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The complexities of European strategy design –
The case of agriculture[1]

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Abstract

In this paper we intend to analyse a number of agricultural documents to see if they mesh with the EU's sustainable development policy. The documents in question were prepared at different times and involved different organizations which reflected the interests of various social and economic stakeholders. After demonstrating the still existing conflict between the Lisbon and the Gothenburg Strategy, we will summarize the thematic strategies concerning EU agriculture. The relationship between agricultural policy and the two basic strategies may have implications for other sectoral strategies (e.g. energy, transport, tourism). If the EU is subsequently able to make headway regarding its strategies, it will also facilitate resolution of this problem at the national strategy level. We will review how the documents' content concurs or differs regarding the EU's sustainable development strategy. Finally we will analyse the factors causing the differences and the contradictions and suggest conditions leading to harmony.

Keywords

EU Sustainable Development Strategy, Lisbon Strategy, agriculture, thematic strategies

1. Introduction

During the last 6-8 years one has witnessed a strengthening in the EU's strategic approach.[3] The increase in global competition and the pressure to clarify and enhance economic objectives have prompted a long-term evaluation of these same objectives. This has resulted in a number of initiatives, among them the year 2000 *Lisbon Strategy* (LiS), which was subsequently revised in 2005. Also because of ominous planetary ecological threats, it has become imperative to environmentally survey the economic and social processes over a long period of time. To counter these threats, the EU created the 2001 *Sustainable Development Strategy of the European Union* (SDS), later revised in 2005. Besides these two fundamental strategies, several other documents focusing on medium and long-term ideas were at the same time prepared. Here we emphasize the 6th Environmental Action Programme of the European Union and the so-called thematic-strategies, which are closely related to this programme. However these documents are not connected by some well-defined principle or clear logic but their relationship is "loose and many times rather vague" (Bulla – Pomázi, 2003:249).

[3]   Several strategic documents have been prepared or initiated, e.g. European Biodiversity Strategy (COM, 1998); Forestry Strategy (CoEU, 1999); Common Implementation Strategy for the Water Framework Directive (CEC, 2001b); Strategy on health and safety at work (CEC, 2002b); European Security Strategy (CEC 2003a); EU Drugs Strategy (CoEU, 2004); Community Strategy Concerning Mercury (CEC, 2005i); An EU Strategy for Biofuels (CEC, 2006c). Some Green Papers and White Papers as a pre-strategic documents were prepared, e.g. Energy for the Future: Renewable Sources of Energy (CEC, 1997); Towards a European Strategy for Security of Energy Supply (CEC, 2000); European transport policy for 2010: time to decide (CEC, 2001c); European Space policy (CEC, 2003b); Towards a future Maritime Policy for the Union (CEC, 2006d).

Several EU documents emphasize that sustainable development is a concept encompassing the totality of social and economic life and necessarily impacts on all EU strategic ideas, policies, and activities, including agricultural and rural development policies. The principle of sustainable development also requires that social and economic objectives should coincide with environmental-ecological constraints.

However this requirement has many pitfalls. The basic problem lies in the ambiguity of the key concepts and definitions. While elaborating and revising its sustainable development strategy (including the Lisbon Strategy), the EU has avoided specifying what sustainable development is and has failed to define *strategy*. Both concepts were interpreted intuitively from a pragmatic point of view.

Over the last two or three decades it has become obvious that sustainable development is an extremely complex, and in many ways ambiguous concept. Implementing sustainable development is difficult, slow, and necessitates compromises. The concept itself has numerous, sometimes contradictory interpretations so it remains difficult to define the elements of the problem in an unambiguous way. Socio-politico players do not always discern the theory's contradictions and uncertainties. In fact, they are often selective toward the theory's various representations, choosing those which suit their political and economic interests. In EU strategy documents (SDS, LiS, thematic strategies), the concept of sustainability is usually not defined or only briefly and superficially dealt with. Generally they quote the Brundtland Report definition and the vast majority of the strategies refer to "three pillars," meaning the need to balance economic, social and environmental objectives. Most of the time they neither address implementational difficulties nor potential priorities. They only emphasize that equal attention should be paid to economic, social, and environmental development. However "*the integration of the three relations into one policy is not equal with the three-pillar interpretation of sustainability*" (Kiss, 2005:7).

However, *the concept of sustainable development originated in global ecology*. Using this as a basic starting point, the problem can be simply defined without distorting it core meaning: mankind has interfered in the global bio-chemical cycles to such an extent that it threatens not only the natural balance developed over years but also the existence of life on earth. It is therefore imperative to change human consumption and production patterns. This means that environmental objectives have absolute priority, while economic and social considerations are subordinate to the Earth's capacity to absorb human activity. Economic and social considerations are also curtailed by the critical level of natural capital and other ecological constraints as defined by ecological economics. The strategies' aim is to transform society and its economy to make it possible to comply with ecological constraints. (Gáthy et al., 2006)

It will be shown that the EU SDS and the various thematic strategies only partially embrace this approach. Moreover, the LiS and European agricultural policy basically ignore this point of view, and this attitude impacts greatly on their approach. This partly explains why their objectives are too cautions and not far-reaching. Their objectives do not entail the restoration of global ecological balance, which has been spoilt by humanity, and they do not fall within natural, environmental constraints.

It is also surprising that none of the EU documents describes the criteria required for a strategy. In our opinion, the major – and mostly interrelated – characteristics of a strategy are the following: *a comprehensive and systematic view, fundamentally new objec-*

tives, a long-term approach, and interpretation as a learning process. (Gáthy et al., 2006, Gáthy – Kuti, 2006)

Many documents use the terms "policy" and "strategy" as synonyms, but often they fail to distinguish between a programme, a plan, and a strategy. A good example of this is that the EU integrated the seven so-called thematic strategies within the 6th Environmental Action Programme (EAP). This ambiguous approach may partly explain the confusion concerning the various time spans. The EU SDS does not specify the time span for which the strategy was prepared. Only at the end of the document is a period of 50 years mentioned (CoEU, 2006). The time spans examined for each specific topic hardly exceed the 6th. EAP's duration, which is considered a medium-term plan. However, the thematic strategies linked to it often establish processes for decades to come. The LiS, which initially extended until 2010, sometimes includes decades long forecasts and examines the processes for this duration. Several ideas related to given fields, such as agriculture and rural development, combine with budgetary planning periods from 2007-2013. This amount of time is too short when one considers the previously mentioned period of 50 years for strategic planning.

There are thus two shortcomings. First of all, the concept of sustainable development is oversimplied and secondly the concept of "strategy" is vague. These two shortcomings are deleterious as they mean the EU SDS inadequately serves as a basis for the creation of other strategies.

2. Synergies between the EU SDS and the Lisbon Strategy – ambition or reality?

For our field of research investigating the relationship between the LiS and the SDS is crucial because this relationship could impact on sectoral policies' content and approach and on related strategic documents. Regarding sectoral policies, the dilemma arises as to whether harmony can be created between the approaches for competitiveness and sustainability, and if yes how and to what extent. For this reason, it is useful to compare agricultural and rural development policy to the two basic strategies, as it may have implications for other sectoral strategies (e.g. energy, transport, tourism). We emphasize that the Lisbon Strategy includes inherent contradictions. Palánkai criticizes the Lisbon programme because it often sets mutually contradictory goals (Palánkai, 2006:1047). Also Halmai and Gács reveal the ambiguity regarding the relationship between the essential strategic elements. (Halmai, 2006:1057; Gács, 2005:212)

The ambiguity of the relationship between the LiS and the SDS and its consequences has already been emphasized. For example, according to the EEAC: "*The unclear relationship between Lisbon and the SD strategy produced contradictory and unproductive controversies that were more blockading than innovative*" (EEAC, 2006:3).

The contradictory relationship between LiS and SDS objectives also exists between the national economic and sustainability strategies, and it stems from the fundamental conflict between medium-term economic competitiveness and long-term ecological/environmental interests. One can only enhance competitiveness by keeping in mind market interests. This may also entail maintaining present consumption patterns, which are harmful to sustainability and often imply increasing material consumption, which runs contrary to sustainability. Sustainability requires ecological constraints, and radically changing consumption patterns by altering their structure and reducing material consumption.

EU documents do not emphasize this contradiction. Moreover, this fundamental contradiction is often sidestepped as if harmony between the two was taken for granted. For example, the important LiS renewal document states the following: "*The Commission proposes to refocus the Lisbon agenda on actions that promote growth and jobs in a manner that is fully consistent with the objective of sustainable development. The actions falling under this strategy should reinforce the Union potential to meet and further develop our environmental and social objectives*" (CEC, 2005h:12). The new year 2005 EU SDS also generally overlooks the conflict: "*the Lisbon Strategy makes an essential contribution to the overarching objective of sustainable development focusing primarily on actions and measures aimed at increasing competitiveness and economic growth and enhancing job creation*" (CoEU, 2006:6). But specifically how can this requirement be fulfilled and to what extent? Neither the social sciences representatives nor the EU documents have so far provided a thorough analysis of this problem.

An analysis of the EU documents illustrates that the relationship between the Lisbon Strategy and the EU SDS is not clearcut. Some interpretations suggest that the LiS and the SDS are on the same level. According to the revised SDS: "*EU SDS and the Lisbon Strategy for growth and jobs complement each other*" (CoEU, 2006:6). The medium-term Lisbon Strategy review and the 2005 EU SDS review refer to the Lis/SDS relationship as "*Being mutually reinforcing, they target complementary actions…*". (CEC, 2005a:4; CEC, 2005h:4-5).

However, other sentences in these documents refer to the pre-eminence of the SDS: "*Lisbon remains **an essential component** of the overarching objective of sustainable development*" (CEC, 2005a:4; CEC, 2005h:4-5); the LiS "*is also to be seen **in the wider context of the sustainable development** requirement*" (CEC, 2005d:2); "*the two strategies must be coherent under the overarching objective of long-term sustainable development. In this way 'Lisbon' can be **an important step** on the way to sustainable development, but it cannot be a substitute for a long-term sustainable strategy*" (CEC, 2005b:5).

Most of the quoted paragraphs are located in the initial introductory parts of the documents and the statements remain at a general level; they are not supported by arguments or concrete examples. An even bigger problem is that when reading the LiS no elements can be found referring to SDS objectives or even its spirit.

Again we have to emphasize that the EU documents do not even discuss the basic contradictions between the LiS and the SDS. They also sidestep existing tensions and, as far as their content and approach are concerned, this constitutes a shortcoming.

Both strategies can potentially fulfil the EEAC requirement "*In our view the annual Lisbon process should be sharpened in scope and direction so that it becomes the occasion for a true annual assessment and stock-taking of the progress of the Union towards the long-term goals defined by the sustainable development strategy. It is not sufficient for the Lisbon process to focus on the narrow traditional economic goals of growth and competitiveness. The sustainability challenge makes it imperative to focus on a broader and longer term concept of the well-being and social health of society and its relationship to the natural environment as the true goal. Conversely the SD strategy needs to take full account of the economic dimension and to help identify the technological and economic opportunities that will arise in the transition to a more sustainable society in the future.*" (EEAC, 2006:3)

In the following section we summarize the facts regarding the LiS/SDS relationship in the following manner. First of all, both strategies are viewed as intrinsic to the European Union since their initial purpose was to set the main tendencies for EU long-term development. Despite this, the two processes run parallell and their contradictions are obvious, although efforts have recently been made to treat them in a uniform way. For some interest groups strengthening economic growth, increasing competitiveness, and creating a knowledge-based society seem utmost and thus they receive greater emphasis in the EU documents. Those representing another school of thought have a different view. They rightly respond that **global ecological sustainability is more important, and that objectives and instruments must be subordinate to this when revising the Lisbon Strategy.**

Unfortunately, even the recent SDS Review process was carried out separately from the Lisbon Strategy. According to Wijkman, "the logic would be to merge these two strategies. Instead we are continuing to discuss issues related to economic growth, social development and environment protection on parallel tracks." (Wijkman, 2006:6)

However, we contend that future revision processes must complement each other. The sustainability strategy was designed for a period of decades while the Lisbon Strategy originally was projected until 2010. Any future review should insist that the Lisbon Strategy adjust to the longer term requirements of the former strategy. Both strategies should serve as a basis for sectoral and other strategies that focus on smaller fields and problem areas.

3. The development of a strategic approach for agriculture

Since the end of the 1990s the strategic approach to agricultural and rural development problems has been reinforced within the EU. Previous agricultural strategies focused on price support schemes and paid little attention to structural transformation programmes. (Szabó, 2001)

The European Union lacks a definite (long-term, comprehensive, documented) agrarian strategy. Some researchers have recently emphasized the necessity of an agricultural strategy at both the national and the EU level. According to Judit Kiss, the absence of an EU agricultural strategy gives Hungary the opportunity to elaborate its national agricultural strategy according to its own interest and conditions (Kiss, 2006). Here we also share Gábor Szabó's view which emphasizes the necessity of an EU agricultural strategy determining the right direction and approach for national agricultural strategies (Szabó, 2006).

Regulation of EU agriculture is determined by the Common Agricultural Policy (CAP). However, agricultural policy objectives rarely appear "in an explicit way in the official documents" (Fertő, 1999:32). It is nevertheless important that agricultural objectives be clearly established, and. Fertő emphasis the following:

- They have to be meaningful to the agricultural public;
- They present agricultural problems which the government deems important to those involved in the debate,
- They serve as a guideline to officials participating in implementation;
- They ensure a starting point and a basis for comparison in evaluating agricultural policy. (Fertő, 1999)

Creating an agricultural and rural development strategy and formulating agricultural policy objectives are necessary due to the need for long-term, strategic thinking. The CAP laid down fundamentally important strategic objectives and these objectives have been achieved.

The CAP which, prior to the Treaty of Rome was a source of debate, is now a major common policy and is paramount in forming cooperation with the EU. Articles 39 of the Treaty of Rome summarized CAP objectives in five points (1st: to increase agricultural production; 2nd: to ensure a suitable standard of living for those involved in agriculture; 3rd: to stabilize agrarian markets; 4th: to guarantee safety of food provision; 5th: to ensure consumer supply at an acceptable price (Halmai, 2004:15)). However, among these agri-environmental directives did not appear. In 1962 the CAP was initially launched as an EU support policy, and was implemented through the price support scheme. Its primary objective was reducing food shortages and ensuring rural Europe's livelihood, and thanks to the CAP these problems were either diminished or solved. But with the CAP came a growing number of negative effects (e.g. an increasing produce surplus, market distortion due to price supports) (Buday-Sántha, 2001) Common agrarian market rules had negative effects both on the Community and the world market, and proved expensive to maintain.

The 1992 CAP reform was a watershed, and it was inspired by both internal and external factors. Among external factors was the GATT Uruguay round. Among internal factors were a distorted market balance, growing expenditures, and agriculture's impact on the environment. The reform's main merit was changing the system from a price-support policy to an income-support policy. The reform's environmental impact was ambivalent. Although it did not encourage intensive production, it also failed to reduce input consumption and thus did not bring about significant progress. Thanks to the reform dealing with the market surplus became cheaper, and thanks to decreasing prices EU produce became more competitive on the world market. From an environmental standpoint, the reform included some important steps. These were introducing regulations for agricultural environmental management support (2078/92/EEC) and for afforestation of agricultural land (2080/92/EEC). These were included in the so-called 'accompanying measures' (Katonáné, 2006).

After the 1992 reform, other reform measures were promptly called for in agricultural policy. Again these were inspired by market and financing problems. In July, 1997 the Commission published a document called AGENDA 2000 which – among other things – comprised detailed plans for a new agricultural policy. Due to external and internal factors radical CAP reform again became necessary, and this caused the Commission to act. The external factors were growing world market demand for food products, adjustment to international market liberalization tendencies, and the Eastern expansion of the EU. The internal factors were uncertainty regarding market balance, the Treaty of Amsterdam, meeting customers' expectations, decentralization, and a demand for enhanced perspicuity.

AGENDA 2000 had several aims. Among them were increasing market control, and accelerating competitiveness in international markets which meant bringing EU prices closer to world market prices. Other aims were strengthening the EU position in WTO negotiations which entailed cutting back export refunds and further transforming market subsidies to direct ones. AGENDA 2000 also sought to prepare the EU for new EU member states and to further integrate environmental aims into agricultural policy. Finally, AGENDA 2000 strived to create uniform rural developmental regulations, a second CAP pillar. AGENDA 2000 also

described the European Agricultural Model which aims to implement multifunctional agriculture. (Ángyán, 2001; Szabó, 2001)

The WTO's 2003 Cancun negotiations brought about agricultural reforms and these were sparked by overproduction that still existed despite preventive reforms and limits on long-term financing. The Cancun round's major objective was to make fundamental changes in agricultural financing. To do this it was essential to decouple subsidies and production and to simplify regulations. It was also important to establish cross-compliance between sustainable agricultural production and consumer demand. Another aspect of reform was reinforcing rural development and this entailed modulation, and expanding the range of rural development support. At last it was deemed necessary to promote agricultural production competitiveness and to meet WTO requirements while mantaing agricultural budgetary discipline. (Kiss, 2003)

As previously mentioned, the Union, in the narrow sense of the term, lacks an agricultural strategy. Ongoing CAP reforms were prompted by market and financing problems associated with external and internal pressures. However, environmental and sustainability issues were only complementary. One of the reasons for the lack of strategic planning may be extremely powerful lobby-interests, which hinder a major breakthrough in agricultural policy. The reformed CAP and AGENDA 2000 determine EU agricultural priorities, but they can only partially substitute for an overall agrarian strategy.

It became obvious that the EU desperately needed an agricultural and rural development strategy, and thus following the EU budgetary period, Council Regulation 1698/2005/EC created the Common Agricultural and Rural Development Fund. The primary aim of the decree is to harmonize rural development policy with the Gothenburg and Lisbon Strategy objectives even though the relationship between the objectives is often unclear. The Union thus intends to allow old and especially new member states the opportunity to establish agricultural and rural development policies. These policies need to conform to the new market-oriented agricultural policy, meet sustainability requirements, and encourage structural transformation. Furthermore, the EU sets strategic member state priorities so the member states can prepare their national agricultural and rural development strategies (EC, 2005) This regulation is an important step, as it attempts to integrate the objectives defined in the two main EU strategies into its functions. However, it does not establish which strategy is preeminent as the various objectives receive equal emphasis.

4. Thematic strategies regarding agriculture

The EU level lacks a document that could be considered an agricultural strategy. However, other than the agricultural policy outlined by decrees and programmes, there is a new type of instrument that supports agriculture sustainability. In the past few years the EU reinforced its sustainability strategic approach by preparing seven so-called thematic strategies related to the 6th EAP. Three of the strategies are closely related to agriculture, while the other four contain a few references to agricultural and rural development processes.

Table 1 summarizes the most important data of the analysed documents, and helps to compare them. Next we examine to what extent these strategies' objectives are in harmony with the SDS of the EU.

Table 1

Some characteristics of the documents and strategies in the EU

Title of documents	Publication date	Number of pages	Time span (year)	Number of objectives/ measures
Thematic Strategy on the sustainable use of natural resources	21.12.2005.	23	25 (2006-2030)	4 *measures*
Thematic Strategy on air pollution	21.09.2005	13	15 (2006-2020)	6 *measures*
A Thematic Strategy on the prevention and recycling of waste	21.12.2005	32	10 (2005-2015)	3 *measures*
A Thematic Strategy on the Sustainable Use of Pesticides	12.07.2006	13	-	5 *objectives*
Towards a Thematic Strategy for Soil Protection	16.04.2002	35	non final strategy	-
Thematic Strategy on the Urban Environment	11.01.2006	12	5 (2006-2010)	6 *measures*
Thematic Strategy on the Protection and Conservation of the Marine Environment	24.10.2005	9	15 (2006-2021)	overall objective
Environment 2010: Our Future, Our Choice – 6th Environmental Action Programme	22.07.2002.	15	10 (2001-2010)	4 *objectives*
A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development	06.2001.	17	-	4 *objectives*
Review of the EU Sustainable Development Strategy – Renewed Strategy	09.06.2006	29	50 (2006-2055)	4 *objectives*
Common Actions for Growth and Employment: The Community Lisbon Programme	20.07.2005	10	6 (2005-2010)	2 *objectives*
The new Lisbon Strategy – An estimation of the economic impact of reaching five Lisbon Targets	01.2006	122	5 (2006-2010)	5 *objectives*

Source: Facts collected by the authors

First of all, it is outright odd that the thematic strategies are not directly connected to the SDS of the Union, but rather subordinated to the 6th Environmental Action Programme. To a large degree this fact clearly illustrates the immaturity of the EU strategic documents system. The thematic strategies focus on a specific aspect of a topic and rightly ignore irrelevant information. However, it remains necessary to create common ground, a "0 strategy" of which the objectives could serve as a basis for the thematic objectives so that they can be coherently adapted to. If the EU SDS does not fill this role, and responsibility is subsequently given to a single-minded environmental programme such as the 6th EAP, there is a danger that the thematic strategies will either fail to promote sustainability or do so inadequately. One already observes this dilemma in the chosen time span. In some cases the thematic strategies objectives' time span exceeds those of the 6th EAP (Table 1). In other words, the

nature of the problem necessitates a long-term approach, which is an important characteristic of strategic thinking.

In the following section agricultural thematic strategies are analysed according to the critical aspects mentioned above, meaning their time span and objectives.

4.1. The time span

An important criterion of the strategic character is the long-term approach. This is especially true when coming up with solutions to current and potential ecological problems based on principles of sustainability. The time it takes ecological processes to change and the need to protect future generations necessitates a decades-long vision. First, by utilizing the two fundamental strategies, we illustrate factors regarding the time span. It is noteworthy that no concrete time span was indicated in the 2001 strategy of the Union. The reviewed document has this to say:

"*The Commission should elaborate a concrete and realistic vision of the EU on its way to sustainable development over the next 50 years. Such a vision should be prepared in a participatory manner and should identify the main long-term objectives and describe intermediate stages and steps towards their achievement.*" (CEC, 2005a:25)

During revision of the Lisbon strategy there was also a shift towards a long-term approach. At the very beginning of the document they emphasize the long-term negative social and economic impact of the social problems: *"…Europe must address the challenge of ageing populations which in the long-run will result in a considerable shrinking of the working-age population while increasing the share of retired persons."* (CEC, 2005d:2). Thus the document raises the need for a long-term approach toward economic growth and employment. The document also discusses how social problems can create social and economic tensions. Some of these social problems are an ageing population and a decrease in the working-age population, which will accentuate over the next decades.

Appropriately, the problem of choosing the time span also arises for thematic strategies. This issue is highly important because the time span could indicate how long the strategy-makers think they are able to influence the processes in a given area. The majority of strategies that specify their time span – differing between 5 and 25 years – usually fail to explain why they chose the given time period. In the thematic strategies' objectives and measures there is little mention of other EU programmes' objectives and target dates (e.g. 6th EAP, Lisbon Strategy).

It is a complex topic and the Thematic Strategy for the use of natural resources states the following: "*To address the environmental concerns relative to the use of natural resources (e.g. raw materials and land), the strategy will put in place actions that will track and monitor the use of natural resources through their whole life-cycle – "from cradle to grave" – and develop the actions necessary to reduce their environmental impacts. The focus of the strategy is to identify – during the 25 year timeframe – the most serious environmental impacts related to the use of natural resources and promote solutions and actions to overcome them by increasing knowledge of them and providing easy access to it.*" (CEC, 2005f:16).

Moreover, in the thematic strategies there is no other reference explaining the selection of time spans. However, explaining the selected time span could also provide important and useful information about the strategic objective. Perhaps the organizing principle could

be the time needed for ecological processes, the time horizon for technological change, or the period necessary for changing social processes and customs.

Overall, in the thematic strategies there is no clear link between time span and sustainability. However, one does detect movement toward a long-term approach. (see: Thematic Strategy on sustainable use of natural resources).

4.2. Objectives

The thematic strategies usually focus on one given field such as natural resources, soil, and use of pesticides. They also establish general objectives regarding these areas. They link measures and objectives, of which the relationship with the EU SDS can also be analysed. The SDS determines four main objectives which are environmental protection, social equity and cohesion, economic prosperity, and meeting our international responsibility. There are also seven main challenges. Among them are climate change and clean energy, sustainable transport, and sustainable consumption and production. The other challenges are conservation and management of natural resources, public health, social inclusion, demography and migration, and finally Global poverty and sustainable challenge.

Most of the thematic strategies strive, at least superficially, to mesh with SDS objectives, but a firm relationship is still difficult to discern. One of the reasons for this could be the disjointed relationship among the documents, as they are originally connected to the SDS via the EAP. However, they should serve as its environmental dimensions.

In the following section those thematic strategies' objectives which are closely connected to agriculture are analysed, with special emphasis on their relationship with SDS objectives. Investigating the thematic strategies related to agriculture indicates that, although they are not clearly linked to the SDS, they nevertheless endeavour to harmonize their objectives with the sustainability strategy. This statement is further supported through analysis of three thematic strategies.

The **Thematic Strategy on the sustainable use of natural resources** meshes with some SDS general and concrete objectives. Examples of this are the conservation and management of natural resources, plus Sustainable Consumption and Production. It highlights that *"The sustainable use of resources, involving sustainable production and consumption is hence a key ingredient of long-term prosperity, both within the EU and globally"* (CEC, 2005f:4). The importance of preparing a thematic strategy is justified by the 6th Environmental Action Programme and the objectives of the Lisbon Strategy: „*… the EU Strategy for Growth and Jobs endorsed by the Spring Summit of 2005 gives high priority to more sustainable use of natural resources. It also calls for the EU to take the lead towards more sustainable consumption and production in the global economy. Europe therefore needs a long-term strategy that integrates the environmental impacts of using natural resources, including their external dimension in policymaking. This Thematic Strategy on the sustainable use of natural resources is a response to that challenge.*" (CEC, 2005f:4). It should be said that the thematic strategy consistently and repeatedly emphasizes a long-term approach, one of the main requirements of sustainability.

In the introduction only a brief sentence refers to the fact that a thematic strategy *"... has to be seen in context with the recently reviewed Sustainable Development Strategy (SDS) and contributes to it"* (CEC, 2005f:4), which could suggest that there is no close connection

between the two strategies. However, a detailed analysis proves that the objectives of the document are in perfect harmony with the objectives of the reviewed SDS.

One of the most important SDS objectives is the preservation of natural resources: *"Safeguard the earth's capacity to support life in all its diversity, respect the limits of the planet's natural resources and ensure a high level of protection and improvement of the quality of the environment."* (CoEU, 2006:3). And it expresses its general objective as follows: *"To improve management and avoid overexploitation of natural resources, recognising the value of ecosystem services"* (CoEU, 2006:13).

The thematic strategy is even more specific: *"The strategic approach to achieving more sustainable use of natural resources should lead over time to improved resource efficiency, together with a reduction in the negative environmental impact of resource use, so that overall improvements in the environment go hand in hand with growth. The overall objective is therefore to reduce the negative environmental impacts generated by the use of natural resources in a growing economy…"* (CEC, 2005f:5).

The two strategies share responsibilities in a viable and efficient manner. The EU SDS sets the general and operative objectives. These objectives include improving resource efficiency, the promotion of eco-efficient innovations, and improving management. They also include avoiding overexploitation of renewable natural resources, and halting the loss of biodiversity. They also focus on elaboration of new plans and programmes, and they ensure that various agreements are fulfilled. The thematic strategy is more concrete. It is more futuristic and, besides describing the objectives, it determines how they can be achieved. To achieve the objectives, the strategy includes measures to: *"improve our understanding and knowledge of European resource use, its negative environmental impact and significance in the EU and globally; develop tools to monitor and report progress in the EU, Member States and economic sectors; foster the application of strategic approaches and processes both in economic sectors and in the Member States and encourage them to develop related plans and programmes; raise awareness among stakeholders and citizens of the significant negative environmental impact of resource use."* (CEC, 2005f:5-6).

CAP reform has continually emphasized the need to use the natural resources in a more sustainable manner. From this the thematic strategy draws the following conclusion: *"Recent reforms in certain policy areas, particularly the fisheries and farming sectors, have gone a long way towards taking the environmental impacts of resource use into consideration. Indeed, the Sustainable Development Strategy was adopted in response to this need for consistent, joined-up policy making across economic, social and environment fields."* (CEC, 2005f:7).

Overall, the Thematic Strategy for the sustainable use of natural resources corresponds with the EU SDS as it further elaborates its objectives and specifies concrete steps to achieve the goals. The relationship is bilateral as the previously illustrated strategic objectives strategies complement each other.

However, the **Thematic Strategy for the Sustainable Use of Pesticides** fails to harmonize with the EU SDS. Although the document doesn't refer to the sustainability strategy, the objectives laid out in the thematic strategy correspond with the SDS's main environmental protection objective. This is supported by the thematic strategy's objectives: *"Increasing awareness of consumers and society at large about the possible risks from the use of*

pesticides has recently triggered actions by certain retailers and governments, as well as the Community, to support forms of agriculture and pest management methods that restrict or better target the use of plant protection products, such as organic farming, integrated pest management, or the use of less susceptible varieties. It is important to encourage a rational and precise pesticide use, as well as appropriate crop and soil management practices. Furthermore, it will be important to improve the behaviour of pesticide users (in particular professional users), who are responsible for a number of misuses including overuses, by ensuring better training and education." (CEC, 2006b:6).

In several ways the thematic strategy's objectives mesh with the EU SDS general environmental objectives. They strive to minimize pesticide hazards and risks to health and environment and to minimize pesticide use and to encourage pesticide-free cultivation. It is essential to point out that only on the list of relative policies is the relationship with the CAP mentioned (see: CEC, 2006b:7).

The final version of the **Thematic Strategy for soil protection** is still being elaborated. Based on the draft version we can only draw conditional conclusions regarding the future document. The first EU SDS stressed the significance of soil protection: *"The 6th Environmental Action Programme published by the Commission in 2001 established the objective to protect soils against erosion and pollution while the Sustainable Development Strategy, also published in 2001, noted that soil loss and declining fertility are eroding the viability of agricultural land."* (CEC, 2002a:4; CEC, 2001a:4).

The document notes that *"In May 2001, the Commission indicated soil loss and declining fertility as a main threat to sustainable development as it erodes the viability of agricultural land."* (CEC, 2002a:6). On the basis of the above mentioned it can be expected that the thematic strategy under development should be in harmony with the EU SDS.

The document still does not contain objectives, but we have to emphasize that it often refers to CAP objectives (see: CEC, 2002a:4; 8; 23).

5. Conclusions and lessons for Hungary

1   First of all, we have to emphasize that the European Union is a world leader regarding environmental sustainability issues. No other area pays such strict attention to sustainability principles. A recent example of this is the Union's initiative to create a common energy policy (see: "energy package"), the results of which have prompted our paper to focus on the complexities of European strategy design.

2   Over the last couple of years the system regarding EU strategies have evolved. There are now endeavours for improving their relationship, but there is not sufficient harmony among them. This inconsistency also exists in Hungary. The national sustainable development strategy is still in an unofficial, draft version. While the second National Development Plan and the National Agricultural and Rural Development Strategy 2007-2013 are still a work in progress. These documents meet EU requirements, and although they are better harmonized than previous materials, there is still room for improvement.

3   The sustainability strategy and the economic strategy (the Lisbon processes) still reveal contradictions, which significantly decrease the chances for success for both sets of objectives.

In Hungary, the conflict is even more obvious as the political elite prefers increasing competitiveness and job creation to sustainable development.

4   Economy and environment represent a basic contradiction and within this contradiction Global ecological sustainability is fundamental. The ongoing revision of the Lisbon Strategy's objectives and instruments must give prevalence to this phenomenom. In Hungary, it will be very difficult to fulfil this requirement as sustainability takes second place, and sustainability is often misinterpreted.

5   What is necessary is a long-term, comprehensive agricultural and rural development strategy, and the CAP should support this strategy. Such a strategy should be based on the two basic strategies and serve as a foundation for the thematic strategies relating to agriculture. In Hungary, based on EU Regulation 1698/2005/E, a comprehensive agricultural and rural development strategy is being prepared. However, the time span is set according to the EU budgetary period, and it is doubtful whether it is possible to enact a viable approach that will satisfy SDS objectives.

6   Rather than on the 6th Environmental Action Programme, the thematic strategies should be directly based on the basic and agricultural strategies. In Hungary, as in other EU countries, this is no formal institutional system corresponding to the EU thematic strategies. There are only partial strategies and they are more or less independent from one other and these strategies need to be more cohesive.

7   In Hungary and the EU it is important to create harmony in terms of basic principles, time spans, objectives and instruments.

In Hungary and other EU member states, it is vital that the various macro-level strategies complement each other. In every country there are major shortcomings in this field. If the EU is able to make headway in this area, it will facilitate solving this problem at the national strategy level. And if these strategies succeed at a national level, this could pave the way for a broad cohesive EU strategy.

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Price transmission in the Hungarian vegetable sector

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Abstract

In this paper we analyse price transmission for the carrot, parsley, tomato, green pepper and potato markets. Although there is a dual farm structure dominated by small individual farms, our results imply that price information flows from the producer to the retail level for potatoes, parsley and carrots. Our results also suggest that farmers do not merely accept prices, but can actually influence market prices. Tomato and green pepper prices have large transmission elasticities, and causality runs from the retail to producer level. It therefore follows that tomato and green pepper producers tend to accept prices and that the sector's prices are determined by upper market levels (processors, wholesalers, retailers). These results are reinforced by the fact that vegetable producers sell a large share of their production through procurement and processing, and therefore are more dependent on the upstream industries, and thus cannot influence prices. For all vegetables in this study the short-run price transmission is symmetric while on the tomato market the long-run price transmission is asymmetric. Results indicate that the tomato market is not competitive and efficient; therefore processors, wholesalers, and retailers are capable of exercising market power, and can instantly transmit producer price increases while just slowly and partially transmitting producer price decreases.

1. Introduction

Two methods are widely used to study how food markets function and to determine the degree of competition in these same markets. These entail measuring the spread in vertical price relationships and analysing the nature of price transmission along the supply chain from the producer to consumer.

Asymmetric price transmission has been studied by numerous authors using different econometric methods. Wolffram (1971) and Houck (1977) used classical methods. Von Cramon-Taubadel (1998) used specification to cointegration methods and Goodwine and Harper (2000) used threshold autoregressive models However, research on price transmission in transition economies is still limited. Exceptions to this are the following: Tóth in 1999; Bojnec and Günther in 2005; Bakucs and Fertő in 2005, 2006; and finally Popovics and Tóth 2006. Price transmission may be a subject particular to transition countries. This is due to pre-1989 distorted markets, poorly developed price-discovery mechanisms and often ad hoc policy interventions. Also one might expect transitional economies to have generally larger marketing margins and more pronounced price transmission asymmetries. Furthermore, while there is a wealth of literature on livestock markets (beef, lamb, pork, milk[2]) studies on horticultural markets are scarce (Ward, 1982; Worth, 1999; Aguiar and Santana, 2002; Hassan and Simioni 2003). Moreover, none of the latter have focused on a transition economy. The paper tries to rectify this problem.

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[2] See e.g. a survey on milk markets by Meszaros and Popovics 2004

More specifically, the aim of the paper is to investigate marketing margin dynamics in selected Hungarian horticultural markets. Section 2 of this paper briefly describes the development of the Hungarian horticultural chain during the last half decade. Section 3 reviews some of the theoretical literature concerning marketing margins and price transmission, while section 4 describes the empirical procedures we apply. Our data and results are reported and discussed in section 5, with a summary and some conclusions presented in section 6.

2. Hungarian agriculture's horticultural sector

This section provides a short description of the Hungarian horticultural chain.

2.1. Vegetable production

In 2005, 2% of total Hungarian agricultural land was used to produce vegetables. Together with potatoes, the vegetable sector uses around 3 per cent of the available agricultural land. Table 1 presents the detailed use of agricultural land in terms of sectors. The potato and vegetable sectors' share of total agricultural land is small (in 2005 0.6 and 2 per cent) and there is now a slight downward trend.

Table 1

Use of agricultural land by sectors (per cent)

Year/Crop	2003	2004	2005
Cereals	68.7	69.9	69.1
Industrial plants	16.2	15.8	17.5
Potatoes	0.8	0.7	0.6
Hay and fodder	6.5	6.2	6.1
Vegetables	2.5	2.3	2.0
Other	5.3	5.1	4.7
Total	100.0	100.0	100.0

Source: Statistical Yearbook of Agriculture, 2003-2005, Hungarian Central Statistical Office, Budapest

The quantity and value of potato and vegetable production does not reflect the decline in the use of agricultural land (Figure 1).When one considers Hungarian agricultural output, it is clear that the vegetable sector's importance is significantly larger. In millions of USD Table 2 presents the total agricultural output, plant production output, and vegetable sector output. Potato production's share compared to the value of total agricultural output is decreasing (1.7 per cent in 2004). However the absolute value of production is fluctuating (99 million USD in 2000 and 140 million USD in 2004). Vegetatable production's share in total agricultural output remains fairly stable at around 10 per cent.

The importance of the vegetable sector in total agricultural production

	1998		2000		2002		2004	
	million USD	per cent	million USD	per cent	million USD	per cent	million USD	per cent
Total	5,387	100	4,533	100	5,737	100	8,156	100
Plant production	2,570	48	2,196	48	2,650	46	4,757	58
Potatoes	176	3.2	99	2.1	106	1.8	140	1.7
Vegetables	560	10.3	453	10	583	10.1	780	9.5

Source: Own calculations from Statistical Yearbook of Agriculture 1998-2004, Hungarian Central Statistical Office, Budapest

Figure 1

Production of selected vegetables
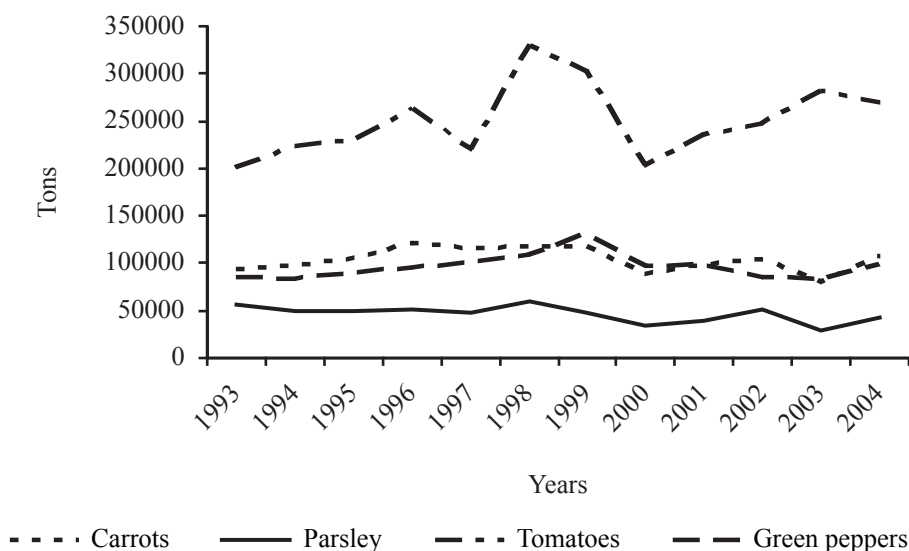
Source: stadat-tables http://portal.ksh.hu/portal, accessed June 15, 2006

Of all the vegetables studied in this paper, green peppers are the ones that are most exported, and this remains true even though the share of production sold abroad decreased from 46 per cent in 2002 to 28 per cent in 2004 (table 3). The import rate for these particular vegetables is generally low, the largest percentage compared to production being for carrots (15 per cent in 2003) and potatoes (13 per cent in 2003).

