Agricultural Economics Research Institute
Committee for Agricultural Economics, Hungarian Academy of Sciences

STUDIES IN AGRICULTURAL ECONOMICS No. 104

Budapest
2006

Studies in Agricultural Economics No. 104.

The Studies in Agricultural Economics is a scientific journal published by the Hungarian Academy of Sciences and the Agricultural Economics Research Institute, Budapest. Papers of agricultural economics interpreted in a broad sense covering all fields of the subject including econometric, policy, marketing, financial, social and environmental aspects as well are published, subsequent to peer review and approval by the Editorial Board.

Manuscripts should be sent in the three copies to the Editor-in-chief, H-1355 Budapest 55, Pf. 5. Instructions for the authors can be found on the website of the Agricultural Economics Research Institute: www.akii.hu
Volumes (individual issues) of the journal are € 50 or HUF 13 000 for institutions and € 23 or HUF 6000 for private persons. Call secretary Nóra Hegedűs, phone (+36) 1476 3064 or fax (+36) 1217 7037.

HU ISSN 1418 2106

CONTENTS

Studies in Agricultural Economics No. 104. p. 5-18. (2006)

The road to a new European rural development paradigm

Gusztáv Nemes[1]
Zsuzsanna Fazekas

Abstract

This article elaborates the concept of 'integrated rural development'. It starts by examining the characteristics and critique of endogenous development as opposed to the previous paradigm. This is followed by examples from the pertinent literature on local development and agro-industrial (or rural) districts and on the application of the network theory in this field. Then, after focusing on the multifunctinal agriculture theory, we posit a working definition for 'integrated rural development'.

Keywords

Rural development, local development, rural policy, European Union, LEADER Programme, centre-periphery, local governance

Introduction[2]

In their article Van der Ploeg et al (2000) suggest that a new rural development model that has slowly but persistently emerged both policy and practice should be followed by a paradigm shift in associated theory. They posit that there is "a need for a new rural development paradigm that can help clarify how *new resource bases* are created, how the irrelevant is turned into a value and how, after combining with other resources, the newly emerging whole orientates to new needs, perspectives and interests." (2000:399). They contend that the new rural development paradigm has emerged in response to the old, modernisation paradigm and constitutes a clear departure from the old order's deterministic nature. However, the new paradigm remains rooted in the past as rural development is usually constructed on the back of existing production structures (Murdoch, 2000). The new paradigm is above all related to endeavours aimed at solving problems related to the post-war modernisation paradigm that shaped European rural economy and society. Moreover, it is closely tied to cultural traditions and social networks that predate the recent modernisation period.

This article elaborates the 'integrated rural development' concept. It begins by examining the characteristics and critique of endogenous development as a contrasting approach to the previous paradigm. This is followed by examples from the pertinent literature on local development and agro-industrial (or rural) districts and the application of the network theory in this field. Then, after examining the theory on multifunctional agriculture, we suggest a working definition for 'integrated rural development'.

[1] Institute of Economics, Hungarian Academy of Sciences, Hungary, H-1112 Budapest, Budaörsi u. 45.
[2] The paper is based on previous research (PhD and post-doctoral), done between 1998-2005, and was supported by the following donors:
Phare ACE Fellowship – CRE – University of Newcastle;
OSI International Policy Fellowship;
Marie Curie Individual Research Fellowship (HPMF-CT-2002-02168), Department of Geography – University of Valencia.

1. Endogenous development

The notion of endogenous development, as suggested by Bassand et al. (1986), has been presented in opposition to traditional understanding, meaning the 'modernist' notion of development. Endogenous development is viewed as hypothesizing that improvements in socio-economic well-being in disadvantaged areas can best be created by recognising and harnessing the given area's collective resources. (Ray 2000). Raskó (2003) claims that rural development's essence entails the liberation of „local creative forces". According to Bassand (1986) "the new meaning of development, that is, qualitative and structural indicators, and not just quantitative and monetary measures, are used as criteria… [and] cultural, social, political, and ecological values as well as social costs and long term effects are combined" for endogenous development (cited in Brugger, 1986 p. 39.).

In the late 70s and early 80s considerable scepticism emerged about the effectiveness of conventional development policy instruments, and some regional development analysts sought alternatives for the then dominant regional development paradigm (Helmsing 2001). Walter Stöhr advocated selective spatial closure (Stöhr & Fraser, 1981) and John Friedmann the agropolitan approach (Friedmann & Douglass, 1978). Although there are considerable differences between the two, they share – based on actors, resources, and capacities – the search for *endogenous* development alternatives.

This concept as a development approach was created as an alternative to the central authorities' practice of treating social and economic sectors as if they were isolated from each other and/or assuming that socio-economic problems can be solved by standard measures, regardless of location or culture. Here emphasis has markedly been on what areas can do for themselves; support and assistance has been geared towards enabling local economic growth (OECD 1996/2). According to Lowe et al (1998:12) the endogenous rural development model's basic characteristics are as follows:

- Key principle - the area's specific resources (natural, human and cultural) hold the key to its sustainable development;
- Dynamic force - local initiative and enterprise;
- Rural areas' function - diverse service economies;
- Major rural development problems - areas' and social groups' limited capacity to participate in economic and development activity;
- Focus of rural development - capacity building (skills, institutions and infrastructure) and overcoming social exclusion.

