Buzás, N. – Lukovics, M. (eds) 2014: Responsible Innovation.
SZTE GTK, Szeged, pp. 41-53.

Innovative food products, technologies in the systems of food production
The questions of risks and safety

Péter Savanya[1] *– Sándor Balogh*[2]

In the system of food products related risks we can observe, that not only their consumption but even their way of production contains risks. The environmental impact of food's mass production technologies also deal a great security issue. In judgment of the technology and innovations – as opportunities – risks and threats are developing in interaction, although there can be time diversion between them and direct negative extern impacts are taking effects in different places. In the concept of responsible innovation the most interesting question is, to secure enough time for identifying and analyzing the risks, and to accumulate necessary knowledge to judge them.

The paper reviews the connection of opportunities and risks of food products and innovation in a theoretical perspective, to highlight the potential and relevant attracted fields on the level of society, nature and economy. The comparison of the risks and opportunities points out, that the benefit of innovation also contains a number of risks. Our available knowledge is only the top of the iceberg, which requires caution both from science and decision makers.

Keywords: food products, innovation, opportunities, risks

1. Introduction

To produce foods in proper quantity and quality is a primary objective for societies in the history of humanity (Buday-Sántha 2011). Nowadays big, interdependent systems of value chains transmit food products in the system of economy for consumers (Lakner 1996, Hanf et al. 2013). To assure they successful operation these systems created technological regimes, to provide innovation for food production and to make the systems able to produce more food products for the society.

The foods, that we consume, have an elemental impact on human body (Kharb–Singh 2004, Prokisch 2010). Primary question for the society is to secure the safety of food products, so they do not cause diseases either on short or long

[1] Péter Savanya, PhD student, University of Szeged, Faculty of Economics and Business Administration, Institute of Economics and Economic Development (Szeged).
[2] Sándor Balogh, CSc (PhD), professor, University of Szeged, Faculty of Engineering (Szeged).

term. Also important, that the consumed food products should be nutrient and healthy (Tarnavölgyi 2009).

The production of worlds food demand is based on the systems of agribusiness, which is one of the most environmental oppressing human activity and leaves a significant ecological footprint on the planet (FAO 2010, Kendall et al. 2010). For the humanity the most notable challenge in the following decades is the prevention of humanitarian catastrophes caused by overpopulation and starvation. On the other side we can note the pressure of climate change, which primary strikes at the poor of developing countries. The primary solution to this problem is to improve human food producer systems, where new technologies and innovation are needed to develop in the near future (Buday-Sántha 2011, WB 2008).

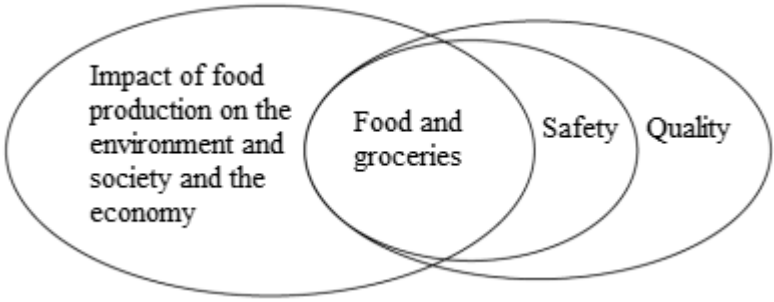
The paper reviews the connection of opportunities and risks of food products' innovation in a theoretical perspective. In the first chapter I review the type of food products' risks according to value chain perspective. This aims to show a horizontal picture how we should evaluate the benefits and risk of innovation on the level of whole society. In the second chapter of the paper I will show some examples from literature, which represent both side of the evaluation when we discuss responsible innovation. To show an empirical example for the responsible innovation I citate an initiative using institutional based innovation, project SAADA, which is a perfect example for the adequate solution regarding innovation in food production.

2. System of risks regarding food products

When evaluating the risks of food products a consumer firstly considers, if the food product which I consume, is harmful for my health or in other words: is it consumable. The other important question connected to the products is, that what kind of affect it has on human organism, therefore how much does it serves healthy nurture (Kharb–Singh 2004, Tarnavölgyi 2009).