Table 3

The ratio of production to foreign trade for selected vegetables (per cent)

	2002	2003	2004
Potatoes			
Imports / total production	4.3	13.6	7.2
Exports / total production	0.7	2 per cent	0.8
Carrots			
Imports / total production	6.4	14.9	8.2
Exports / total production	0.2	0.9	0.1
Tomatoes			
Imports / total production	3,0	3,0	4.8
Exports / total production	0.3	0.2	0.1
Green peppers			
Imports / total production	6.8	6.5	6.7
Exports / total production	46.3	38.3	27.9

Source: Author's own calculations from the Statistical Yearbook of Agriculture, 2002-2004, Hungarian Central Statistical Office, Budapest

Table 4 presents areas sown by agricultural enterprises and areas sown by individual farms, and the total sown area for some Hungarian vegetables. From the data comes a picture of a dual farm structure. In Hungary most vegetables are produced on individual farms (69.9 per cent in 2001 and 71.4 per cent in 2005).Tomatoes are exclusively produced on individual farms. However, for certain vegetable species the picture is somewhat different. In 2005 only 5 hectares of green peppers and 10 hectares of potatoes were produced by agricultural enterprises (versus 270 hectares and 3,982 hectares respectively in individual farms). An important indicator of the vegetable sector is the area covered with greenhouses and walk-in plastic tunnels.

Table 4

Sown area of vegetables in terms of legal farm entities (hectares)

	2001		2005	
	Agricultural Enterprises*	**Individual Farms**	**Agricultural Enterprises***	**Individual Farms**
Potatoes	3,815	32,838	3,440	22,462
Tomatoes	601	5,394	817	2,801
Green peppers	248	4,283	124	2,601
Total Vegetables	27,920	62,649	24,845	62,114

* enterprises + co-operatives
Source: The sown area devoted to major crops on arable land, May 31, 2001. The sown area devoted to main crops on arable land, May 31, 2005, Hungarian Central Statistical Office, Budapest

2.2. The processing sector

In Hungary fruit and vegetable processing is the third largest food industry sector, producing 10 per cent of the total industry output (excluding tobacco). However, sectoral privatisation started late, and in the early nineties did not attract foreign capital. In 1994, foreign capital's percentage of total capital in the industry was 72 per cent, increasing to 89 per cent in 2000. Therefore, the concentration process was late in coming. C5 (the industry's five largest firms) concentration index was only 27 per cent in 1994. However, it went to 53 per cent in 1999 and then shrunk slightly to 49 per cent in 2003. Thus C5 concentration in vegetable processing has a middle rating compared to other food industry branches. C5 concentration has a higher concentration ratio than in wine production or in the bakery industry (29 per cent), but a much lower concentration ratio than in sugar, starch, vegetable oil or breweries (99-100 per cent). In Hungary the number of fruit and vegetables processing firms was 170 in 2000 and 191 in 2004.

Table 5

The ratio of production sold for procurement and processors

	2002	2003	2004
Potatoes	6	8	7
Carrots	19	26	25.5
Parsley	8	10.5	11
Tomatoes	57	82	44.3
Green peppers	25	40	40

Source: Author's own calculations from Statistical Yearbook of Agriculture 2002-2004, Hungarian Central Statistical Office, Budapest

Table 5 shows the proportion of vegetable production sold for procurement and processing. The importance of the processing industry varies for different types of vegetables. Tomato producers are the most reliant on the processing industry, selling up to 82 per cent (2003) of their production through this marketing channel. Green pepper and carrot producers follow with 40 per cent and 25 per cent (2004) of their production sold for procurement and to processors. Parsley and potato growers are at the bottom of the list with only 7 and 11 per cent (2004) sold for procurement or processing.

2.3. The retail sector

Since the late 1990s the Hungarian food retail sector has been dominated by large, mostly foreign owned supermarket chains. However, the small, 'corner' shop network hasn't disappeared and retains a relatively high market penetration (69.9 per cent), frequency of shopping (35.5 per cent). However, the amount spent per shopping trip is rather low at 1000 HUF (Fertő et al., 2005).

Table 6

Number of food retail and specialised shops

	2002	**2003**	**2004**	**2005**
Non-specialised store with food dominance	36,529	35,963	34,805	33,838
Fruit and vegetable shop	3,389	3,489	3,449	3,324

Source: stadat-tables http://portal.ksh.hu/portal, accessed June 15, 2006

Despite the dominance of large supermarkets and discount stores, there are more than 33000 non-specialised food stores operating in Hungary. Because of strengthening competition and increasing concentration, the number of shops is slowly, but constantly decreasing. The number of specialised fruit and vegetable shops increased until 2004, and has been gradually decreasing since (Table 6).

3. Theoretical background

The marketing margin is the difference between the retail and the producer or farm gate price. It represents marketing costs such as transport, storage, processing, wholesaling, retailing, advertising, etc.:

$$RP = FP + M \tag{1}$$

M, the marketing margin, is composed of an absolute amount and a percentage or mark-up of the retail price (Tomek and Robinson, 2003):

$$M = a + b*RP, \text{ where } a \geq 0 \text{ and } 0 \leq b < 1. \tag{2}$$

If the markets are perfectly competitive, then $b = 0$, and the margin becomes the constant a, which can be interpreted as the marginal cost[3]. With the use of logarithmic data, the long-run elasticity between the prices is readily available from the marketing margin model. If prices are determined at producer level, we use the *mark-up* model:

$$lnRP = \alpha_1 + \varepsilon_{FP} lnFP \tag{3},$$

where ε_{FP} represents price transmission elasticity from the farm price (*FP*) towards the consumer price (*RP*). If $\varepsilon_{FP} = 1$, we have perfect transmission, and thus the *mark - up* will be $(e^{\alpha 1} - 1)$. $0 < \varepsilon_{FP} < 1$ indicates that transmission between the two prices is not perfect.

If however, prices are determined at consumer level, then the use of the *mark-down* model is appropriate:

$$lnFP = \alpha_2 + \varepsilon RP \, lnRP, \tag{4},$$

where ε_{RP} represents transmission elasticity between the consumer price (*RP*) and the producer price (*FP*). As before, there is perfect transmissio; if $\varepsilon_{RP} = 1$, and the *mark - down* equals $(1 - e^{\alpha 2})$. Imperfect transmission results if $\varepsilon_{RP} > 1$.

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[3]   As Bojnec and Günther (2005) point out, the constant margin might also depend on various other factors (e.g. existence of returns to scale, mark-up changes, technological or other input cost changes) beyond the farm component of the retail good.

A common perception is that reaction to price increases differ from reaction to price decreases. More exactly, retailers tend to pass on more rapidly price increases to consumers, whilst it takes longer for consumer prices to adjust to producer prices if the latter decrease. There are several major explanations for the existence of price asymmetries. First, asymmetrical price transmission occurs when firms capitalize on quickly changing prices. This is explained by the *search costs* theory (Miller and Hayenga, 2001). This occurs in locally imperfect markets, where retailers are able to exercise their local market power. Although customers have a number of other choices, it might prove difficult to quickly access information about other stores' prices because of *search costs.* Therefore, although firms can quickly raise their retail prices to keep pace with producer price rises, they are much slower to reduce retail prices if upstream prices decline. Second comes the problem of *perishable goods* (Ward, 1982). This prevents retailers from raising prices as producer prices rise. Wholesalers and retailers with perishable goods may be reluctant to increase prices because they risk a lower demand and ultimately being left with the spoiled product. Third, adjustment costs or *menu costs* (Goodwin and Holt, 1999) may underlie asymmetric price adjustments. Menu costs involve those costs occurring with re-pricing and adoption of a new pricing strategy. As with perishable goods, menu costs also prevent retailers from changing prices. Finally, the *exercise of oligopoly power* can encourage asymmetric price transmission. It appears in markets with highly inelastic demand and concentrated supply; many food chains have such market organisation characteristics. It is necessary to state that in the long run such collusive behaviour is rather difficult to maintain, because of the incentive for one firm to cheat the others (Miller and Hayenga, 2001, p. 554). Recent papers have endeavoured to establish the link between price transmission and market power. Using a formal theoretical model Weldegebriel (2004) evaluated the impact of oligopsony power on the degree of price transmission. By using as a benchmark the degree of price transmission in a perfectly competitive market, Weldegebriel showed that oligopoly and oligopsony power do not necessarily lead to imperfect price transmission. Although in some cases this does occur. Indeed, they may counteract each other's impact on the degree of price transmission. The outcomes depend on the functional forms for retail demand and farm supply.

4. Empirical procedure

Over time most macroeconomic time series are not stationary, i.e. they contain unit roots. Over time their mean and variance are not constant. If one utilizes the standard classical estimation methods (OLS), statistical inference can result in biased estimates and/or spurious regressions. In the pertinent literature there are a large number of unit root tests[4] available (see Maddala and Kim, 1998 for a comprehensive review).

Even though many individual time series contain stochastic trends (i.e. they are not stationary at levels), in the long run many of them tend to move together, suggesting the existence of a long-run equilibrium relationship. Two or more non-stationary variables are cointegrated if there are one or more linear combinations of the stationary variables. This implies that the stochastic trends of the variables are linked over time, moving towards the same long-term equilibrium.

[4]   Consider the first order autoregressive process, *AR(1)*:

$y_t = \rho y_{t-1} + e_t$, $t = ..., -1, 0, 1, 2, ...$, where et is white noise.

The process is considered stationary if $|\rho| < 1$, thus testing for stationarity is equivalent with testing for unit roots ($\rho = 1$). Rewriting to obtain:

$\Delta y_t = \delta y_{t-1} + e_t$, where $\delta = 1 - \rho$, the test becomes:

H_0: $\delta = 0$ against the alternative H_1: $\delta < 0$.

4.1 Testing for unit roots

Maddala and Kim (1998) argued that because of size distortions and poor power problems associated with the commonly used Augmented Dickey-Fuller unit root tests, it is preferable to use the DF-GLS unit root test, derived by Elliott, Rothenberg and Stock (1996).

With structural breaks in the time series, the unit root tests might lead one to incorrectly conclude that there is actually a unit root, when in fact the series are stationary with a break. Several unit root tests were developed to handle the problem. The Perron (1997) test performs an endogenous search for the breakpoints by computing the t-statistics for all possible breakpoints, then choosing the breakpoint selected by the smallest t-statistic, meaning the least favourable one for the null hypothesis.

4.2 Cointegration analysis

The two most widely used cointegration tests are the Engle-Granger two-step method (Engle and Granger, 1987) and Johansen's multivariate approach (Johansen, 1988). The Johansen cointegration procedure is based on estimating the following Vector Error Correction Model (VECM):

$$\Delta Z_t = \Gamma_1 \Delta Z_{t-1} + \ldots + \Gamma_{k-1} \Delta Z_{t-k+1} + \Pi Z_{t-k} + u_t \tag{5}$$

where $Z_t = [RP_t, RP_t]'$, a (2 x 1) vector containing the retail and farm prices, both integrated of order one, $\Gamma_1, \ldots \Gamma_{k+1}$ are (2x2) vectors of the short-run parameters, Π is (2x2) matrix of the long-run parameters, ut is the white noise stochastic term.

$$\Pi = \alpha\beta' \tag{6}$$

where matrix α represents the speed of adjustment to disequilibrium and β is a matrix which represents up to (*n - 1*) cointegrating relationships between the non-stationary variables. Trace and maximum Eigen-value statistics are used to test for cointegration. Once (5) is estimated we can proceed to test for weak exogeneity tests. The terms of vector α (factor loading matrix) measure the speed at which the variables adjust towards the long-run equilibrium after a price shock. The α vector of the weakly exogenous variable equals zero. To find the direction of the Granger causality between the two price series, restrictions are tested on the α vectors. If however, the true data generating process contains various regime shifts, then the Johansen test is likely not to reject the no-cointegration null hypothesis.

Gregory and Hansen (1996) introduce a methodology to test for the null hypothesis of no-cointegration against the cointegration alternative with structural breaks. Under the alternative 3 models are considered. Model 2 comes with a change in the intercept:

$$RP_t = \mu_1 + \mu_2 \varphi_{t\tau} + \alpha^T FP_t + e_t, \, t = 1, \ldots, n. \tag{7}$$

Model 3 is similar to model 2, only contains a time trend:

$$RP_t = \mu_1 + \mu_2 \varphi_{t\tau} + \beta t + \alpha^T FP_t + e_t, \, t = 1, \ldots, n. \tag{8}$$

Finally, model 4 allows a structural change both in the intercept and the slope:

$$RP_t = \mu_1 + \mu_2 \varphi_{t\tau} + \alpha_1^T FP_t + \alpha_2^T FP_t \varphi_{t\tau} + e_t, \, t = 1, \ldots, n. \tag{9}$$

Because usually the time of the break is not *a priori* known, models (7) – (9) are esti-

mated recursively allowing T to vary between the middle 70% of the sample:

$$| \ 0.15n \ | \le T \le | \ 0.85n \ |$$

For each possible breakpoint, the ADF statistics corresponding to the residuals of models (7) – (9) are computed, then the smallest value is chosen as the test statistic (as it is the most favourable regarding rejection of the null). Critical values are non-standard, and are tabulated by Gregory and Hansen (1996).

4.3 Asymmetrical error correction representation

Most asymmetry analysis uses the following Ward (1982) specification, which is based on an earlier Woffram (1971) and Houck (1977) specification:

$$\Delta RP_t = \sum_{j=1}^{K} (\beta_j^+ D^+ \Delta FP_{t-j+1}) + \sum_{j=1}^{L} (\beta_j^- D^- \Delta FP_{t-j+1}) + \gamma_t \tag{10}$$

Here, the first differences of the producer prices are split into increasing and decreasing phases by the D^- and D^+ dummy variables. Asymmetry is tested using a standard F-test to determine whether β_j^+ and β_j^- are significantly different.

These approaches do not take into consideration the data's time series properties and many of them suffer serial autocorrelation that usually suggests spurious regression.

With the development of cointegration techniques, attempts were made to test asymmetry in a cointegration framework. Von Cramon-Taubadel (1998) demonstrated that the Wolffram-Houck type specifications are fundamentally inconsistent with cointegration and proposed an error correction model of the form:

$$\Delta RP_t = \sum_{j=1}^{K} (\beta_j^+ D^+ \Delta FP_{t-j+1}) + \sum_{j=1}^{L} (\beta_j^- D^- \Delta FP_{t-j+1}) + \varphi^+ ECT_{t-1}^+ + \varphi^- ECT_{t-1}^- + \sum_{j=1}^{P} \Delta RP_{t-j} + \gamma_t \tag{11}.$$

The error correction term, (ECT_t), is in fact the long-run (cointegration) relationship's residual:

$$ECT_{t-1} = \mu_{t-1} = RP_{t-1} - \lambda_0 - \lambda_1 FP_{t-1} \ ; \lambda_0 \text{ and } \lambda_1 \text{ are coefficients. The error correction term}$$
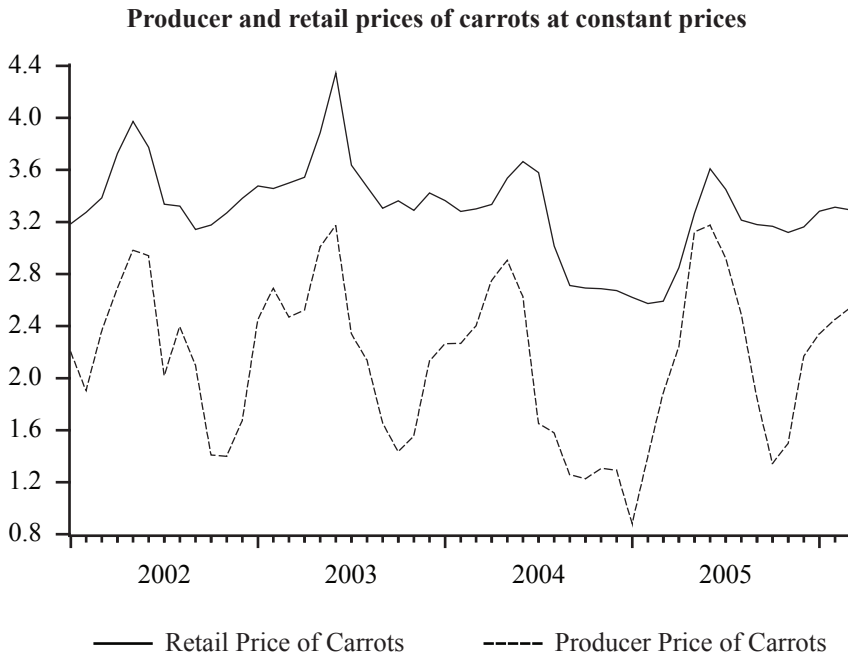is then segmented into positive and negative phases (ECT_{t-1}^+ and ECT_{t-1}^-), such that:

$$ECT_{t-1} = ECT_{t-1}^+ + ECT_{t-1}^-.$$

Using VECM representation as in (11), both the short-run and the long-run symmetry hypothesis can hence be tested using standard tests. Valid inference requires one price to be mildly exogenous regarding both the long and short run with respect to the parameters in (11).

5. Price transmission analysis in the Hungarian vegetable sector

Due to processors' and/or retailers' market power, it is usually assumed that farmers have no influence on producer prices, meaning food processors and retailers use their market power to gain the upper hand against farmers. In order to obtain further information on supply chain participants in specific product markets, it is necessary to analyse price transmission. Price transmission is the process where price information flows through the marketing chain in a given direction, and it is transformed through the various economic players' influence in the market. It is quite common for various producer and consumer support groups to contend that asymmetrical price transmission characterizes agricultural and food markets. This perceived asymmetry is usually considered disadvantageous for both consumers and producers. The idea is that food processors, wholesalers, and retailers tend to quickly pass on producer price increases to consumers, while price decreases are only transmitted slowly and sequentially. 51 monthly producer and retail price observations conducted between January 2002 and March 2006 are used for the analysis. The nominal price data provided by the Hungarian Statistical Office was deflated to January 2002 in terms of the Hungarian consumer price index. Figures 2, 3, 4, 5, 6 present producer and retail price evolution for the selected vegetables and potatoes.

Figure 2

Producer and retail prices of carrots at constant prices

——— Retail Price of Carrots   ----- Producer Price of Carrots

Source: Own calculations based on stadat-tables http://portal.ksh.hu/portal, accessed June 15, 2006

Figure 3

Producer and retail prices of parsley at constant prices

Source: Own calculations based on stadat-tables http://portal.ksh.hu/portal, accessed June 15, 2006

Figure 4

Tomato producer and retail prices at constant prices

Source: Author's own calculations based on stadat-tables http://portal.ksh.hu/portal, accessed June 15, 2006

Figure 5

Green pepper producer retail prices at constant prices

——— Retail Price of Green peppers

- - - - - Producer Price of Green peppers

Source: Author's own calculations based on stadat-tables http://portal.ksh.hu/portal, accessed June 15, 2006

Figure 6

Potato producer and retail prices at constant prices

——— Retail Price of Potatoes   - - - - - Producer Price of Potatoes
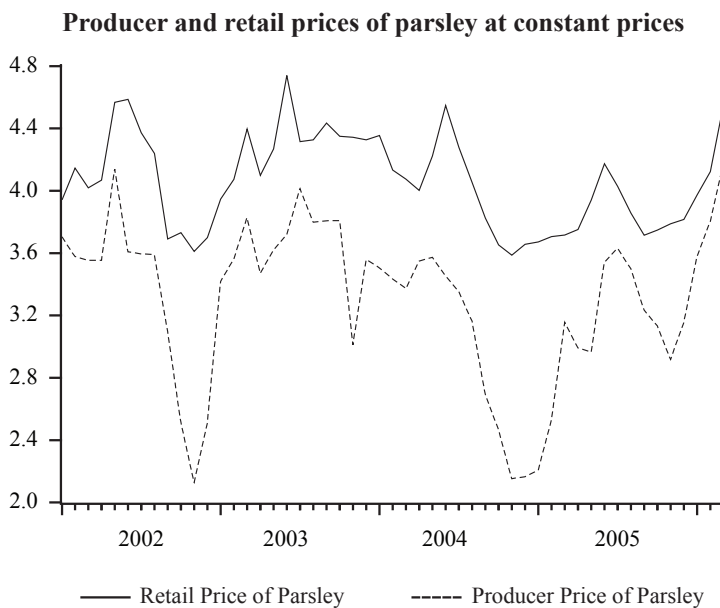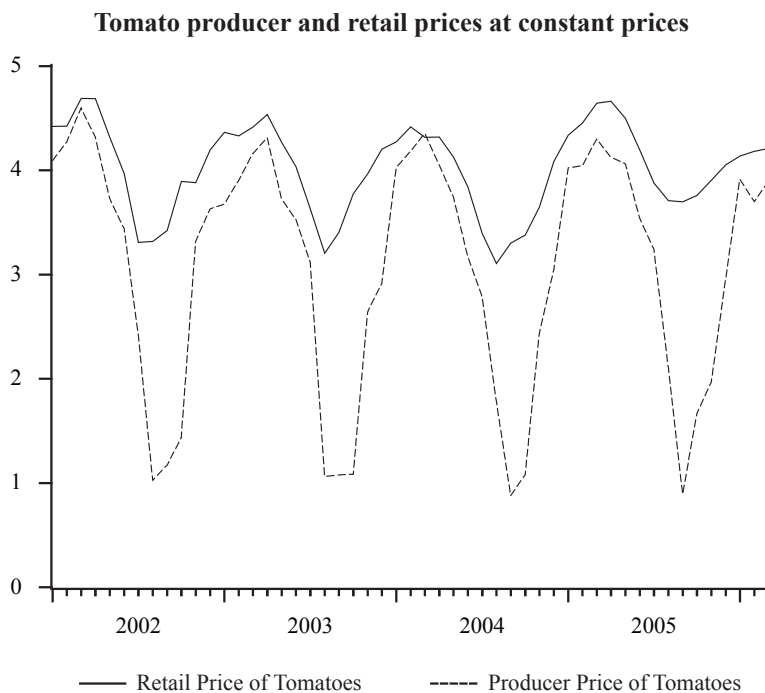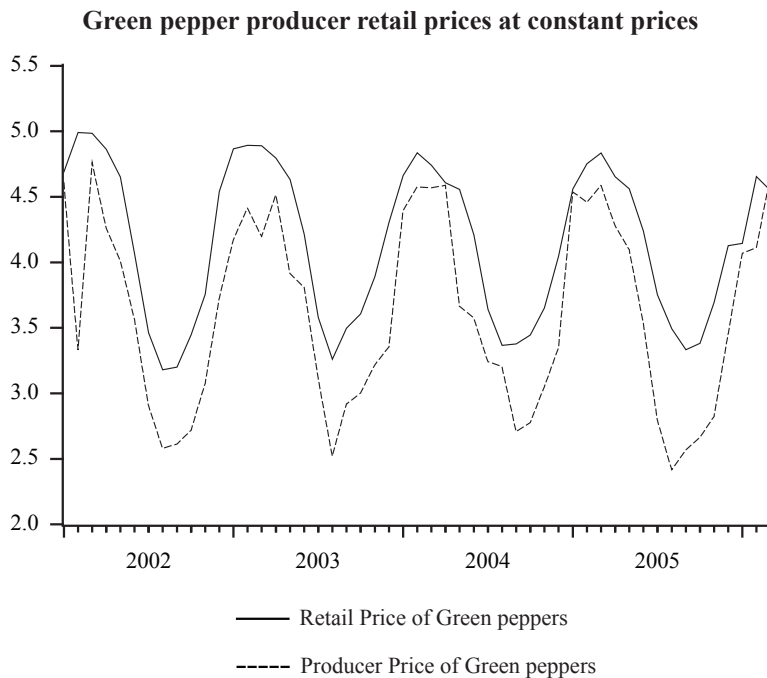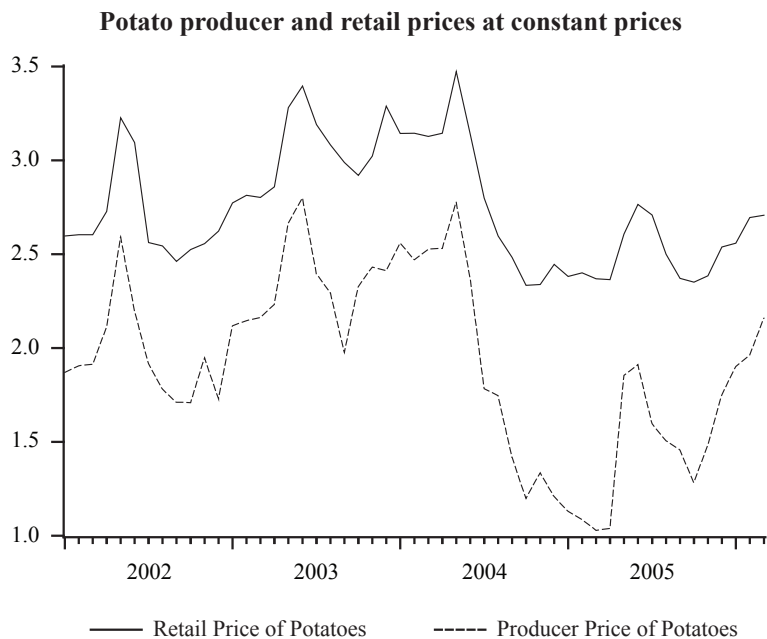
Source: Author's own calculations based on stadat-tables http://portal.ksh.hu/portal, accessed June 15, 2006

As expected, seasonality plays a major role in determining the producer and, to some extent, retail prices. Except for potato and perhaps parsley prices (Figure 3 and 6), prices for all other products included in this paper exhibit seasonal patterns. Seasonality is especially obvious for the tomato and green pepper markets (Figure 4 and 5). Graphical examination of green pepper prices indicates that producer and retail prices increase and decrease simultaneously, resulting in a relatively constant marketing margin, and this trend suggests price transmission symmetry. However, Figure 4 indicates that large drops in tomato producer prices are typically followed by much smaller decreases in retail prices while producer price increases instantly appear at the retail level. A priori this indicates asymmetrical price transmission in the tomato market.

For reliable results formal analysis is needed and this requires the use of recent time series econometrics innovations. Unit root tests on the selected vegetables' deflated producer and retail prices reveal that all price series except those for carrots are non-stationary. Therefore we in turn apply cointegration and Vector Error Correction methods to analyse the producer-retail price transmission for potatoes, parsley, tomatoes and green pepper prices. Table 7 presents the results of the cointegration analysis for the non-stationary price pairs.

Table 7

Cointegration analysis (Johansen, 1988)

Model	Lag length	H_0	Trace test		λ_{max} (max Eigen value) test	
			Test statistic	95% critical value	Test statistic	95% critical value
Parsley prices	1	r = 0	*19.57	20.26	*14.16	15.80
		r = 1	5.40	9.16	5.40	9.16
Tomato prices	0	r = 0	28.13	20.26	22.34	15.80
		r = 1	5.79	9.16	5.79	9.16
Green pepper prices	1	r = 0	28.13	20.26	24.29	15.89
		r = 1	5.79	9.16	7.76	9.16

* Significant at 10%
Notes: 11 seasonal dummies were included to account for seasonality

Because after using the Johansen method non-stationary, potato prices did not cointegrate, we used the Gregory and Hansen (1996) procedure to seek cointegration with possible structural breaks. The method identified the cointegrating relationship with a structural break that transpired in June 2004[5], which was similar to equation 7. Since carrot prices are stationary, they were analysed using OLS methods. Slightly exogenous prices (i.e. those that not adjusting to the long-run equilibrium in the advent of exogenous shock) were brought about from cointegration analysis. With slightly exogenous prices within the context of cointegration analysis, Granger direction causality is instantly determined. The Vector Error Correction Models (equation 11) and the Vector Autoregressive Model (for the stationary carrot prices) are estimated next. Table 8 illustrates the result of the short and long-run symmetry tests.

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[5]   The recursively estimated ADF test statistic is – 6.60, rejecting the no-cointegration null hypothesis at 5% level of significance

Table 8

Short and log-run price transmission symmetry tests

	Potatoes	**Carrots**	**Parsley**	**Tomatoes**	**Green peppers**
Long-run transmission test statistic	F(1,44) ~ 0.208	NA	F(1,42) ~ 0.043	F(1,38) ~ 7.694*	F(1,40) ~ 0.246
Short-run transmission test statistic	F(1,44) ~ 0.827	F(1,43) ~ 0.001	F(1,42) ~ 0.593	F(1,38) ~ 7.556*	F(1,40) ~ 0.140

* Significant at 1%

Of the five vegetable prices, only tomato prices reject both the symmetrical price transmission null-hypothesis on a short and long-run basis. Table 9 presents estimates regarding transmission elasticity, and a price causality price summary (the dominant market levels that determine industry prices), and long and short-run price transmission. Generally, competitive pricing supposes that transmission elasticity equals 1, and the prices on two market levels are only linked by a constant absolute margin.

Table 9

Elasticity, causality and price transmission results

	Potatoes	**Carrots**	**Parsley**	**Tomatoes**	**Green peppers**
Elasticity of transmission	0.85 (0.46 after June 2004)*	0.75	0.70	2.40	4.10
Price causality	FP → RP	FP → RP	FP → RP	RP → FP	RP → FP
Long-run transmission	symmetric	-	symmetric	asymmetric	symmetric
Short-run transmission	symmetric	symmetric	symmetric	asymmetric	symmetric

* A structural break occurred in June 2004, which reduced both prices, but increased the margin.

Despite a dual farm structure which is dominated by small individual farmers, price determination flows from the producer to the retail level for potatoes, parsley and carrots. This indicates that farmers do not simply accept prices but also can influence market prices. Tomato and green pepper prices reveal significant seasonality, rather large transmission elasticities, and causality flowing from the retail to the producer level. Therefore, tomato and green pepper producers tend to accept rather than determine prices, and industry prices are determined by downstream market levels (processors, wholesalers, retailers). These results are in line with table 5 data revealing that vegetable producers (whose production is largely sold for procurement and processing) are more dependent on downstream industries and cannot influence prices. For all vegetables in this study short-run price transmission is symmetric, but in the tomato market long-run price transmission is asymmetric. It therefore follows that the tomato market is not competitive and efficient and thus processors, wholesalers and retailers can exercise market power, and instantly transmit producer price increases while only slowly and partially transmitting producer price decreases.

6. Conclusions

The paper investigated the long-term relationship between retail prices and the farm-gate price for Hungarian carrots, parsley, tomatoes, green peppers and potatoes where production structure tends to be dominated by small-scale farmers. The fragmented production structure may have deeper implications for the performance of the horticultural sector. However, its impact on price transmission from the producer to the retail level seems limited. Farmers producing tomatoes and green peppers accept rather than determine prices, and only the tomato market presents price transmission asymmetries. Not surprisingly these markets are characterised by a high share of production sold for processing, perhaps enabling processors to exercise their market power. Seasonality affects most products analyzed, especially tomato and green pepper prices both at the producer and the retail level. Our results (except for the tomato chain) correspond with those of previous research investigating price transmission in the vegetable chain. Worth (1999) concluded that four of the six vegetable products studied do not present reveal transmission asymmetries, Hassan and Simioni (2003) conducted a detailed analysis of price transmission in the French vegetable sector, but their results do not confirm the belief that middlemen are able to exercise market power and profit from fluctuating producer/retail prices. However, Ward (1982) analysed the United States vegetable market with pre-cointegration methods, and found positive price transmission asymmetries, meaning producer price decreases are passed on more quickly and more completely to retail prices than producer price decreases. Due to a lack of other price transmission studies regarding vegetable chains in transition economies, we may only compare the results with other product chains. Price transmission analysis for the pork (Bakucs and Fertő, 2005), and beef (Bakucs and Fertő, 2006) sectors also concluded that even though the production system is fragmented, producer/retail price transmission is symmetric.

Acknowledgements

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Vertical price transmission between market operators in Hungarian agricultural product chains

Tibor Varga[1]

Abstract

Price transmission studies related to the cointegration of price time series are a suitable means for studying market dominance at the various market levels in the food product chains. For this study a price transmission asymmetry study was carried out for 18 commercial food product chains. In this study a monthly price time series was used for the period 2001 to 2005. It was found that there is significant product variation in market dominance which spans the entire industry. However, the variation is not significantly linked to either sectors or vertical levels. At times it is unstable and can easily tilt toward the vertical partner level. Depending on price changes, it can also vary, which, in turn, reflects changes in weather conditions. Following a radical change in prices, there is almost never enough time to achieve full price restoration before the onset of another price shock. The fact that prices are not fully restored may partly explain the continuing value divergence of agricultural prices.

Keywords

price transmission, cointegration, market power, food product chain, Hungary

Introduction

For obvious reasons Hungarian agricultural producers tend to be immobile. This is because their experience and assets are difficult to convert into other activities. Moreover, agriculture is not only a living, but also a way of life. As market operators, they frequently accept unfavourable input and output prices over long periods of time, and thus regularly suffer losses. To compensate for this they are given agricultural subsidies. This holds true at the the local market level for agricultural products. At the local market level there may very well be smaller yet more sophisticated price deviations according to local market power relationships. Such transmission of value through prices is called price transmission. In fact, producers may at times benefit from the process. The positive or negative differences between the actual price and the local benchmark equilibrium price reflect these value-diminishing or value-increasing trends.

Cointegration means the joint movement of various time series. In that sense, cointegration may exist between the sales prices of successive market operators in a vertical market. A cointegrated market is a market where price fluctuations are coordinated over a longer period of time, while in the short run price changes are erratic.

Gardner (1975) was the first to apply the price transmission coefficient to the food economy. Similar studies were conducted by Kinnuchan & Forker (1987) and Colman (1985). Palaskas (1995) examined whether perfect price transmission was conceivable. Von Cramon-Taubadel's 1998 approach has won many followers. In 2003 Rapsomanikis, Hallam & Conforti developed a method to demonstrate price transmission asymmetry and it is now widely used. In Hungary, studying price transmission in relation to cointegrated agricultural price time series has so far yielded directly utilisable results for the dairy and meat product chains. In 2004 S. Mészáros and P. A. Popovics conducted a methodology overview concerning dairy industry research. In the same vein P. A. Popovics and J. Tóth's 2006 paper

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reviews the study's findings on the asymmetry of price transmission in the dairy industry. J. Tóth's 2003 study on asymmetry draws on data analysing the Austrian meat industry. He partly conducted the study to make known Hungarian research methods. L.Z. Bakucs' 2005 study on the asymmetrical price transmission phenomenon also deals with various methodological issues.

1. Price transmission: research method and econometric foundations

There are several methodological groups regarding the study of vertical price transmission. Among the best known are the 'first differences' methods, 'the sums of first differences', 'error correction methods' and 'threshold methods'. Our studies are based on what is now the most widely used examination method, meaning the above-mentioned cointegration theory[2] and the error correction method (ECM), which originates from the former.
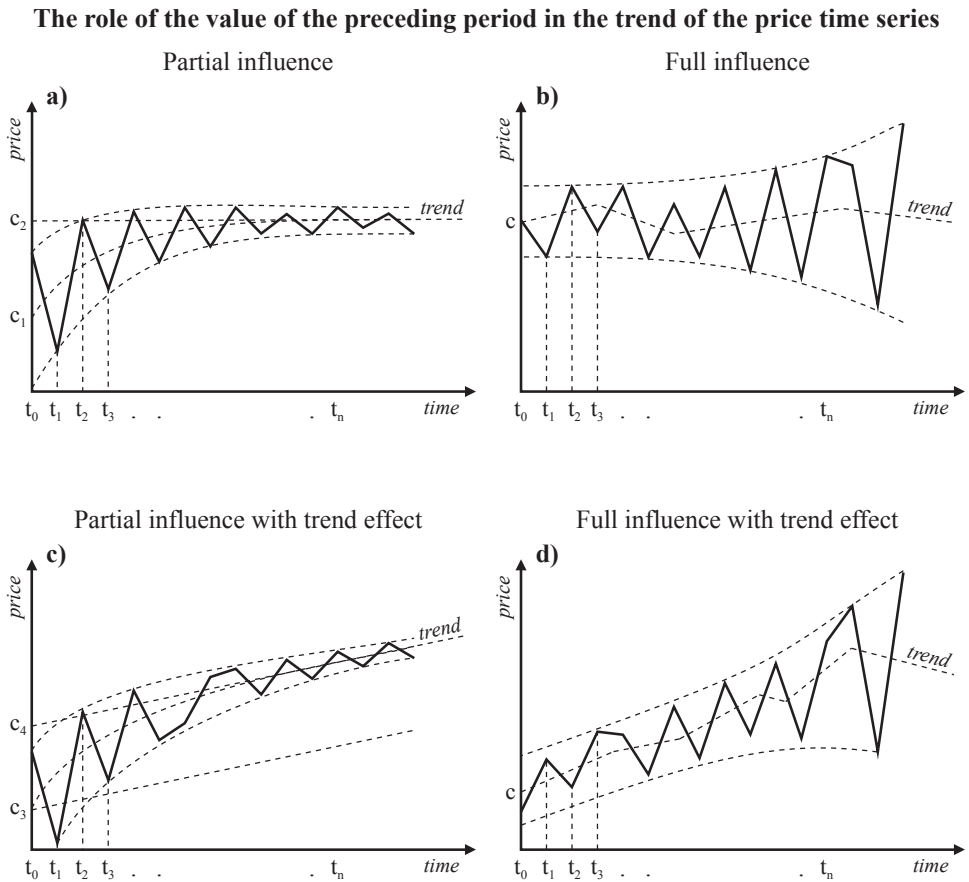
The vertical cointegration study is essentially a comparison between the price time series of two vertically related aggregated market operators in the product chain. The description of the relationship draws on information suggested by price trends and differences emerging from these trends of actual prices occurring at specific times. Therefore, this method is only suitable for time series managementcharacterised by stable and clearly definable statistical indicators. Our analysis is fundamentally limited to stationary processes, meaning processes that are 'stable over time' in the above sense of the word. This fact solidly endorses any new method capable of reducing this constraint through new methodological tools. The cointegration theory enables the study of time series which lack stability. Examining such time series is made possible by certain conversions in order to achieve their statistical stability.