Ray (1997:345) contends that endogenous (or participatory) development's main characteristics are threefold. Firstly, it establishes development activity within a territorial rather than sectoral framework, meaning the area's size is smaller than a nation-state's. Secondly, economic and other development activities are reoriented to maximise benefit retention within the local area by assessing and exploiting physical and human local resources. Thirdly, development is contextualised by focusing on local people's needs, capacities and perspectives, meaning that a community should be able to assume some responsibility for initiating its own socio-economic development. 'Partnership working' – interaction between

public bodies or between the public, private and voluntary sectors – has been increasingly recognised as a mechanism to introduce and manage endogenous development (Ray 2000). In pursuit of a common policy objective (an area's socio economic regeneration), the various partners pool their resources. Theoretically, the partners come up with consensual strategies, thus integrating their responsibilities or contributions (Edwards et al, 1999).

As stated by Shortall and Shucksmith (1998:75), "development is not just about increasing goods and services provided and consumed by society. It also involves enabling communities to have greater control over their relationship with the environment and other communities." Therefore, through central policies, the system's key elements are empowerment, capacity building, appropriate social animation and the provision of suitable training and development institutions. According to Picchi (1994), certain political-institutional arrangements can also further endogenous development patterns. These include a rich services network – provided by local administrations – for economic sectors, planning mechanisms, aimed at strengthening development patterns and a stable climate for industrial development. Keane indicates two main ways in which endogenous development differs from exogenous: firstly, it is not only an economic concept, but also a process dealing with the total human condition; and secondly it embraces numerous possible development conceptions and then at an appropriate local level pitches the objectives and paths (Keane 1990:291). He also states that the endogenous approach "represents a significant change from investment on physical capital to investment in developing the knowledge, the skills and the entrepreneurial abilities of the local population" (p. 292).

The endogenous development approach has also, however, been viewed as possessing various weaknesses. Brugger (1986) claims that there are significant gaps in the endogenous development theory, though he suggests that they can be overcome through systematic analysis of practical experience and thus remain useful for policy makers (pp. 47). Nevertheless, later on Lowe et al (1995) considered this a weakness, claiming that social theory has not been effective in furnishing useful models that provide information on endogenous approaches. Slee (1994:191) also remarks that: "endogenous development is not so much a concept with clearly defined theoretical roots but more a perspective on rural development, strongly underpinned by value judgements about desirable forms of development".

One of the chief criticisms by Lowe et al (1995) is that the endogenous approach can relegate whole areas into low growth trajectories, particularly if this has been the case in the past. Brugger (1986) also contends – based on the Swiss experience – that 'too endogenous,' self-reliant development that ignores external effects and global economics, can seriously harm the regional economy and society (pp. 50). Extensive literature on the Leader Programme's subsequent implementation process warned about possible problems concerning social exclusion and new social groupings' and associations' legitimacy in participating in local development (see Shortall and Shucksmith, 1998; Ray, 1996; Kearney, 1997; and others). Participatory approaches to rural development have striven to ensure the efficient use of rural resources, but have generally enhanced powerful local players' domination over decisionmaking or else have been undermined by local apathy (Lowe et al., 1998; Ward and Nicholas, 1998).

Slee (1994) asserts that, in terms of state policies, under the endogenous approach local areas remained almost as dependent as under the previous regime. Development agencies realised that rural areas may possess untapped growth potential. Thus, the same

agencies and officials who once favoured exogenous development embraced bottom-up approaches. Slee states that: "Development agencies have thus adapted their modus operandi, without altering their fundamental aims and objectives. They have recognised that long-run developmental gains are likely to be secured more effectively by encouraging local entrepreneurship than by inducing footloose branch-plants into the area. The same packages of infrastructure development, grant-aid, loan finance and business and community support services are still in evidence, but the agencies have learned to adapt elements to local social and cultural context" (Slee 1994:193). Lowe at al (1995) further contend that the endogenous development approach often does not address the important question of how local production and consumption circuits interact with extra-local circuits. Moreover, they suggest that the crucial distinction should be between local and external control over development processes, and that a useful way to proceed is an institutional focus which specifies precisely how the links between local and external actors are established as well as the specified relations' nature. This approach, they conclude, recasts endogenous and exogenous concerns into the analysis of economic relations as relations based on power. (Lowe et al 1995:94).

2. Agro- industrial (rural) districts

The rural district literature applies the old industrial districts concept in the rural development arena (Marshall 1890 and 1927 cf. Fanfani 1994; Lowe et al 1995). This literature, expanding on the endogenous approach, proposes a more complex understanding of the relationship between local and extra-local development factors. Authors, citing economically successful rural districts, attempt to explain the industrial districts' success in endogenous development. They contend that socio-economic networks, harking from the agricultural past, are crucial for success. "Collective action enables small entrepreneurs to mobilise social relations to improve their economic performance and create new opportunities for growth. Successful cases of rural development demonstrate that collective action produces a local framework in which a constructed environment, institutions, symbols, and routines facilitate the activities of small firms by providing access to resources that could not be accessed by individual action alone" (Brunori and Rossi 2000:409).