The third dimension is where the effects are only experienced in an indirect way for the consumer, which is production's social and environmental impact (Kendall et al. 2010). These social and environmental mechanisms separate in time and space from the physical consumption of food products, although these are the emphasized risks considering food production. These impacts and risks can be separated from each other, but through the system of time differential feedbacks they are connected in the food product's social production and consumption (Figure 1).

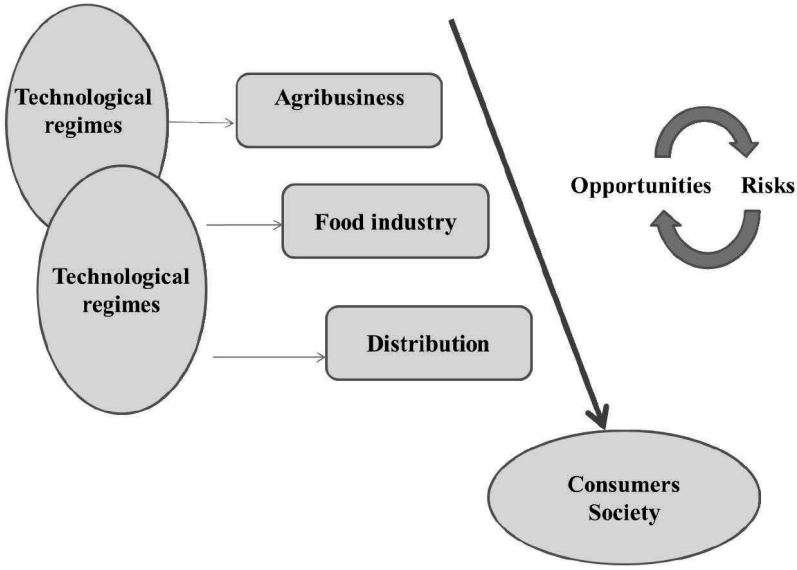
Figure 1. Types of direkt and indirect risks of food products



Source: Own construction

The groceries took off the "shelves" are delivered through a long value chain, which is operated by a number of connected technologies and originations' network. In the chain of the production – processing – distribution of groceries, the food industry has the processing and andconverting functions (Figure 2).

Figure 2. The represented risks in food products value chains



Source: Own construction

2.1. Agricultural systems

The production chain, which delivers the food products also broadcasts the risks present in the system and in the technologies to the consumer. The groceries took off from the shelves literally contains the whole production's risk factors, on a wid-

er scale the production's social and environmental impacts (Heyder–Theuvsen 2009).

The system can be divided into three aspects regarding its role in production: agricultural production (ingredient production), the food industry (processed goods production) and trade (distribution towards consumers). The individual industrial branches are global systems, which contains unique and also related technological regimes (Lakner 1996).

The first step in groceries production is agricultural production. The agriculture firstly produces ingredients for food production; secondly it produces groceries in unprocessed way directly to the consumers (fruit and vegetables). The modern agricultural production system basically relies on technological regimes, such as chemical industry and biotechnology (plant protecting chemicals, artificial fertilizer, and soil protecting chemicals).

The questions behind the food products' security begin at the level of ingredients and production technologies (Tarnavölgyi 2009). The different and more frequently developing technologies means an elemental intervention in food production. Procedures, like breeding improvements are used for centuries, but nowadays it is argued to use gene modified plants and animal ingredients for human consumption (Heszky 2010). The technical regime and development are controlled by global corporations and their networks. Profit oriented companies are using technologies and their development, to reach larger profit and to introduce them on the market. The companies' interest and their demands are forcing quicker employment of innovations, which automatically generates the risk management's institutional and social flaw. Firstly the prescribed time for the evaluation of risks reduces; the applied examination's effectiveness usually does not give enough opportunity to represent long term and metastatic risks. Furthermore the risks caused by future technologies cannot be sensed or shown by todays diagnostically procedures. The procedures' supervision is usually under governmental jurisdiction, in the evaluation of risks and security the social control is reduced. A worldwide known story regarding chemical usage and risks is the case of DDT and Monsanto, where an ecological catastrophe alerted the worlds' attention on the applied, also considered as secure chemical's harmful long-term impacts, which could affect the whole population (Kendall et al. 2010).