For time series essentially defined by their value at an earlier point in time, statistical instability is partly due to dispersion of the value pertaining to the earlier point in time which is added to the dispersion of the uncertainties (random effects) at the moment in question. The two dispersions reinforce each other at the observed moment with the result that, at that moment in time, the time series may receive its subsequent value from a scale considerably wider than before. As time progresses, it follows that this scale widens, which means that the probable values at consecutive time points become increasingly difficult to estimate. While the uncertainty caused by random effects (determinant factors that are not yet or cannot be quantified) cannot be reduced, the uncertainty pertaining to the preceding point in time's value is reducible.

The above-described situation occurs if the preceding point in time's value fully affects the value of the point in time under scrutiny. However, if the previous value only partially impacts (in the time series equation it is multiplied by a coefficient of a value below 1.0), its value will gradually decline (is reducible below any limit). Thus, it may occur that the time series values little by little approximate a threshold, around which they will only vary because of random effects. Figure 1.a shows this result. The time series initial trend, starting from the c_1 point, reaches the c_2 point upper threshold where it will only randomly vary.

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[2]   The method was invented by C. W. J. Granger, who was awarded the 2003 Nobel Prize in economics in acknowledgement of his achievements in the field, more specifically, for creating the economic term 'cointegration' and for developing the method suitable for the management of non-stationary time series.

Figure 1

The role of the value of the preceding period in the trend of the price time series

Partial influence

Full influence

Partial influence with trend effect

Full influence with trend effect

If the time series equation contains a trend factor, the value's effect from the preceding moment in time also decreases. Then the trend effect will continue to be exerted. The trend will subsequently shift from the c_3 starting point to the c_4 starting point (Figure 1.c).

Returning to the situation where the previous point in time's value fully influences the value of the time point in question, the time series trend must differ from the above scenario. The value of the previous point in time is transferred to the given point in time's value without any change. The former neither reduces nor increases the latter. Given that the expected (mean) value of the random effects is zero, the time series will not diverge from the initial value over a longer period. In the short term, however, the time series may adopt increasing values because the dispersion of values' band gradually widens. If no trend effect needs to be reckoned with (Figure 1.b), the possible joint movement of two time series of the above type can no longer be established with the required certainty because of the accumulation of the above-mentioned uncertainties. In such a time series equation, the preceding period coefficient is 1.0. Such equations are called equations **containing a unit root**. As in the equations of the above-described time series, this coefficient's value had to fall between -1.0 and 1.0, and are considered equations **without unit roots**.

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While Figure 1.d also shows a time series with a unit root, it also contains trend effect. The increasing dispersion of values also complicates the determination of the trend direction. Beyond controlling the fluctuation of values, it is necessary to eliminate trend effects when comparing such price equations.

There are suitable tests for determining with sufficient certainty whether or not a unit root exists in a given time series[3].

As we have seen, a time series containing a unit root is not a stable time process. We have previously concluded that in connection with direct influence processes, with these type of processes the value of the point in time under scrutiny changes in the most straightforward manner. This depends on the value of the preceding point in time and a variable's value reflecting random effects. The respective equation is as follows:

$$y_t = y_{t-1} + v_1 \tag{1}$$

where: y_t is the value of the period under review
y_{t-1} is the value of the preceding period
v_t the variable of random effects at the time point in question and
t is the time index

At each point in time, the difference between the consecutive values, the increase of the time series, equals the random effects variable's value:

$$y_t - y_{t-1} = v_1 \tag{2}$$

Since the random variable's value varies around zero, its dispersion being constant, it is a stable time series in itself (v). If that is true, then the time series (Δy), derived from the difference between the time series consecutive values marked with y, i.e. the first differences of the time y series, must also be considered stable:

$$\Delta y_t = y_t - y_{t-1} = v_1 \tag{3}$$

In the above equations, the y_{t-1} factor's coefficient is 1.0 (which is therefore not marked). Thus equation (1) contains a unit root: for example, it is not stable. On the other hand, as stated above, equation (3) is stable. By generating its first differences, a non-stable time series has thus been converted into a stable one.

Granger (1981) stipulated that a non-stable time series is called a first-order integral and is marked with $I(1)$ if its increment (the time series generated from the difference between its successive values) is stable. A time series, which is stable in itself, is called a zero-order integrated time series and is marked with $I(0)$.

Rephrasing our previous statement: by generating its first differences, a first-order integrated time series has been converted into a zero-order integrated time series.

If a pair of first-order integrated processes (e.g.: x_t and y_t) has a zero-order integrated combination (e.g.: $y_t = a \cdot x_t + v$), then the two time series are cointegrated. **The equation expressing the combination is the cointegration equation.**

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[3] We have used the 'extended Dickey-Fuller-test' and the 'Phillips-Perron-test' as the tests most widely employed unit root tests.

It is possible to test the cointegration equation's existence for a pair of time series containing a unit root (cointegrated process), meaning the existence of cointegration. Suitable procedures are available to ensure the viability of testing methods[4].

Once the cointegrity of two price time series has been established and it is assumed that the two prices continuously and mutually affect each other[5], then a correlation can be established for one of the price's increments, in which it will depend on the increments of the other price at the moment in question and in the past as well including its own past increments. That correlation contains a long-term function for the relationship of the two prices (cointegration equation) and a short-term price-equalising function, which expresses the gradual recovery trend (correction) of the equilibrium price proportion upset by the sudden change of one of the prices (error). These relationships are described by the 'Error Correction Model' (ECM).

The ECM's short-term price restoration[6] block can be broken down separately to the sub-correlations of price increases and price decreases. This enables the rate of price increase and price decrease to be separately quantified. If these rates are different, the price effects are probably asymmetrical.

The cointegration equations enable us to determine the long-term purchase and sales prices of a vertical level. These are the prices in a permanent functional relationship with each other, expressing the technological relationship between the production factor and the finished product prices. **This price proportion expresses the correlation between the equilibrium purchase price and the equilibrium sales price between vertical local market operators. In this sense, these prices can be considered their own long-term local benchmark equilibrium prices.** In the error correction model, the benchmark equilibrium price of the purchase price $x = f(y)$ and the benchmark equilibrium of the sales price $y = f(x)$ can be defined, respectively, as the function of the sales price and the function of the purchase price. As for the actual movement of prices, any price increase and price decrease are always relative to these benchmark equilibrium prices. It is possible to define the values of the actual prices above and below the benchmark equilibrium price. **Similarly, it is possible to measure the degree of these price deviations (price surpluses or shortages) at certain time points and the frequency of price deviations during certain periods. Its value for the entire period under review gives an indication as to the existence and location of market power** (Figure 2). Subfigures a, b, c and d are indications as to the market power relations suggested by their respective headings.

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[4]   Several methods exist for testing cointegration, e.g. the Durbin-Watson test, the extended Dickey – Fuller test or the Johansen cointegration test. We have used the Johansen cointegration test.

[5]   The reciprocal effect of the two prices permits the disproportionate frequency and degree of effects of different direction. The assumption is useful even if in practice only one price, i.e. that of the dominant market operator exerts any influence on the other in the vast majority of cases, in the form of a shock-like price impulse (increase or drop). The disproportion is expressed by the value difference of the quantified effects.

[6]   Price restoration = restoration of the original price relations

Figure 2

**Market power relations as a function of the degree of price
deviation from the benchmark equilibrium price (BEP)**

y* price is **weak** upstream

y price is **strong** upstream

y price is **weak** downstream and
x* price is **strong** upstream

y price is **strong** downstream and
x price is **weak** upstream

* x = purchase price; y = sales price

If, as a result of the rise of the purchase price, the sales price is typically below its benchmark equilibrium price, it follows that the seller is unable to pass on the increased price of his production factor, ie he does not possess market power, meaning he is 'weak upstream' (Figure 2.a). In the reverse situation, when he can maintain his sales price typically above its benchmark equilibrium, he is 'strong upstream' (Figure 2.b). This is only possible if one has market power. If the seller is forced to reduce his price and if, in such situations, the production factor seller is typically able to keep his sales price over its benchmark equilibrium, then, exercising his market power, the latter is 'strong upstream.' On the other hand, the product seller who can't pass on the price decrease to the production factor seller is 'weak downstream' (Figure 2.c). However, if the seller of the production factor is forced to reduce his price below its benchmark equilibrium for a long period, he is 'weak upstream', which means that market power resides with the seller of the product reducing his price, who is 'strong downstream' (Figure 2.d).

As previously mentioned, the error correction model also contains values for the restoration rate for the original price and the levelling of the margin which covers the

entire period. These values enable the calculation of the average restoration period. Again, its value indicates the existence and location of market power (Figure 3). Subfigures a, b, c and d are indications as to market power relations suggested by their respective headings.
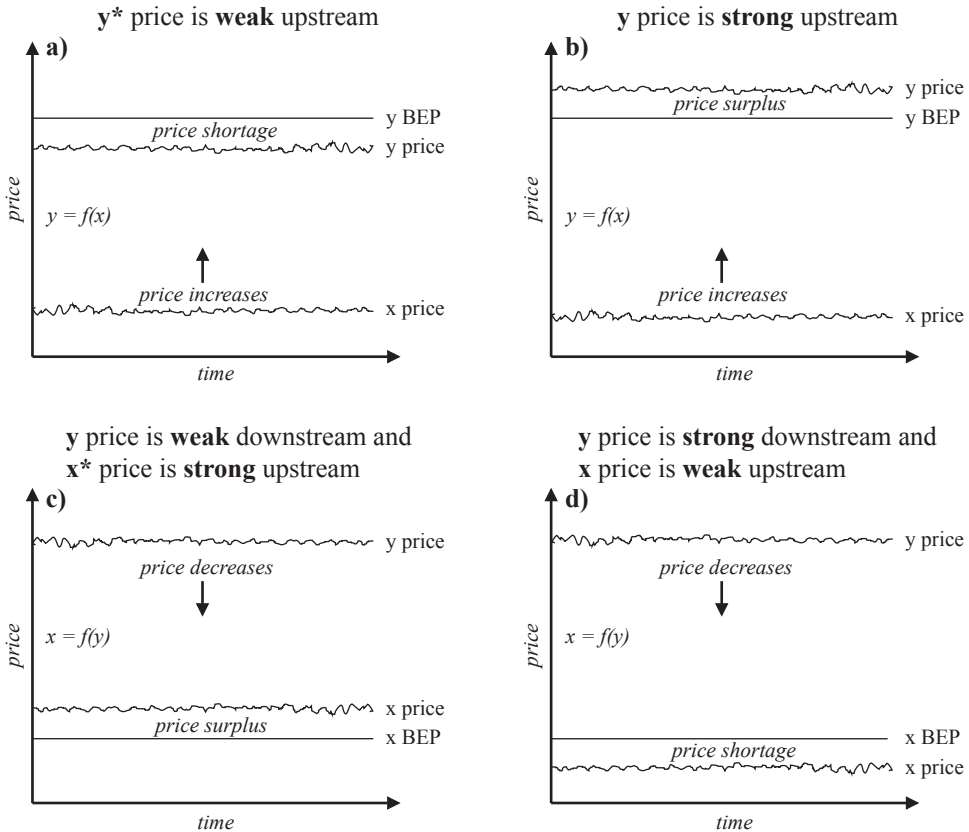
Figure 3

Market power as the function of price restoration
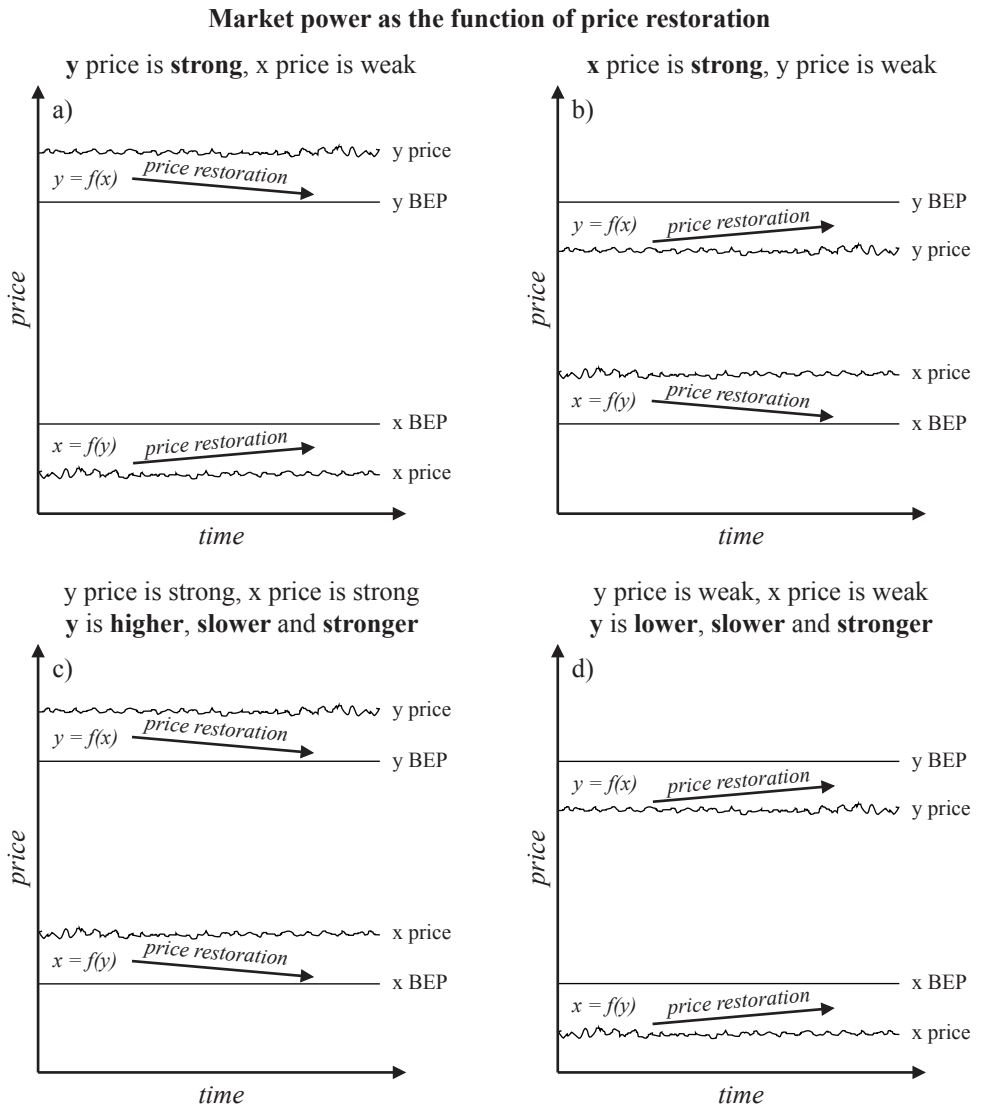
As far as price restoration is concerned, both of the error correction model's equations model provide (different) values. If the recovering y (sales) price and the recovering x (purchase) price converge to their benchmark equilibriums respectively from above and from below, the seller of the product priced y is considered strong vis-à-vis the seller of the production factor priced x (Figure 3.a), as top-to-bottom price restoration indicates the weakening of an existing dominance. In the same vein, upward price recovery indicates faltering in terms of lack of dominance. Prompted by a similar consideration, in the reverse situation the seller

of the product priced x is considered strong vis-à-vis the seller of the production factor priced y (Figure 3.b). If both prices are being re-established from the top, market dominance is with the seller of the product whose price can be restored and thus surrenders the power position of its seller more slowly than the other, ie. the one with the higher recovery time factor, as the values are positive (Figure 3.c). In the event that both prices are being restored from the bottom up, market dominance resides with the seller of the product whose price is capable of being restored faster than the other, meaning the one with the higher recovery time factor, because these values are negative (Figure 3.d). In Figure 3.c and d, the direction of the arrow signifying price restoration is descends less sharply for the price y, which means there the recovery is slower so the owner of the product priced y is in the dominant position in both situations.

The equations describing mutual price determination, where the price x influence on price y and the influence of price y on price x are quantified, can include earlier values of both the influencing and the influenced prices. In economic terms, the inclusion of the latter in the model is justified, as a radical change in price's effects may be felt over a long period. The value of the coefficients in the equation may change depending on the number of variables assuming an earlier value, which are included in the model. In the model the equations' form may also change. They can also contain constant values and trend variables.

The selection of the equations best describing actual price relations (the specification of the equations) requires circumspection, reliance on statistical indicators and economic considerations. In order to be accurate, the model must be based on market links knowledge regarding the product chain and market operators' typical decision-making mechanisms. The general rules of logic also need to be taken into consideration. As for the latter, one must consider how easily one's conclusions on the whereabouts of the dominant market position can be nullified if, for example, one finds that a particular vertical-level y price is 'strong upstream', while the same price is found to be 'weak upstream' as a x price on the next vertical level. Such equation pairs must be considered to be erroneously specified even if they are cointegrated and are correct from an econometric point of view. They must be omitted from the scope of our study along with their vertical links. Similarly, the comparison of the price deviation and price restoration findings may also yield contradictory conclusions. Such price equation pairs and their links should also be disregarded.

The fact that a wide range of pros and cons must be considered before selecting which equations to use partly explains why we have not completely followed the most widely employed methodological rules of procedure (Rapsomanikis 2004). We have also chosen not to follow von Cramon-Taubadel's (1999) method. Instead we have opted to directly utilise the error correction model results, without separating its error correction block into price increases and price decreases.

Based on the Granger causality test, the above series of procedures first establishes the 'influenced-influencer' relationship over the long term and performs the estimation by separating the error correction side of the so selected single increment equation to a price increase side and a price decrease side. For the price restoration rate the two sides will thus have a different coefficient value. The two coefficients will express, respectively, the transmission rate for price increases and the transmission rate for price decreases. An F-test then establishes whether the difference between the two is significant. Determining market dominance follows the logic that the dominant market operator seeks to decelerate the restoration

of price change consequences which are favourable to him and to accelerate those which are disadvantageous. According to this assumption, if the results reflect this condition, it also means that asymmetry causing market dominance lies with the market operator benefiting from the asymmetrical price change.

We have modified the above testing method by omitting the Granger causality test. This is because we wanted to determine the price effects' causality direction at a different point in the test. Therefore, we kept both equations of the error correction model (both the one that expresses price x influence on price y and the one expressing price y influence on price x). We did not separate the error correction sides into price increase and price decrease blocks. Instead, the two equations' price levelling coefficients are weighed against each other. We tested the ratio the price values determined by the cointegration equation yielding the 'benchmark equilibrium series' and they were above and below the benchmark equilibrium value during the entire period under review. In both equations this indicator takes on the same value Then we examined the values yielded by each equation for the price restoration rate. In the equations this indicator takes on a different value Market dominance is attributed to that market operator whose price remained more immune to the effect of the price changes. In other words, the market operator who can, over longer periods of time, achieve a value over his benchmark equilibrium price to a larger extent than a value below his benchmark equilibrium price. Furthermore, the market operator who could better delay the restoration of the price favourable to him while better accelerating the restoration of the unfavourable price. The situations shown in Figure 2 and Figure 3 illustrate the possible positions of vertical price relations and the power positions pertaining to the specific situations. Figure 4 shows our testing method, a modified version of Rapsomanikis' testing procedure.

Figure 4

Rapsomanikis' price transmission test, modified for the purposes of our study

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                    ┌─────────────────────────────────┐
                    │  testing the order of integration│
                    │  (Augmented Dickey-Fuller test,  │──────────┐
                    │    Phillips-Perron test)         │          │
                    └─────────────────────────────────┘          │
                                                      if the order of
                                                   integration is different
                                       ┌─────────────────────────────────┐
                                       │ conclusion: lack of integration  │
                                       │   objective: causality test      │
                                       │   (Granger causality test)       │
                                       └─────────────────────────────────┘

 if there is a unit root                              if there is no unit root

┌──────────────────────────┐  if there  ┌─────────────────────────────────────┐
│ testing the cointegration│  is no     │ objective: to estimate the          │
│ of price time series     │  cointeg-  │ autoregressive lagged modell for    │
│ (Johansen test)          │  ration    │ the causality test                  │
└──────────────────────────┘            └─────────────────────────────────────┘

      if there
  cointegration exists

┌──────────────────────────┐
│ setting up and estimating│
│ the error correction model│
└──────────────────────────┘

┌──────────────────────────┐
│   measuring asymmetry    │
│ (average price deviation,│
│   price deviation ratio, │
│ numerical ratio of price │
│  deviation, price        │
│  adjustment period)      │
└──────────────────────────┘

            ┌─────────────────────────────────┐
            │ comprehensive assessment of      │
            │ market integration and price     │
            │ transmission                     │
            └─────────────────────────────────┘
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Additional indicators were produced and analysed in order to achieve a more accurate description of the dominance relations. The following price **transmission indicators** have been employed:
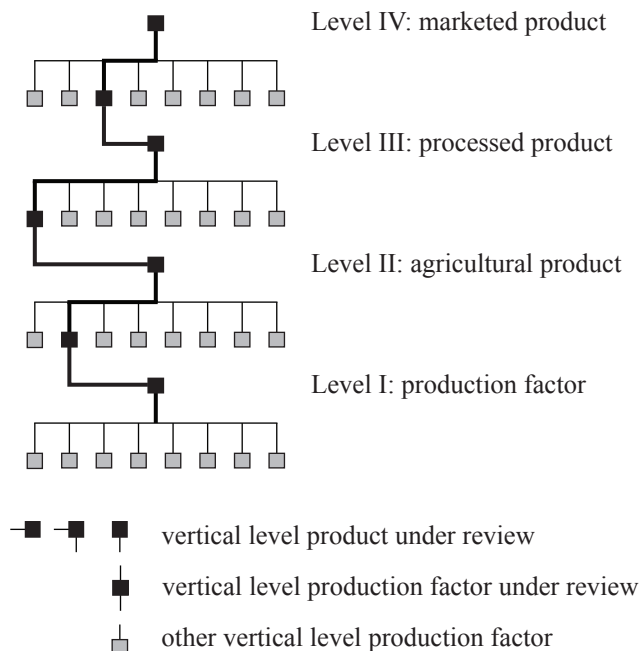
Price transmission indicators		
Description	**Content**	**Dimension**
price difference	The difference of the price surpluses and price shortages over the period under review.	HUF
average price deviation	The average price deviation (price surplus or price shortage) for the entire period.	HUF
price deviation ratio	Expresses the direction and degree of deviations exceeding 50 percent of the degree of the deviations from the benchmark equilibrium price. The positive and negative signs indicate the dominance of price surpluses and price shortages, respectively. Its numerical value expresses the ratio of the type of price deviation within the total price deviation.	%
frequency of price deviation	Expresses the numerical ratio of occurrence of the dominant price deviation (price surplus or price shortage) during the whole of the period.	%
price change ratio	The ratio between the average price deviation and the price	%
price deviation stability	The quotient of the price deviation ratio and the frequency of price deviation; range: *0.5 < price deviation stability < number of units in the time series*	a number without dimension
price restoration period	The period required for the margin to level off	months

2. The scope and database of the test

Vertical price transmission has been performed in 18 finished product chains for all of the producing and processing industries (the aggregated food sector). Other than the aggregated food product chain, the product chains were assembled by beginning with a finished product, and tracing the production route of one of its production factors until we reached an agricultural product's production factor. In that way, five vertical levels and two processed product levels (III a product level: the milling industry) and (III.b product level: the baking industry) were defined for marketed bread products. Other processed products and the aggregated food products were analysed on four levels and one processing level (III) (Figure 5).

Figure 5

The delimitation of products and levels in the vertical price transmission test

Level IV: marketed product

Level III: processed product

Level II: agricultural product

Level I: production factor

■ ━ ■ ━ ■   vertical level product under review

■   vertical level production factor under review

▢   other vertical level production factor

Each of the 18 levels of marketed products (IV) is based on its respective level of processed products (III , III.a and III.b). 8 levels of agricultural products (II) were analysed below the level of processed products. 4 different levels of production factors (I) are linked to agricultural products. The test was performed for the following product chains:

The product chains (marketed products) included in the price transmission test

Aggregated food products	
level IV	**Marketed food products, alcoholic beverages and tobacco**
level III	Processed food products, alcoholic beverages and tobacco
level II	Agricultural products
level I	Agricultural inputs

	Product chains (1-3)		
level IV	**white bread**	**Semi-white bread**	**Cottage-style loaf**
level III.b	Bread and fresh pasta	Bread and fresh pasta	Bread and fresh pasta
level III.a	Milling industry products	Milling industry products	Milling industry products
level II	Wheat	Wheat	Wheat
level I	Fertiliser active ingredients	Fertiliser active ingredients	Fertiliser active ingredients

Product chains (4-6)		
level IV	**Sirloin**	**Pork chops**	**Leg of pork**
level III	Processed and preserved meats	Processed and preserved meats	Processed and preserved meats
level II	Slaughter cattle	Slaughter hog	Slaughter hog
level I	Mixed fodder for calves	Feed for fattening pigs (I. II. III.)	Feed for fattening pigs (I. II. III.)

Product chains (7-10)			
level IV	**Bologna**	**'Olasz' salami**	**Processed ham**	**'Gyulai' sausage**
level III	Finished meat products	Finished meat products	Finished meat products	Finished meat products
level II	Slaughter hog	Slaughter hog	Slaughter hog	Slaughter hog
level I	Feed for fattening pigs (I. II. III.)	Feed for fattening pigs (I. II. III.)	Feed for fattening pigs (I. II. III.)	Feed for fattening pigs (I. II. III.)

Product chains (11-13)		
level IV	**Broiler chicken**	**Pasteurised milk**	**'Trappista' cheese**
level III	Processed poultry products	Liquid milk	'Trappista' cheese
level II	Gallinaceous poultry for slaughter	Cow's milk, raw	Cow's milk, raw
level I	Broiler chicken feed (starter, grower, finisher)	Mixed fodder for cattle	Mixed fodder for cattle

Product chains (14-16)		
level IV	**Granulated sugar**	**Cooking oil (sunflower-seed)**	**Dairy margarine**
level III	Processed sugar products	Vegetable and animal fats	Vegetable and animal fats
level II	Sugar-beet	Sunflower-seed (for oil production)	Sunflower-seed (for oil production)
level I	Fertiliser active ingredients	Fertiliser active ingredients	Fertiliser active ingredients

Product chains (17-18)	
level IV	**White table wine**	**Red table wine**
level III	White table wine	Red table wine
level II	Wine-grapes and ungrafted vines	Wine-grapes and ungrafted vines
level I	Fungicides	Fungicides

The above vertical levels' monthly product price time series for the period January 2001 – December 2005 were used for our price transmission calculations. We drew on data from the Central Statistical Office (KSH) Information Database and the AKI Market Price Information System.

Vertical price transmission tests essentially require price data. However, certain indicators can also be calculated using the price indices from the seven indicators described in section 1. With the exception of the first two indicators which are expressed in monetary units, all the other indicators can be calculated from the price index lines. Price indices were used to generate the results of the aggregated food product chains.

Other than the price time series, food processing price indices are also recorded in the KSH Information Database. In cases where only a product's price index line was available (e.g. food processing), the price time series was generated from the price indices, i.e. by matching the latter to a minimum of three non-contiguous monthly price data obtained from other sources.

The tests were designed to define the relationships that can be most accurately described concerning the existence of cointegration. For that reason, no constants were used in these equations and we also made an effort to eliminate the effects of inflationary trends. Our price time series were deflated for that purpose. The application of our own price index would be the best method to eliminate inflation. That would, however, generate an invariable time series, unsuitable for further testing. Deflating while using the consumer price index would yield a variable time series, and the variance would also involve the input of elements unrelated to the price to be deflated, which would generate an undesirable distortion. Applying the product group's price near the product in question in terms of a deflating device would result in a similar situation. The core inflation indicator essentially considers inflationary elements influenced and controlled by the National Bank[7]. Certain factors such as basic food products and seasonal prices are disregarded. The price effects eliminated from the core inflation indicators are, however, essential for our tests. Consequently, if we use core inflation to deflate our prices, we deflate with that very factor (the basic inflation), from which we want to extricate our prices. In general, this occurs while not deflating with precisely those effects that we wish to examine, and thus which are preserved in our prices. For the above reasons, it suits our purposes that the core inflation indicator has been considered a suitable deflating device.

3. Test results and assessment

In vertical price transmission tests, particularly if there is no close normal correlation between the observed time series, the correct assessment of whether or not cointegration exists should be ensured by a 'filter system', which is best for minimising the risk of errors. This includes the test to establish the existence of the above-described unit root, the test to assess the existence of cointegration between the time series and the test to assess causality relation probability. In the error correction model where cointegration is quantified following the test performance to establish its existence at acceptable probability, the time series lagged values are also included as an influence factor. The cointegration relationship

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[7] The core inflation indicator is calculated on the basis of the consumer price index. Under the agreement between the KSH and the National Bank (MNB), the methodology of the computation of the core inflation indicator is reviewed on an annual basis. As a result of the annual review, in addition to the items deleted previously from the consumer price index (non-processed foods, household energy and vehicle fuels, other seasonally priced products, pharmaceutical products subsidised by the Social Insurance Fund, services with a set official price and own-account housing services), lard, flour, groats and bacon were also dropped from the product list in 2003. The coverage of core inflation is thus 65.8%. It is calculated by the re-weighing of the index. The core inflation indicator is calculated on a base of December 1994 (MNB, 2006).

(the cointegration coefficient's degree) may also be dependent on the number of lags applied in the model. Therefore, the relevant methodology can also provide reference points concerning the optimal number of lags. In fact, the optimal number of lags is the one for which the value of the so-called Akaike information criterion or the Schwarz criterion is the lowest. However, as stated above, freedom from logical contradictions is a more important criterion. For example, if a market operator at an intermediate level in a product chain is considered upstream dominant in the market operator's downstream price relation, the market operator should also be upstream dominant in terms of price relation with the next highest level. We have therefore tested all possible lag versions (for the time series of 60 units, there are 16 in a single-direction relationship in each price pair). Without the versions containing a constant and a trend variable, which were disregarded for reasons stated above, there were 1,714 cointegration equation combinations. 16 possibilities were thus tested for the single-direction correlation of each price pair and the test priorities were considered for selection and approval of the least contradictory and best-fitting version and the assessment of the values. This was based on the correlation of the cointegration benchmark equilibrium series and the price series, among which the seven (or five, for price index series) price transmission indicators referred to above.

On the basis of the cointegration tests, lack of cointegration was established for only two price time series pairs. These two belonged to the processed and the marketed product levels of the sirloin and margarine product chains.

This high proportion of cointegrated price time series is not at all surprising if one considers first that vertical levels' purchase and sales prices must move in close correlation due to technological constraints (specific primary material requirements) and, second, the 16 equations per level provide a sufficiently safe opportunity for demonstrating cointegration where it exists.

Below, you will find an assessment of the findings for our price transmission tests on the cointegrated price pairs. These are are illustrated in Figure 1.

The resulting data in the **aggregated food product chain** confirm an opinion which has already gained credence among experts: agricultural production is undergoing dual price pressure. With a product chain approach, there is pressure from below, meaning production side factors and a different kind of pressure from above, meaning from processed product retailers, which is passed from the processors to agricultural producers.

The price transmission between the production factors' sales prices and an agricultural product's sales price has been found to be asymmetrical. During the observed period, 58.3 of the monthly observations (frequency of price deviation), production factors' prices were higher than the benchmark equilibrium of the respective production factors. During the same period, 56 percent of the differences from the benchmark equilibrium price were higher than the benchmark equilibrium price (price deviation ratio). In the five years under scrutiny, market dominance was with the market operator performing the production factor supply. This is confirmed because, on average, he was able to maintain his prices over his benchmark equilibrium price to a degree of 0.6 percent of that price during the period in question (price change ratio). This (not prominent) price surplus generated in the production factor supply was fairly evenly spread between the monthly prices. This is shown in the price deviation's stable value, which is close to 1 (0.96). However, during the reviewed period, the price

disparity caused by each price impulse (in our case, price decrease) is adjusted on average during a period of 80.4 months (price restoration period)[8].

The cointegration results between producer and processor levels have shown an asymmetry of 2.2 percent favouring the processor. In 65 percent of the observations and in 62.5 percent of the price deviations producer prices were below their respective benchmark equilibrium prices With a stability of 0.96 percent, price difference is considered to be balanced. The partners have accepted the cointegration of prices as an established practice. The restoration period of over two years (46.3 months) further indicates the series of incomplete price adjustments. In the light of the figures, the processors' market dominance vis-à-vis producers appears more pronounced than for production factors sellers.

The same producers, however, are bound to suffer a moderate dominance by retailers. In terms of the prices' percentage, their price shortage is below 0.1 percent. They were compelled to record a price shortage for 53.3 percent of the period, and their price shortage (price deviation ratio) was 51.7 percent. The price stability rate was 0.97. On average, prices were fully restored in 5.2 months. This information envisages unstable dominance by retailers, an interesting concept because, as we shall see regarding the major product chains' results, retail chains have an even more powerful market dominance. One should not forget, however, that the above result data concern the totality of food product chains, within which the individual product chains to be discussed below play an important if not exclusive role.

The only difference between the **three bread product chains** included in this study is the level of secondary processing. Any varying price movements are limited to bread products' different processors and retail prices

When investigating the product chain's lowest price pair, meaning the sales prices for fertiliser active ingredients and wheat, asymmetry favouring the production factor appears in the price transmission. The balance of the differences from the benchmark equilibrium price was a price surplus of HUF 39.9/month in the average of the five years under review. During the reviewed period the price surplus was, on average, 45.2 percent for fertiliser active ingredient prices. Such a price surplus degree. also implies that, in 88.3 percent of the monthly observations, the price for fertiliser active ingredients was above their benchmark equilibrium price. Price surplus accounted for 97.4 percent of all price differences, meaning the price was above its benchmark equilibrium price for a continued period of time. There was only one instance when fertiliser active ingredient sales were unable to take advantage and keep pace with the sudden increase of wheat prices, and this followed the drought in the second half of 2003. Throughout that 6-month period, their prices remained below their increased benchmark equilibrium price. The long-term price surplus also implied a stable price difference (1.1). The average price restoration period exceeded the five years under review (62.7 months).

At the next levels of the product chain, the price pair for wheat and milling industry products reveals primary processor market dominance. This particular asymmetry is reflected in the price of wheat remaining below its benchmark equilibrium price by HUF 1.6/kg over a five-year average. This 6.5 percent price shortage for the average price of wheat transpired in 73.3 percent of the months under review, accounting for 75.1 percent of all price differences.

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[8]   Price restoration is a convergent process, in which the existing difference (residual difference) decreases into a constant direction in each interval (month). As the value of this ratio (cointegration coefficient) is lower than 1, the difference will never completely disappear. For our purposes, a price restoration of 99 percent was considered a complete one.

The price difference was stable (1.02). The long price restoration period (45.3 months) also confirms the milling industry's continued existence dominance.

The third identical price pair for bread product chains concerns milling industry products and the 'bread and fresh pasta' baking industry product group. At this point, our results appear to clash with most experts' opinions as to where market dominance lies, and the issue will now be discussed in more detail. Our calculations suggest that, in this market relation, market dominance lies with the milling industry. That average HUF 1 price surplus represents 2.8 percent in the price of flour. The price surplus month ratio is 43.3 percent. Price surplus accounts for 60.6 percent of the total price difference. Price deviation was not stable (1.4). Since price restoration would take almost 900 months, it is to be considered only a theoretical possibility. If this pattern of change for the price of flour and its benchmark equilibrium price are examined (Figure 6), it is found that there were two relatively long periods when the price of flour was significantly over its benchmark equilibrium price during the observed time frame.

Figure 6

**Price transmission between the milling industry and
the baking industry (2001-2005)**
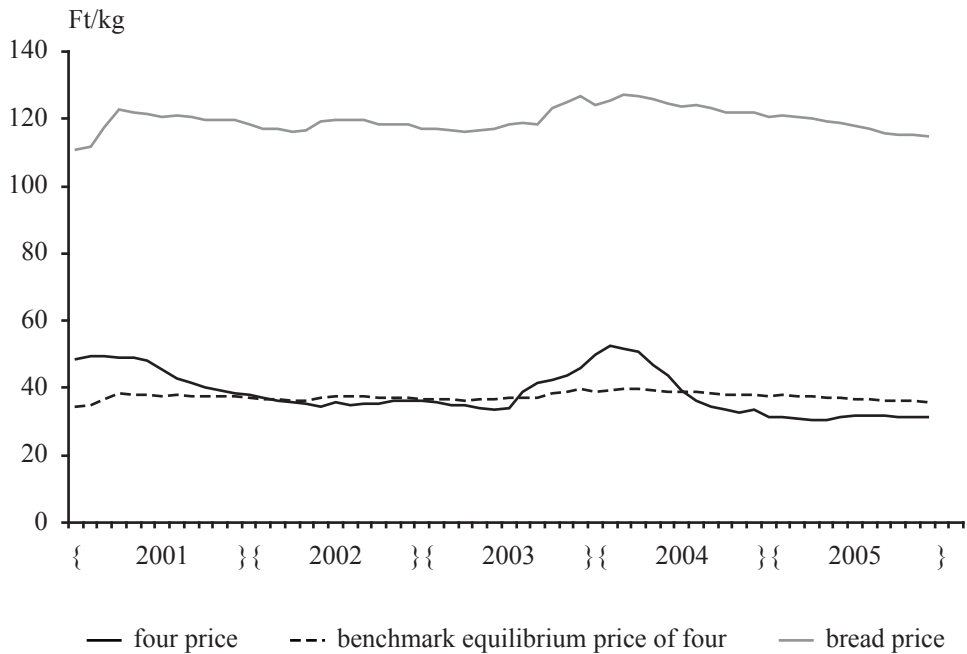
The first period entailed all of 2001, whereas the other, which followed the 2003 drought, lasted until July 2004. The results of our calculations for these two flour price surplus periods led us to conclude the existence of milling industry market dominance. Figure 6, however, shows that, during the last 18 months of the reviewed period, there was a positive though moderate flour price shortage. If our testing had been limited to these last 18 months, in all probability it would have revealed baking industry market dominance, since baking industry price decreases were able to force flour prices below the flour benchmark equilibrium price throughout that period.

Price transmission between bread production and bread retailing resulted in market dominance, which differed for the various products on the retail side. It represented a price shortage of HUF 0.7, HUF 0.5 and HUF 5.1 respectively in the processors' sales price for white bread, semi-white bread and cottage loaf. That price shortage respectively amounted to 0.6 percent, 0.4 percent and 4.1 percent of the actual prices. The ratio of price shortage months within the observed time frame was respectively 65 percent, 66.7 percent and 91.7 percent, whereas the price shortage within the total price difference was respectively 68.8 percent, 63.5 percent and 99.3 percent. With values around 1, the price difference was stable. For white bread, price restoration was around 0, meaning there was no major lag, meaning the processors' price virtually coincided with its benchmark equilibrium price. For semi-white bread and cottage loaf, price restoration would require 45 months and over two thousand months respectively.

Since we wanted to emphasise product differentiation in the price war between processing and retail, we changed tack and opted for assessment by indicator rather than by product. Our calculations have revealed the retailers' strategy: retailers stopped vying for a substantial price surplus on white and semi-white breads, striving to compensate for the loss of profit on cottage loaf.

