent of the conventional beekeepers are certified at present, based on 834/2007 EU Council Regulation, 889/2008 Commission Regulation and the past present national organic legislation 34/2013 VM (MRD). The purpose of the on farm survey was to get data on the most important management practices (type of hives, number of migration, varroa control) in three counties including 62 apiaries with 5164 colonies.

Parallel with the survey we studied the possibilities of Varroa destructor control with accepted materials in the organic system. The aim was to compare methods in experiment under field conditions. The successful varroa control is one key factor of organic operation as well. Results suggest that traditional horizontal hives are over represented in the east part of Hungary (91%). Migration/year varied between 1-5 depending on the region. In the paper the experimental results (three sites in Hungary, with 20 colonies) of thymol and oxalic acid treatments are presented with the efficacy values. The results show that the efficacy varied between 47,9- 96,4%. The results suggest that the only thymol based control strategy can ensure a limited (1-3 year) sustainability of the treated colonies concerning commercial organic production. The difference, oxalic acid based control resulted in significantly higher mite mortality. Other technological factors may have important roles in the control strategy against Varroa destructor especially in organic apiculture.

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Dániel Szalai, Tamás Szalai Szent István University, Gödöllő, Hungary

7. Effects of various soil cultivation methods in areas exposed to erosion

Soil protection, including erosion prevention, plays a predominant role in tillage systems applied in environment friendly viticulture technologies. In addition to erosion control saving water may become a priority in growing areas of dryer ecological conditions (in some vintages). Lake Balaton Region is also characterized by such ecological features. Nowadays when new stress factors occur caused by climate change as a result of global warming, environment friendly grape growing increasingly highlights the necessity of harmonious nutrient supply, the selection of proper soil cultivation methods adapted to the growing area, the application of purposeful pest management, and the appropriate – not excessive – loading of vines in order to have better chances of producing virus-free merchandise and propagation material of good quality. According to forecasts, climate change will cause more frequent droughts, an increase in temperature and more frequent occurrences of heavy rainfall. Abiotic stress effects due to inappropriate tillage will negatively influence the growth of vines. Mulch and cover plants help protect the soil from erosion and deflation; however the benefits and favorable effects on weed control should not be neglected either. Mechanical soil cultivation carried out using the appropriate cultivation equipment at the right time is equally justified in soil cultivation systems. Long-term cultivation experiments have been carried out at the Badacsony Research Institute for Viticulture and Oenology for almost a decade. In our experiments (with a renewed and increased number of treatments in 2013) soil coverage with organic plant debris, long-term and temporary plant coverage and mechanical soil cultivation are compared in a sloping (peak-to-valley direction) system. Our aim is to examine the effects of different soil cultivation methods on erosion, soil- and plant nutrient supply, harvest parameters, and on soil moisture. We were able to observe the effects of the different soil cultivation methods on erosion protection under high rainfall in 2010 and under less than average rainfall in 2012. Concerning the examined soil cultivation methods, we measured the most favourable soil moisture, nutrient supply condition and harvest results in the rows covered with organic plant debris, every year of the project. It can be stated, that each year, with both temporary and long-term plant covering treatments, less moisture remained in the soil, than at parcels treated with organic plant debris.

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