The agriculture – as a producing system – is the most environment oppressing human activity. The extensive agricultural production and land use, has a constant effect on environmental rearrangement and on the ecological system. E.g. the chemical usage on bugs eradicates them from the food chain, causing a disturbance in a whole circle's ecological system. The application of artificial fertilizer manipulates soil water's ecological system in the same way. Apart from the protection of environmental values, the society's drinking water is also affected by chemical accumulation and it's spreading in the ecological context (Kendall et al. 2010).

In conclusion we can say that the technological regimes behind agriculture are more concentrated, more and more potential is focused in less companies' authority (Table 1). The 60% of applied chemicals are ruled by the branch's four big companies. So the generating of risks is increasing, and is connected to a more concentrated group of decision makers (WB 2008). On the other hand the evaluation and examination of risks are not developing in the same way, so the opportunity of social control and intervention regarding responsible innovation is decreasing. With the agricultural production's global volume increase the environmental oppressing and the ecological risks are spreading in a great measure around the world.

Table 1. Major suppliers of agricultural inputs and growing concentration

	Agrochemicals		Seeds		Biotechnology	
Company	2004 sales ($ million)	Market share (%)	2004 sales ($ million)	Market share (%)	Number of U.S. patents[a]	Patent share (%)
Monsanto	3,180	10	3,118	12	605	14
Dupont/Pioneer	2,249	7	2,624	10	562	13
Syngenta	6,030	18	1,239	5	302	7
Bayer Crop Sciences	6,155	19	387	2	173	4
BASF	4,165	13	—	—	—	—
Dow Agrosciences	3,368	10	—	—	130	3
Limagrain	—	—	1,239	5	—	—
Others/Private	7,519	23	16,593	66	1,425	34
Public Sector	—	—	—	—	1,037	24
Market concentration[b]						
CR4 (2004)	60		33		38	
CR4 (1997)[c]	47		23			

Sources: UNCTAD 2006b; International Seed Federation at http://www.worldseed.org.
a. Number of U.S. agricultural biotechnology patents issued during the 1982–2001 period.
b. Market concentration is measured by the concentration ratio CR4, which indicates the market share of the four largest firms participating in the market.
c. Fulton and Giannakas 2001.
— = not available.

Source: WB (2008, p. 137)

The agricultural production and products, the ingredients' global trade brings another dimension in to the system (Buday-Sántha 2011, Hanf et al. 2013). Through the context of trade, the food product's consumption separates in space, from the risk creation during the production of the ingredients. So in some societies with the increase of production and consumption volume, the risks and negative externalities are increasing disproportionately compared to their food product consumption – especially in agricultural ingredients exporting countries.

2.2. Food industry

The food industry is the central actor in producing food ingredients and food products from raw materials. More part of nutrition is based on processed or on modified groceries. The food industry and the applied technologies are the main determining elements of the food's security and quality features.

The food industry uses a large scale of technologies, from the handling of raw materials, through the breeding chemical procedures, to the hygienically systems. On the basis the question considering technologies used in food industry is

security, to determine if the product contains harmful components. The other question considering processed food products, is to analyze its effects on the human organism, what kind of quality the product has (Ruckman 2002).

In the food industry applied aggregates (e.g. colourant) are prevalent on a wide scale, and their numbers are growing. In parallel the number of food allergy patients and the food diseases are increasing. The food industry innovation and technology development brings more risk factors in the consumers' life. Even more interesting and troublesome question is the interactions between the chemicals in raw materials and the aggregates applied in the food industry (Tarnavölgyi 2009).

Technological regime and its concentration are similar to the agricultural systems. The food industry is also described by concentration procedures, a few big company rule the market in some sub-branches. The companies have major influence in introducing innovation in the branch's technology development. This concentration although has positive effect on the development of quality assurance. The production and trade of groceries are done on a global scale; this procedure could increase the harmonization of quality assurance standards (Hajdu–Lakner 2000, WB 2008).