The **sirloin product chain** is a slaughter cattle product chain. On the first level, the sale of mixed fodder for calves was established as the production factor. Slaughter cattle production became the next level. The price transmission between these two levels reveals producers' market dominance Consequently, those selling mix fodders experience a price shortage of HUF 13.1, which accounts for 22.4 percent of the price. In 95 percent of the observed months, price shortage occurred and accounted for 99.5 percent of the differences with the benchmark equilibrium price. That is another indication that price shortage remained stable. In fact, there is no price restoration (4,836.8 months). The trend during the last 18 months of the observed time frame showed a rise in the price for slaughter cattle and a decrease in prices for mixed fodder. In fact, these price movements meant that our calculation results leaned toward producer market dominance.

The price transmission between the price time series of slaughter cattle and processed and preserved meats led to processors market dominance. This dominance meant producers incurred a price shortage of HUF 30.2, which accounted for 13 percent of the per kilo price for slaughter cattle. The producers' price shortage occurred in 91.7 percent of the reviewed period, accounting for 96.7 percent of the total price difference. In the case of prices for slaughter cattle, no actual price restoration occurred either (4,054.6 months).

Due to the previously mentioned absence of cointegration, no price transmission could be computed between the processor level and the processed product retailer level. The price divergencies, however, clearly reveal market dominance at the retailer level.

Further on various aspects occurring in the pork production level and product chains will be discussed. These can be uniformly termed **slaughter hog product chains**. At the processor level, it includes two product groups, meaning processed and preserved meats and finished meat products. At the retailer level, the former group includes pork chop and leg of pork product chains. The finished meat products group includes bologna, 'olasz' salami, processed ham and 'Gyulai' sausage product chains.

The product chains' first level entails feed for pigs. The three feed types' weighted average price was deemed to be the price pertaining to the production factor level. At the producer level, the buying-in price for slaughter pigs represents the other part of the observed price pair Market dominance between the two levels was revealed to reside on the agricultural producer side. An average price shortage of HUF 6.2 can be established in the price for *fattening* pig feed. Compared to the average price of the feed, this price shortage represents 14.2 percent. A price shortage of 76.7 percent was seen during 76.7 percent of the months in the pertinent time period., accounting for 88.4 percent of the total price divergence from the benchmark equilibrium price. Moreover, weak positive stability (1.15) was observed in the price divergence among the feed types. There was no significant restoration in terms of the feed types' price movement (5,123 months).

Regarding price transmission at the successive vertical levels, the market dominance of slaughter pig production could be revealed vis-à-vis both meat processing and the production of finished meat products. Price transmission asymmetry is reflected in the data further down. Compared to the price of the processed and preserved meats and finished meat products, an average price surplus of, respectively, HUF 4.2 and HUF 3.5 was generated in the buying-in price for slaughter pigs. These represented 1.8 percent and 1.5 percent respectively in the price for slaughter pigs. Obviously, the same series of slaughter pig purchase prices was applied to both price pairs. The different results were due to the various price series for the two processed product groups. A higher market dominance by producers was revealed for raw meats, which have undergone a lower level of processing and therefore include a greater weight in terms of slaughtering activity. It therefore follows that producers are more dominant vis-à-vis slaughter-houses than vis-à-vis-the production of finished meat products. In other words, the value added during production can somewhat reduce producers' dominance. Incidentally, this particular dominance by producers was of a modest nature. This is confirmed by the price deviation indicators' values. Producers achieved a price surplus in less than half of the period under review: 41.7 percent and 36.7 percent respectively for processed and preserved meats and finished meat products. The price surplus included 58.6 percent of the price divergence for processed and preserved meats and 56.6 percent of the price divergence for finished meat products. Consequently, the price surplus was not stable throughout the entire period under review. The price deviation stability indicator of processed meats and meat products was 1.41 and 1.54 respectively. The price restoration period was 91.3 months and 75.7 months respectively for processed meats and finished meat products. As for monthly price movements, the high slaughter pig buying-in prices of 2001 represented the price surplus amplitude, which is expressed by the price deviation stability indicator. The fluctuation of buying-in prices remained essentially close to the price throughout the rest of the period.

Between levels three and four of the product chains, retailers had exclusive market dominance for processed meats, whereas for finished meat products it alternated between the two sides.

The price transmission for pork chops resulted in a price shortage of HUF 24.6 for those processing the product, which represented an average 5.5 percent of the price. Processors underwent a shortage of HUF 32.6 per kilogram on leg of pork. That shortage entailed 7.2 percent of their prices. For pork chops, a price shortage of 91.6 percent occurred during 76.7 percent of the period. The price shortage for leg of pork occurred during 80 percent of the period, accounting for 94.6 percent of the total price difference. The high numerical ratio (frequency of price deviation) and the equally high proportion (price deviation ratio)

for the price shortage indicates stable price deviation. For both price pairs, the period of full price restoration exceeds the observed five-year period (99.5 months and 93.3 months respectively).

As mentioned above, with the four finished product chains market dominance varied between the processor and retailer levels.. Processors generated a price shortage with trade prices for processed ham (average HUF 40.3; 9.6 percent of the price) and the 'olasz' salami (average HUF 7.2; 2 percent of the price). There was a minimal price surplus for 'Gyulai' sausage (HUF 0.9; 0.1 percent of the price). A higher price surplus was generated for bologna (HUF 13.3; 3.8 percent of the price). For processed ham and for 'olasz' salami, the price shortage was 99.7 percent in 90 percent of the five-year period and 86.6 percent in 80 percent of the period. For 'Gyulai' sausage and bologna, the price surplus was 51.3 percent in 50 percent of the observed time frame and 90.9 percent of the total price difference in 75 percent of this time frame. ,The price deviation was sufficiently stable enough for processed ham and the 'olasz' salami (1.11 and 1.08 respectively), and positively stable for the 'Gyulai' sausage (1.03). However, it was not stable for bologna (1.21). Price restoration is virtually absent for processed ham and the 'olasz' salami (4,913 and 4,087 months respectively), but it is complete in 49.5 and 19.9 months respectively for the 'Gyulai' sausage and bologna.

In the broiler chicken product chain, market dominance is systematically revealed at the upper level of each pair of levels.

At the first level of the product chain, the weighted average price for broiler feed (starter, grower and finisher) was considered the production factor price. At the second level, the sales price for gallinaceous poultry for slaughter was included in the first product chain price pair. Price transmission for the price pair resulted in an average price shortage of HUF 4.7 on broiler feed. In terms of the feed price, it represented 8.4 percent. The ratio of price shortage months was 91.7 percent. Price shortage accounted for 98.9 percent of all price deviations. Price deviation was considered stable (1.08). For broiler feed, price restoration was virtually absent. (2,729 months).

Price transmission asymmetry between sales prices for gallinaceous slaughter poultry and processed poultry meat transpired as a price shortage of HUF 20.9 for gallinaceous slaughter poultry, which encompassed 11.9 percent of the gallinaceous slaughter poultry sales price. The price fell below the benchmark equilibrium price for 91.7 percent of the observed time frame, which totalled 98.9 percent of all price deviations. Price deviation was considered stable (1.08). No price restoration cropped up for the gallinaceous slaughter poultry price (2,729 months).

When it came to the price pair for processed and sold poultry meat, the processor incurred a price shortage. The price shortage entailed HUF 5.6, 2 percent of the price. Price shortage transpired in 70 percent of the months in the given period, in 81.9 percent of all price deviations. Price restoration is a non-factor for the processed poultry price (3,909 months).

With **dairy product chains it is more** complicated to determine market dominance than with poultry products. Mixed fodder marketers are clearly dominant vis-à-vis raw milk producers and clearly the retail trade is dominant in relation to processors. On the other hand, when it comes to those producing and processing liquid milk, producers are the dominant party. However, with 'Trappista' cheese it is the opposite and processors dominate. During the observed period between 2001 to 2005, the buying-in price for raw milk typically hovered around HUF 70 per litre, and this lasted until January 2004, after which it dropped by

about HUF 10 and then remained at that level. With liquid milk, the raw milk price remained above its benchmark equilibrium price until 2004. In response the price transmission study evaluated producers as market operators who can resist long-term price pressure from producers, meaning they are considered as the dominant party. The price of Trappista cheese is only moderately linked to fluctuations in the raw milk price. This can be partly explained by its higher added value content. This issue is dealt with in more detail in the section on the in-depth interviews. Given the processors' 'Trappista' cheese price of HUF 800-1,000/litre, the HUF 10/litre raw milk price decrease falls below that required to alter the otherwise unstable position of market dominance. Therefore, the 'Trappista' cheese market dominance was considered to reside with the processors.

In the dairy product chains, prices for mixed cattle fodder include a price surplus of HUF 3.5 compared to producers' prices for raw milk, which entail 7.4 percent of the mixed fodder price. A price surplus transpired during 70 percent of the given time period with a ratio of 72.9 percent compared to all price deviations. The distribution of price deviations was stable throughout the period (1.04). During the given time frame the price deviation is not equilibrated (90.2 month).

In the price transmission between the producers' sales prices for raw milk and processed liquid milk, an average price surplus of HUF 4.7 appears for raw milk. This price surplus represents 8.7 percent of the raw milk price. Price surplus occurred in 68.3 percent of the months under review, and entailed 87.5 percent of all price deviations. There was considerable fluctuation in price deviations. The high price surplus period extending to 2004 was followed by a low price shortage period. The price deviation stability indicator was 1.28. At 2,365 months, the price restoration rate was negligible.

For the price pair of raw milk and 'Trappista' block cheese, an average price surplus of HUF 23.7 appeared for the cheese. This 3.1 percent price surplus of 3.1 percent happened in 75 percent of the reviewed five-year period, accounting for 76.4 percent of all price deviations. For the entire period, price deviation was stable, with the price restorations transpiring in an average of 16.5 months.

The price transmission between processors and retailers resulted in a price surplus for the retail trade. This was indicated by a HUF 0.7 per litre price shortage in the processors' price for liquid milk and the HUF 7 per kilogram price shortage in the processors' price for 'Trappista' cheese. The price shortage for liquid milk and cheese came to, respectively, 0.8 percent and 0.9 percent of the price. The price shortage for liquid milk was apparent in 55 percent of the period under review, accounting for 68.1 percent of all price deviations. However, for cheese, the price shortage period was only 48.3 percent, in 63 percent of all price deviations. Price deviation varied throughout the period. For liquid milk, in 2002 and 2003 price shortage appeared as a lasting downturn, which was preceded and followed by smaller waves of surpluses and shortages (1.24). The price fluctuation of cheese was characterised by shorter and wider amplitudes in both directions (1.3). No price restoration was apparent for liquid milk (3,370 months). For 'Trappista' cheese, however, the restoration process was completed in an average of 15.6 months.

For the **granulated sugar** product chain our calculations indicated that both the sellers of fertiliser active ingredients and sugar processors are in a dominant position vis-à-vis sugar beet producers. Retail trade is in a dominant position within the market relationship between processors and retailers.

During the observed time frame, a price surplus of HUF 17.5 per kilogram was achieved in the fertiliser active ingredient price, which entailed 15.8 percent of the price. This price surplus occurred during 75 percent of the period, accounting for 89.5 percent of total price divergence. There were radical price deviations . During the 2001-2002 period a high price surplus for fertiliser active ingredients occurred. In 2005 there was also a considerable price surplus when the buying-in price for sugar beet was low. The price deviation stability indicator was 1.19. Price restorations were completed within a month.

Price transmission between sugar beet production and processing generated an average price shortage of HUF 0.3/kilogram by producers during the period 2001 to 2005. This price shortage, representing 4.1 percent of the buying-in price for sugar beet, occurred during 58.3 percent of the period. Within the total price deviation, price shortage accounted for 64.4 percent. While the price deviation was stable (1.1), the low 2005 buying-in prices represented a minor amplitude. Price restoration could not be completed for the buying-in prices of sugar beet (2,771 months).

Testing the pair for trade price processed sugar and retail price granulated sugar revealed an average price shortage of HUF 0.6 of processors' sales price. This shortage represented 0.4 percent of the price. Price shortage was detected for 50 percent of the reviewed months. The price shortage ratio within all price deviations was 59.5 percent. Throughout the first half of the five-year period, price deviation remained very stable. While prices began to fluctuate slightly during the second half of the period, they were still essentially below the benchmark equilibrium price. The indicator's 1.19 value indicates that decreasing stability.

As with the broiler chicken product chain, market dominance in the **sunflower seed based** cooking oil and margarine product chains always resides at the higher level between each level pair.

The price transmission for the production factor and the agricultural product yielded an average price shortage for the former of HUF 0.4 in the sales price per kilogram of fertiliser active ingredients. That price shortage of 0.3 percent of the price of active ingredients occurred in 48.3 percent of the five-year period, accounting for 51.3 percent of all price deviations. The price deviation stability indicator was 1.6, meaning market dominance was extremely unstable in the product prices relationships, which is also shown in the minimal (1.3 percent) price shortage for the production factor. Price restoration rate was very low between two points in time (months). The time required for a complete restoration is 180 months.

In the price relationship for the agricultural product and the processed product, the sunflower-seed sales price suffers a price shortage vis-à-vis the vegetable oil sales price. The price shortage is HUF 4.4 per litre. That is 8.3 percent of the sunflower seed price. The price shortage occurred in 90 percent of the period, accounting for 94.8 percent of the total price difference. On average, prices were fully restored in 39 months.

As discussed above, for margarine a non-cointegrated price transmission took place between diverging price time series, ensuring a price surplus devoid of price restoration potential (i.e. dominance) for the retailer of the processed product over the processor.

Price transmission in the **wine product chains** resulted in a dominant position for the vertical partners both below and above the producer level. For white table wines, the

processor level was exposed to price pressure from retailers of the processed product, while processors were dominant over retailers when it came to red table wines .

A price surplus of HUF 84.5 per kilogram was achieved in the price for fungicides chosen as the production factor, which represented 4.1 percent of the price. This price surplus occurred in 56.7 percent of the five-year period, amounting to 60.6 percent of all price divergence. The fluctuation of fungicide prices was characterised by an acceptable level of price deviation stability and a restoration period of less than 20 months.

The relationship between the sales price of wine-grapes and the processors' price of white table wine is clearly expressed by the HUF 1.6 price shortage of the price of wine-grapes. That price shortage which composed 3.2 percent of the price of grapes, occurred in 56.7 percent of the studied months, representing 59 percent of total price deviations. Price deviation was stable (1.04), and prices were restored within 15 months. The same price relationship also created the price shortage of wine-grapes in the processors' price of red table wines. Here, price shortage amounted to HUF 1.2, which entailed 2.6 percent of the price of grapes. The ratio of price shortage months was 56.7 percent, while the price shortage ratio and the price deviation stability were respectively 57.1 percent and 1.01. On average, prices were restored in 15.6 months.

For white table wines there was a price shortage of HUF 3.7 in the processors' sales price, which totalled 3.7 percent of the price. In 91.7 percent of the period under review price shortage was observed. The ratio of price shortage within all price deviations was 99.2 percent. Price deviation was considered stable (1.08). Full price restoration would have required 538 months. However, a price surplus of HUF 0.6 materialized for the price of red table wines. That price surplus which came to 0.6 percent of the price happened in 60 percent of the pertinent five-year time frame. The proportion of values over the benchmark equilibrium price was 69 percent. Price deviation was somewhat unstable. Moreover, frequent modest price fluctuations could easily overturn existing market dominance positions.

What is most noteworthy about the results of the product-level price transmission tests are the **great product-to-product differences in industry-level market dominance**. For some products neither party is in a dominant position. For example, let us take the finished product processor level in the pork product chains. There market dominance was apparent for pork chops, leg of pork, 'olasz' salami and processed ham, but no dominance was apparent for bologna and 'Gyulai' sausage. When one views all products, one presumes that retail trade is in a dominant position and calculates a tactical price shortage on certain products, which it subsequently compensates for with other prices, which are not necessarily food products.

Another observation that could alter the stereotypical view regarding market dominance is that **some of the actual dominant market positions are unstable, meaning they could easily tip in favour of the vertical partner level**. This phenomenon could be observed for market dominance where price deviations were just slightly over 50 percent in either direction. This also applies to market dominance between the processor and retailer levels of the food product chains, which currently tip in favour of the retail trade. In the product chains the same phenomenon was observed regarding the advantage enjoyed by the 'Gyulai' sausage retailer level and regarding the advantage enjoyed by sunflower seed producers vis-à-vis the sellers of fertiliser active ingredients.

Weather related price fluctuations parallel with the relationship between prices and yields can also affect prices to the point of creating **shifts in market dominance**. Following the drought of 2003 there was a prolonged rise in wheat prices. Although this price rise was unable to convert the price pressure of fertiliser active ingredients into market dominance, it was sufficient to generate a ripple effect in the price of flour, which has brought about the dominance of mills over the baking industry.

The results of price transmission tests have confirmed that **the emergence of stable market dominance is not specific to either product chains or vertical levels**. In the various product chains, the dominance of retail trade may range between 59 and 99 percent. The average 51.7 percent price surplus at the retail level in the aggregated food product chain is especially remarkable.

The test results provide insight into how this kind of vertical integration keeps producers' interests at heart. The Alföldtej operation's first results are already apparent. Rather than increasing buying-up prices, **assertion of producers' interests** has initially resulted in the **normalisation and stabilisation of market relations and contract terms and** conditions, all of which will be further discussed below. At a later phase in this economic power struggle price achievements are expected to appear.

The test results have also shed light on the cointegration price restoration process. Other than for 10 out of the 58 vertical market relations, it was determined that **there was no genuine potential for full price restoration during the observed (five-year) time frame.**

Our test method was based on the cointegrative simultaneous movement of prices. It permits short-term divergence of prices within certain boundaries, provided that the distance between the cointegrated prices (benchmark equilibrium series) is restored according to a specific (in our case, definable) restoration coefficient. The price transmission calculations treat restoration as a mathematical possibility, without considering its actual probability. That is why the results show that the restoration cycle can exceed the length of the period under review.. The person adopting the procedure is supposed to consider price restoration's actual reality.. Otherwise stated, if the price restoration cycle exceeds the reviewed time period, it indicates lack of restoration and cointegration. If the restoration period is shown to be within the period yet remains incomplete, failing to reach an equilibrium, it indicates a non-perceptible value leakage. (Figure 7). **The dominant market operator can decelerate his own prices' beneficial change so that the next price change cycle starts before the previous one has ended.** Just like a good volleyball team whose well-timed shots stop the ball from hitting the floor.

Figure 7

A leakage of value reflected in terms of price relations' imperfect restoration
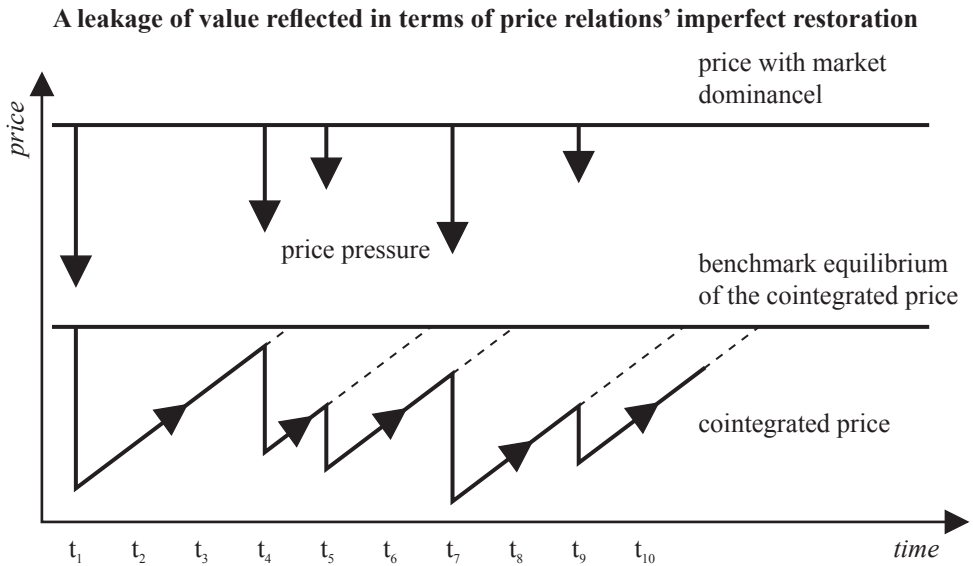
With agricultural pricing, imperfect price restoration may explain a decades-long gradual divergence of a product's market price from the Walrasian equilibrium price, meaning its presumed but indefinable inherent notional value. A hypothetical perfect market's equilibrium prices had been shaped by the existing oligopolistic/oligopsonic price diverting mechanisms. This was done so the equilibrium prices of the oligopolistic/oligopsonic market were accepted by the market operators instead of the market prices in proportion with notional values. These imply the possibility of value leakage, which occurs without being perceived by the (in our case, agricultural) market operators with opposing interests since, over the long run, they tend to lose sight of the benchmark equilibrium price, which in the market helps them find their way. Instead their price calculations will be based on previous prices and the prices from familiar local markets. Market power equilibrium stemming from supply and demand is supposed to ensure the full restoration of prices. Agricultural producers prefer visible yet unpredictable deterioration of price values over its alternative, meaning concentration which threatens their livelihood. Instead, they tend to compensate for this long-term value leakage which undermines their income with other activities or from grants.

In the prices accepted (their own benchmark equilibrium price), price-follower market operators will also absorb price-setting value leakage, thus sacrificing further parts of their income and grants. As a result, the original value (notional price, perfect market price) is no longer traceable and will cease to operate as a benchmark equilibrium price.

4. Discussion

As mentioned in the introduction, price transmission studies have been published in Hungary for the pork product chain (Bakucs L.Z., 2005) and the dairy product chain (Popovics P.A. - Tóth J., 2006). Based on von Cramon-Taubadel's method, these studies examined asymmetry in the rate and the extent of price increases and decreases (VECM) in order to establish the existence of market dominance with one of the opposing market operators. Our research method does the same, drawing on indicator values which are based on the price surpluses' degrees and shortages compared to the cointegration equation as the benchmark equilibrium price. Our research differs from the above tests which employed the Granger causality test to determine the market's dominant side. Instead we used the actual price surplus compared to the average cointegration equation's price to locate market dominance.

The meat product chains study first analyses a ten-year time series, then contends that a structural break occurred. After the meat product chain study divides it into two sections, each of which is then analysed separately. We examined a five-year period with the assumption there were no breaks in the economic policy. While the meat product chains study was based on two aggregated pork prices, our calculations were based on six trade product prices along the same product chains. Despite the above differences in concept and time horizon, both the von Cramon-Taubadel method and the method adopted by us revealed cointegration between the prices of pork product chains. Our study covered more commercial products and managed to display more details concerning market dominance.

The paper analysing dairy price product chains price transmission is based on monthly price data over an eight-year period, which breaks down into two separate periods. It uses the Akaike and the Schwarz information criteria for determining the optimum number of lags. Thus no lag is taken into consideration for the unit root test, whereas two lags are applied for the Autoregressive Distributed Lag model. The latter is employed because no cointegration was found by the unit root test. For logical reasons out of sixteen lags we selected the optimum number of lags. No statistical tests were applied. In light of our previously mentioned results, the ADL model and our cointegration equations yielded similar results for market dominance directions. This was despite the above-mentioned differences in approach.

Annex 1

Result indicators for the price transmission calculation within food product chains

product	number of lags	price deviation (HUF)	average price deviation (HUF)	price change ratio (%)	frequency of price deviation (%)	price deviation ratio (%)	price deviation stability (without dimensions)	restoration period (months)
aggregated foods Pc_Rt	14	-1,129.8	-18.8	0.0	-53.3	-51.7	0.97	5.2
aggregated foods Pd_Pc	12	-60,032.2	-1,000.5	-2.2	-65.0	-62.6	0.96	46.3
aggregated foods Ex_Pd	3	32,805.7	546.8	0.6	58.3	56.0	0.96	-80.4
cottage loaf P2_Rt	2	-304.9	-5.1	-4.1	-91.7	-99.3	1.08	-2,345.8
cottage loaf P1_P2	5	62.6	1.0	2.8	43.3	60.6	1.40	895.9
cottage loaf Pd_P1	15	-94.6	-1.6	-6.3	-73.3	-74.4	1.02	20.4
cottage loaf Ex_Pd	14	2,394.3	39.9	45.2	88.3	97.4	1.10	-62.7
semi-white bread P2_Rt	4	-27.6	-0.5	-0.4	-66.7	-63.5	0.95	-44.9
semi-white bread P1_P2	5	62.6	1.0	2.8	43.3	60.6	1.40	895.9
semi-white bread Pd_P1	15	-94.6	-1.6	-6.3	-73.3	-74.4	1.02	20.4
semi-white bread Ex_Pd	14	2,394.3	39.9	45.2	88.3	97.4	1.10	-62.7
white bread P2_Rt	15	-40.8	-0.7	-0.6	-65.0	-68.8	1.06	0.0
white bread P1_P2	5	62.6	1.0	2.8	43.3	60.6	1.40	895.9
white bread Pd_P1	10	-97.9	-1.6	-6.5	-73.3	-75.1	1.02	45.3
white bread Ex_Pd	14	2,394.3	39.9	45.2	88.3	97.4	1.10	-62.7
sirloin Pd_Pc	6	-1,814.7	-30.2	-13.0	-91.7	-96.7	1.05	4,054.6
sirloin Ex_Pd	7	-785.9	-13.1	-22.4	-95.0	-99.5	1.05	-4,836.8
pork chops Pc_Rt	14	-1,474.4	-24.6	-5.5	-76.7	-91.6	1.19	93.3
pork chops Pd_Pc	1	252.4	4.2	1.8	41.7	58.6	1.41	91.3
pork chops Ex_Pd	10	-369.5	-6.2	-14.2	-76.7	-88.4	1.15	-5,123.3

product	number of lags	price deviation (HUF)	average price deviation (HUF)	price change ratio (%)	frequency of price deviation (%)	price deviation ratio (%)	price deviation stability (without dimensions)	restoration period (months)
leg of pork Pc_Rt	14	-1,955.1	-32.6	-7.2	-80.0	-94.6	1.18	99.5
leg of pork Pd_Pc	1	252.4	4.2	1.8	41.7	58.6	1.41	91.3
leg of pork Ex_Pd	10	-369.5	-6.2	-14.2	-76.7	-88.4	1.15	-5,123.3
bologna Pc_Rt	2	796.9	13.3	3.8	75.0	90.9	1.21	2,719.9
bologna Pd_Pc	1	209.8	3.5	1.5	36.7	56.6	1.54	75.7
bologna Ex_Pd	10	-369.5	-6.2	-14.2	-76.7	-88.4	1.15	-5,123.3
'olasz' Pc_Rt	8	-433.9	-7.2	-2.0	-80.0	-86.6	1.08	4,086.7
'olasz' Pd_Pc	1	209.8	3.5	1.5	36.7	56.6	1.54	75.7
'olasz' Ex_Pd	10	-369.5	-6.2	-14.2	-76.7	-88.4	1.15	-5,123.3
processed ham Pc_Rt	13	-2,415.8	-40.3	-9.6	-90.0	-99.7	1.11	-4,913.9
processed ham Pd_Pc	1	209.8	3.5	1.5	36.7	56.6	1.54	75.7
processed ham Ex_Pd	10	-369.5	-6.2	-14.2	-76.7	-88.4	1.15	-5,123.3
'Gyulai' Pc_Rt	8	56.4	0.9	0.1	50.0	51.3	1.03	49.5
'Gyulai' Pd_Pc	1	209.8	3.5	1.5	36.7	56.6	1.54	3,318.1
'Gyulai' Ex_Pd	10	-369.5	-6.2	-14.2	-76.7	-88.4	1.15	-5,123.3
broiler chicken Pc_Rt	5	-333.4	-5.6	-2.0	-70.0	-81.9	1.17	3,908.9
broiler chicken Pd_Pc	12	-1,256.0	-20.9	-11.9	-91.7	-98.6	1.08	-3,181.6
broiler chicken Ex_Pd	1	-282.2	-4.7	-8.4	-91.7	-98.9	1.08	-2,728.8
liquid milk Pc_Rt *	2	-43.0	-0.7	-0.8	-55.0	-68.1	1.24	3,369.5
liquid milk Pd_Pc	1	284.9	4.7	8.7	68.3	87.5	1.28	2,365.4
liquid milk Ex_Pd	8	207.5	3.5	7.4	70.0	72.9	1.04	90.2
'Trappista' cheese Pc_Rt	1	-421.7	-7.0	-0.9	-48.3	-63.0	1.30	15.6

product	number of lags	price deviation (HUF)	average price deviation (HUF)	price change ratio (%)	frequency of price deviation (%)	price deviation ratio (%)	price deviation stability (without dimensions)	restoration period (months)
'Trappista' cheese Pc_Pd	7	1,420.8	23.7	3.1	75.0	76.4	1.02	-16.5
'Trappista' cheese Ex_Pd	8	207.5	3.5	7.4	70.0	72.9	1.04	90.2
granulated sugar Pc_Rt	1	-33.1	-0.6	-0.4	-50.0	-59.5	1.19	43.8
granulated sugar Pd_Pc	8	-18.4	-0.3	-4.1	-58.3	-64.4	1.10	2,771.1
granulated sugar Ex_Pd	15	1,050.8	17.5	15.8	75.0	89.5	1.19	0.0
cooking oil Pc_Rt	15	-270.0	-4.5	-2.3	-80.0	-79.2	0.99	96.5
cooking oil Pd_Pc	15	-266.8	-4.4	-8.3	-90.0	-94.8	1.05	39.1
cooking oil Ex_Pd	2	-25.6	-0.4	-0.3	-48.3	-51.3	1.06	179.8
margarine Pd_Pc	15	-266.8	-4.4	-8.3	-90.0	-94.8	1.05	39.1
margarine Ex_Pd	2	-25.6	-0.4	-0.3	-48.3	-51.3	1.06	179.8
white table wine Pc_Rt	15	-223.1	-3.7	-3.7	-91.7	-99.2	1.08	537.8
white table wine Pd_Pc	6	-94.3	-1.6	-3.2	-56.7	-59.0	1.04	14.9
white table wine Ex_Pd	5	5,070.8	84.5	4.1	56.7	60.6	1.07	-19.9
red table wine Pc_Rt	4	33.7	0.6	0.6	60.0	69.0	1.15	-4,499.9
red table wine Pd_Pc	6	-74.1	-1.2	-2.6	-56.7	-57.1	1.01	15.6
red table wine Ex_Pd	5	5,070.8	84.5	4.1	56.7	60.6	1.07	-19.9

* Rt: retail trade
Ps: processing industry
P1: milling industry
P2: baking industry
Pd: production
Ex: production factor

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Product development in the European and overseas food industry

Sándor Balogh[1]

Abstract

In the present study various product development trends in the food industry are reviewed with the main focus on convenience, organic and functional foods. Also highlighted are differences between the U.S. and Europe in terms of consumer habits and food supply trends. Through exploring the reasons behind differences in the extent of product innovation, the author illustrates the different role convenience products have in the US and European markets. Also revealed is the relationship linking convenience products, gluttony, and obesity. In the USA a third generation of convenience products has already appeared with the dual aim of delivering convenience and health. Although in Europe consumption "philosophy" accepts the importance of convenience, greater emphasis is placed on natural origin, freshness and traditional recipes.

Key words

Food industry, product innovation, convenience products, organic foods, functional foods

Introduction

The present author has previously examined food industry innovation trends and the subsequent results of the innovation process. This paper will present the latest results of this research. The research partly endeavoured to explore new sources of information, and the current paper is mainly based on these new sources.

Most of the new information comes from the Internet. The author's work was greatly facilitated by the establishment of an accessible global product development data bank for the food industry. In this system the wealth of information available can be considered *electronic innovation transfers*, meaning sources for company product development which don't mesh with the Guternberg galaxy's traditional, paper-based products.[2]

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[2]   In Europe ProductscanOnline, operated by Datamonitor, is the institution which transmits the greatest amount of product development information in the fastest time. From its homepage, information can be obtained about tens of thousands of food industry products spanning 41 product groups,. It is available both in English and in German. In the United States Mintel focuses mainly on food service innovations, which may have applications in manufacturing. There are other sources for Innovation information, such as e.g. Eureka! Ranch®, the magazine of professional inventors, or the Merwyn Technology service of the same organization. There are also other industrial publications like Welcome 2 Innovation put out by The National Starch Food Innovation. Internationally, Stagnito Communications Inc. is the major market player when it comes to innovation information. This particular field has experienced a high degree of concentration since May 2000 when Stagnito began a cooperation agreement with Marketing Intelligence Service and Medical World Communications Company, which unified their network information systems, creating an up-to-date, extensive data bank. This system also includes data from Industria Alimenticia, a South American communications source for product innovation. Since Stagnito started in 1980, approximately 190,000 new food industry products have been registered and evaluated. Earlier ProductscanOnline also began formal cooperation with Stagnito, resulting in the Japanscan Food Industry Bulletin information system, which was also associated with Productscan. Japanscan Food Industry Bulletin is a monthly journal, and in each issue 350-400 new foods are presented. Each issue contains a minimum of fifty pages of colour graphics. The bulletin also publishes food industry news, market reports, and company profiles. The author of this paper considers Stagnito Communications Inc.'s most important publication to be a monthly journal entitled Stagnito's New Product Magazine. It can be downloaded from the company's website's archives. As an example of its scope, in its June 2006 issue 1,825 new foods were presented.

The main thrust of research methodology was qualifying and evaluating known innovation scales. In the second part of the 20th century the constantly increasing introduction of new products made it necessary to define, with the help of a certain scale, the differences manifested in novelty value. Basic theoretical literature offers a wide range of innovation scales, and novelty degree classifications, on the basis of which the studied products' or product groups' novelty value can be qualified.

Buzzel and Nourse (1967) , who were among the first to publish such categorizations, set up a three-degree scale.[3] Their system was simple, understandable and easily applicable to the food industry. Booz, Allen and Hamilton's system (1980) had 6 degrees and this system was also adopted by Kotler (1980).[4, 5]

In recent decades the novelty value and novelty degree of new foods have been defined in diverse and contradictory ways. The application of these definitions has led to greatly different and occasionally contradictory conclusions as to the number of product innovations, depending on whether the restrictive or extensive approach of product innovation was used.

During our practical observations of food industry product development, it was important whether a statistically documented figure was obtained from restrictive or extensive approaches in product innovation. In Europe one generally uses restrictive interpretation while in the United States one uses the extensive approach. This can even result in differences in order of magnitude, reflecting an alternative methodology rather than a differing pace of product development. Theoretically these methodological differences can be justified, but one knows of no attempts to do so.

Referring to Nielsen Early Intelligence System figures, Connor (1988) reports that in the 1970s 5,000-7,000 new products annually appeared on the food market. He also refers to Dancer-Fitzgerald-Sample agency data, which state that every year between 1964-1972 about 500-600 new products appeared. Furthermore Connor states that this figure was obtained on the basis of the strictest new product definition he knew.

Restrictive and extensive interpretations respectively represent manufacturers' and consumers' value judgements. According to the OECD (1979) "new products are goods pro-

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[3] Buzzel and Nourse classified foods according to their novelty value as follows:
   a) Expressly new products, which basically differ from current market products in form, production technology, composition, and possible uses;
   b) Products widening the choice or new brands which add to the available choice in terms of packaging size, flavouring or form;
   c) Product improvement or introduction of new elements, meaning modification of existing products in terms of appearance, flavour, composition or packaging.

[4] Booz, Allen & Hamilton placed new products into 6 categories:
   a) Products new worldwide, creating a brand new market.
   b) New product families, meaning new products entering the established market for the first time.
   c) Supplementing existing product families. These are new products supplementing a product family which has been already introduced.
   d) Perfecting and modifying existing products. These are products replacing existing products, compared to which they are superior both in performance and in attributed value.
   e) Repositioned products. These are existing products targeted at new markets or market segments.
   f) Reduced-cost products: new products offering the same function only cheaper.

[5] Without examining sectoral or product specificities, Kotler nonetheless observed the food market over five years and made several observations. In accordance with the above categorizations, he found the following proportions regarding novelty degrees: Products new worldwide: 10%; New product families: 20%; Supplementing existing product families: 26%; Perfecting and changing existing products: 26%; Repositioned products: 7%; Reduced-cost products: 11%.

duced with new technology". Clearly this is the manufacturers' approach, whereas Wasson (1960), for example, indicated that consumers will consider every recent utility value as new, irrespective of its technological novelty. Porter (1976), whom Galizzi and Venturini quoted in 1996, provides the key to the problem as he indicated a difference in innovation between convenience and non-convenience products. The innovation of convenience products usually does not entail substantially modifying the product and in the U.S. there are a lot of convenience products. If one accepts the US extensive interpretation of innovation, one sees why the number of new products is higher than in Europe, occasionally with orders of magnitude. The extensive notion is theoretically outlined by McCorkle (1988), who analysed product development in the US food industry. He felt that new packaging, new manufacturer's guarantees, new design, new material composition, new taste or any other new "consumer benefit" represented product development. Food safety, associated with natural foods, is also considered a consumer benefit. However, McCorkle ephasises the decisive role of so-called pioneering brands, which provide a certain quality standard for the manufacturers.

Paradoxically, the present system of classification used in US product development practice is closer to the approach taken by Joseph Schumpeter (1949), the European Father of innovation theory. In his book entitled "The Theory of Economic Development", the concepts of "production" and "innovation" are defined as follows: "Production means the combination of existing things and forces... To produce something different or the same thing in a different manner means the combination of these forces in a different way." These new combinations are innovations, five basic cases of which were indicated by Schumpeter.[6] Noteworthy is the similiarity between the novelty value definition for FMCG products, published regularly by the Marketing Intelligence Service (MIS), and Schumpeter's definition for the innovation criteria as such.[7]

Environment of innovations: pulling and pushing effects

The traditional industrial processing of raw materials entails several well-known consumer benefits:

- the shelf-life of foods improves;
- the time period which food is fit for consumption becomes more uniform;
- due to industrial processing and packaging technology, they are easily transportable and are available over a greater geographical area;
- Potential production of new types and combinations;
- increased processing gives added value;
- in terms of convenience, packaging facilitates preparation and consumption as well.

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[6] Schumpeter classifies innovation in the following manner:
  a) A previously unknown Generation of new products or a generation of improved products.
  b) Introduction of new production processes in the given industry, which are not necessarily based on a new scientific discovery and which may also be a novel commercial procedure associated with a certain product.
  c) New market potential, meaning creation of a national market in a country where the newly created market may have previously existed elsewhere.
  d) Creating new supply markets for raw materials or semi-finished goods, regardless whether this supply source previously existed. In some cases the supply source may have been disregarded or considered inappropriate, or perhaps it is a newly established source.
  e) Establishing a new organization. For example, creating a monopoly position by making or terminating a trust.
[7] Marketing Intelligence Service Ltd. Of Naples, New York operates a system called Innovation Ratings to analyze FMCG (Fast Moving Consumer Goods) novelties.