In the topic of quality assurance we can find interesting questions such as the effects of food products on health, their effect on human organism (Kharb–Singh 2004). It is enough to mention the food products' flavoring aggregates such as oil, fat, salt and sugar (e.g. energy drinks) and their negative effects on obesity, as the developed societies common illness, and its complications: cardiovascular illnesses, diabetes etc. (Ruckman 2002). The treatment and curing of these diseases comes with great expenses for these societies, and as a factor of risk and social security it is strongly connected to food quality assurance. On the field of illnesses regarding provisioning and nutrition we can also mention some flavoring aggregates with long-term medical impacts. After a decade usage it can be shown, that some of these flavoring aggregates may cause cancerous diseases. Although not in all cases can we clearly state the relation between cancerous diseases and the food industry chemicals, it still makes their usage an elemental social security problem, the application of these technologies in the field of responsible innovation.

One of the main aspects of today's food industrial innovations' is the development of functional groceries, which creates a new approach of foods (Kharb–Singh 2004). In these cases the food's ingredients and agents' collective effects provides medical impacts for the product. The intervention in the function of the human organism through groceries is a cardinal security aspect regarding this type of healthcare (Meister 2002, Ruckman 2002).

2.3. Distribution

The system of distribution delivers the groceries on the consumer's table. The foods on the market's shelves can be considered as the top of the iceberg, this is on-

ly level with the consumer mainly interacts. In the distribution systems we can mention logistic systems and trade of food products. The security measures regarding the trade, containment and shipment of food products have important role in consumer protection. The adequate shipping and containment are fundamental in maintaining the food products warranty and assuring quality. The trading abuse regarding food warranty are unfortunately are well known. The supervision of these is mostly under administrational jurisdiction, the control of distribution is key element in providing sense of secure for the consumers.

The complicated system and long supply chains which are connected to the food products social consumption have a great environmental oppressing impact. The global production and trade of food products is increasing, so its importance becomes more significant. It is not a negligible social angle, that apart from the hegemony of the big systems, the local food providing systems are forced back. The breakdown of these systems makes the society defenselessness in food provision, also the big systems broadcast the global risks to the local consumers (Hanf et al. 2013, Heyder–Theuvsen 2009)

As we saw the production and consumption of food products creates an interdependent system on the level of economy and nature. One of the most important conclusions is, that the risks caused by technologies and innovation; do not absolutely appear in the groceries. This especially concludes the field of agriculture, which directly affects the ecological environment. The risks and the indirect form of negative externalities appear not only in consumable forms but on the level of nature, economy and society. In the awareness of consumer these risks are not connected; for them only the product's material risks are manifested, the consumer detects and evaluates just these risks. But for the society the risks appear aggregately on the level of complete system, in where mass consumption of imported groceries causing ecological damages through the neighbouring countries agrarian production, with the consumption of these products we also consume their industrial chemicals, which's long term effects on human body are not known, and runs the potentials and capacities of the local food production system out.

3. Responsible innovation – opportunities and risks

Through the systematic research of food product related risks we can observe, that not only their consumption but even their way of production contains risks. The environmental impact of food's mass production technology also deals a great security issue. In judgment of the technology and innovations – as opportunities – risks and threats are developing in interaction, although there can be time diversion between them and direct negative extern impacts are taking effects in different places. In the concept of responsible innovation the most interesting question is, to secure

enough time for identifying and analyzing the risks, and to accumulate necessary knowledge to judge them (Sutcliffe 2013, von Schomberg 2011).

In the following I will summarize some of the critical topics mentioned by the specialized literature, which opportunities and which threats must we take into account regarding food product innovation (Table 2).

The presented topics are covering a wider aspect regarding food product innovation, than the groceries secured consumption. The shown problems are only excerpts. The topics detailed discussion, the scientific facts and result, the experts pros and cons offers us a great number of specialized literature. Our goal is not a detailed discussion of the topic. The comparison of the risks and opportunities points out, that the benefit of innovation also contains a number of risks. Our available knowledge is only the top of the iceberg, which requires caution from science and from the societies' decision makers.