Internationally, the joint WHO and FAO nutrition policy is regarded to be the main governing principle for New Product Development (NPD). Defined in the early 1980s, it held governments responsible for supplying adequate, healthy and safe food. It is also stated that this responsibility would be backed by statutory guarantees (Balogh, 1993).

It is clear from this definition that the three aims of nutrition policy are fulfilled by consumers, manufacturers and traders or by the government in power which also has certain responsibilities in the matter. Governments have to provide strategic direction, establish norms for food industry players, and provide the statutory framework for minimal conditions (for instance safety of nutrition). Manufacturers and traders may (or may not) choose to contribute to this strategy (for example in the case of healthy nutrition), but ultimately the consumers' lifestyle choices determine what is adequate and desirable food consumption. Obviously such lifestyle choices are subject to influence.

Innovation – and thus market reaction toward new products – results from the effect of two "forces". One is "demand pull", meaning the consumers' demand for new products, and the other is "technology push", meaning the pressure from manufacturers and traders on consumers. However, this does not simply entail factors influencing an individual's food consumption, which food economics have already adequately explored. For example, through investigating consumer reaction toward innovative products new information could surface. However, this particular field of theoretical research has not been adequately explored.

It can be stated that although consumers influence the demand pull effect in different ways and with varying degrees of intensity, the impact of technology push can be considered universal. When it comes to food, current theories do not adequately explain demand pull's influence when it comes to consumer needs. Obviously, enhanced consumer purchasing power bolsters the potential influence of demand pull. However, it is easy to see that effective demand's various levels can both curb or stimulate technology push's effect.

It was Traill (1997) who described demand pull's effect as being a consumer driven force that brings about innovation. Trail's explanation includes the following:

- economic factors (already described above);
- personal consumer considerations (for example the demand for healthy food), which have been, in the food industry, a major force behind new product development;
- demographic factors (which are going to be discussed in more detail below);
- the relegation of local factors into the background; and
- a gradual uniformization of consumer habits.

Although these factors' effect mechanism is manifested in a complex manner, the last three should be considered in detail. Demographic factors are above all are responsible for the spread of convenience foods. During the last century, the mass employment of women was the first factor to cause a consumer demand for food which could be prepared easily at home. This, in turn, led to a trend toward snacking as compared to family meals. Later a large number of snack foods appeared, mainly popular among the younger generation. Emphasis shifted from health to convenience. This entailed a lifestyle choice where convenience was no longer linked to preparing food but to easy consumption in any situation.

A century ago supply was still determined by local factors. First of all locally produced goods were the mainstay of supply, but this changed when transport technology and increased trade put an end to this limitation. This meant the beginning of the slow but unstoppable process toward uniformization of consumer habits. Traill (1997) observed this process using data obtained from the mathematical food consumption analysis in 29 European countries, which indicated that geographical differences were decreasing. This prompted him to ask if we were witnessing the emergence of a "European diet".

However, gradual uniformization in consumer habits is accompanied by a mostly European trend, which can described as *consumer patriotism.* Here consumers demand food from their birthplace or place of residence, goods which reflect local taste and which are locally produced. However, this trend is hard to quantify.

Obviously, the effect of supply side technology push can reach the consumers only through three kinds of *filters*. The first is the economic filter, the second the consumers' social and cultural determination filter, while the third represents the consumers' subjective value hierarchy. (For example, whether consumers consider time or health as most significant, or to what extent they accept the preparation of food to be a creative, value-enhancing activity.)

In developed countries the food industry offers a rich and increasing variety of products. A typical figure, for example, is that approximately 15 thousand new foods and drinks enter the US market every year (Table 1).

Table 1

Number and distribution of product innovations on the US market*
(FMCG products)

Year	New products, total	Foods	Drinks	Toiletries**	Household goods	Mixed***	Animal food
1992	15,886	8,159	1,611	4,625	786	254	451
1993	17,363	8,077	2,243	5,327	790	462	464
1994	21,986	10,854	2,597	7,161	704	293	377
1995	20,808	10,816	2,581	5,861	829	406	315
1996	24,496	11,072	3,524	8,204	785	467	444
1997	25,261	10,416	3,424	9,371	1,177	291	582
1998	25,181	10,838	2,985	9,556	1,002	361	439
1999	25,928	11,628	3,069	9,519	872	296	546
2000	31,432	13,373	3,541	11,747	1,695	349	727
2001	32,025	13,200	3,777	11,597	2,088	569	794
2002	31,785	13,452	3,584	10,979	2,091	814	865
2003	33,678	14,812	3,984	11,139	1,546	739	1,458

* together with figures from Canada;
** health care goods and cosmetics;
*** tobacco goods, car care goods, photo goods, etc
Source: Productscan Online (2006)

On the larger European market, the number of new food industry products is in fact about one-third lower than in the United States.[8, 9] However, as previously pointed out, this difference is not realistic. The difference can be explained by two factors:

1. The US figures are almost full-scale, while the European data are obtained with occasional and representative data collection;
2. In the USA[10], following Schumpeter's original definition, the „new product" concept encompasses a larger range of product innovations, whereas in Europe a more restrictive interpretation for new products is adopted.[11]

Principal product development trends in the food industry, consumer benefits and risks

If we disregard the fact that the novelty value of new products marketed by manufacturers varies considerably, the wealth of new products may be misleading In the early 20th century, after extensive R & D input, came the first generation of convenience products which represented original (worldwide) novelty and facilitated home preparation of food. As for the second generation of convenience food, the innovation process is accomplished with significantly less R & D input than before. Above all it combines portability and innovative packaging.

Internationally, it is well established that, compared to other processing industries, the potential for food industry innovation remains limited. Following Christensen and Kristensen's lead (1994), Traill (1997) examined the extent of processing industries' innovativeness using the following criteria:

- the proportion of product-innovative companies,
- the proportion of new products to turnover value and
- the extent of R & D intensity

After completing his examination, Traill concluded that the food industry was dead last.

Traill's evaluation matches OECD findings (Eurostat, 1998). The food industry spends the least on research and development, and it has the lowest R & D rate among all industries. When R & D is calculated proportionately and in terms of added value, in five European countries an average of 1.9 % is spent and in Japan 2.0%, but proportionately the electroncis industry spends 10 times as much and the pharmaceutical industry 15-20 times as much.

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[8] New product information is in the archives on the homepage of just-food.com, which claims to provide "authoritative and timely global business information" about the European food industry. On a monthly average 20-25 new products can be retrieved from previous issues, usually from information about food industry companies which were published for some other purpose. According to this source, 3,945 new products were launched annually by European manufacturers.

[9] Other information sources on European product innovations seem of lesser importance. As an example, Paris-based SIAA's homepage indicated which 510 products were awarded prizes at a 2004 industry fair. Products hailed from 40 countries and in all 1850 products were in competition. Unfortunately, SIAA (Société d' Industries Agro-Alimentaire) also publishes figures of dubious value, gleaned from other information sources.

[10] Marketing Intelligence Service Limited of Naples, New York operates a system called Ratings that decides whether products are new depending on whether they represent a breakthrough or an improvement following 6 criteria: composition; positioning; packaging; technology; creating a new market; merchandising.

[11] Such a simple approach is equally evident in the EU's innovation statistics. The EU's analysis specifies three categories for issued products. These categories stem from an analysis of 15 food industry products, classifying them as unchanged, modified or novel products. Unfortunately, the EU's classification methodology is perhaps too simple as "novel" products" are considered an integral whole. On the other hand, US product development policy shows how diverse and also how relative food industry products' novelty may be.

This low rate of innovativeness partially explains the scarcity of novelties at the top of the scale (basic new research-intensive products appearing worldwide) while the introduction of convenience products requiring "only" development has become the general trend in product innovation. However, this situation may stop due to the production of functional products.

However, let us continue analyzing the present situation. High income levels, a low proportion of consumer food expenditures, and easy access to such processed foods have the following consequences:

1. consumers accept food industry convenience products,
2. thus food preparation occurs mainly outside the household,
3. therefore, during the food preparation phase, there is almost a complete absence of control over nutrition destined for household members.
4. The general population (albeit mainly young people) become gluttonous consumers of convenience products,
5. In developed countries the sedentary lifestyle – coupled with gluttonous consumption of convenience food – results in endemic obesity.

One can see from Knutson, Penn, and Boehm's (1983) figures that growth in obesity coincides with the spread of convenience products. According to their data, during the years 1960-1980 each US citizen consumed an annual food surplus of 1,408 pounds, and thus the average daily nutrient intake per person increased from 3,150 Kcal to 3,520 Kcal.

In both Europe and the United States[12] the growth of obesity is a common social problem. As we will see, society's "response" to this problem differs greatly in Western Europe and in the USA, as does consumers', traders' and industry's reaction. Comparing European and overseas data immediately reveals that the proportion of overweight and obese consumers is much higher in the United States than in the European countries. It is true, however, that the trend shows that European countries are beginning to "catch up with" the US when it comes to obesity (Table 2).

Table 2

Growth of the proportion of obese and overweight population in seven countries in one decade

Name of the country	Proportion of obese and overweight people		Change between 1993 and 2003, %
	in 1993	in 2003	
Japan	2.4	3.2	33.3
France	6.6	9.4	42.4
Italy	7.0	8.5	21.4
Spain	8.8	13.1	48.9
Germany	no data	12.9	no data
United Kingdom	15.0	23.0	53.3
USA	23.3	30.6	31.3

Source: Business Insight, (2006/b)

[12] Obesity can be quantified using the body mass index (BMI). It uses a relative number placing the body weight (in kg) in the numerator and the body height (in m) in the denominator. The resulting quotient is the body weight index. Thinness is when the value is under 20, normal weight between 20.1-24.9, fat between 25.0-29.9 and obesity over the value of 30. The BMI evaluation does not distinguish between adult men and women. In Hungary 48.2% of adult women and 57.5% of adult men are overweight or obese. (HVG, 14th October, 2006; p. 135)

Paradoxically, the rate of the US population on a diet essentially exceeds that in the European countries (Table 3). However, this is largely due to the uncontrolled consumption of convenience foods.

Table 3

**Proportion of adult population on diet and not on
diet in the USA and in Europe in 2004**

Region	On diet, %	Not on diet, %
USA	44	56
Europe	29	71

Source: Business Insight (2006/b)

Both on the demand and on the supply sides there are several possible solutions to obesity as an endemic social disease. These solutions may also reveal typical differences depending on whether they originate in Europe or the USA. For instance, the consumer may try the following:

1. to purchase organic products instead of buying food products processed from traditionally produced agricultural raw material;
2. choosing so-called functional foods for environmental or genetic reasons;
3. consuming dietary food with calibrated content and packaged products containing a smaller amount of food reflecting the consumer's desire to lose excess weight ;
4. however, like most US and European consumers, the consumer may decide to simply accept the choice offered by the food industry.

Consumer decisions

Consumer behaviour may range from complete conformity (mere acceptance of the choice offered by the food industry) to complete refusal (a switch to organic products), and the following two types of behaviour fall between these extremes:
- lowering daily nutrient intake, omitting or reducing certain food components and a change to so-called "healthy" nutrition;
- on the other hand, opting for functional food endowed with beneficial supplements.

The previously listed consumer choices merit a short explanation.

In the US and European consumer markets *Organic (bio) products*[13] differ in terms of importance. For 2005 major differences were predicted, stating that such products would be in greater demand in the US than in Europe (Table 4). However, available data do not confirm this. The other principal prediction was that increased consumption of meat products and ready-to-eat foods would eclipse the consumption of fruit, vegetables, fruit juices, tea and coffee, of which the growth was expected to fall below average.

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[13] Hungarians and German speakers use the term "bio" whereas anglophones and EU official nomenclature use the term "organic". In Hungary there are other popular expressions to describe such products. However, these technical terms also apply to the production of food or fodder in an exceptionally clean environment.

Table 4

**Per capita consumption of organic products on major
national markets, 1995-2005 (forecast)**

unit of measurement: USD/capita/year

Year	F	D	NL	S	UK	EU average	US
1995	10.5	18.7	18.2	8.7	3.9	12.0	10.7
1996	11.6	22.0	17.8	10.9	5.3	13.5	13.4
1997	12.0	21.9	17.9	11.1	7.2	14.0	16.6
1998	13.9	25.6	20.8	11.1	9.3	16.1	20.0
1999	15.9	28.3	21.7	12.4	11.4	17.9	23.7
2000	16.7	30.1	22.3	13.1	13.0	19.0	28.2
2005	28.8	66.5	29.1	19.7	69.5	42.7	62.9

Source: Datamonitor (2001)

Functional foods. There are several definitions for functional foods. The Japanese were the first to use this term for foods endowed with more than run-of-the-mill content. In the US the term is used both for food and for certain ingredients it contains. According to the Japanese Health and Welfare Ministry's official definition, these are "…processed foods, containing ingredients, that aid specific bodily functions in addition to being nutrious." (Ichikawa, 1996).

Generally people know about the nutritional and sensory functions. However, the physiological aspect (the third aspect) is less known. It entails the neutralization of harmful substrates, control over the bodily and physical condition, enhancement of good health, and the prevention of diseases.

As published by Jónás (2006), functional foods have assumed a leading role in US food production. Riva (2002) predicted that the 2002 annual functional food revenue of about 2 billion dollars could rise, in annual market turnover, to 20 billion dollars in the US, 3.5 billion in Japan, and 2 billion in Europe. However, Business Insight (2006/d) reported that the combined US and European functional food turnover had reached USD 26.4 billion, this according to 2005 figures.

These figures confirm the AC Nielsen (2006) market research company's observation that some European consumers have never bought or even heard of such foods or drinks. However, a majority of Irish, Finns, Dutch and Swedish consumers regularly buy products made from whole grain or with high fibre content. In Europe, yoghurt enriched with probiotic or acidophilus cultures is the most popular in Poland, Ireland and Russia[14]. In Hungary research into functional foods and ingredients is also centre stage.[15]

[14] Information derived AC Nielsen was published on www.freeweb.huwelnesstipp and it was based on Below The Line magazine, which was Downloaded on 19th October, 2006

[15] In January 2005 Alltech Inc., a major international animal health company, held an international conference in Budapest. In 2006, following the conference, two prominent Hungarian institutions of higher education published their observations. During the conference, which was organized by the University of Kaposvár, there was one central message: today 59 per cent of the total world death rate is due to diseases brought on by economic/sociak problems. Moreover, 25-70 per cent of these diseases could be prevented through optimal food intake. In October, 2006 the Food Industry Faculty at the University of Szeged organized a conference with 11 lectures focused on reviewing research into individual functional foods and their components.

Functional foods have a major role in preventing cardiovascular diseases, high blood pressure, tumours, digestive system diseases, and osteopathies. Among the foods originating from plants, oats, soybean, linseed, tomato, garlic, broccoli, citrus fruits, cranberry, tea leaf, wine and grapes contain functional ingredients. Regarding foods of animal origin, fish and dairy products (especially fermented dairy products) contain certain useful ingredients.

Business Insight (2006/a) did a comparative product development anyalsis regarding EU, Japanese and US functional foods with the goal of detecting similarities. In the three markets antioxidants, calcium, glucosamine, omega-3 fatty acid and whey were studied. The increased use of functional ingredients was found to depend primarily on the producers. Business Insight considered as most innovative the use of the herb Cimicifuga racemosa, followed by the use of licopenes and ginkgo.

During the course of the study, Business Insight also pointed out the rigidity of the European regulatory system.

'Healthy' foods. One could say that "healthy nutrition" has a European character. In the late 1980s the European branch of FAO-WHO made nutritional recommendations focusing on a healthy nutritional structure and more specifically on methods to fight obesity (Balogh, 1993). One group of the recommendations dealt with the so-called "Mediterranean diet", of which the essential elements can also be identified on the basis of the above information. They are the following:
- to decrease total daily energy intake;
- to rebalance the intake, increasing the proportion of food from plants and lowering food from animals;
- to focus on the problem of fat, salt and sugar consumption and to promote plant oils over animal fat and to reduce salt and sugar consumption.

According to a Eurostat (2002) representative survey covering 11 EU Member States, approximately half of 15-year-old girls were on a diet, meaning they watched what they ate. However, only 16-22% of teenage boys did the same, but the boys were more willing to drink low-fat milk. Boys were also the main consumers of chocolate and, in Ireland, 80% of boys daily ate chocolate. Similarly, the majority of young people consumed soft drinks on a daily basis, with boys being the principal consumers. According to the same survey, in each Member State young people daily ate chips, various snacks or French fries, although the consumption rate varied. Regarding fruit consumption, the study's findings were surprisingly high: among Belgian young people 39% of boys and 53% of girls ate fruit daily, and this was the lowest proportion in the survey. Portugal was at the top end where 91% of boys and 95% of girls ate fruit on a daily basis.

A 1996 survey, designed to determine how consumers had changed their dietary habits in the previous six months, was carried out in the then Member States. The survey revealed how much movement there was toward healthy nutrition; According to these data:
- 18-37% of consumers decreased fat consumption (great differences were observed between Member States);
- 13-34% started to consume more fruit and vegetables;
- 15-32% consumed less sugar;
- 5-19% switched to buying whole grain flour;
- 7-22% decided to avoid additives;
- 6-35% consumed less salt and 5-15% drank less alcohol in the six months before the survey (Eurostat, 2002).

In Europe – and even more so overseas – there is a great variety of nutritional and lifestyle recipes to help people control their weight. Here we will not endeavour to evaluate them. Unfortunately, healthy food combined with a *wellness* lifestyle could merely turn into a temporary fad.

As for the US situation, the key to healthy nutrition is considered to be what the food industry supplies. (Business Insight, 2006/b) According to the 5 leading food industry companies, 58.1% felt reducing salt, fat and sugar content to be decisive in guiding consumers towards healthy nutrition. 43.8% considered clearly labelling nutritional value as important and 81% of the top company managers questioned held the view that in the following 5 years "indulging" consumers would continue. However, the essential difference was the belief that in the future the consumption of functional foods would increase significantly, and this fact is considered the key consumer "response" toward the issue of healthier nutrition. A slightly smaller importance is attributed toward consuming healthier foods as main meals and even less importance is given to eating fewer snacks.

Differences in the European and US "nutritional philosophies"

Both in Europe and the US the popularity of convenience products seems an indisputable fact. In Europe convenience products are mainly supplied by multinational food companies. (In Hungary, for instance, Maggi products are in fact owned by Nestlé; Knorr products by Unilever, and portable pasta soups by several South Asian companies.

Although in Europe the convenience food industry seems at a standstill, or perhaps even in decline, in the USA the second generation of convenience products (so-called superfoods) has been followed by the third generation, which **attempts to combine aspects of convenience, health and functionality**.

When it comes to food, in Europe naturalness and freshness may actually regain first place in the hierarchy of values. (Eurostat, 2002) In this context two prominent initiatives should be mentioned. One is an attitude-forming book titled "A book about pure flavours, traditions and the enjoyment of food". The book consists of 15 parts, and in the 69 chapters the European authors explore the following idea: "the worldwide spread of accelerating life can be resisted only by preserving the quiet enjoyment of things born out of Nature. The sheltering slow-down should start at the table with slow flood" (Riva, 2002).

The basis for the other European initiative is reflected in Council Regulations No. 2081/92/EEC and No. 2082/92/EEC and subsequently the French initiated the EUROTERROIRS (Regions of Europe) program . This initiative established that, following a uniform criteria system, each EU Member State should list its traditional and local agricultural products. Such a system means that despite increased European integration, Member States can preserve their agro/culinary treasures yet enhance their competitiveness by making them known in Europe.

As a result of the EUROTERROIRS program, the number of products in the European Inventory reached 4,000 in 1997. Within this, the French national collection numbered 890, the Portugese 330, the Spanish 532, the German 300 and the British 395 items. In 1998 Hungary joined this Community initiative and in 1999-2000 began its national collection. The Hungarian program was called "Traditions, Tastes, and Regions" (Hungarian abbreviation: HÍR)

and listed 300 products. Of the 300 products, 86 came from the Southern Great Plain, 58 from the Northern Great Plain, 46 from Central Hungary, and 130 of them were food industry products (Pallóné Kisérdi, I., 2003).

In the US the advent of "Better-for-you foods" symbolizes the fight against obesity, and constitutes a major consumer trend. However, there is a still stronger product development trend, meaning products you can eat "on the run". This latter product development trend entails easy portability, and ready to eat foods. For this reason it is not geared toward household consumption; there is no need to collect or process ingredients at home and there is no need for creative food preparation.

Hence the second generation of convenience products of which the central trait is portability, meaning immediate consumption at home, or on the go. In professional terminology these products are called "superfoods", "ultra-convenient food products", "hand-held products", "grab and goers", "grab and go offerings", "heat and serve", "heat and eat" (the latter ones in the food service sector). In the US market the turnover for these products is on the increase (Table 5).

Table 5

Turnover change of certain foods in the United States (2004/2005)*

Product group	Turnover, billion USD	Increase in value, %	Volume increase, %
Deep-frozen ready-to-eat food	3.4	2.3	3.2
- within this: deep-frozen dinner	no data	1.0	5.4
Deep-frozen sandwiches	1.0	2.4	1.1
- within this: deep-frozen breakfast	0.513	23.5	10.0
Deep-frozen meat lunch	0.673	2.0	0.9
Deep-frozen poultry	2.2	7.8	4.3
Deep-frozen fruits of the sea	1.6	3.0	3.0
Deep-frozen vegetables	no data	no data	3.3
Deep-frozen potato	0.2	4.1	4.3

Remark: Without Wal-Mart data; * 52-week figures calculated for the financial year closed on 17th April
Source: Based on the data of Chicago Information Resources Inc.: www.stagnito.com

Second-generation convenience foods in the USA. Let us now view some randomly chosen examples of the consumer benefits offered by these "ultra convenience" new products:

There is, for example, **Yoplait Go-Gurt Yogurt** by General Mills (Minneapolis). This "child-friendly" yoghurt comes in an easy to open (even with the teeth) recloseable tube which can be stored in the refrigerator or placed in lunch boxes (1998).

Kellog's Nutri-Grain Twists Cereal Bars (1998) come in two flavors, which are placed one under the other in the same tube. Kellog USA is based in Battle Creek, Minnesota.

Breakaway Foods of Columbus, Ohio came out with a macaroni/cheese/egg creation called **IncrEdibles Convenience Foods.** This dish was packaged in a microwaveable plastic container referred to as "Push'n Eat" which can in fact be opened with a push (1999).

General Mills created **Colombo Yogurt with Spoon-in-a Snap**. There are two disposable plastic spoons located on the bottom of the yoghurt lid (1999).

Create Crunch Cereal Mixing Kit offers in a single box 4 morning cereals and 4 other products, from which children can create their own crunchy breakfast at home. The recommendations state that the 8 packages can be combined in 100 different ways (The manufacturer is not named in the source.) (1999).

Campbell Soup of Camden, NJ launched **Sip Microwaveable Soup,** a microwaveable mixture of tomato, mixed vegetables, and chicken cream soup. It comes in a cup which can be placed in a car's drink holder and be sipped with a straw (2001).

P. J. Squares of Glen Ellyn, Illinois marketed a sandwich filling called **Peanut Butter & Jelly Slices**. It has peanut butter on one side and jelly on the other, and is the same size as American cheese slices. It can be placed into the sandwiches immediately after opening. The jelly comes in grapefruit and strawberry flavours (2001).

Weston Bakeries of Toronto, Canada came up with **Country Harvest the Better Half Bread.** It is white and brown two sliced bread that comes in one package and is designed satisfy various family needs. The bread bag opens at both ends, and has a resealable zipper on one end and a plastic clip on the other (2002).

Uncle Ben's of Vernon, California invented **Uncle Ben's Frozen Breakfast Bowls.** The product is a plastic bowl containing a complete frozen breakfast (bacon, eggs, and potatoes). It is easy to carry and can be consumed outside the household at weekends (2002).

The Kellogg Company of Battle Creek created **Kellogg Drink'n Crunch Portable Cereals** (2003)[16]. It is a cereal product that is easy to carry and the package contains two cups: one for the milk, and the other for the cereal. The consumer mixes the cereal and milk in his/her mouth so no spoon is needed.

Portion packaging. The concept that food with specified food quantities or calories can be efficient in the fight against obesity is gaining ground in US and more recently in European product development. This led to products containing a definite quantity of calories, and is used by Kraft Foods, General Mills and Frito-Lay.

According to Brian Wonsink, Professor at Stanford University, (Business Insight, 2006/e) 65% of overweight Americans became fat because they were not aware of how much they were eating. Experimentally he established that a person receives and reacts to approximately 200 impulses a day related to eating. Professor Wonsink's recommendation "never to eat directly from a bag or from a box" runs contrary to a strong product development trend in the US food industry.

Other trends of product development

Nutraceuticals. This term was created by combining the words "nutrition" and "pharmaceutical." A nutraceutical can be defined as any substance that may be considered a food, or part of a food that provides medical or health benefits. This includes prevention and treatment of disease (Bland and Medcalf, 1996). This innovation trend/product group's aims and

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[16] Productscan Online publishes an annual summary entitled "Build a Better Mousetrap." In the annual summary they evaluate and rank the most noteworthy food industry product innovations.

effects are similar to those of functional foods. Accordingly, the previously quoted authors contend that all functional foods correspond to this definition. However, nutraceuticals differ in that they are produced not by the food industry but mainly by pharmaceutical companies. This fact determines potential differences in composition and differing technological procedures. Genomics, transcriptomics, metabolomics and nanotechnology may also be used to create them, a fact underlined by Business Insight (2006/c). It is hoped that using nutraceuticals will further personal nutritional recommendations.

Third generation convenience products. On the US market the third generation of convenience products is beginning to become popular. These products combine convenience and health plus functional food ingredients (Business Insight, 2006/d.). However, just categorizing a product as "healthy convenient" causes doubts as to how healthy these innovative products really are. For example, included among them are confectionary industry products and desserts.

In Europe a crisis is predicted in convenience food (Datamonitor, 2006/a). This is because convenience has dropped to third place in terms of consumers' food priorities. It now stands at 12 per cent and comes behind tastiness (55%) and healthiness (33%). According to Business Insight (1966), "heart friendly" food is of critical importance for three consumer groups: pregnant and lactating women, sick people, and athletes

Also more emphasis is being placed on *satisfying the singles' market.* (Datamonitor, 2006/b). In Western Europe one-third of households are single-person entities, and, when calculated per person, they spend approximately 13% more than two-person households, and thus singles constitute a lucrative market. Unmarried people between 35 and 49 yearly spend almost 4,000 Euros on food, drink, and personal care items, and in 2007 the singles' market could reach Eur 900 billion. One of product innovation's goals is to accommodate this lifestyle by offering singles variety and appropriate package sizes. Consumers between 25 and 60 could also be enticed by higher quality products.

In the USA and Europe *Home workers* as food consumers also present an intriguing market segment (Datamonitor, 2006/c). Among countries there are great differences in the proportion of people working at home. In Sweden and the Netherlands, the proportion of home workers is 22-23%, and in the USA approximately 16%. This means that there are about 20 million US home workers and 7 million British. This market segment is large enough to merit special attention regarding its food, drink, and personal care preferences.

Innovations in the field of children's foods and drinks. Between 2001 and 2006 among 15 product groups cereals and bakery products had the slowest innovation rate (3.7 %), while the fastest rate (17.2%) was observed for sweetened and flavoured, spreadable foods (Business Insight, 2006/f). Confectionary industry functional products were the mainstay of this trend, and this was especially true when the product came with a toy. There was a marked difference in consumer habits between only children and children with siblings, and this fact will continue to impact on the food and beverage market for children.

Innovations in the drink market. Between 2002 and 2006 the top performer in terms of product development (225%) was ready to drink, hot beverages (Business Insight, 2006/g). Fizzy drinks are expected to maintain their dominant market share, but within the beverage group mineral water's proprotion is steadily increasing. The product portfolio of large drink manufacturers is undergoing a change. On the drink market, convenience, daily portion packaging, organic origin and functional character will also be key product characteristics.

Certainly fads also play a role in manufacturers' product development decisions. For example, fads can determine one's consumer choices. At present Asian products are fashionable (Business Insight, 2006/h). There could also be a fad for products associated with wellness, which are currently popular in Hungary. In the USA health and wellness products come under the same umbrella.

Conclusions

Thanks to the electronic, global information system for product development in the food industry, it was possible to review international trends in this field. This system ensures a wide-ranging collection, systematization and evaluation of information, thereby enabling the participants in the innovation chain to promptly react to economic phenomena.

From the information obtained from the system, the following conclusions were drawn regarding the current state of the product innovation process:

In Europe and the USA there are similarities and differences in food industry product development trends. In both markets there is expansion in the supply of convenience products. In Europe this is occurring more slowly and may even stagnant, while in the USA it is peaking. In Europe preserving traditional foods is considered to be an important Community task, but unfortunately it lacks support. The key word for present generation convenience products is portability, meaning the product can be consumed anywhere/anytime. The convenience food phenomenon may lead to gluttonous energy intake by consumers ignorant about healthy nutrition, thus causing mass obesity. In the US and European, the supply of functional foods is growing rapidly with the latter leading the way. For food industry companies the greatest scientific and business challenge on both sides of the Atlantic may be capturing the functional food market.

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Consumer behaviour in the Hungarian beer market

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Abstract

In the Hungarian food economy beer marketing remains something of an enigma. Based on a direct-question survey, focussing mainly on educated younger consumers, this article offers an overview of the most important characteristics of Hungarian beer consumption. It is important to stress that beer consumption is *situational*, meaning tied to specific consumption situations. Research results prove that logistic regression analysis is a suitable method for determining why consumers opt for specific beverages in specific consumption situations. To analyse targeted marketing, the application of heuristic methods, and decision trees provide a high degree of accuracy. This has proven true for consumers that drink non-alcoholic beers.

Keywords

direct-question survey, consumer study, logistic regression, decision tree approach

Introduction

Over the last few years there has been a boom in scientific publications that analyse wine consumer behaviour (e.g. Gaál & Párdányi, 2006, Lehota and Komáromi, 2004) but knowledge of the factors influencing beer consumption is much more limited. In Hungary, professional public opinion is much less preoccupied with the concept of beer marketing as compared to wine marketing. An excellent example of this is the much greater number of internet "hits" received for the Hungarian word "wine marketing" than for the term "beer marketing." On google.com wine marketing received 29,000 hits while beer marketing received only 2 (Search Data: 07.01.2007). A cynic might say that while "small-scale" wine makers enjoy speaking and writing about wine marketing, "large-scale" brewers actually do it. However, marketing must be based on sound scientific research. Otherwise, one runs the risk of wasting money on it. In developed market economies one observes almost equal acceptance of beer and wine marketing. Let us take, for example, the scientific database scholar.google.com. Using the key words "wine" and "consumer behaviour," 1,280 hits were received, and with "consumer behaviour" and "beer" 1,120 hits. On an international scale, it is hard to determine whether beer or wine marketing research is the most advanced.

In European culture, beer production has long held an important role, but beer has never enjoyed the respect that wine has. In the early years of the medieval period, viticulture and wine production were a central activity in some European royal courts (England, the Netherlands, Poland). But in the 15th and 16th centuries this was abandoned. Historically, beer production has been closely associated with urbanisation and industrialisation. Some sources state that in 17th century England per-capita beer consumption reached 100 litres (Unger, 2004).

In the 20th century beer production steadily rose and consumption was stable in traditional beer-drinking countries such as Australia, South-Africa, the US, and Germany

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(Leifman, 2001), and in traditional wine-drinking countries beer consumption shot up (Christianne et al., 1993). For example, between 1970 and 2005 French beer consumption increased by 20% (Hauteville, 2005)

The beer industry is fairly concentrated. Reller (2000) estimated that multinational firms dominate approximately 60% of the world beer market. At the beginning of the nineties Szabó (1991) observed a sharp drop in the number of small-scale beer producers. However, contrary to expectations, in the early 21st century there are still numerous independent, small and medium-scale breweries. These smaller breweries are especially numerous in European countries such as Germany, Switzerland, and Belgium. Between 2000 and 2005 the number of German breweries remained stable at 1,280. Of these 1,280, 670 were situated in Bavaria. (http://www.brauer-bund.de/index1.html).

According to Reller (2000), small and medium-scale beer breweries play an important role in regional development. A medium-scale German brewery with 100 employees creates 400 additional jobs in agriculture, logistics, trade and catering.

To increase their exports traditional beer-producing countries try to exploit European integration and globalisation. For example, between 1999 and 2005 German beer exports increased from 9.5 million hl to 14.5 million hl. It is an open-ended question whether European integration has brought about a single European beer market, or whether one should refer to a geographically varied market based on different member states. To answer this question, Nielsen et al. (2003) carried out a detailed econometric analysis, based on a time-series examination of beer retail prices in 15 different EU member states. The bivariate cointegration analysis tests demonstrated that the single price series were non-stationary and, with a few exceptions, it could be generally stated that the bivariate price pairs were also non-stationary. For the (few) situations where in fact the price pairs *did* cointegrate, the result appeared not to be viable to an increase in the information set and an inconsistent ordering would apply. Correlation analysis indicated relatively high partial correlations for real producer price comparisons. However, because the single price series were non-stationary the high correlation was likely to be inaccurate. From the empirical analysis we thus conclude that there was no evidence of market segments for groups of countries in the delineation of the relevant geographical market. Individual countries appeared to have domestic producer price trends that were not shared by other countries. Therefore, the relevant market for the individual countries was their own domestic market.

During recent years greater attention has been paid to the health-effects of beer consumption. A meta-analysis by Di Castelnuovo et al. (2002) showed a statistically significant inverse association between light/to moderate beer consumption and vascular risk, but this association was smaller than in case of red wine consumption.

In terms of practical and applied economic science, there are several reasons to analyse factors influencing beer consumption:

1. In their doemstic market Hungarian beer producers are facing new challenges. In Hungary beer drinking lacks tradition and during the 1950s per capita consumption did not reach 5l/capita. From the sixties to the early nineties consumption has monotonically increased. In 1990 the per capita consumption reached a peak of 105.1 litres/capita. During the last sixteen decades consumption has decreased monotonically; in 2005 consumption was barely 71 litres/capita (HCSO: Statisti-

cal yearbooks, 1950-2005). This total equalled only two thirds of the totals kept over the last fifteen years. Hungarian beers are increasingly less competitive. From 1993-2003 imported beers had a market share of 1.5-2.8%, but the post-Eu accession average for 2004 and 2005 increased to 15.5%. In the seventies Hungarian hop production was nearly one thousand ha but in the mid nineties it ceased to exist (www.fao.org).

2. In-depth interviews with Hungarian food industry marketing specialists indicate that the major beer companies have conducted an intense marketing campaign. Of course the major beer companies have ample capital to conduct such campaigns (Table 1) and, off the record, some experts estimate that the average promotion cost is approximately 0.6-0.1 €/l beer. It is an open question whether these efforts have a tangible effect on consumers or not. There is a wide range of research literature studying the effect of prices or income on beer consumption. Mészáros (1984) analysed the Hungarian data which proved income elasticity regarding beer consumption. The value of income elasticity was 0.894 (t = 20.3), and price elasticity -0.619 (t = 7.1). Based on data for the last two decades, our preliminary econometric analysis of aggregate beer consumption did not yield reliable results. Though it theoretically exists, we were unable to detect price or income elasticity of consumption, and the cross-price elasticity between beer and its substituents was also undetected. This fact can be explained partly by a relatively high level of data aggregation but we contend that the most important factor is that the socially imbedded determinant for beer consumption is hard to grasp using econometrics. It is thus an open question how much the respondents' socio-economic backgrounds impact on the situational nature of beer and beverage consumption.

Table 1

Main beer producing companies in Hungary

Companies	**Year of establishment**	**Owner**	**Revenue (Euro)**	**Beer Production**
Bordsodi Sörgyár ZRt. (Borsodi Beer Brewery Closed Ltd.)	1973	Interbrew-group		2.2×10^6 hl
Brau Union Hungária NyRt. (Brau Union Hungary Open Ltd.)	Sopron (1895) Martfű (1985)	Heinecken-group	147 million	1.5×10^6 hl (Sopron) 0.75×10^6 hl (Martfű)
Dréher Sörgyárak ZRt. (Dreher Beerbreweries, Closed Ltd.)	1854	SABMiller-group	162 million	2.8×10^6 hl
Pécsi Sörfőzde ZRt. (Pécs Beer Brewery Closed Ltd.)	1848	Ottakringer-group		0.89×10^6 hl

Source: Association of Hungarian beer producers

3. We have analysed this problem by multinomial logistic analysis. This is a rather new method that lends itself to measuring stochastic relations between a set of independent variables, measured on a nominal or ordinal scale, and dependent variables, and measured categorical variables.

4. Predicting consumer behaviour is a question of considerable practical and theoretical importance. The development of machine learning algorithms offers new analytical solutions. Comparative analysis of different prediction methods provides

the opportunity to choose the optimal methodological background for marketing strategies.

Based on an analysis of the scientific literature and on focus group interviews, we formulated basic research aims:

1. Formulating a general picture of consumer behaviour in the Hungarian beer market;
2. Determining how various drinks appear in different drinking situations
3. Determining what influences the different socio-economic factors regarding beer consumer behaviour and product choice;
4. Comparing different methods of consumer-segmentation involving market targets;

Methodology

In the first phase of our research we conducted three focus group interviews with beer consumers. Two interviews took place in Budapest and one in a small Hungarian town. Broadly speaking the participants were middle-class. These interviews illustrated that the "beer consumer" hails from numerous social classes, ranging from a hard-working low-paid street sweeper guzzling cheap beer at the nearest tarven to a yuppy flaunting his/her wealth by drinking trendy beer. The majority of participants emphasized that there are two basic forms of beer drinking situations. First of all, beer for relaxation purposes, meaning in a family setting. Then there is beer for different social occasions. The majority of respondents were satisfied with the selection offered, but felt that the atmosphere surrounding *beer culture* was less than ideal (e.g. restaurant don't put a lot of emphasis on beer) Well-traveled, better educated people were generally less satisfied with beer culture.

Characteristics of the sample

From the interviews it was evident that the most important consumer segments are the younger generation, which is why we placed special emphasis on researching this group. A *snowball technique* was partly used to gather the questionnaire results, and they were also partly collected through the Internet. Participants were encouraged to answer by a small gift offered by a brewing company. As a result, more than 2,000 questionnaires were completed. To our knowledge, this was the largest Hungarian beer consumption survey ever. From analysing the basic socio-demographical characteristics of the sample (Table 2) and comparing them with national trends, it was clear that in our sample younger people were over-represented.

Therefore, the sample can't be considered as representative, but is viable as an analysis of younger consumers who are the most susceptible to beer industry innovations. In the sample younger and especially better educated respondents were over-represented, but in this way we were able to collect more reliable information on the attitudes and opinions of younger consumers. If we apply Lazarsfeld's classic "two steps flow of communication" model (1948), the better educated respondents provide the opportunity to study the attitudes of potential opinion leaders.

Table 2

**Basic socio-economic indicators of respondents, compared
the national-wide demographic indicators**

Indicator	Nation-wide value		Sample	
Gender	Male	44%	Male	52%
	Female	6%	Female	48%
Age	18-25	23%	18-25	64%
	26-35	39%	26-35	17%
	36-65	19%	36-65	15%
	> 65	30%	> 65	4%
Place of living	Budapest	17%	Budapest	28%
	Centre of county	29%	Centre of county	17%
	Other town	16%	Other town	35%
	Village	38%	Village	18%
Highest level of qualification	Primary school or lower	21%	Primary school or lower	6%
	Accomplished high school	60%	Accomplished high school	71%
	College, university	19%	College, university	23%
Social status	Single	19%	Single	41%
	Couple without children	33%	Couple without children	30%
	Couple with children	27%	Couple with children	22%
	Single parent with child(ren)	21%	Single parent with child(ren)	7%

Source: Hungarian Central Statistical Office (2005a, b); own data collection

Mathematical models

In socio-economic analysis, the application of a binary logistic model is rather well known and widely applied (Fertő and Szabó, 2004). In using a binary logistic regression model, a set of regression coefficients is estimated that predict the probability of the outcome of interest. The logistic model can be written as

$$p_j = \frac{\exp(\beta_j x)}{\sum\limits_{j-1}^{n} \exp(\beta_j x)}$$

β_{k+1} can be set to zero as a normalisation, an thus

$$p_{k+1} = \frac{1}{\sum\limits_{j} \exp(\beta_j x)}$$

As a result, the j logit has the form

$$\log \frac{p_j}{p_{k+1}} = \beta_j x$$

for j = 1,…,k

The logit is the log of the odds that an event occurs. (The odds are a ratio between the probability that an event occurs, and the probability that an event won't occur). The coefficients in the logistic regression model tell us how much the logit varies based on predictor variables' value. If we have more that two events (more than two categories) we can extend the binary logistic regression model. If the measurement level for dependent variables is nominal, we have to use multinomial logistic regression analysis.

In target marketing it is essential to group consumers. In order to classify consumers a decision tree algorithm is applied. Building a decision tree model commences with a root node. The date is partitioned to the children nodes using a splitting rule (Srivastava et al., 1999). A splitting rule is composed of the following form: If $A > c$ then s belongs to L, otherwise to R. Here A is a selected variable, c is a constant, s is the data sample and L and R are the left and right branches of the node. In this example splitting is done by using one variable and a node has two branches and thus two children. A node can also have more branches and the splitting can be done based on several variables (Chae et al., 2001).

For each node the optimal splitting is sought based on "purity" function, calculated from the data. The data are considered pure when they contain the samples from only one class. The most frequently used purity functions are entropy or other formulae, expressing data dispersion (e.g. Gini-coefficient). The data for each children node are again partitioned to maximalise the purity function. The tree-building is an iterative process: the tree is continually constructed until the data purity in each node reaches the predefined level, or until leaf nodes contain a predefined minimum number of data samples. Each leaf node is then labelled with a class. Usually the node class is determined through a majority rule: a node is labelled according to the class to which the majority of the training data belong.

The QUEST algorithm constitutes a part of SPSS 14.0 software and was designed to handle categorical variables. A QUEST tree is a decision tree that is constructed by splitting space subsets into two or more child (nodes) separately, beginning with the entire data set. To determine the best split at any node, any acceptable pair of predictor variable categories is merged until there is no statistically significant difference within the pair regarding the target variable. This QUEST method naturally deals with interactions between the independent variables directly available for examining the tree.

To predict non-alcoholic beer consumption four predictor variables were selected: gender, age, per capita monthly revenue and a respondent's place of residence.

Results

Some basic features of beer consumption

Sixty percent of beer consumers drank beer at least once a week. Only 16% of consumers declared that they drank beer only on special occasions. The age for becoming a regular beer drinker (consuming beer at least once in a month) was between 16-25 years. The most prestigious brands were those developed in Western European states: Amstel, Tuborg, Steffl… The wide choice of products and keen competition were reflected by the fact that during recent years the majority of regular consumers (57%) tried more than 5 brands with 26% trying more than ten different products, indicating that consumer brand loyalty was rather low (Table 3). These facts showed that beer consumption was an integral part of con-

sumers' everyday consumption, and that there is strong competition between different producers. This is due to multinational companies' trying to increase their market share through aggressive advertising campaigns. Another possible explanation for the relative low level of brand loyalty is because there are only minimal (if any) differences between the brands when it comes to sensory characteristics.

Table 3

Some indicators of brand-loyalty in case of Hungarian beer-consumers (%)

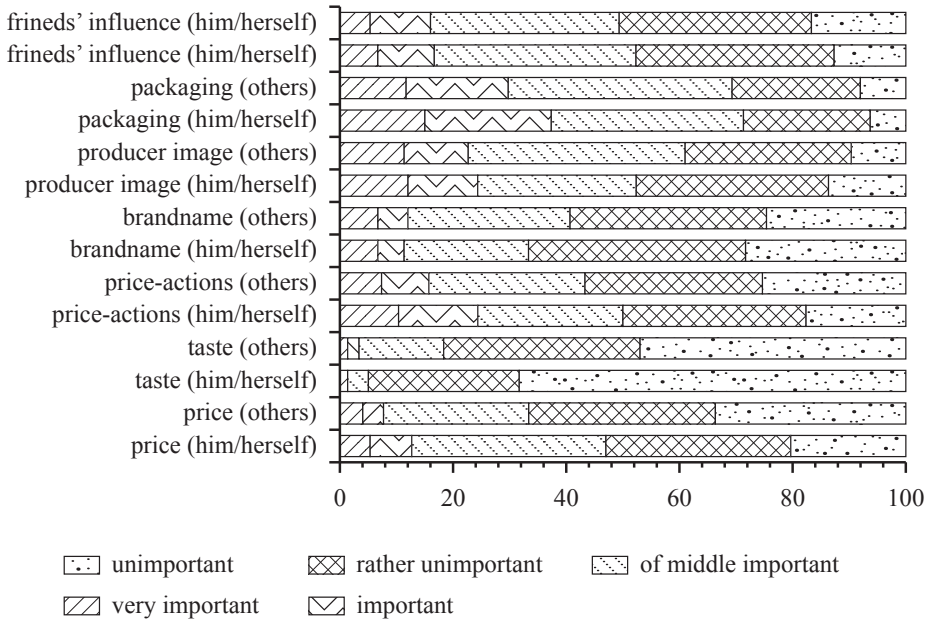| If in my shops I do not find my favourite beer	I would not do it, definitely	I would rather not do it	It depends, whether I would do it or not	Probably I would do it	I would not do it, definitely
… I would search in another shops	35.6	31.8	23.5	7.3	1.7
… I would buy another beer brand of the same producer	7.4	24.2	40.1	25.9	2.4
… I would tell it to the shop manager	52.0	21.7	10.7	11.4	4.1
… If the price of my favourite beer have been augmented by 30 %, I would buy the same	7.7	26.6	30.1	26.9	8.7

Source: own survey

In the pertinent marketing literature it is suggested (e.g. Totth, 1996; Domán & Tamusné, 2006) that people's opinions are often skewed because respondents' assume a given role. This is why we utilised two questions to emphasise factors influencing a consumer's choice of beer. One of the questions dealt with the perceived effect of various factors regarding a given consumer, and another dealt with estimating various factors regarding respondents' opinions..

After analysing the responses (Figure 1) it became clear that there were only slight differences between the results obtained from the above two questions. The most important factors were taste of a given product, price, and brandname. It is noteworthy that although word-of-mouth impact had been considered as a significant factor, we assumed that its impact would be underestimated. However, it is clear from the results that the quality of a particular beer is an everyday topic of conversation. If one accepts that drinking beer is a "trendy" thing to do, then in the future beer will be an important alcoholic drink.

It was also surprising that the respondents clearly stated that packaging and the manufacturer's image were important to them when it comes to choosing a product. This runs contrary to the idea of product taste as a significant factor, and shows the importance of a beer company's *image*. Even though beer companies are working hard on their image, they continue to lack a definite image strategy.

Figure 1

**Effect of different factors regarding a respondent's choice of beer
and how respondent's opinion affects other consumers**

friends' influence (him/herself)
friends' influence (him/herself)
packaging (others)
packaging (him/herself)
producer image (others)
producer image (him/herself)
brandname (others)
brandname (him/herself)
price-actions (others)
price-actions (him/herself)
taste (others)
taste (him/herself)
price (others)
price (him/herself)

0   20   40   60   80   100

⬚ unimportant   ⬚ rather unimportant   ⬚ of middle important
⬚ very important   ⬚ important

The importance of price and discount sales are further evidence proving consumers are hardly demanding when it comes to the taste of beer. At retail outlets beer is often placed close to cash regisiter and this underlines the extent of impulse buying in beer consumption.

Analysing the results definitely shows that the theoretical model for positioning the different types of drinks are widely supported by primer results. In this high tech era of computerized jobs alcoholic drinks are no longer used to quench one's thirst. Beer is used for after work relaxation and for various informal (causal) social or family occasions. Beer advertising tends to emphasise family occasions rather than simple social occasions.

Choosing what and when to drink

One's choice of drinks greatly depends on the situation. Figure 2 indicates that in everyday consumption the most popular drinks are mineral water and soft drinks, and only occasionally beer. Wine is increasingly limited to celebrations and other specific occasions. Using the survey results, a conceptual model for different drinks has been set up (Figure 3).

Multinomial logistic regression.were used to analyse choice of drinks in relation to the drinker's socio-economic status.

In various cases some drinks accounted for a relatively low share and for this reason there were too many empty cells in the questionnaire to obtain a reliable result. In order to avoid this computational problem drinks with less than a ten percent share were deleted. After deletion there remained only two or three drink types, from which we determined the influence of socio-economic factors in relation to the respondents.

Figure 2

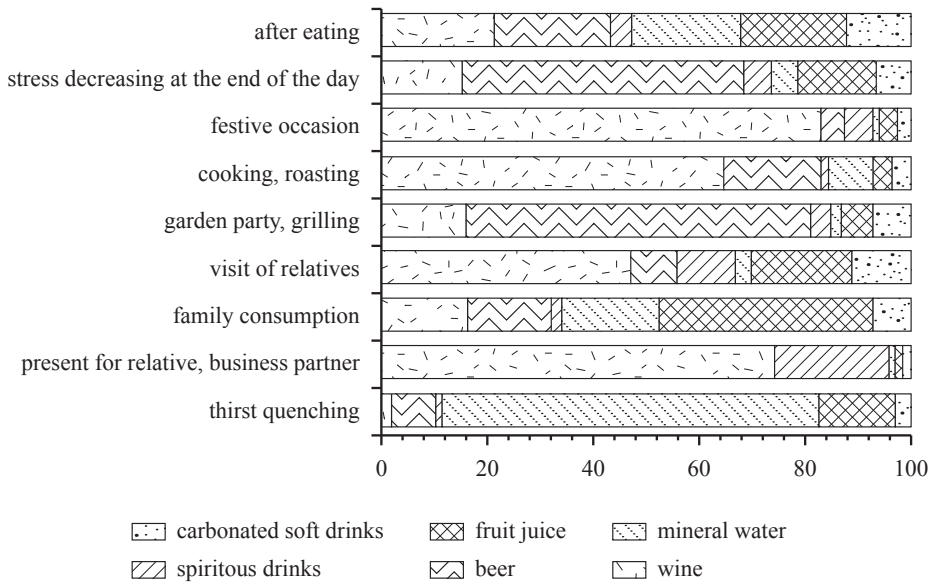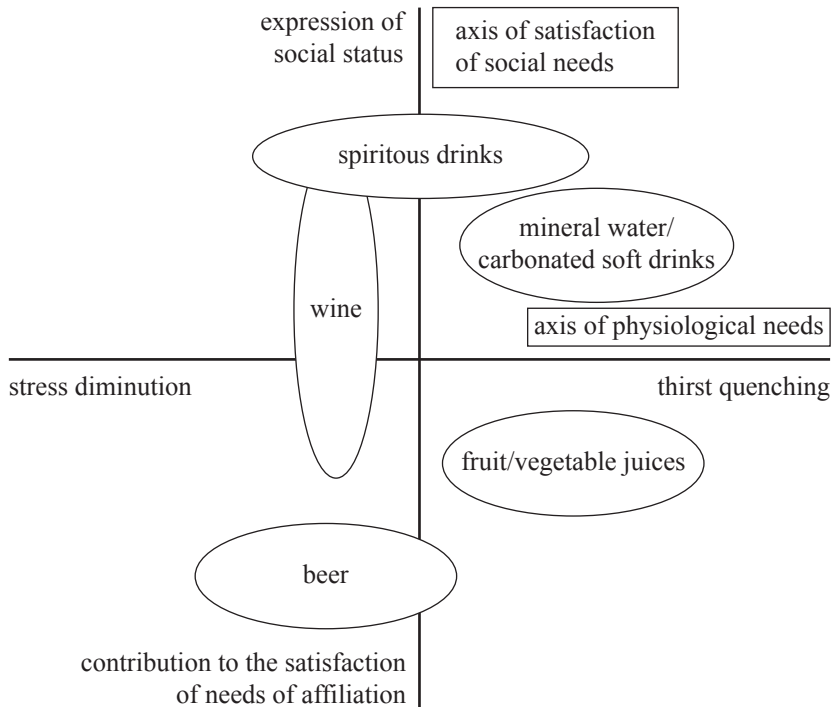**How often different drinks are consumed during various social occasions.**

	carbonated soft drinks		fruit juice		mineral water
	spiritous drinks		beer		wine

Figure 3

**Conceptual framework for satisfaction toward different
social needs in relations to different beverage types**

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In Table 4 some of the results are summarized.

Table 4

**Results of loglinear analysis on how socio-economic factors influence
the selection of different drinks in different occasions**

Preferred beverage after free-time main eating

Reference category: Beer	Wine	Mineral water	Fruit juice	Carbonated soft drink
Gender: men (reference category: women)		0.458	0.347	0.444
Place of living: Budapest (reference category: other town or village)	0.324		1.578	0.548
Income level: (reference category: low)				
Middle	0.754		0.421	
High	0.873			
Highest qualification level (reference category: at the most high school diploma)				
Unaccomplished college, university	0.423	1.570		
BSc or higher	0.758	2.010	1.345	
Nagelkelke's R square	0.345	0.288	0.357	0.377

Preferred beverage for family consumption

Reference category: Beer	Wine	Mineral water	Fruit juice	Carbonated soft drink
Gender: men (reference category: women)	1.345	0.458	0.477	0.254
Place of living: Budapest (reference category: other town or village)	0.557		1.322	0.987
Income level: (reference category: low)				
Middle		1,544.000	1.484	1.541
High		1.387	2.004	
Presence of young people or children (below 18 years) in family (reference category: absence of minors)		3.458		
Highest qualification level (reference category: at the most high school diploma)				
Unaccomplished college, university	1.252	1.570		
BSc or higher	1.255	2.010		
Nagelkelke's R square	0.325	0.245	0.411	0.274

Preferred beverage for garden(grill) party

Reference category: Beer	Wine	Mineral water	Fruit juice	Carbonated soft drink
Gender: men (reference category: women)		0.658	0.254	0.241
Place of living: Budapest (reference category: other town or village)	0.388		0.654	
Income level: (reference category: low)				
Middle	1.478		1.254	1.541
High	2.365	1.114	2.045	
Presence of young people or children (below 18 years) in family (reference category: absence of minors)		2.324	3.458	2.487
Highest qualification level (reference category: at the most high school diploma)				
Unaccomplished college, university	1.669			1.441
BSc or higher	2.245	1.981	1.421	
Nagelkelke's R square	0.147	0.250	0.423	0.142

The results indicate that mainly poor elderly rural drinkers look on beer as a thirst clenching beverage. This can be explained by the greater role technology has in upper class society. Families with small children prefer mineral water or fruit juices even for garden barbeques.

As a rule beer is preferred as an end-of-the-day beverage mainly by wealthier young consumers. Without doubt beer is foremost a drink for social occasions and parties.

Our research supports Kidorf et al's. (1990) results contending that alcohol increases social assertiveness.

Niche marketing opportunities in the beer sector

During recent years greater product development has been devoted to promoting non-alcoholic beer, and there is a good explanation for this. Not only is non-alcoholic beer competitively priced compared to other beers, but producers are not required to pay a post-production tax, thus making it a lucrative product.

For this reason producers need to determine exactly who drinks non-alcoholic beer. Analysis has confirmed that about a quarter of consumers can be considered regular non-alcoholic beer drinkers, but it is necessary to precisely identify who these consumers are. The traditional predictive method for group membership with categorical predictor variables is binary logistic regression analysis.

We applied this method to predict the consumption of non-alcoholic beers, and utilized the same predictors as for determing the impact socio-economic factors' have on a consumer's situational beverage choice. However, after applying this method we were forced to conclude that the binary logistic regression's performance was poor. After trying to determine the regression equation using the Conditional Forward algorithm we also concluded that the method was unsatisfactory. The Cox and Snell R square value was 0.066, the Nagalkerke's R square 0.098.

The alternative method used was the Quest Tree algorithm of SPSS for Windows 14.0. Validation for the model was based on cross-validation technique. In building the decision tree this method uses all the data. The risk estimate is computed by partitioning the data into k separate subsets. After k decision trees are constructed using the same growing criteria as the tree under evaluation. The first tree uses all folds except for the first one, and the second tree again uses all the folds except the second one and so on. This continues until each fold has been excluded once. For each of these trees, a risk estimate is computed, and the cross-validated risk estimate is the average of these k risk estimates for the k trees, weighted by the number of cases in each fold. In our case the k number o was equal to 10.

After analysing the tree structure (Figure 4) there is no doubt that the most important segments are consumers, who live in small towns. Among younger people a typical non-alcoholic beer consumer is a man between 26 and 35 who lives in Budapest or in a larger town.

Figure 4

Determination of non-alcoholic beer consumer groups using the data mining technique
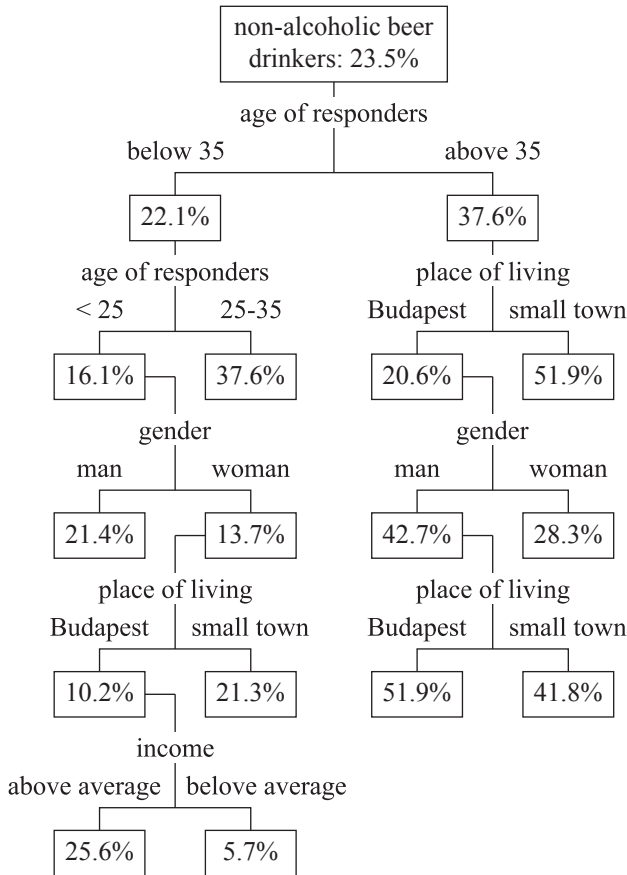
Some practical implications for beer producers

Our research results confirmedour expectations, meaning better educated people consume new kinds of beverages more often than less educated people who tend toward traditional beverages.

Beer marketing mainly targets younger people. However, in certain circumstances the beer companies don't transgress by targeting those under drinking age. An example of this a Dreher beer factory museum where minors are not allowed to visit. In our view this is absurd as younger generations need to socially adapt to the reality of alcohol.

The beer industry is highly competitive. For this reason *authentic* product innovation, especially concerning new types of beer, greatly matters. When it comes to innovation, we stress the word *authentic* because in some cases the same beers are marketed under different names.

The results of our research support the marketing strategy of beer producers, which market beer as the drink for social occasions, e.g. parties. Our results support Holroyd's (1978). At an experimental „party" participants who were timid and prone to rejection drank less beer and had lower blood alcohol concentrations than outgoing participants who were socially accepted.

Targeted marketing would benefit from a wide-ranging application of the most recent data mining methods. The industry would also benefit by emphasizing the postive health effects of beer drinking.

In Hungary small-scale producers do not adequately market their products. This should be rectified.

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Hungary's Biofuel Market

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Abstract

In 2005 the Hungarian Exise Tax Act was amended regarding the sale of biofuels. The amendment stipulated that from July 1, 2007 fuels with a 4.4 volume percentage bioethanol content will be sold in Hungary. It equally stipulated that from January 1, 2008 fuels with a 4.4 volume percentage biodiesel content will also be sold. Hungary's stated 2010 biofuel objective is 5.75%, which is calculated in relation to energy content. Blending requirements for this transition are 144 thousand tonnes of bioethanol (or 106 thousand tonnes of ETBE, due to its higher energy content) and 183 thousand tonnes of biodiesel. Hungary's planned biofuel production capacities are approximately 3 million tonnes of bioethanol and 400 thousand tonnes of biodiesel, which seems farfetched both from a raw material and market point of view. Generous long-term estimates predict bioethanol production will utilise 40-50% of Hungary's maize production, (3-4 million tonnes) and 1.2 million tonnes of wheat. And from this would come 1.4-1.7 million tonnes of bioethanol. Hungarian rape and sunflower seed total approximately 850 thousand tonnes, and from this approximately 255 thousand tonnes of biodiesel could be produced. Hungarian domestic demand does not require this much product, and these quantities would entail major exports, especially for bioethanol (1.2-1.5 M tonnes).

Key words

Production, consumption and export of bioethanol and biodiesel, raw material supply and handling of by-products

Introduction

Global energy demand is continually increasing. Pessimistic forecasts state that in the coming decades this demand can only be met by fossil fuels. The 1973 oil crisis made developed countries recongise that fossil fuel reserves are limited, and that crude oil production has peaked, meaning that already excavated and economically extractable energy sources are about to be depleted. Morever, **environmental pollution,** caused by increased use of crude-oil derivatives, poses a significant problem. And of course there is **climate change**.

Beyond environemtnal protection and the replacement of fossil energy resources, utilising biomass has other advantages. These include job creation and preventing rural depopulation, as well as securing energy supply and decreasing political dependence on energy rich countries.

Moreover, utilising agricultural biomass for energy production could help alleviate problems caused by agricultural overproduction. In most developed countries agricultural output exceeds internal consumption, and thus several sectors struggle to market surplus products. By utilising surplus production and mitigating social tensions generated by loss of income and unemployment, agriculture can go beyond producing food for animals and humans, and start to produce energy.

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In developed countries world climate change is a hot topic and it has drawn attention to the use of renewable resources. The European Union has declared that it is ready to unilaterally reduce its carbon dioxide emissions and thus to increase renewable energy use. The new target is for renewable energy to constitute 20% of total energy consumption. Of this 20%, 10% would come from biofuel, and this target is to be reached by 2020. [European Comission, 2007]. The European Council's Action Plan for Energy Policy [March, 2007]. has already established a 20% binding target rate for renewable energy and a minimum mandatory 10% blending rate for biofulels by 2020. However, the target is set for the whole Union, while the Member States are required to increase their utilisation of alternative energy resources at a pace and rate consisent with their capabilities. Within the 20% target rate, the member states have to set their own target according to their country's means and their present utilisation rate for renewable energy sources. On the other hand, the minimal 10% blending rate for biofuels will apply to every member state.

Also growing biofuel production may cause serious problems. There is fierce competition for cereal grains among ethanol production companies, the food industry, and the animal feed and husbandry sector. In the EU and USA increasing ethanol production using today's technology may cause dependence on biofuels or food instead of oil.

The EU and USA apply a significantly high tariff rate for biofuels produced using the most environmentally friendly technology and for their raw materials, meaning Brazilian sugar cane bioethanol and to a lesser degree palm oil from the tropics. Regarding the more expensive biofuels from developed countries, current rhetoric tends to focus on environmental protection and energy security. However, the nature of agriculture policy is becoming increasingly obvious, meaning that biofuel production is aimed at ensuring subsidies for farmers. Agricultural producers strongly resist any reduction of current tariff rates. It will be difficult to cease subsidies for first generation biofuel production if second generation biofuel technology is viable. [Popp, 2007].

This study's primary focus is on Hungary's present situation and future potential. After providing an introduction to the Hungarian biofuel market, the paper surveys the current and future status of processing capacities, plus the domestic and export outlook as well as the legal framework governing Hungarian biofuels. This paper also examines the scope for biofuel production and utilisation in relation to those products potentially suitable as biofuels.

1. Hungary's biofuel market: birth and surrounding conditions

Hungarian Government Decree No. 2233/2004. (IX. 22.) set the 2005 national objective for replacing traditional fuels at 0.4-0.6% of total energy content, while a 2% rate was set for 2010. Later this was modified by Parliamentary Resolution No. 63/2005. (VI. 28.), aiming for 2% in 2007 and 4% in 2010.

Later Government Decree No. 2058/2006. (III. 27.) stipulated that **Hungary must entirely conform to the EU Directive on Biofuels**[2] used in transportation. A large number of

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[2] Directive 2003/30/EC of the European Parliament and of the Council, OJ L 123, 17/052003. The Directive on Biofuels set a reference value for the national indicative targets at 2%, calculated on the basis of energy content, of all fuels for transport purposes placed on their markets by 2005, while the market share of biofuels is set at 5.75% for 2010. In 2007 the European Commission recommends a minimum share of 10% for biofuels by 2020 in its schedule regarding renewable energy.

measures have been taken to reach, by 2010, a minimum 5.75% biofuel ratio per total energy fuel content for the Hungarian transportation sector:

- providing tax incentives for trade in biofuels;
- making E85 fuel a national standard;
- potential introduction of used cooking oil in public transport coupled with a tax exemption or with reduced excise tax;
- developing biofuel raw material production and processing capacities to a level exceeding domestic demand so to supply the European market;
- subsidising raw material production and processing within the framework of National Development Plan II;
- creating small biofuel production capacities, while still considering regional development aspects within the framework of regional development projects;
- researching production technology and applications for biofuels' application, providing special support to technical and scientific endeavours creating second-generation organic waste biofuels.

In order to promote the sale of biofuels conforming to the Directive on Taxation of Energy Products[3], on January 1, 2005 Hungary introduced an excise tax exemption in the form of a tax refund on blended **biodiesel** fuels, as well as on **ETBE[4]** fuels produced from bioethanol. Since both types of fuels are blended in mineral oil derivatives, the excise tax exemption only covers the blends' biofuel portion. The excise tax exemption only covers a maximum of 5 volume percentage of the final blend for biodiesel and a maximum of 15 volume percentage for ETBE. The tax on bioethanol can only be reclaimed if it is a ETBE constituent, i.e. it only falls on 47% of the ETBE found in the blend, the equivalent of its biofuel content. The tax exemption refers to any fuel, regardless of national origin.

The tax paid on biofuels can be reclaimed by the entity marketing the fuel-blend. Due to 2005 budget restrictions, the maximum tax refund limit was 2% of the total fuel amount produced or imported by the given entity, which will increase by 0.5% yearly until 2010[5]. The refund amount is HUF 85 per liter for the marketed biodiesel (which amounts to a maximum HUF 4.30 per liter for 5% blends), while it is HUF 103.5 per liter for bioethanol (limited to the ETBE in the blend at a maximum HUF 7.30 per liter).

Before introduction of the new tax laws, **Hungary** did not produce a commercially significant **amount of biofuels**. The measure aimed to create commercial biofuel production capacities and to launch biofuels blended with traditional fuels. As a result, in 2005 Hungary planned to reach a 0.4-0.6% ratio of biofuels to total fuel.

In Hungary during the second half of 2005 ETBE production began. In January 2005 MOL Plc. launched an international tender to purchase 11 thousand tonnes of bioethanol for 2005, 47 thousand for 2006, 67 thousand for 2007 and 75 thousand for 2008. Of the 10 thousand tonnes of bioethanol produced in Hungary during 2005, 4 thousand were used in Hungary while the rest remained in stock or were sold in Austria and Slovakia. For biodiesel the incentive was ineffective as the tax allowance did not ensure biodiesel production competitiveness.

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[3]   Council Directive 2003/96/EC, OJ L283, 31.10.2003

[4]   Bioethanol may be blended into petrol directly or by adding isobutylene, which is a by-product that comes while refining crude oil. This is how ethyl-tertio-butyl-ether (ETBE) is created which, due to its significant bioethanol content, can be considered biofuel. ETBE is used for replacing MTBE (methyl-terctio-butyl-ether), most frequently used in Hungary to increase the octane number (it is produced from isobuthylene, as a reaction with methanol).

[5]   Exemption may last for six years dependent on European Commission approval.

During 2005 slightly more than 3 thousand tonnes of bioethanol were blended into fossil fuels in the form of ETBE, while in 2006 approximately 17 thousand tonnes were intended for this purpose.. When calculated on the basis of energy content, this meant **0.07% for 2005**, but ETBE production and blending only started in the second half of the year. When calculated on the basis of energy content, the estimated **2006 r**atio for ethanol use was **0,35%,** which **reflected a petrol ratio of 0.95%** (Table 1).

Table 1

Fossil fuels and biofuels used in Hungary

Name	2005		2006*	
	thousand tonnes	PJ	thousand tonnes	PJ
Motor petrol	1,462	61	1,500	63
Motor diesel	2,475	104	2,550	107
Total	3,937	165	4,050	170
In which 47% of ETBE	3.30	0.12	17.10	0.60
Biofuel ratio, %	0.08	0.07	0.42	0.35
Biofuel ratio to petrol, %	0.23	0.20	1.14	0.95

* based on estimation
Source: Energy Centre Public Interest Co. and MOL Plc. data

Late 2005 Excise Tax Act amendments heralded a change in excise tax exemptions. For **bioethanol** this change comes into effect **on July 1, 2007**, and for **biodiesel on January 1, 2008**. If the fuel-blend biocomponent (as biodiesel, directly blended bioethanol or ETBE) **reaches a 4.4 volume percentage**, the **excise tax duty will decrease**; and, failing that, it will increase. For fuels containing a 4.4 bioethanol volume percentage (through direct blending or as ETBE) the difference will be HUF 8.30 per liter, while for fuels containing biodiesel the difference will come to HUF 8. This regulation means the tax refund is replaced by an **excise tax differentiation**, simlar to the Austrian model, which imposes a "penalty" tax on fuels not containing environmentally friendly components. Tax differentiation does not provide **tax reduction** for the more environmentally friendly fuels: tax exemption for biological origin fuels ceases and therefore the excise tax on almost all types of fuel, including fuels with biocomponents, will grow. The regulation was made so as not to put extra strain on the national budget.

In response to the revamped regulations, in early January 2006 MOL Plc put out a tender for the purchase of **biodiesel-components** (fatty acid – methyl-esther) and vegetable oils (*SVO: Straight Vegetable Oils*). For the period 2008-2012 a purchase contract was concluded for **220 thousand tonnes of biodiesel** and **40 thousand tonnes of vegetable oil. From January 1, 2008 MOL Plc will be selling diesel with 4.4% biocomponents**, but the sale of these products will not be restricted to Hungary, but will also occur in Slovakia, Croatia and Austria. The sales proportion will entail a 30:70% benefit for the Hungarian market.

In order to reach **the 4.4 volume percentage blending rate, in 2008 the Hungarian market's blending requirement will reach 71 thousand tonnes of bioethanol.** 2008 is the first full year that Hungary will use the 4.4. volume percentage biofuel ratio derived from bioethanol. The EU Directive and the Government Decree stipulate a **5.75%** target, which is

calculated on the basis of energy content, which is supposed to be achieved by **2010**. If Hungary does manage to reach the year 2010 **5.75%** target, **144 thousand tonnes of bioethanol components** will be blended. **If blending** continues in the form of **ETBE**, the required quantity of bioethanol will have to be modified due to ETBE's different energy content and density. If this happens, in the year **2008 67 thousand tonnes** of bioethanol is projected to be blended in the form of ETBE, while in **2010 it will reach 106 thousand tonnes** (Table 2).

Table 2

**Quantity of bioethanol needed to reach the 4.4 volume percentage or
the 5.75 percentage blending ratio (based on energy content)**

Name	2008			2010		
	thousand tonnes	thousand hl	PJ	thousand tonnes	thousand hl	PJ
Motor petrol	1,560	20,526	65	1,608	21,158	67
Bioethanol	*71*	903	1.9	*144*	1,822	3.9
Bioethanol ratio, %	4.57	**4.4**	2.94	8.95	8.61	**5.75**
Motor petrol	1,560	20,526	65	1,608	21,158	67
47% of ETBE	*67*	903	2.4	*106*	1,426	3.9
Biofuel ratio, %	4.31	**4.4**	3.75	6.6	6.74	**5.75**

Source: calculation made at the Agricultural Policy Department of Agricultural Economics Research Institute (AKI) on the basis of data from Energia Központ Kht. and MOL Plc.

In order to make it possible by 2010 to blend 5.75% bioethanol (based on energy content), the currently effective fuel regulations will have to be amended. This means that a maximum 5 volume percentage bioethanol can be blended into petrol, while using 5.75% bioethanol (based on energy content) as the blending component actually entails a 8.6 volume percentage. According to experts, the **fuel standard modification may happen within 2-3 years**, which makes it possible to use a higher percentage of bioethanol from 2010 on. However, the EU's longe-range plans require even higher blending rates, and to reach them Hungarian cars will have to undergo a major transformation. MOL Plc. is busy developing its ETBE production blending component. For this reason Mol has transformed its Százhalombatta operation plus its Bratislava MTBE production facility. Mol has also established an ETBE production capacity in Tiszaújváros where the total output is about 160-170 thousand tonnes. Since this quantity in itself is not enough to meet the EU reference value, **joint blending of bioethanol and ETBE components is the most probable outcome.**.

Current fuel standards prohibit a higher biocomponent ratio mainly because car manufacturers are reluctant to provide guarantees. In order to eliminate this problem, special spare parts and new engine types are needed, which in turn will increase manufacturing costs and make such cars more expensive. However, in Hungary real incomes are expected to stagnate so new, more expensive cars are unlikely to suddenly become popular and modernizing older cars.is improbable Without the cooperation and acceptance of car manufacturers and consumer groups, it is not possible to change automobile standards. . Even if the various interest groups did accept such measures, changing the standards would require about three years. Thus, one **cannot expect Hungarian domestic demand for ethanol to suddenly shoot up**.

For biodiesel , a blending rate of **4.4 volume percentage** means using **124 thousand tonnes** of biodiesel for fuels, but the stated **2010** target would require **183 thousand tonnes of biodiesel** for blending (Table 3). Although biodiesel and traditional diesel's energy content differs less than that of petrol and bioethanol, the 5.75% blending ratio to energy content means blending a 6.21 volume percentage of biodiesel. Therefore one also has to change the fuel standard for biodiesel, but experts say this is less problematic than for bioethanol.

Table 3

**Quantity of bioethanol needed to reach the 4.4 volume percentage
or 5.75 percent blending rate (based on energy content)**

Name	2008			2010		
	thousand tonnes	thousand hl	PJ	thousand tonnes	thousand hl	PJ
Motor diesel	2,681	31,917	113	2,816	33,524	118
Biodiesel	*124*	1,404	4.6	*183*	2,083	6.8
Biodiesel ratio, %	4.61	**4.4**	4.07	6.51	6.21	**5.75**

Source: calculation made at the Agricultural Policy Department of the Agricultural Economics Research Institute (AKI) on the basis of data from Energy Centre Public Interest Co. and MOL Plc.

2. Existing and planned processing capacities

2.1. Bioethanol

Hungary's current **bioethanol-production capacity** is approximately 80 thousand tonnes, and is located in **Szabadegyháza** and **Győr**. These facilities mainly serve the food and drink industry, plus the pharmaceutical and chemical industries. Recently both plants made significant capital investments, especially Hungrana in Szabadegyháza where a major technological improvement and capacity enlargement project is being carried out to go from dry processing technology to wet. From 2008 the plant will annually be able to process 1 million tonnes of maize. There 40-45% of the raw material will become bioethanol, while 55-60% will become isoglucose, the company's main product. This is because preliminary calculations indicate that the capital investments will only achieve a return with the previous production percentages. Owing to capacity enlargement, the Hungarian market's **2007-2010 bioethanol demand could be safely satisfied by the existing two producers.**

Despite this, up until autumn 2006 various investor groups were announcing the establishment of plants in more than 20 locations, capable of processing about 7.8 million tonnes of maize and 1 million tonnes of wheat.

The planned and announced investments are associated with four large investor groups. Swedish **SEKAB**, majority owner of SEKAB Bioenergy Hungary Zrt., wishes to invest EUR 380 million in Hungary to build **four bioethanol plants**. The four planned locations are **Mohács, Marcali, Gönyű and Kaba**. The investment process is expected to start in spring or summer of 2007, depending on how fast the company can obtain authorisation after which production will start in late 2008 or in early 2009. The planned four plants are expected to process about 1.5 million tonnes of maize per year, as well as approximately 600 thousand tonnes of biomass and 60 thousand tonnes of organic waste. Consequently the planned plants

will produce 124-125 gigawatthours of electric energy and about 500 thousand tonnes of bioethanol. They will also produce 460 thousand tonnes of DDGS, 423 thousand tonnes of liquid carbon dioxyde and 3 thousand tonnes of active carbon.

So far the largest bioethanol project in Hungary has been announced by Swiss *United BioFuels* **Holding**. In its 6 plants the company would process 2 million tonnes of maize. **The planned locations are: Martfű, Mohács, Csurgó, Orosháza, Szeghalom and Almásfüzítő.**

The third largest investor, the American **CSLM Holding,** wishes to establish a bio-ethanol plant in **Hajdúsámson**, and aims to process 1 million tonnes of wheat per year.

The Hungarian-owned **Hungarian Bioenergetic (Mabio) Zrt.** hopes to transform 1.75 million tonnes of maize to bioethanol in five different locations. Three processing plants are projected for **Bácsalmás**, **Csabacsűd** and **Dunaalmás**, while sites for the other two plants have yet to be selected.

Two additional investors (Rodeport Kft., BIO-MA Zrt.) have more modest and less developed plans related to three locations: Fadd, Sarkad, Mezőhegyes.

Beyond the large investment projects that fall within the framework of the New Hungary Regional Development Programme (Új Magyarország Vidékfejlesztési Program) in 2007-2008 the Ministry of Agriculture and Rural Development is planning to back 40 producer-owned bioethanol plants to the tune of HUF 200 million per plant, each with a grain processing capacity of 15 thousand tonnes.