Table 2. The challenges of food product innovations

Opportunities	**Risks**
To secure stabile and adequate food products for the societies, to support the developing countries in their nutrition problem, and fight against deep poverty	
- Gene modification offers opportunity to create new plants, which can provide high harvest volume, even in extreme weather conditions (Heszky 2010, Pepó 2010). - New technologies provide higher harvest volume and improve products' quality (Glits et al. 2008). - The breeding of livestock, which makes animals more resistant in extreme conditions. - Vaccination and medical care of livestock, which leads to a higher survival rate (Tuboly et al. 1998).	- The knowledge regarding gene modified food products' long term effects on the human organism are not efficient (Heszky 2010). - Plant protect chemicals can affect the ecosystem on larger levels, which could lead to species' extinction. Chemicals accumulated in the living organism could cause serious illnesses, when it exceeds a certain level (Kendall et al. 2010). - With the animal based products certain chemicals can directly reach humans, which effects on the human organism have not been tested (Farsang 2003).
Opportunities	**Risks**
Food products, as an instrument to influence the human organism's physiological progresses	
- The innovation of functional food products means a new method in treatment of illnesses, as well as in establishing dietary with functional medical effects (Prokisch 2010). - Through the development groceries' production we have the opportunity to produce food products, which can preserve the consumers' health and can be obtained by a larger number from the society (e.g. high-fiber nutrition), can decrease the numbers of cardiovascular and obesity patients, and the expenses on their treatment (Kharb–Singh 2004).	- The aggregates applied in creating functional food products could cause currently unknown allergies (Ruckman 2002). - The functional food products could cause concerns in the consumers regarding the product's credibility and its price-value evaluation. Promoting the food products medical benefits and introducing them on the market may lead to serious abuses, gives opportunity to mislead the consumers (Meister 2002).

Agribusiness	
- For the developing counties it is a primary opportunity to employ mass numbered, untrained labor, to take part in global trade (Alidou et al. 2010, WB 2008). - The increase of the food industry's capability to create added value and rising productivity is key in the branch's competitiveness (Lakner 1996).	- With the spreading of agricultural opportunities global overpopulation can intensify, the development in nutrition could lead to millions of starving on the world societies' periphery (WB 2008). - The improvement in production technologies mainly increases productivity, which could reduce the number of needed labor (WB 2008). - The growth of the big systems rearranges the national production's system, which could cause social and economic instability (Hanf et al. 2013, WB 2008).
Opportunities	**Risks**
Food product consuming society	
- The development of nutrition science and food production, in cooperation could lead to a healthier society (Kharb–Singh 2004, Tarnavölgyi 2009). - The knowledge about food and the results of nutrition science could improve the society's preparedness and consumer awareness (Kharb–Singh 2004, Tarnavölgyi 2009).	- The demand intensive flavors brought new, still unknown aggregates' mass application in food production, which can be consumed by millions for years (Tarnavölgyi 2009).

Source: Own construction

3.1. The validation of responsible innovation in food products' production and consumption

As we saw the production and consumption of food products is a complex system on the level of economy, environment and society, which is supported by its own technological regime. The main question in the field of responsible innovation regarding food production is to monitor the effects of innovation in other subsystems. I valuate the risks of food products' responsible innovation through the threats system (King–Sutclife 2011).

3.2. Technological security

Food quality assuring systems have a well-functioning and widely used method to notice and evaluate threats regarding short warranty products. The food industry puts great efforts to improve its quality assurance system, and the governments' administration demand these kinds of preparations. It is elemental social interest to secure food products quality, and to maintain trust in food products.

Although the food industry still lacks the necessary procedures when it comes to notice and evaluate long term risks. We can still esteem with high efficiency a new aggregate's or a newly invented food product's negative impact on the human organism. In case of the tested amounts, the product does not have negative effects. But what if the product is consumed for years (Tarnavölgyi 2009)?

We have insufficient data about when the innovation is used on a large scale, in mass numbers and for longer terms, what kind of effect has it on the human organism, when it is used for a long time. What kind of future, global and mass medical risk we take, if the people consume these newly invented products in the present.

3.3. Economy-Society-Environment

Considering the food products systematic risk system, we can observe phenomenon's such as environmental oppression or negative economic and social processes like the connection between increasing yield and population explosion. The responsible innovation has also a key role here.