In October 2006 because of lower EU sugar prices, *Eastern Sugar* announced that it would close down its factories in the Czech Republic, Slovakia and Hungary . In *Eastern Sugar's* **Kaba location** a bioethanol plant suitable for processing 300 thousand tonnes of maize annually will be built. The new plant's investment costs will be financed with EU subsidies provided to the producers to compensate for losses due to the sugar plant's closure.

The new capacities are mostly scheduled to be started in 2008-2009, but their completion will depend on whether they get EU subsidies from 2007 on. Given the limitations of the Hungarian market, the planned bioethanol plants are mainly geared toward European export demand for biofuels. According to the our calculations, if **all the planned investments occurred, Hungarian grain processing's total volume would exceed 9 million tonnes. And from this 3 million bioethanol tonnes could be produced.**

As we will see later, the demand for grain exceeds the amount that can be safely produced from domestic production. However sufficient current stocks are, in the medium run a raw material shortage may occur, especially if weather conditions become poor which could in turn cause a need for grain imports! This would cause prices to shoot up, which would not only endanger Hungarian bioethanol production profitability as higher **feed prices** would also harm Hungarian animal husbandry. Another problem is finding a market for the finished and by-products. In the above mentioned plants the quantity of bioethanol projected to be produced surpasses expected domestic demand several times over. Therefore **we think that the announced capacities are excessive. Even if one is totally optimistic, it still remains that feasibility and profitability for bioethanol production are limited to 3-4 million tonnes of maize and 0.8-1.2 million tonnes of wheat.**

2.2. Biodiesel

Hungary lacks an operating biodiesel plant. However, there is now a a half-completed one, and by the autumn of 2006 amendments to excise tax regulations had sparked development in Hungarian biodiesel projects. In fact, 14 plants had reached either the planning or construction phase.

In Hungary there are **two biodiesel plants currently under construction One of them is the Kunhegyes plant [Bánhalma] which is owned by Közép-Tisza MG Rt. The other is the Intertram Kft. Mátészalka plant. Toghether they have a 10 thousand tonne capacity**. In November 2005 the Kunhegyes plant started test production, and the biodiesel produced is currently transported abroad. However, they took part in MOL Plc's tender for biodiesel suppliers. The Mátészalka investment began at the turn of the century, and in August 2006 began test production by processing sunflower seed.

Right now the most important plant under construction has **a capacity of 150 thousand biodiesel tonnes. It is being constructed at MOL's Komáron site**, and produces diesel from rape seed, sunflower seed, used cooking oil and – in case of a raw material shortage – animal fat. For security of supply reasons MOL Plc. has decided to work with *Rossi Beteiligungs GmbH* and establishe a plant equipped with efficient technology capable of producing biocomponents of uniform quality. The company will supply MOL with 120 thousand tonnes of biodiesel per year for five years, while selling 30 thousand tonnes abroad.

Tempora Bioenergia Zrt., with a production rate of 100 thousand tonnes of biodiesel, will also produce for export. The company intends to locate plants in **Günyű and Polgár**. One third of the processed raw material will come from Hungarian sources, the rest from abroad. Biodiesel production by-products (sleet, glycerine) will be used in the company's biogas plant.

Though not presently operational**,** two biodiesel plants have been located in **Baja** and **Gyöngyös** with a total capacity of 30-40 thousand tonnes, while in four other locations (**Bábolna, Tab, Szerencs, Pacsa**) other biodiesel plants with a total capacity of 50 thousand tonnes have been established, though they are presently not operating.

The total biodiesel production capacity **of plants under planning is a little over 400 thousand tonnes**, which would require processing approximately 1.3 million tonnes of oil seeds. **But even if all the rape and sunflower seed beyond that necessary for domestic consuption were processed for biofuel, the amount of raw material would not be sufficient. In addition, the planned capacities exceed Hungary's expected 2010 biodiesel demand by 120%.**

3. Issues regarding the establishment of processing plants, supplier relations and by-products

For biofuel processing plant long-term profitability, several factors should be considered before capital investment. The most important factors are **suitable markets (for both the end-product and the by-products) and securing raw materials for continous operation**.

From the biofuel producers currently operating in Hungary, we opted to scrutinize Hungrana and how it purchases raw material. The plant currently purchases 500 thousand tonnes of maize per year. **The suppliers are located within a radius of 100 km, the average distance being approximately 50 km.**

Although vendor relations are long-term, contracts are renewed annually, which is explained by purchase price insecurity. The main problem is the absence of a reference price related to the purchase, and therefore the parties cannot conclude longer contracts. Thus securing raw material for continuous plant operation requires a serious organisational effort and a lot of man hours. The fact that most of the suppliers are wholesalers makes the job somewhat easier. This is because only wholesalers have long-term storage and drying facilities. Also dealing with wholesalers limits the number of operators the company needs to interact with.

The arrival of large volume bioethanol production will make securing raw material supply vitally important. If all the planned capacities swing into operation, theoretically Hungary may come to need grain imports, and this will be especially true in years of poor weather and poor crop yields.

For both types of biofuel absence of long-term contractcs coupled with competition for raw materials may boost the prices, which may in turn accelerate biofuel production costs. If fewer capacities are established, the raw material producers might then suffer, and this would be particularly true for grain producers if the grounds for state intervention narrow or if state intervention disappears altogether. It is therefore apparent that both parties would benefit from long-term contracts with fixed prices, or at least prices tied to a reference price.

If subsidies for energy crop production were associated with a long-term contract with a bioethanol producing plant, vendor relations would be more stable and long-term contractual relations made easier. On the other hand, tenders directed at investors could also require long-term contracts with the suppliers, which would also help avoid the danger of plants' relying on the same source of raw materials.

A vital part of investing in biofuel production plants is selecting a suitable location.. It therefore makes sense to locate bioethanol and biodiesel plants near the raw material producer and the end-product consumer since long distance deliveries (in both cases) may significantly reduce profitability. When transporting the end-product and marketing the by-products, potential transport methods should be examined, be they river, rail, or road. In Hungary river transport remains cheapest and thus it is best to locate bioethanol and biodiesel plants near the Danube.

The question of **managing by-products** is also very important. Biodiesel production by-products (rape seed and sunflower meal) are not suitable for animal feed, and thus there is limited potential for using them (combustion, biogas production). If an investor is not well-informed and clever regarding by-product utilisation, then by-product disposal can entail further costs.

Bioethanol production by-products can be used as animal feed, therefore close proximity to animal husbandry facilities offers a distinct advantage. This is even more valid for dry grind technology, where a large volume of by-products means expensive transport costs. It is no coincidence that most of the currently planned investments are located along the Danube in the principal grain growing and animal breeding regions.

Most of WDGS (wet distillers grains with solubles) or DDGS (distillers dried grains with solubles) which are created during dry grind bioethanol production can be utilised as animal feed. For every **100 kg of maize used in bioethanol production, 30-32 kg of ethanol is created, as well as 30 kg of carbon dioxide and 29 kg of DDGS** [Butzen et al, 2003]. DDGS is an effective, easily digestable form of animal feed. It is rich in protein and energy, and also contains vitamins and minerals. It is a good food source for beef and milk cows, but can also be fed to poultry and swine.

When it comes to food for animals and humans, bioethanol by-products produced during wet milling are even more valuable and marketable than DDGS. In WDGS for every **100 kg of maize, one can produce 29 kg of ethanol, 20 kg of gluten, 5kg of corn husk and 3 kg of corn steep** [Butzen − Hobbs, 2002]. By using extrusion from corn steep one can create corn steep oil, a valuable vegetable oil with a high vitamin content. Gluten constitutes a high protein basis for animal feed, but corn husk is also highly marketable (especially for companies producing animal feed for pets).

So far animal feed producers in Hungary have primarily used DDGS for feeding milk cows. In cow feed mix and concentrates DDGS can constitute up to 20% of the conent. **DDGS's** raw protein and fat content is relatively high, but **can also be used to partially replace fat and protein** carriers while increasing the cows' feed intake. This is because of DDGS's favourable price/value ratio. Chicken and swine feed can contain up to 10% DDGS.

Gluten offers slightly more opportunities for utilisation. To a limited extent it **can partially replace expensive imported soybean.** However, Gluten has a lower protein content and lacks certain essential amino acids, and therefore corn glutein may only replace 10-15% of the soybean used.

In 2005 the Hungarian animal feed industry purchased DDGS for HUF 22 per kg Today animal breeders and animal feed producers still require DDGS and are willing to pay a slightly higher price. In fact, in 2006 in the town of Szabadegyháza, the Hungarana Maize Startch and Isoglucose Manufacturing and Trading Ltd. (Hungrana Keményítő és Izocukorgyártó és Forgalmazó Kft.) transformed its operation to apply wet milling technology. Nonetheless, currently in Hungary there is no domestic DDGS available for purchase.Wet milling process by-products (corn steep and gluten) can be sold at a much higher price than DDGS. In 2005 gluten was sold by Hungrana at HUF 140 per kg, corn steep at HUF 52 Ft per kg, and corn husk at HUF 20 per kg.

On the basis of foreign trade statistics it is difficult to estimate the quantity and value of Hungarian DDGS and gluten imports. According to HS codes, the two products cannot be separated, as both are imported under the code HS 2303101100 (starch waste from maize with a minimum of 40% protein content). Statistics indicate that the imports of this product group increased from 1.1 thousand tonnes per year in 2000 to 20 thousand tonnes per year in 2004, the import price fluctuating between HUF 109 and HUF 117 per kg. Based on this, current usage is still negligible.

If one views data available on Hungarian animal feed usage and considers the distribution of DDGS usage in the US animal breeding sectors, **in the medium-run DDGS usage in Hungary will likely reach 300-350 thousand tonnes. These figures are based on our own projections for livestock numbers and projections by current animal feeding systems**. We estimate the quantity of DDGS used by the individual sectors as follows:

- milk processing: 87 thousand tonnes;
- cattle : 87 thousand tonnes;
- pork : 56 thousand tonnes;
- poultry: 105 thousand tonnes.

If one calculates current soybean usage in Hungary, which is about 700 thousand tonnes annually, Hungarian usage of gluten may fall between between 70 and 100 thousand tonnes. However, one has to recall that DDGS and gluten may partly replace each other. The actual usage proportion will probably depend on how much is produced and their price. Currently it is not known what percentage of the planned investments will be using wet milling or dry grind production.

If one takes DDGS and gluten usage as a starting point, the Hungarian market may be able to absorb approximately 1-1.15 million tonnes of maize processing by-products, meaning the rest will have to be exported. Delivery costs dictate that primarily EU Member States will be the target markets [Potori et al, 2006].

On Table 4, one sees that during the past five years the EU imported only 700-800 thousand tonnes of DDGS annually and this was mainly from the USA.. In terms of planned capacities this equals less than expected Hungarian production. The low import volume is because DDGS is difficult and expensive to transport, and thus bioethanol producers seek nearby markets.

Regarding import potential, the gluten situation is more promising but it is noteworthy that imports dropped to half between 2000 and 2005! This drop, however, wasn't because of a decline in in EU demand, but to increased domestic use in the USA, which is the principal exporter. This fact was also confirmed by soaring prices linked to a decrease in supply. In 2006 there was also the B10 GM maize scandal which caused a steep decline in imports from the US. B10 GM maize was prohibited within the EU and this further constrained gluten supply.

The above data indicate that out of all the by-products coming from Hungarian bioethanol production gluten has strong external market outlook, but demand is still limited. Likely there will be a surplus amount of these by-products, which could be used for energy production (combustion, gasification).

Table 4

**EU import of protein animal feed and by-products of bioethanol production,
2000-2005**

Thousand tonnes	2000	2001	2002	2003	2004	2005
Corn gluten	4,863	4,183	4,140	3,570	3,301	2,548
DDGS	723	690	825	773	670	722
Soybeen	27,820	29,244	29,479	30,818	30,666	31,467
Total protein animal feed	**36,960**	**37,443**	**36,593**	**37,606**	**38,368**	**36,281**

Forrás: Toepfer International [2006]

4. Foreign market prospects for biofuels produced in Hungary

In the previous sections we stated that if planned biofuel production capacities actually do start operation in Hungary, in 2009-2010 bioethanol and biodiesel production will significantly exceed Hungarian demand, meaning a huge volume of excess products will have to be placed on foreign markets. **Due to factors linked to transportation, the potential export market should be the EU Member States**. The EU Directive on Biofuels has set a 5.75% reference value. If this 5.75% reference value is to be achieved, then given the expected 2010 petrol and gas consumption structure, **12.6 million tonnes of bioethanol and 11.5 million tonnes of biodiesel will have to be used in the EU-25**. Compared to the 2005 production level (721 thousand tonnes of bioethanol and 3,184 thousand tonnes of biodiesel), this will mean a market expansion of 11.9 million tonnes for bioethanol and 8.3 million tonnes tonnes for biodiesel. **In 2010 the quantity of Hungarian bioethanol available for export (1.2-1.5 million tonnes) will constitute about 10-13% of the expected additional European , while for biodiesel (70 thousand tonnes) this will be less than 1%.**

In 2005 the EU issued a Directive on Biofuels, stipulating a 2% reference value. This directive was also complemented by targets set by individual member sates. However, according to 2006 reports on the EU-25, neither the year 2005 2% reference value nor the stated 2005 national targets were ever met. On the contrary, in most of the Member States the biofuel usage rate didn't come close to target values. Estimates show that in 2005 EU-25 biofuel usage was only 1% of total fuel consumption. Serious tax incentives or the obligatory application of the stipulated target values will be needed to meet the 2010 target in the EU-25 Member States. Unofficial information suggests that the Commission will recommend obligatory blending.

If mandatory biofuel blending to total fuel stock was required **at a 5.75% level** (starting from the current fuel consumption and biofuel production figures), **this would result in a significant shortage in each Member State.** Therefore the Member States could try to meet EU requirements in the following ways:

- competitive production of biofuels;
- tax allowances or subsidies (although in this case the former would no comply with the Directive on the Taxation of Energy Products);
- usage of import biofuels.

Given the scarcity of agricultural land, unfavourable climate and soil conditions for raw material production, and high intervention prices for grain, the EU Member States have few options for competitive biofuel production. Between 2010 and 2020 the advent of second generation biofuels is expected to bring about much more efficient biofuel production in Europe.

France has a EU high grain self-sufficiency rate iof more than 200%, which is mainly due to its barley and maize production. Hungary is the only other Member State with a similarly high maize and wheat ratio, which places it in a good position. In Germany rye and wheat production exceeds the internal usage volume by approximately 20-40%. Surprisingly, Spain's self-sufficiency rate is only 70%, but in 2005 the country was still was the largest bioethanol producer and user in Europe. This was due to importing raw material such as wheat for animal feed and barley. In some Member States grain production falls well short of meeting current demand. The self-sufficiency ratio of Belgium, Holland and Portugal falls between 25-50%. In Estonia, Greece, Italy and Ireland the ratio does not exceed 80%. Belgium, France, Germany and Poland have stong and competitive sugar production.

The most suitable land for growing **rape seed is** in Germany, France, the United Kingdom, Poland, Hungary, Lithuania and Denmark**.** Germany, France, Italy and the Czech Republic use a significant amount of rape seed for fuel production. Even today Germany and Italy have to rely on imported rape seed, which limits opportunities for further expansion. Due to tax allowances for biofuels Germany[6] and some other countries are biodiesel importers, and are thus able to absorb other countries' production such as the Czech Republic's and Austria's.

The best places for **growing sunflowers** are France, Hungary, Spain, Slovakia and the newly joined Romania. In the other countries there is only a limited area for production or production simply isn't possible.

If the EU Directive on Biofuels becomes mandatory, bioethanol and biodiesel production will ignite increasing competition for both raw material and end-products. This would prove lucrative for Hungary regarding the sale of biofuels, but for Hungarian producers (and for other European producer countries) several questions remain :

- it is not known how the world market price for oil will change;
- it is not known what technological and self-sufficiency level non-EU countries will attain;
- it is not known how large consumers outside Europe (e.g. USA, Brazil, China) will influence demand;
- Even though wheat and other grains currently provide cheaper animal feed than wheat, Hungary enjoys a huge competitive advantage due to its low-cost maize production. However, world trade liberalisation means other Member States will be able to obtain cheap raw material from South America and from other developing countries. It is difficult to forecast how this will effect EU bioethanol production;
- after securing the biodiesel standard, it will be possible to blend biodiesel produced from imported vegetable oils. These imported vegetable oils will be primarily soybean and palm oils, and blending them will be possible at a higher ratio into biodiesel produced from rape seed;

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[6]   As of 1 August 2006 the tax exemption of biofuels was cancelled in Germany and from 2007 on a certain percentage of all fuels will have to be biofuel (4.4% biodiesel, 2% bioethanol).

- as for bioethanol, in Europe one will have to be ready for competition from Brazil, the USA and developing countries, especially after WTO negotiations end and if a bilateral agreement with MERCOSUR states is reached.

It is difficult to forecast which Member States will have more intensive biofuel production and which will import from third countries or other Member States. This certainly depends on their own raw material supply (although the Spanish example seems to refute this!), but subsidies, taxation policies and the entire economic environment may also have a large influence.

The media mainly mention Germany and Sweden as potential external markets forHungarian bioethanol. This assumption is well-founded, because presently there are only three EU countries where bioethanol usage exceeds internal production: Sweden, Germany and Great Britain. The latter doesn't constitute a target market for Hungary, because it is too faraway and its Atlantic ports provide easy access for cheap overseas imports.

Sweden and Germany are much more realistic alternatives. Both Member States are leading biofuel consumers and their stated national targets are much more ambitious than the EU average. Sweden already has a high green energy usage rate as biomass energy entails 17% of total energy consumption. In Sweden biomass energy is a major source for heating and the country would also like to blend bioethanol produced from wood (cellulose) into petrol.

With a biofuel consumption rate of 90% Sweden is the largest regional biofuel consumer. In Sweden various automobile types were launched with flex engines (Volvo, Saab, Ford), but blending stimulated by tax incentives has also created a large bioethanol market. Starting in 2005 the Swedish government set a 3% blending rate target and Sweden (jointly with Spain) initiated the fuel standard modification at the European Commission, increasing the 5% bioethanol ratio to 10%.

Thanks to generous incentives, in recent years Swedish bioethanol consumption has shot up and analysts expectfuture growth. This projection is based on a considerable increase in car sales with flex engines (in 2006 15% of cars sold in Sweden had flex engines).

At the moment approximately 80% of Swedish ethanol consumption is served by Brazilian imports. Importing Brazilian ethanol was facilitated by the decision not to apply an ethanol specific tariff, but rather a tariff for "other chemical materials" of only EUR 2.5 per hl. However, this has been somewhat offset because as of **January 1, 2006 there hasn't been an excise tax differentiation for bioethanol imported with the favourable tariff.** This should lead to a price increase, because presently Brazil offers the cheapest source for ethanol.

Continued dependence on imports is expected, particularly in the short run. This is because to meet projected 2010 consumption levels internal production would have to grow twelvefold, but in the coming 10-15 years this appears unlikely. In Sweden bioethanol is presently made from wheat, barley, and rye, but research is being conducted on making bioethanol from wood, and second generation bioethanol production may provide a breakthough in this field. Consequently, **Swedes are taking interest in EU produced bioethanol, and this interest includes Hungary.**

A vibrant and growing demand promises future market opportunities. However, Brazilian bioethanol's strong share of the Swedish market is worrisome because it exists despite a tariff, albeit a reduced one. If tariffs are further reduced, this may well lead to a greater influx of Brazilian bioethanol. However, it is uncertain when and by how much tarriffs will be reduced so Sweden may long remain a market for Hungarian bioethanol. Moreover, Swedish investors are showing interest in investing in Hungarian bioethanol production. A drawback is that high transport costs from Hungary mean that only cheap bioethanol can be competitive on the Swedish market.

Sweden consumes more bioethanol than biodiesel, although the 2% blending ratio also encourages biodiesel use. Presently about half of Swedish demand is met by biodiesel from Swedish rape seed, and the remainder met by EU imports, mostly from Germany and Denmark.

On the other hand, German biodiesel consumption and production is highly developed. In 2004 German biodiesel production had already reached 1.04 million tonnes, while 2005 production is estimated at approximately 1.67 million tonnes. As a result, the area devoted to rape seed almost doubled between 1990 and 2005. In Germany in 1990 an area of 722 thousand hectares was devoted to colza while in 2005 this attained 1.3 million hectares.

In recent years consumption has also shot up with biodiesel consumption reaching almost 1.8 million tonnes in 2005.

Bioethanol production lags far behind that of biodiesel. In 2005 approximately 200 thousand tonnes were produced and for 2006 500 thousand tonnes are projected. However, Germany still relies on imports.

Biodiesel production is limited in scope as oil seed growing areas are not that extensive. In Europe **blending rate targets can only be reached by far greater bioethanol consumption**. And this also holds true for Germany because for 2007-2009 the stated German national blending rate target **is 4.4% for biodiesel and 2% for bioethanol, but by 2010 this will rise to 3%.** In Germany there is less raw material for bioethanol production, and therefore the country's expected bioethanol demand exceeds its domestic production. Germany is a lot closer to Hungary than Great Britain so **Germany may comprise a potential market for Hungarian bioethanol producers**.

In Hungary there will be excess biodiesel. In the short run it will be harder to find a significant biodiesel market, especially considering that the main biodiesel consumers are also producers. However, over time the rising blending rate means that Hungary will be able to sell the excess quantity to its neighbours.

5. Hungarian raw material production

The future for Hungarian sunflower seed and rape seed is bright. The two crops are already attracting keen interest and the entire quantity is used either internally or abroad. Therefore, due to a national shortage of these grains, biodiesel production will not be a major factor in Hungary. Otherwise, Hungarian biodiesel production will have to be partially built on imported raw material. However, Hungary's neighbours also suffer from a shortage of oil plants.

Biofuel production provides an alternative use for **surplus crop production.** In the short and medium term using crops for human consumption or animal feed is not predicted to increase. This is because only modest growth is expected in consumption by humans and livestock numbers are likely to stagnate. Moreover, high transport costs and scarce transport links make it difficult to expedite crop surpluses abroad. Also bolstering the use of crops for energy sources is the argument that it renders unnecessary. the payment of intervention prices and storage subsidies as well as selling intervention volumes and paying export subsidies [Potori − Udovecz, 2006].

5.1. Grains

Maize and wheat constitute the principal raw material required for bioethanol production. **During good weather years 11-12 million tonnes** of the two crops are harvested. If one then assumes food and animal consumption to be **6.6-7.3 million** tonnes, then there remains an annual surplus of **3.7-5.4 million tonnes.**

Wheat is grown on 24-26% of the country's ploughland and is Hungary's major crop. However, dry weather greatly impacts on the extent of the harvest. For example, at less than **3 million tonnes,** 2003 represented the lowest wheat yield within the 2000-2006 period. However, in 2004 more than **6 million tonnes** were harvested. Apart from erratic yields, sales opportunities are curtailed because crop ares are highly dispersed which means too many different types of wheat are grown.

In recent years wheat for human consumption or animal feed amounted to approximately **2.6-2.8 million tonnes, and i**n future years these consmption numbers are not forecasted to radically change. After exports, in average years there is an annual surplus of about 800 thousand tonnes. However, anticipated growth in bioethanol production may boost demand for wheat and thus some of the wheat currently exported could be used in bioethanol production. We estimate this quantity at a maximum of 400 thousand tonnes, because it is improbable that good quality high protein edible wheat will be used for biofuel production. An annual average maximum of **1.2 million tonnes of wheat** should be available for bioethanol production. This equals the biodiesel industry's requirements, because some of the plants intend to utilise only 10% wheat as an emergency reserve in case of a maize shortage.

The planned facilities would primarily rely on maize. Similar to wheat and other crops, getting alcohol from maize is determined by its sugar and starch content. Although making bioethanol from maize is less efficient than from sugar beet, maize is still more suitable than wheat. According to the pertinent literature, one needs **3.14 tonnes of wheat** to produce one tonne of bioethanol, while with maize **one needs only 2.72 tonnes.** Maize also offers a higher per hectare yield and thus provides **one and a half times more** bioethanol from the same area.

In Hungary maize is grown on 24-26% of the ploughland. However, the yield for maize is volatile, which makes it similar to wheat. One reason for this is that the maize plant mainly needs moisture in May, July and August, months where drought is often a problem. In the past five years an average of **7.2 million tonnes of maize was harvested.** During the observed period the yield was lowest in the drought year 2003 and highest in 2005.

In recent years maize for industrial purposes and for animal feed was between **4-4.5 million tonnes**. In 2002 exports were over 2.1 million tonnes, but the average volume

was 1.5 million tonnes. If one assumes that the exported maize also went for ethanol production, and takes into account the remaining 1.5 million tonnes, then an annual average of 3 million tonnes of maize is available.

If one assumes growth in average yield, stagnation in livestock numbers, and bioethanol by-products used as animal feed, a positive scenario is that up to **40-50%** of domestic maize production (3-4 million tonnes) could be used for bioethanol production. This entails potential bioethanol production of **1.2-1.4 million tonnes. Most of this amount would have to be sold in the EU.** To meet the 5.75% blending rate to total energy content, **144 thousand tonnes** of bioethanol would be needed, and this could come from a maize yield of **55-70 thousand hectares**. It is noteworthy that in the medium term a demand for bioethanol is not anticipated in the Hungarian market because **MOL Plc**. **only wishes to purchase the quantity needed to meet the tax friendly blending rate.**

Wheat and maize stocks that are available as raw material equal a maximum 4.2-5.2 million tonnes and from that 1.4-1.7 million tonnes of bioethanol can be produced. This comes to only about half of the annuounced planned processing capacities. In fact, approximately 1.3-1.6 million tonnes less.

5.2. Oil plants

In Hungary oil plants follow grain as the second major group of cultivated plants. Among Hungarian oil plants rape and sunflower seed stand out when it comes to biodiesel production. In 2005 663 thousand hectares were devoted to rape and sunflower crops.

Sunflowers are grown on 10-12% of Hungary's arable land. In 2005 1.1 million tonnes of sunflower seed were harvested, 7% less than the 2004 record volume,which amounted for a third of the EU-25's production. **Over the past seven years the average yield was 0.9 million tonnes.** The Hungarian per hectare yield is generally higher than that of the EU-15 average, but lower than in France. The Hungarian per hectare yield for 2004 was 2.47 tonnes, in 2005 2.17, and in 2006 2.23.

Thanks to its high oil content Hungarian sunflower seed is popular, and when favourable weather conditions prevail it is harvested earlier than in neighbouring countries. Approximately 70% of the sunflower harvest is processed by the Hungarian vegetable oil industry, and the remaining 30% is exported. Hungary's total sunflower seed yield is one million tonnes. It is estimated that from the total yield **50 thousand tonnes could, in the medium term, be used for fuel** production, but this excludes exports. However, if fuel production were to replace export, annually **400 thousand tonnes of sunflower seed would be available**.

In Hungary rape seed is the second most oil plant grown, but so far the area consecreated to rape seed has only amounted to 2-3% of plouged land. In pre-EU accession Hungary the average rape seed yield fluctuated between 1-1.9 t/ha. This fluctuation was partially caused by adverse weather, meaning frequent frost damage, or drought. Another reason for the fluctuation was the limited use of fertilisers and pesticides. During the past three years the average yield has exceeded 2 t/ha and in 2004 it was 2.78 t/ha, but this still falls short of the EU-25 average of 3.4 t/ha. In 2006, thanks to good weather and an enlarged sowing area, **329 thousand tonnes of rape seed were produced**, which exceeded the 2004 record yield by 13%.

There are multiple ways of using rape seed and its cultivation offers numerous advantages. For example, it is an excellent fore-crop for winter wheat and meshes well with apiculture areas, but only since the last decade has its relevance been recognised in Hungary But rape seed is a sensitive plant, requiring expertise to nuture it. In Hungary areas suitable for rape seed really only amount to 240 thousand hectares. In 2006 a record 232 thousand hectares were sown and this was one and a half times more than in 2005. If agrometeorological aspects are also taken into account, only 150 thousand hectares are prime rape seed growing areas.

In the future the demand for rape seed is expected to continue to grow. This is because the number of European biodiesel facilities is also increasing and their demand for raw material has to be met. Processing plants in Hungary and abroad are keenly interested in Hungarian rape seed. In fact, Hungarian rape seed has always enjoyed a market, though the purchase price has been volatile.

Due to the great interest in rape seed, **even doubling the sowing area would not entail a major commerical risk,** but crop rotation and climatic factors only allow a limited growth in area. Moreover, devoting more crop land to oil seed plants would only be to the detriment of grains.

In Hungary rape seed processing is currently insignicant. This is because Bunge Zrt, the dominant player in vegetable oil production, dismantled its operation and moved it abroad. Hungary's current annual diesel consumption is approximately 2.5 million tonnes, which by 2010 will grow to 2.8 million tonnes. In 2010 anticipated domestic biodiesel demand will be about **183 thousand tonnes**. To produce this volume, approximately **555 thousand tonnes of rape seed** will have to be processed. Under average weather conditions, the total annual rape seed yield of 240-250 thousand tonnes could produce 80 thousand tonnes of biodiesel. This quantity would only allow a 2.5% blending rate to total energy content. Even if one processed the total Hungarian rape seed yield and sunflower seed surplus, it would still be impossible to meet the blending rate of 5.75% to total energy content.

It would be possible to expand rape seed production by **increasing the average yield**, but to accomplish this proper agrotechnology needs to be applied. Based on a minimum yield of 3t/ha[7], the 150 thousand hectares optimal for rape seed could produce 450 thousand tonnes of rape seed. These 450 thousand rape seed tonnes plus the 400 thousand sunflower seed tonnes left after domestic use could yield **255 thousand tonnes of biodiesel** . This means that approximately 60% of projected biodiesel production capacity(410 thousand tonnes) could be satisfied by domestic raw material.

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[7]   The average rape seed yield of 3 t/ha has not been reached yet, despite the fact that on the basis of the results of the experiments of OMMI (National Institute for Agricultural Quality Control - NIAQC) the types and hybrids of rape seed recognised by the government are potentially able to provide much higher yields.

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Results of a questionnaire survey of Hungarian organic farms

Sándor Kis[1]

Abstract

Carried out in 2006, this study presents the results of a questionnaire survey covering 110 organic farms. For these farms the study shows the production structure, the parameters governing the conversion from conventional production to organic farming, and the factors motivating this conversion. Among aspects surveyed are changes in cost-output/sales price and respondents' opinions regarding selling organic products. Also discussed are respondents' subsequent success stories. Included in this paper are farmers' future expectations relating to demand and prices. The results obtained are contrasted with those published in domestic and international professional literature.

Keywords

organic farming, willingness to change, questionnaire survey, analysis, Hungary

Introduction

In Hungary and all over the world the amount of area devoted to organic farming and the number of farms producing organic products are continually increasing. Internationally the size of organic production areas is superior to 51 million ha. In the year 2004, organic production was carried out on 167,000 European farms on an area of 6.5 million ha. Of this total 5.8 million ha and 140,000 farms were in the European Union. The share of agricultural land devoted to organic production amounts to 34%. In Italy one finds the largest organic production area and the most organic producers (Willer – Yussefi, 2006) In Hungary since the 1980s organic farming has experienced continual growth. Based on 2005 data collected by Hungária Kht., the area devoted to organic farming was 122,615 ha and there were 1,353 organic Hungarian organic enterprises. This occurred after a slight decrease compared to the previous year. Organic farming means farming without the use of synthetic fertilizers and synthetic plant protecting chemicals. Organic farming is based on biological cycles, organic manuring, and biological plant protection (Radics, 2001) Organic agriculture entails a production method based on a harmonious relationship among soil, plants and human beings with the main purpose of sustaining a natural cycle. Of course these practices are coupled with the need for food production. Rather than always striving for the highest possible yield, it means a conscious effort to produce healthy foods of high biological value using the most environmentally friendly methods possible. In Anglophone countries end products produced in this way are designated as organic products while in several European countries they are termed biological products. Elsewhere they are referred to as alternative products (Kissné, Bársony, 2000) Among organic farming's fundamental principles are soil protection and environmental protection. This involves utilizing plants' natural capacities, and those of animals and of those capacities particular to given regions. Maintaining environmental quality is a must. In organic farming artificial supplementary materials are applied at minimum rates only, and one forgoes the use of synthetic fertilizers, plant protecting chemicals and pharmaceutical products. The aim of organic farming is in accordance with the national Program for Agro-Environmental protection (NAKP). It endeavours to promote agricultural practices based on sustainable use of natural resources, preservation of natural values, biodiversity

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and also regional values. Also present in this programme is the production of healthy commodities. NAKP measures relating to agro-environmental protection were advertised in the form of target programs, and included in this was a target program for organic farming. The greatest interest was in target programs for organic farming and grass utilization. Regarding applications for the year 2002, this statement held true for both the applied area (27 and 35%) and the number of applications (20 and 33%). As for farmers interested in organic farming, those farming areas already converted to organic farming represented more applications than those seeking support to change to organic farming (Szabó et al, 2000) Other than the NAKP program, the National Program for Regional Development also deals with organic production matters. The National Program for Regional Development supports propagation of environmentally friendly production methods and improving rural employment and income. It also endeavours to improve production structure related to given land sites, and promote environmentally conscious farming and sustainable land use. Its other organizational aims are environmental improvement and reduction of agriculture's environmental impact. Several authors and publications deal with the subject of organic production, but for more extensive farming surveys less information is available.

AT Szent István University environmental research was carried out regarding the use of plant protecting chemicals in Hungary. This research project's official numbers were T042503 and GAK ALAP 00138/2004 and fell under the auspices of the National Foundation for Science and Research. The research projects dealt with applying economic methods to measure the viability of reducing the inherent risk of using plant protecting chemicals in Hungary and with programs for optimizing herbicide use in terms of the environment. The economic effects of reduced chemical use were examined and in the summer of 2006 a questionnaire was compiled to gather as much information as possible on the natural and financial aspects regarding organic farms' economic management and on the subject of production conditions. This study presents the general results of the questionnaire survey. Results of each topic surveyed are separately compared with the professional data from other pertinent literature and perceivable differences are evaluated.

Methods and materials

The database for the research was gathered from data from a nation-wide questionnaire inquiry carried out in 2006. From the list of addresses available, 110 farms were selected by means of random sampling in hope of ensuring area and regional representation.

The questionnaire comprises several topics, and comprehensively investigates the transition from conventional farming to organic production. Other topics are the factors prompting conversion and the effects of output changes. Also covered are cost and prices relating to the change over. Data are gathered on farm resources, sales possibilities and farmers' future expectations. The second, large unit of the questionnaire – still a work in progress – contains data on output, cost and sales revenue according to different branches or farming. Data are evaluated using simple mathematical/statistical methods, which were completed using Excel and SPSS programs. The results obtained were compared with data in the domestic and international professional literature.

Results

Distribution of farms in terms of area location

From investigating the area distribution in the studied organic farms it can be stated and also statistically proved (the values of the Chi^2 test statistics relating to 7 statistical regions both in county and regional examinations were higher than the critical value at a confidence level of 95%) that the area location distribution of organic farms is uneven. For example, even when viewed on a regional level, differences between area units are apparent. 24% of the farms are found in the Great Plain southern region, 31% in the Great Plain northern region, 12% in the North Hungarian region, 5% in the Central Hungarian Region, 13% in the southern Transdubian region, 10% in the Transdubian northern region and 5% in the western Transdubian region. In the two Great Plain regions, the number of organic farms surpasses the average, and 55% of the farms under study are located here. The percentage of organic farms operating in the Transdanubian (28%) and Central Hungarian (5%) regions is lower than the average.

Production structure

Data were requested on the type of production practiced on the farms regardless if they were only organic, or both conventional and organic. On the studied farms 76 practiced only organic production and on the remaining 34 both organic production and conventional production were practiced. *Of the 110 farms, on 66 farms (60% of those studied) only crop production was practiced while 34 farms (31%) raised crops and kept animals* (Table 1). However, the rate of processing and integrating activity was low.

Table 1

Distribution of the directions of production

Denomination		Number of farms	Percentage of farms
Crop production		66	60%
Crop production and animal husbandry		34	31%
Bee keeping	Possessing area	4	4%
	Without area	2	2%
	Total	6	5%
Processing		2	2%
Animal husbandry- fishery		1	1%
Integrator		1	1%
Total		110	100%

Source: on the basis of own survey

Research on the Conversion Process

While looking into the motivation behind conversion from conventional production to organic farming, Rigby-Caceres (2001) established two separate groups, and the study distinguished between those who voluntarily converted for personal and environmental/ethical motives and farmers drawn by attractive prices. Factors leading to conversion were fur-

ther detailed by Padel (2005) who explored the personal, economic, and external factors behind conversion. British research (ADAS, 2003) revealed that on crop farms lucrative prices and other economic motivations do not fully explain the reasons behind conversion since a 10% reduction in organic prices could significantly reduce surplus profit, thus showing that economic reasons alone don't lead to conversion. Nevertheless, their surveys indicated that 55% of converted farmers did so because of the higher sale prices. According to an earlier 2002-2003 Szent István University survey, 23% of organic farmers converted for economic reasons, 22% for ethical reasons, and 55% converted for both reasons (Csótó-Triczka, 2003).

Respondents were able to choose from a list of motivating factors and were able to select from among several categories. On average a respondent marked 2-3 categories Category frequency is shown in Table 2.

Table 2

Reasons for conversion

Reason	Number of mentioning individuals (capita)	Percentage
Personal conviction	67	61%
Environmental concern	58	53%
Production of healthy food	54	49%
Higher sales price	51	46%
Negative factors in relation to chemicals	46	42%
Higher support	33	30%
Less hectic market	9	8%

Source: own survey

The majority of the respondents initiated organic farming out of personal conviction and out of concern for safe production and environmental protection. When contrasted with the earlier research results, the rate for economic motivation factors was lower. Also the opportunity for higher sales prices and higher subsidies were selected on fewer occasions. 51 survey respondents selected higher sales prices as the chief factor behind their decision to convert, and 33 respondents mentioned greater subsidies. Still on the economic question, farmers were asked if prior to conversion they had calculated the economic ramifications of conversion and come up with a subsequent financial plan. .Surprisingly 62 farmers or 56% of the respondents had not made such calculations. Another question concerned the precise time when organic farming practices were implemented. Usually the answer was at the beginning of the conversion process, but . in some cases actual organic farming preceded the introduction of the formal rules governing organic farming. Fig. 1 shows the conversion process dynamics on the studied farms. Until 1990 only 5 farms had begun organic production, then between 1991 and 1995 there were 8 more farms and between 1996 and 2000 the number shot up to 38. After the year 2000, a further 59 farms converted to organic production. Thus, the conversion wave started in 1995/1996 (Figure 1).