As an example we can mention the big system's scale-economical and capital based technology development, versus local economies opportunities, which are relying on local labor and production. For the developing countries, improvement based on technology and capital is not an available alternative (Alidou et al. 2010, WB 2008). The increasing production volume shows results in the elimination of starvation, but it has a counter effect on economic development and employment. Moreover, it comes with the environment's extensive exploitation. So forcing these types of innovations is not an adequate solution for developing countries. There are other alternative innovation systems apart from technology based innovations, which are showing good results. These programs are concentrating on institutional innovation, where technology only has a support role. The OECD and the World Bank has launched several of the mentioned programs (Alidou et al. 2010). These programs are targeting the development of agribusiness, with the adaption of network based economic innovation, urban development and the instruments of networking (FAO 2010, Heyder–Theuvsen 2009). These social innovations are offering solutions on production volume, as well on employment improvement (Knickel et al. 2008). Plus the local providing chains are producing with less environmental oppression.

3.4. Project SAADA – example for responsible innovation in food production and agribusiness

A The project SAADA (Strategic Alliance for Agricultural Development in Africa) was carried out between 2006 and 2009 as a pilot project with the participation of West-African developing countries (Burkina Faso, Benin, Ghana, Mali, Niger, Nigeria, Togo). The program was mentored by the IFDC (International Fertilizer Development Centre) and the Dutch Ministry of Foreign Affairs operating as a primary sponsor. The management capacity and knowledge base was provided by the experts from institute of Berenshot and Agrarian Science University of Wageningen. In the program near 150 thousand farmers participated, the programs radius touched 370 thousand household, so the group of the program's stakeholders means

more than 1 million people. The study of Alidou et al. (2010) summarized the practices of the program, we citate this document.

The program aimed to put the CASE (Competitive Agricultural System and Enterprise) initiative in to practice in West-Africa. A conception of the program focused on improving the agrarian production and promoted the farmers to become agrarian-entrepreneurs. The logic of the program aimed to develop the connection in the value chain of agribusiness and to improve the capacities with the instruments of network based enterprise development policy.

The core of the program is the expanding the human capacities with education. The farmers could learn progressive agriculture and business knowledge in an education and skill improving program. On the network organized skilled farmers can get much easier input for the business based production, because they can manage the supply chain and application of resources. The program involved more groups of stakeholders – e.g. government and the institutes of local public government – as the potential organizer of local integrations, and cooperated with other African agrarian development agencies and merchandise agencies.

The improving of the institutional framework is a notable part of the development matrix, which includes the policy mix of enterprise development. The concept of micro-lending system (e.g. Gramen-modell) is a successfully operating construction in much developing countries of the world. The concentration of capital and technology infer the need for improvement of actors' capital absorption capability in the agribusiness systems. The project SAADA tries to improve the connection between the bank system and the farmers through creation standardized credit construction packages. More than 40 financial institutions form 5 West-African countries took part in the lending program, and more than 9 million Euro credit was transferred.

The Project SAADA shows a good practice in responsible innovation, in where adequate solutions are work out for relevant problems. The network business form as a social innovation contributes to stabilise nutrition in developing countries, improve the efficiency of farmers' production system without extensive farming land use; and the effected countries are able to join to the international trade of food products with exportable wares.

4. Summary

After over viewing the connection of responsible innovation in the field of food production and consumption we can make the following theoretical notes:

- The risks of groceries are complex because of the systems' connections, which applies on the risks' origin, on the risks' direction and term and on the prevention measures used against them.

- The risks of food production and consumption are only taken into account by the consumers' point of view; there is not much attention towards the long term social and ecological risk factors of food production.
- To manage the risks in the production and consumption of foods products it is necessary to have a horizontal and vertical cooperation in the risks management systems.

The basic element of the responsible innovation is a society controlled decision mechanism to manage the technological and economic revolution. It is a necessary condition that there should be adequate time for knowledge accumulation in the society. The revolution and the implementation of innovation always include uncertainty. But considering the interests of society we need to evaluate how many risks are we willing to take. The decision and those who are affected by the decision are separated regarding the innovation's negative external effects. The circles of beneficiaries are notably known, but the negative externalities and its shareholders are unknown, if we do not see the potential negative effects. The responsible innovations' message for the decision makers is that we must analyze the foreseeable benefits with their possible risks. The uncertainty is an inherent part of the innovation processes, but more prepared decision makers can give us chance to evaluate: what is worth, and what is not.

Bibliography:

Alidou, M. – Lem, M. – Schrader, T. – de Zeeuw, F. (2010): *Local entrepreneurship, agribusiness cluster formation and the development of competitive value chains. Evaluation of the Strategic Alliance for Agricultural Development in Africa (SAADA program) 2006-2009*. Berenschot, Wageningen UR.