Figure 1

Temporal distribution of the number of farms undertaking organic production (without accumulation)
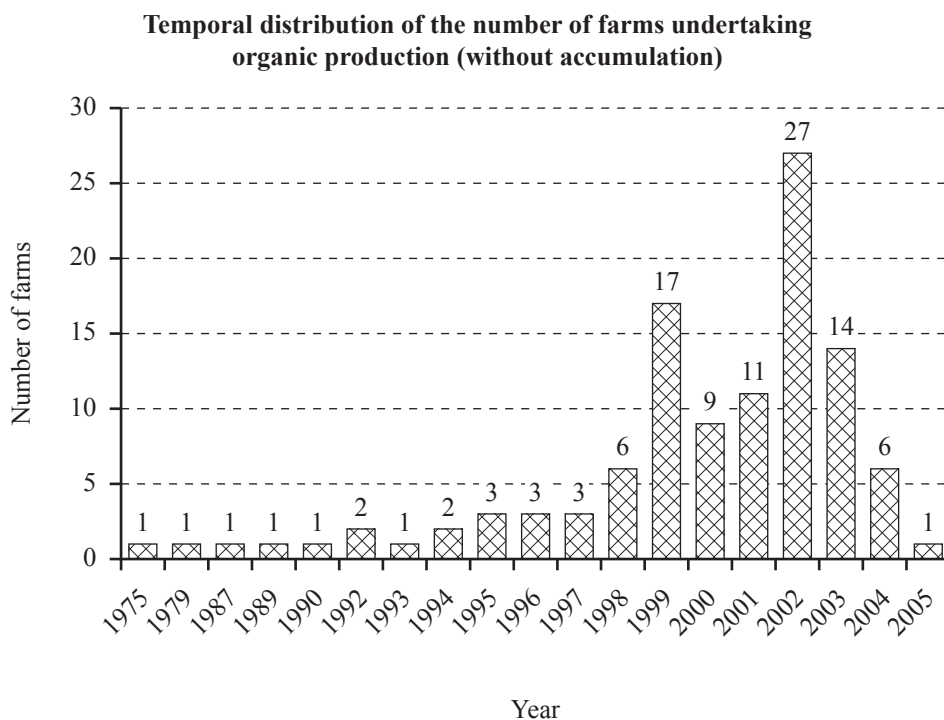
Source: on the basis of own survey

In 1999 the dynamics of conversion accelerated. Backing this trend were a larger market and more subsidies.

Examination into land size and branch of cultivation

Of the 110 farms studied, most were farming on a land area of 10,035 ha, but one farm had a noteworthy additional 4,000 ha because it contained a fish pond. Table 3 categorizes farms in terms of size. From the table it can be seen that the majority of the farmers had very small land areas In fact, one third of the farms produced on areas smaller than 5 ha.

Most farms possessed plough land and grassy areas. If one leaves out the plough land, little of the remainng land was in orchards, gardens, and forest areas (Table 4).

Table 3

Classification of the farms according to size categories

Size category	Number of farms	Cumulative number of farms	Cumulative percentage of farms
< 1 ha	13	13	13%
1.01-2 ha	8	21	20%
2.02-5 ha	12	33	32%
5.01 - 10 ha	9	42	41%
10.01 - 15 ha	7	49	48%
15.01 - 20 ha	8	57	55%
20.01 - 30 ha	8	65	63%
30.01 - 40 ha	6	71	69%
40.01 - 50 ha	6	77	75%
50.01 - 60 ha	3	80	78%
60.01 - 70 ha	3	83	81%
70.01 - 80 ha	3	86	83%
80.01 - 90 ha	2	88	85%
90.01 - 100 ha	2	90	87%
100.01 - 200 ha	7	97	94%
201.01 - 1000 ha	4	101	98%
1000.01 - 2000 ha	1	102	99%
> 2000 ha	1	103	100%

Source: own survey

Table 4

Distribution of the area of the farms under examination
**(according to branches of cultivation)**

Branch of cultivation	Total area (ha)	Number of farmers	Average land size (ha)
Plough land	4,071.28	67	60.76
Fish pond	4,000.00	1	4,000.00
Grassland	1,780.06	33	53.94
Orchard	112.29	12	9.36
Garden	60.43	24	2.52
Vine-yard	8.90	5	1.78
Forest	2.30	2	1.15

Source: own survey

The actual land use distribution was distorted by the size of the fish pond. With the exception of this noteworthy data, analysis reveals that plough land represented a significant proportion (Figure 2). Minus the fish pond, average land size amounted to 59 ha (including the fish pond it amounted to 97 ha).

Figure 2

Distribution on the branches of cultivation (without the fish pond)

Plough land
67.46%

Forest
0.04%

Vine-yard
0.15%

Garden
1.00%

Orchard
1.86%

Grassland
29.49%
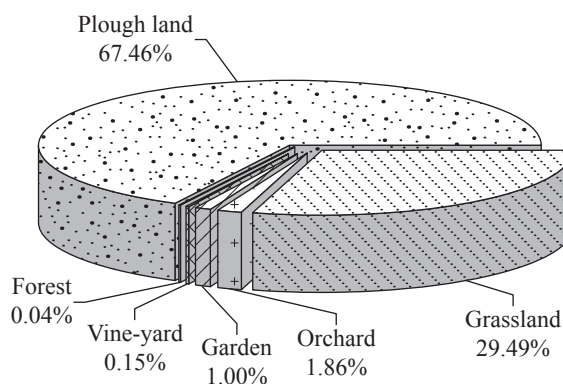
Source: on the basis of own survey

In comparing these data with those published in the 2005 Biokontroll Hungária Kht. report (Roszík et al, 2006), it can be stated that 40.2% of the surveyed areas consisted of plough land, meadow and the share of land devoted to grazing was higher (53.4%) when contrasted with the respective values existing in the sample. (67.46% and 29.49%). In the year 2004, the share of plough land in the area monitored by Biokontroll Hungária Kht. was 48.33% (Roszik et al, 2005), but the share of meadow and grazing land was only 46.36%.

Since beginning organic farming, respondents were asked if any change had occurred in the size of the utilized areas. 21% of the studied farms changed the area size, 16% of them brazenly opting for an increase, and 2% opting for reduction. The percentage of farms where area size varied between increase and decrease was a mere 3%.

Of the 110 questioned, 103 farm operators were operating on their own private land, and 7 farms did not own their own land because the nature of their operation (bee-keeping, processors, integrators) did not require it. 60% of the producers were farming their own land and 30% were operating on both their own land and on leased land. Only a small proportion of the farms (5%) were operating exclusively on leased land. In three cases, land area was leased from family members, and 2 organic farms were operating on government land.

Research on the land area locations not only dealt with the size of the land area, but also with the perceived quality of the land. Respondents were asked to categorize their area in terms of whether they considered it as of good, medium, or bad. Subsequently, respondents were asked to evaluate their land using an objective yardstick, meaning golden crown (GC) measurement. Respondents were asked to provide information about the golden crown values regarding the best and worst parts of their location and about their area's average golden crown value. Golden crown value is an index that indicates land quality. Participants were

more than willing to categorize their land as bad, medium, or good but significantly fewer were willing to assign objective golden crown values to their land.

55% of the respondents regarded their land area as of medium quality, while 26% felt it was good and 19% as bad. One half of the respondents revealed their land quality in terms of golden crown. The worst location had a value of 0.7 GC and the best one a value of 47 GC/ha. The sample *average was 21.3 GC which is better than the national average (19.8 GC/ha).* 62% of the farmers produced on an area having 15-30 GC/ha, and 15% of the locations could be considered as good quality (above 30 GC/ha) and 15% of very poor quality (below 10 GC/ha).

Labour force – rate of employment

In the study two questions dealt with manpower and human resources. One question dealt with the number of employees and the number of seasonal workers. The other question dealt with family members working on the farm, which is often the case with small-scale operations. Surprisingly on *75 farms there were no employees, and when a need for labour occurred day-workers were hired.* Table 5 shows a distribution of the farms in terms of employees.

Table 5

Distribution of the farms on the basis of the number of employees

Number of employees	Number of farms
Less than 5 capita	22
5-10 capita	5
11-25 capita	2
26-40 capita	1
41-100 capita	1
101-200 capita	3
More than 200 capita	1

Source: own survey

If a farm did have employees, there were generally fewer than 5 per capita. 63% of farms with employees belonged to this group. There were 13 farms that had only one employee. Of these 13 farms, on six of them the employee was a family member. 5 farms employed 2 workers, 1 farm 3, and on 3 farms had 4 workers each On these farms all employees were family members. On farms with more than 4 employees only one had an employee that was a family member, and on the remainder employees were not family members. One can conclude that small-scale farms tend to employ family members. 18 farms tended to hire seasonal workers, and generally only 1-5 per capita.

The extent of farm mechanization

The questionnaire yielded data on the extent of mechanization and the amount of machinery on the farms. Mechanized equipment was divided into 4 groups based on its capacity, and respondents could select from a variety of farm implements and on the list. 26 farms (24% of the farms included in the study) lacked mechanized equipment. When work

arose requiring mechanized equipment, these farms contracted the job out on a commission basis. A significant portion of the farmers had mechanized equipment (Table 6). The majority of the farms (57%) had facilities for mechanized equipment.

Table 6

Examination into the degree of supply with machines

Denomination	Number of farms	Percentage of farms
Farm having neither power- nor working machines	26	24%
Farm having power- and also working machines	63	57%
Farm possessing only working machine	19	17%
Farm possessing only power machine	2	2%

Source: own survey

Changes in production during the conversion process

Respondents were asked whether they produced the same products as prior to conversion to organic farming. The purpose of this question was to determine if the producer possessed a basis for comparison regarding the two production methods. Only responses given by producers were taken into account since processors and integrators are not fully informed on the subject. 76% of the respondents had already produced the same goods as those produced with organic farming. The remainder (24%) however, were new to organic farming and had never before produced the same goods. It was also determined whether previous to officially converting to organic operations farmers had been using artifical materials or had already been using natural materials in plant production. Information was sought on whether different chemicals (fertilizers, plant protecting chemicals, yield-increasing agents) had been used in conventional production previous to conversion and whether organic manure had been applied as a nutrient additive.

56% of the respondents used fertilizers, 61% plant protecting chemicals, 54% applied both chemicals before starting organic production. Yield increasing additives were used by 15%, and other materials by 4%. It is noteworthy that even during conventional production 56% of the respondents manured their land areas. Before converting to organic farming 37% of the respondents did not use either chemicals, fertilizer, plant protecting materials or other yield increasing additives. Later respondents were asked how and what they used in place of artificial chemicals. Several questions were posed regarding changes in production technology. One of the questions dealt with the type of equipment organic farmers used to control weeds, and how much they used them. In 96 of 110 farms, some kind of plant protecting procedures was applied. More often than not respondents selected mechanical (75%) and agrotechnical (57%) methods Physical protection and authorized chemicals were used by 50-52% of theose questioned, and biological plant protection by 41% of the respondents.

Figure 3 indicates provides a proportional breakdown of plant protection methods by a "hypothetical average farm".

Figure 3

Average proportion of plant protecting methods
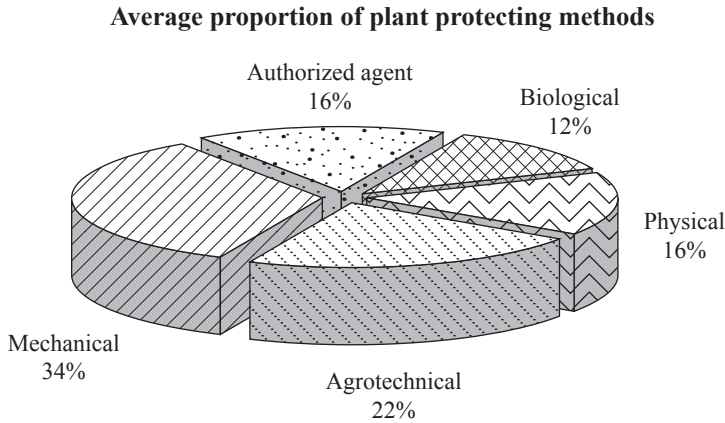
Source: own survey

According to the average value, the most frequent and the major method was mechanical plant protection, followed by agrotechnical methods. Both authorized chemicals and physical plant protection had a share of 16%. Biological plant protection was used the least.

In terms of weed control, respondents had to choose among 6 categories, and 97 valid answers were given. For weed control methods 79% of the respondents marked mechanical, then came manual at 68% and then agromechanics at 48%. Biological was selected by 14% and chemical use by 16%. Physical weed control was mentioned by 26% of those questioned. Foremost among weed control methods were soil cultivation, mechanical weed control (inter row cultivator, weed-comb, mowing) and in some locations manual labour.

On a "hypothetical" average farm the weed control response averages would be the following: mechanical (39%), manual (28%). These were followed in order of magnitude by agrotechnical control, biological methods and spraying with authorized chemicals (Figure 4).

Figure 4

Average frequency of the elements, applied in weed control

Source: Own survey

134
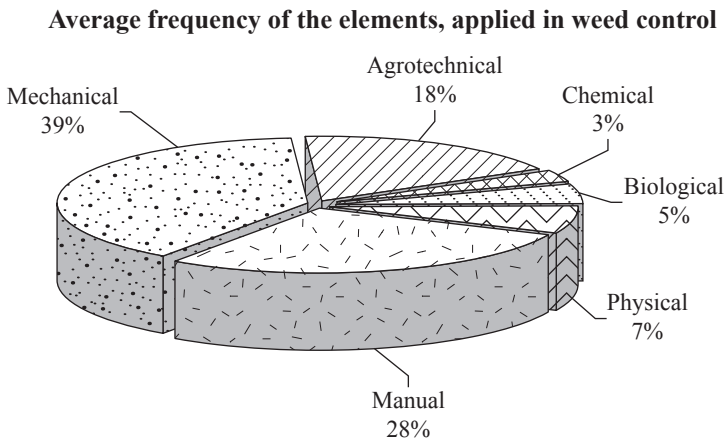
For nutrient supply there were 93 valid responses. Respondents were questioned about their nutrient supply methods and the proportions applied by the given farm. The most common nutrient supply element was organic manuring, which was mentioned by 77% of the respondents. 55% mentioned ploughing in green manure crops. Mulch and compost were used by 22-27%, and 23% applied other materials such as bacterial manure, sandstone powder and other minerals. From the above data it was determined what proportion of materials an average farm used for nutrient supply (Figure 5).

Figure 5

Average of the results of nutrient supply
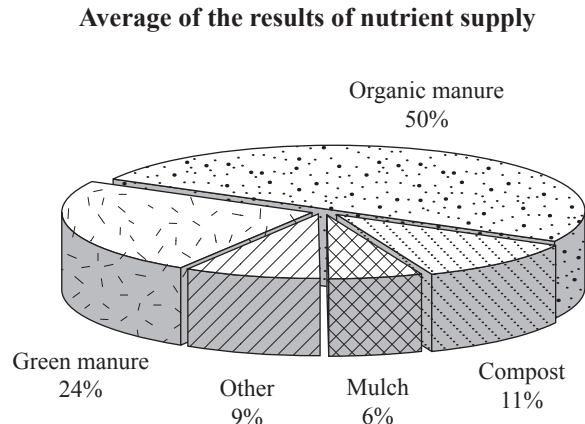
Source: own survey

Cost analysis

To provide an economic comparison regarding the technologies applied for conventional and organic production, respondents were asked about the actual cost changes they had undergone. A question dealt with the change in 3 main categories (machine cost, cost of labour, material cost) and also with other categories, which were sometimes brought up by respondents. Of the 110 organic farms, 98 reported cost increases in some of the above categories. 12 farms did not respond to this question. It was impossible to establish whether the lack of response was due to unwillingness to answer or whether there had in fact been no cost increases.

45% of those questioned mentioned labour cost increases and another 27% mentioned machinery cost increases. Both of the previous cost categories were related to abandoning chemical use because mechanical cultivation and labour costs subsequently increase for weed control. Increased labour costs also extended to other agricultural branches that require a lot of manual labour such as horticulture, fruit and vegetable production. 22% of those questioned experienced an increase in material costs and 6% mentioned an increase in other costs. For other costs most of those surveyed stipulated supervision and certification fees, delivery costs and membership dues.

Still on the topic of costs, participants were urged to mark the principal cost categories in their operations and assign these principal cost categories a numerical share in total operations.

After viewing the average of the obtained responses, a "typical" farm's cost structure in relation to the survey's average values was able to be determined (Figure 6). The highest cost item was associated with operating machinery amounting to 29% of total cost. The cost of seed and propagating material was also significant as well as wages for seasonal and permanent workers. There were also other expenses.

Crop protection costs and nutrient supply amounted to 8-9% of overall costs and were inferior to the 20-25% incurred in conventional production.

Figure 6

The average cost structure
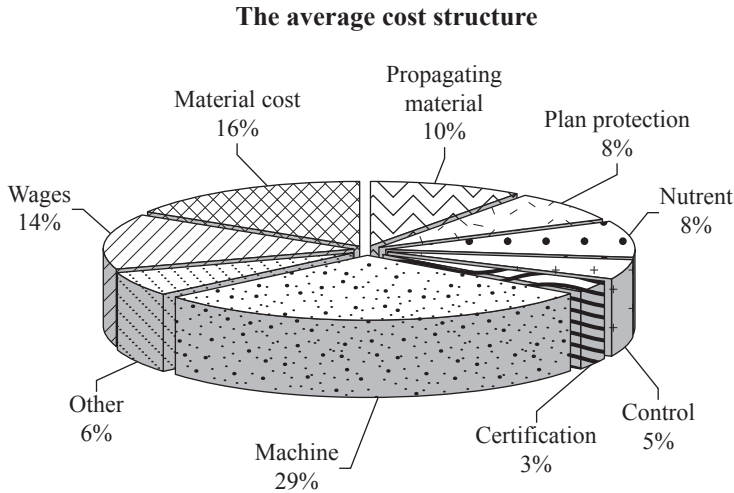
Source: author's own survey

The results obtained mesh with those published in the domestic and international professional literature. The greatest costs incurred in organic production came from wages and related payments, and underlying expenditures such as costs linked to weed control, be they manual or mechanical. Within related costs tractor operation and maintenance represented the greatest expenditure (Radics, 2002:575). According to Offermann-Nieberg's (2000) research, variable costs on organic farms are generally only 60-70% of those on conventional farms. It has been asserted that organic farming fixed costs are almost 45% higher. On average organic production costs amount to 80-100% of those on conventional farms. According to Szente (2005) organic production's cost-level has increased in recent years. However, compared to conventional production, those converting to organic farming don't need to make major investments.

Danish research into the cost structure of crop production on organic farms has stated that the cost of soil cultivation, machine and wages for manual labour involved in seeding amounts to 20-40% of the total cost. Among total expenditures per ha, 22-58% involves depreciation and interest payments. 12-46% of the total cost is related to paying workers a commission work (Jacobsen et al, 2005)

Through cost analysis one sees that costs entailed in converting to organic farming were related to a change in cost strucutre rather than to the extent of production. Undoubtedly organic farmers save money on the cost of protective chemicals and of spreading fertilizers,

however, they have to spend more money on soil cultivation, organic manuring, plant protecting procedures and labour. To a degree the latter expensives offset the savings inherent in organic farming.

Evaluating output changes

Survey participants who had converted to organic farming were asked about output changes. Respondents had 9 categories to choose from, and for the output changes questions 96 valid responses were obtained. Table 7 contains the distribution of the answers.

Table 7

Judgement of the change in output

Denomination	Number of respondents (capita)	Percentage of the respondents
Unchanged output, deviation max +/- 10%	43	44.79%
Output reduction between 10-15%	22	22.92%
Output reduction above 15%	29	30.21%
Output increase above 15%	1	1.04%
Output increase between 10-15%	1	1.04%
Total	96	100.00%

Source: own survey

Generally, respondents did not specify an increase in output as stagnant and decreasing yields were the norm. According to 45% of the respondents, output divergence fluctuated within a band of +/-10% as compared to conventional production. A further 53% of those questioned experienced an output decrease of greater than 10%. In two cases, a respondent reported an output decrease of 30-35%. In the table these two responses are included among output decreases above 15%. Two respondents indicated an increase in output of above 10%.

According to Offermann - Nieberg (2000) organic farming outputs are generally lower compared to conventional production, although results vary significantly depending on the operation.. Their research showed that vegetable and animal product output approach those on conventional farms. Grasslands and cereals reached 70-100% and 60-70% respectively of the conventional farm results.

Between 1993 and 2001, British researchers examined the average organic crop yield of several crops and compared them with results achieved by conventional production. Over eight years the average potato yield was 43% lower than the conventional average. During the same time period the average organic winter wheat yield was 20% lower (Cormack, 2002).

Sales prices

During conversion from conventional production to organic farming, it is possible to sell products at a top price (premium). This economic fact was behind the changeover on several farms.

The price of designated organic products is generally higher than the usual market price. The actual price varies according to countries and markets (Radics, 2002:569). According to KSH data (Central Statistical Office) in 2002 there were significant average price differences between conventional and organic products (Table 8). In fact, for some product ranges one could make double the conventional average price. However, regarding higher prices for organic products, it should be noted that these prices are decreasing from year to to year and sales price trends differ for markets and regions. When creating a model for the Hungarian situation to illustrate the relationship between sales price and market saturation, Takács and Takácsné György (2002), Takács (2006) stated that the the growing number of new entrants may drastically decrease the income from organic production by reducing the attainable market premium – equilibrium price.

Table 8

Comparison of average price of conventional products with that of organic products

Denomination	Average price of organic products (Ft/kg)	Average price of conventional products (Ft/kg)	Average premium (%)
Winter wheat	45.0	23.1	94.8
Winter barley	26.5	25.5	3.9
Spring barley	37.0	27.3	35.5
Maize	34.0	20.1	69.1
Sunflower	80.0	73.0	9.6
Rape	71.5	50.9	40.2
Green peas	71.5	51.3	39.4

Source: KSH; 2004:18.

Between 2001 and 2003, an Austrian survey researched differences between the price of conventional products and that of organic products. The survey stated that prices significantly diverged according to products. For potatoes, fresh fruits, milk, dairy products the difference amounted to 45-55%, 18-37%, 10-14% and 0.8-10%, respectively and it is noteworthy that in the case of fresh vegetables, the difference came to -6.4-13.4%. Therefore, in some cases, the organic product was cheaper than the conventional. (Schantl, 2004)

Of 100 respondents, 69 managed to obtain higher sales prices than with conventional products. However, the remaining 41 respondents (37% of those questioned) were unable to get a top price, demonstrating the previously predicted price decline. Farmers were asked to indicate the rate of the obtained/obtainable top price. Table 9 shows the distribution of the answers.

21% of those interviewed accepted the price offered by the merchant based on the apparent relation to market price. Only 5% of the respondents made decisions based on the sales price alone. The decision was not influenced by merchants' offers or other factors. 60% of the interviewees could numerically define the order of magnitude of the premium and 14% of the respondents were able to obtain a top price of 30% or even higher. The order of magnitude of the potential top price fluctuated within a wide band according to products and markets, but on the whole it was lower than that mentioned in the professional literature.

According to 71% of the respondents, there was no such product/good with which a spectacularly high top price could be reached, but the remainder (29%) felt that for some products the top rate was extreme. Such products were e.g. potato, spelt (German wheat), oil-pumpkin, sunflower and plant-germs. 14 interviewees felt that even very low top price values could be achieved e.g. for maize, alfalfa, green peas and cereals, and even spelt, which runs contrary the previous statement.

Table 9

Distribution of the premium obtained according to categories

Rate of premium	Number of respondents (capita)	Percentage (%)
0%	4	4%
0-5%	13	12%
5-10%	12	11%
10-15%	11	10%
15-20%	10	9%
20-25%	4	4%
25-30%	1	1%
Above 30%	15	14%
According to the offer of the merchant	23	21%
Own decision on price	5	5%
Did not answer	12	11%

Source: own collection

Examination into the sales processes

In the questionnaire several questions were included to garner information on sales practices, market possibilities and future expectations. 54 of the farmers, or nearly one half of the interviewees sold all of their products. 40% of the respondents marketed only a part of their yield, keeping the rest for their own consumption for alimentary or feeding purposes. For market reasons farmers were sometimes unable to sell the total yield. However, 11 farms, or 10% of the sample, sold nothing as all products were used for internal consumption. Unfortunately, several farmers indicated that they were unable to sell any of their products, not even as conventional products. 2 interviewees didn't sell their crops, but utilized these products for farm animals. Animals or products of animal origin were brought to the market.

For sales channels respondents were asked to mark those types that applied to their farms. Respondents were able to select among several sales channel choices. Table 10 shows the distribution of the answers.

Table 10

Distribution of the sales channels applied

Mode of sale	Percentage
Sales contract	67%
Sales from house/farm	39%
Sales on organic market	15%
Sales is organic (bio)shops	9%
Sales through cooperatives (TÉSZ)	6%
Sales in own shop	4%

Source: own survey

The most frequent forms of sales were contractual sales and sales made directly from the home. The relationship between the farm-size and sales channels was separately investigated and it became clear that only 15% of farms smaller than 1 ha possessed sales contracts. In the case of larger farms this form of sales was overwhelming, and almost all of the large-scale farms had sales contracts. A clear majority of farms on a land area of less than 1 ha sold directly from their farm location (77%). This mode of sales decreased with the increase in productive area, and ceased altogether for farms above 200 ha in size.

According to Frühwald (2003) in Hungary selling directly from one's farm location is a typical practice offering the advantage of maintaing personal contacts, product identity and fewer logistic problems. However, it seems disadvantageous as the farmer does not take into account certain associated expenses. This means that the farmer doesn't have a clear picture of his/her financial situation (I.e. gross income interest). The author of this paper contends that the key markets for organic products are organic shops, supermarkets, but this is still in its initial stage. This is slightly inconsistent with Szente's findings (2005:96-97), according to which 41.4% of the organic products were purchased at markets, 40.7% at supermarkets, 39.4% in organic shops and only 6.6% were purchased from producers, and one could go on to cite more statistics. Results obtained by the author of this study back Frühwald's statements that after sales contracts, the most frequent mode of sales is selling from the farm/house. The proportion of sales in organic markets and organic shops (bio-shops) is lower (Table 10).

Sales price is unequivocally determined by the sales channel chosen by the farm. If the producer sells his/her goods to a merchant or middleman, then the producer must accept the fact that the price will be lower than that obtainable by selling directly to the consumer. With that in mind this study researched the proportion of farms capable of obtaining a top price in terms of the given sales channels. The result showed that farmers can get the top price at organic markets (88% of those who appear on the market). This proportion is also high (83%) for those selling through producer and retail cooperatives. Surprisingly, the proportion of those selling from their own farm location was the lowest (50%). 61% of those selling directly from their farm location and 67% of farms possessing sales contracts were able to fetch the top price.

In terms of sales channels, it was shown that in countries where supermarkets are less prominent in marketing organic products, it was easier for producers to obtain an even higher top price. In these countries, the growth rate in consumption is higher. However, although at

supermarkets the top price may be lower for organic products, these products are nonetheless exposed to a wider array of consumers (Schmid – Richter, 2000).

Therefore, displaying organic products at shopping centres could presumably bring about an increase in consumption thanks to greater exposure, but at the same time price reduction should be taken into consideration. Widespread exposure of organic products at supermarkets may have two consequences; on the one hand, market peneratration and stabilization, and on the other hand reduction in the top price obtainable by the producer.

Of the 105 respondents, 53 (50.5%) were having to cope with sales problems. Among the farms under study, 24% sold only in small lots, 39% only in large lots, and 38% both in small and in large lots. 79% of the respondents possessed their own clientele. 77% of those selling in small lots had their own clientele. This also held true for 68% of those selling in small and large lots and 90% of those selling only in large lots. 60% of the farms continually delivered goods to market while the remainder of the farms only periodically/seasonally brought products to market. Of those who possessed an established clientele, 47% had sales problems. For farms without a private clientele it came to 57%.

58% of those selling in small lots said they had sales problems. This was also true for 49% of those selling in small and large lots and 43% of those selling in large lots. Thus, it was mainly farmers who couldn't transport a large amount of product to marker who were having sales problems. When one related sales problems to farm size, it was expected that small-scale farms would experience more sales problems. However, this expectation did not prove correct as sales problems cropped up regardless of farm size. It was impossible to discern a correlation between sales problems and farm size as sales problems were present in every category.

Sales potential were influenced by whether the given farms were officially certified. Of the farms studied 64 had official certification from the Hungarian supervisory organization. A further 36 farms were certified both from the Hungarian and foreign supervisory organizations and 2 farms had only foreign certification. 7 farms were not certified at all. One of these had no intention of seeking certification in the near future and the other 6 farmers never planned to become certified. Regarding certifcation and supervision, the current author was curious as to the extent certification was held necessary by the farmers. 75% of the respondents thought that without certifcation organic products could not be sold. According to another 12%, organic products could be sold but not at the top price. 11% felt that certification did not indicate quality and therefore it was possible to sell a product without certification.

According to Kürthy's 1997 research, turnover of organic products could be increased through price reductions, increasing sales channels, and displaying organic products more often at super and hypermarkets. One should strive for the widest possible domestic market.

43% of the interviewees stated that Hungarian accession to the European Union has had no effect on organic production. Another 39% stated that EU accession has provided greater market opportunities and simultaneously increased competition. Yet another 16% believed that Hungary's joining the European Union has bolstered market opportunities. Only 2% considered EU accession as negative. As for post-accession price tendencies, Hajmási (2003) stated over the long run there would be price differences between Hungarian and the EU countries, but that agrarian prices would be increasingly calculable. Orbánné's

2002/2003 research stated that during the last decade internal EU prices did not converge (except for a few products) and for this reason one shouldn't expect Hungarian prices to converge with a hypothetical EU unit price. In her view, factors inducing price changes are only indirectly linked to accession, and in some cases they are not at all linked to accession.

Evaluating subsidies

In the case of conventional field crop production, farmers can apply for support on the basis of area (Single Area Payment Scheme) and they can also apply for national "top-up" support. In 2005 a farmer could obtain a total subsidy of 38,046 HUF/ha (A 2005. évi területalapú…). *Organic producers can take part in a target program for organic field crop production, as a surplus subsidy*. During the conversion period they can ask for 44,150 HUF/ha, and after conversion they can seek a 31,395 HUF/ha subsidy. This subsidy was available for farmers who weren't using chemicals. In total a farm in the midst of converting to organic practices can obtain support amounting to 82,169 HUF/ha, and after conversion 69,441 HUF/ha (FVM, 2005).

13 of the studied farms did not meet the minimum size for subsidy payments. Most of the interviewees did not receive conversion subsidies. However, most of the interviewees (72% of the farms) operating on locations meeting the minimum size requirements received subsidy payments. 26% of the subsidized respondents received payments associated with organic production only, and 11% of them were getting subsidies based on area only and/or received national supplementary subsidies. 60% received both organic support and payments on an area basis. Two interviewees were aware that they received support, but they could not say where it came from. Of 110 respondents, 70 got some kind of subsidies and only 55 of them could give a rough monetary figure. On average the 55 organic farms received support amounting to 48,091 HUF/ha. The resulting subsidy average amount exceeded those for conventional production. Another 40 respondents (36% of those included in the survey) were not receiving any subsidies.

Efficiency and profitability

At another stage in the survey participants were asked to state if it was possible to obtain higher farm income through organic production than with conventional production. Of the 110 farms under study, on 5 farms there had not previously been conventional production and thus they did not possess a basis for comparison. Another 4 farms failed to answer this question, thus in comparing efficiency 101 valid answers were gathered. *58% of the respondents felt that higher farm income did not result from organic farming*.

The relationship between efficiency and sales prices was separately studied. According to the answers obtained, 69 farms managed to get top prices, and 32 of them (46%) achieved higher efficiency. 41 farms did not manage to get top prices, but at the same time 10 farms (24%) obtained top prices providing a higher income than with conventional production. This was rendered possible because the organic farmer could get higher subsidies and/or the farmer's costs fell below the conventional cost level.

As for the correlation between support and efficiency, it was found that 70 farms received some kind of production subsidy associated with organic production and or/payments based on area. Twenty-six (37%) of the 70 farms indicated that they could achieve better income from organic production than from conventional farming. Of the 26 farms 5 increased efficiency but without getting the top price.

40 farms failed to receive support payments. In this group, 16 farms operating without subsidies achieved higher income than with conventional farming. There were 5 farms which did not receive subsidies but nonetheless managed to increase efficiency. This was perhaps due to cost reduction and/or yield increase or to a change in sowing structure.

Future expectations

After viewing the data, focus turned to the farmers' future plans. Farmers were asked what kind of changes they would initiate in relation to organic production. 109 valid answers were received. In total 83% of interviewees either intended to retain their farms at the present size or wanted to increase size. 17% of them were thinking of reducing or terminating operations. Among those interviewees wishing to terminate operations, it was felt that organic farming did not bring about higher income. It is however noteworthy that of the 5 farmers wishing to terminate their operations, 4 thought that future demand and prices would increase. The fifth respondent believed demand would remain unchanged, but nevertheless the farmer still decided to cease organic farming operations.

89% of those producers wanting to reduce the size of their organic operation considered that income from organic farming did not exceed that of conventional production. 45% of those not wishing to change the size of their organic operation and 46% of those opting to enlarge felt that organic production would certainly provide higher income than conventional agriculture.

28 producers said they would increase the size of organic production. Of the 28 producers, 25 responded to the question about whether organic farming was more profitable than conventional farming. Since conversion higher income was achieved by slightly more than half of the 25 respondents (13 capita) and perhaps this could justify increasing farm size. Presumably, the 12 farms choosing size increase hoped to enhance profits and to reach a minimum (economic) size. All of the 28 farms were confident that future demand would increase. 16 interviewees anticipated demand and price increase. 11 farmers expected demand increase and essentially unchanged prices and there was only one single farm that expected future price reduction to run parallel with demand increase. This runs contrary to the European tendency where until 2005 there was stagnation in the number of organic farms (Járási, 2006).

It was also asked whether the given farm had the intention of enlarging/modifying its activity or alter the proportion of each activity. Respondents could mark defined categories or if none of them proved to suitable, they could present their opinion under a newly created category. 57 of the respondents said they were not planning to initiate any changes in their present production structure. The majority (45%) of those intending to change would change/enlarge their production structure towards production for consumption purposes and some toward processing activity (42%). 26% of the respondents would steer their operation toward animal husbandry and 15% would cultivate various feed crops. 17% of the farms under study would willingly undertake an integrator role.

It should be noted in examining production structure that the given answers do not reflect in all cases the answers regarding size changes in organic production. Several answers referred to the farmer's desire to reduce the size of organic production. However, these same farmers would strengthen their processing activity and integrating role. For this reason data on production structure and change in production cannot be directly compared.

Regarding future changes, interviewees were asked what sort of changes they anticipated in terms of demand and prices. *82% responded that demand would increase and another 11% expected stagnant demand. Only 7% anticipated a decrease in demand. The majority felt that prices would increase, and only a small minority expected price reduction.* (Table 11). Here the optimists were more numerous, but this could be explained by ignorance of market processes.

Table 11

Price- and demand expectations

Expectation	How many % of the respondents did it choose
Increasing demand, decreasing price	3%
Increasing demand, increasing price alike	46%
Increasing demand, insignificantly changing price	33%
Demand is stagnant	11%
Decreasing demand	7%

Source: own survey

The survey also tried to determine whether producers utilized any advisory services. 55% of the farmers did not utilize advisory services, but 17% of those still considered it necessary, while 82% of them neither wished to utilize such a service nor deemed it necessary. 1% left this question unanswered.

Conclusions

The questionnaire survey indicated a late nineties boom in organic farming. Among the factors behind the conversion, most respondents emphasized personal conviction, health, and environmental protection. Of course economic factors weighed heavily in their decision, including top prices and access to subsidies.

On the surveyed farms nearly one-third operated on areas of less than 5 ha in size. As for the different types of farming, plough land and grassland utilization were in the forefront while gardens, vineyards, and forest areas were fewer. Nearly a quarter of the farms did not have mechanized farm equipment. There were few employees and small and medium farms did not hire much labour. On small-scale farms employees were generally family members. Also the opportunity to be self-employed appeared to be a motivating factor behind conversion to organic farming as it also meant access to greater subsidies.

Financially, conversion to organic farming sometimes entailed greater costs. This was true when it came to labour and machinery as organic farming means not using chemicals, and thus causes greater expenditures for weed control and nutrient supply.

 Farm cost data show that most expenditures are for machinery, materials, labour and labour related expenditures. 54% of interviewees felt a change in output of +/-10% could be expected while 53% of the respondents mentioned an output reduction of more than 10%. However, output reduction could be offset by top prcies for organic products. 63% of the farms included in the survey managed to obtain top prices. Top prices vary according to

products and markets. 14% of the respondents were able to obtain a top price of more than 30%. Nevertheless, one now sees a continual erosion in top prices for organic products which potentially could slow or even stop rapid growth in organic production.

46% of the respondents received conversion subsidies and nowadays 72% of those farms exceeding the minimum-size requirement receive basic subsidy payments coupled with national complementary subsidies and/or backing from the organic farming target program. In the sample the average subsidy exceeded 48,000 HUF/ha.

58% of the respondents felt they could not match the profits made in conventional production,, but the remaining farms achieved higher income than that obtained from conventional production.

As for the future, 83% of the farmers said they would either keep the farm size at present level or would enlarge. 17% of the respondents opted for reducing the size of their organic operation or stopping completely. Several farms were willing to enlarge their production structure in order to produce diverse crops and to move into processing. More than 80% of the farmers expected future demand to grow.

On the whole, the results obtained agree with those published in domestic and international literature, although the data reveal large variations. Output changes for participating farms harmonize with the pertinent professional literature data, but for costs and top prices there is a slight difference among the answers. Organic production is not cheaper than conventional production, but one observes an alteration in cost structure and in certain cases a slight increase in cost levels. Most producers are able to get top prices for their products, but the amount generally differs from that, published in the professional literature. Presumably, the reasons for this are price spatial and temporal shifts, expanding production, sharpening competition and market saturation.

One of the preconditions for the development of Hungarian organic farming is growth in domestic consumption. Presently a significant amount of Hungarian organic commodities is exported as raw material. To bolster domestic production processed materials should be exported, and the processing industry should be expanded. Organic products must be on full display and easily accessible by consumers. Also necessary are communication channels linking producers and consumers.

High prices are currently a barrier to people's buying organic products and thus hinder organic production. High sales prices are not necessarily due to more expensive production, but rather to the commercial price differential which is higher than that for conventional products. Organic farming is also hampered because of the lack of information flow between each player in the commercial process and by the lack of a common outlook and forum where the diverse interests are reflected.

Cheap Imports from eastern countries may hinder the competitiveness of Hungarian organic. Another hindering factor is the gradual saturation of the western organic product market.

It is possible to promote Hungarian domestic production through government subsidies, targeted advertising campaigns, and by stressing the need for a healthy lifestyle. Further research is necessary to solve the previously mentioned problems. Such research will reveal the ecological, economic, and social effects of organic production. Also required is sophis-

ticated data gathering at the farm, county, and regional level.. Hungarian organic production needs to develop databases allowing long-term analysis of changes in the field of organic production and also allowing comparitive analysis between conventional and organic production.

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    Harris, S., Swinbank, A. and Wilkinson, G. (1983): **The Food and Farm policies of the European Community.** New York: Wiley.

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