Buday-Sántha A. (2011): *Agrár- és vidékpolitika*. Saldo, Budapest.

FAO (2010): *Agro-based clusters in developing countries: staying competitive in a globalized economy*. Food and Agriculture Organization of the United Nations, Rome.

Farsang A. (2003): Genetikai módszerek a vakcinaellenőrzésben. *PhD thesis*, Szent István Egyetem, Budapest.

Glits M. – Horváth J. – Kuroli G. – Petróczi I. (eds) (2008): *Növényvédelem*. Mezőgazda Kiadó Kft., Budapest.

Hajdu I. – Lakner Z. (2000): Nemzetközi tendenciák – hazai dilemmák: a magyar élelmiszeripar világgazdasági környezete és stratégiai fejlődési irányai az ezredfordulón. *Élelmezési Ipar*, 4. pp. 1-43.

Hanf, J. H. – Belaya, V. – Schwiekert, E. (2013): Who's Got the Power? An Evaluation of Power Distribution in the German Agribusiness Industry. In Harvey, H. S. Jr. (ed.): *The Ethics and Economics of Agrifood Competition*. The International Library of Environmental, Agricultural and Food Ethics Series, Vol. 20, Springer Netherlands, Amsterdam.

Heszky L. (2010): Biotechnológia és növénytemesztés a XXI. században. *Agrofórum*, 1, pp. 88-91.

Heyder, M. – Theuvsen, L. (2009): Corporate Social Responsibility in Agribusiness: Empirical Findings from Germany. Presented Paper, *113th EAAE Seminar "A resilient European food industry and food chain in a challenging world"*, Chania, Crete, Greece, September 3-6, 2009.

Kendall, R. J. et al. (2010): *Wildlife Toxicology*. CRC Press, London.

Kharb, S. – Singh, V. (2004): Nutraceuticals in Health and Disease Prevention. *Indian Journal of Clinical Biochemistry*, 1, pp. 50-53.

King, M. – Sutclife H. (2011): *What the public want to know about company use of new technologies.* Obtained through the internet: www.matterforall.org.

Knickel, K. – Zerger, C. – Jahn, G. – Renting, H. (2008): Limiting and Enabling Factors of Collective Farmers' Marketing Initiatives: Results of a Comparative Analysis of the Situation and Trends in 10 European Countries. *Journal of Hunger & Environmental Nutrition*, 2-3, pp. 247-269.

Lakner Z. (1996): Modernizáció és versenyképesség. *Élelmezési Ipar*, 4, pp. 2-34.

Meister, K. (2002): *Facts about „Functional Foods"*. American Council on Science and Health, New York.

Pepó P. (2010): *Növénynemesítés*. Agrár- és Gazdálkodástudományok Centruma Mezőgazdaság-, Élelmiszertudományi és Környezetgazdálkodási Kar, Debrecen.

Prokisch J. (2010): *Funkcionális élelmiszerek hatóanyagai*. Center-Print Kft., Debrecen.

Ruckman, S. (2002): Functional Foods – Are safety and efficacy important? *NutraCos*, 5-6, pp. 26-28.

Sutcliffe, H. (2013): *A report on Responsible Research & Innovation*. MATTER, http://ec.europa.eu/research/science-society/document_library/pdf_06/rri-report-hilary-sutcliffe_en.pdf. Download date: 10th May 2014.

Tarnavölgyi G. (2009): Az élelmiszer-adalékanyagok szakmai és fogyasztói megítélése. *PhD thesis*, Kaposvári Egyetem Gazdaságtudományi Kar, Kaposvár.

Tuboly S. – Medveczky I. – Rusvai M. – Varga J. – Aranyossy A. (eds) (1998): *Állatorvosi járványtan*. Mezőgazda Kiadó, Budapest.

Von Schomberg, M. (2011): Prospects for Technology Assessment in a framework of responsible research and innovation. In Dusseldorp, M. – Beecroft, R. (eds): *Technikfolgen abschätzen lehren: Bildungspotenziale transdisziplinärer Methoden*. Vs Verlag, Wiesbaden.

WB (2008): *Agriculture for Development. World Development Report 2008*. World Bank, Washington D.C.