Lundvall (1992 & 1993) is at the forefront in stating that local areas' capacity to engage in learning and innovation processes through networks is subject to underlying supportive influences of the local cultural context which a certain institutional inertia enhances. Some areas are more suited to network development and hence will benefit more from endogenous development than more remote areas. Rural industrial districts are viewed in the framework of flexible specialisation and a growing integration between food production, processing and retailing. According to Lowe et al (1995:95) "closely networked relations between local farms, processors, distributors and retailers make for flexibility in adapting to technological and market changes, but at the same time, allow value-added in the non-agricultural aspects of the food chain to remain within the regional economy, rather than being captured by exogenous, and often multi-national, food companies." Successful innovation is linked to local actors' "associational capacity." (Cooke & Morgan 1993).

"The logic of the industrial district is self-reinforcing. The more distinctive each firm is the more it depends on the success of other firms' products to complement its own. Repetitive contracting, embedded in local social relationships, cemented by kinship, religion and politics, encourages reciprocity… The vibrancy of the districts is not due to their geography

alone, but to their social practices" (Powell and Smith-Doerr 1994: 386). This implies that rural areas have greater development potential while rural actors are more attached to local cultures and social structures (Brunori and Rossi 2000; Brusco 1996; Murdoch 2000; Paloscia 1991; Letenyei 2000). Fanfani (1994) identifies over sixty Italian districts that had, through endogenous development, been successful and claims that agro-industrial districts' success originates from the relationship between agricultural specialisation and strong local artisanship. Examples of these local development triumphs are in producing poultry, pork meat, and Parmesan cheese.

Though rural industrial districts need not necessarily specialise in food production, Cooke and Morgan (1994) show how farm family local networks can seek mutual benefits through co-operation and yield rural development that is sustainable and innovative. They cite Capri in Emilia-Romagna as an example where, throughout the 20th Century, social networks provided a useful development resource. Initially, these families co-operated in manufacturing straw hats, but in the 1950s the market collapsed and since then they have diversified into textiles, furniture, leather and food.

According to OECD (1996), there are four key requirements for a rural district's success, which are considered as a socio-economic network: flexibility, competence, efficiency and synergy. Through strategic planning, flexibility is needed to respond to and forestall market changes, spawning diversification from single sector dependency toward a broader rural economy. Through network linkages common strengths may be revealed among local area firms and beyond. Sharing information may promote common business strategies, identifying optimum practices and enhancing greater efficiency. Efficiency includes developing economies of scale through idea and resource pooling to attain mutual objectives. For example: encouraging joint processing, distribution and retailing of production so to ensure that value-added stays local and is not absorbed by middlemen en route to the market. Synergy is best achieved where information, innovation and business transactions flow most freely. Unlike Italian success stories, most regions lack independent artisan associations. However networks can offer an alternative, "enabling very small producers to collectively purchase or contract for business functions, locate new markets, and share technologies." (OECD 1996: 38).

Nonetheless, not all rural regions can become successful agro-industrial districts that prosper with no (or hardly any) external help. From the literature it seems apparent that only in rural areas with long-standing agricultural or processing networks have bottom-up innovations proved successful without significant government intervention. "Innovations have failed when introduced to societies with non-supportive cultural and institutional traditions." (Cécora 1999:6) One should recognise that these successful case studies are exceptional and may be linked to local specificity, and thus challenge the efficacy of transferring endogenous rural development models elsewhere. The localities' varied socio-economic and geographic conditions as well as the nature of their external relations result in uneven development. For Lipietz (1993) , the European rural areas' current socio-economic development results in a "leopard skin" quality with some areas joining dynamic sectors and systems while others remain outside (Saraceno 1994). "This mosaic of regional development draws our attention to the various ways in which new economies are superimposed on the old" (Murdoch 2000:415).

3. The 'network paradigm' in rural development theory – the 'Third way'?

Given this mosaic, it may be that endogenous and exogenous approaches are not necessarily antagonistic or mutually exclusive. A proposed theoretical solution to bridge the perceived divide is to harness networked relationships' rural development potential (Amin and Thrift 1994; Cooke and Morgan 1993; Letenyei 1999; Murdoch 2000). However, this new understanding of networks differs somewhat from that used in endogenous development theory to describe a relationship between local firms and social actors, based on trust, reciprocity and mutual understanding that lays the foundations for local economic development. Instead, the network paradigm seeks to establish a 'third way' (Lowe et al 1995) or synthesis between endogenous (local, bottom-up) and exogenous (extra-local, top-down) links in order to foster learning and innovation processes (OECD 1993 and 1996). These are, by many authors, deemed central to economic growth(Camagni 1995; Capello 1996; Cooke and Morgan 1993; Powell 1990; Powell and Smith-Doerr 1994). From their work, it appears that networks offer the most appropriate means toward innovation and learning. Powell (1990) argues that it is the open-ended, relational features of networks that facilitates transfer and learning of new knowledge and skills. However, retrieving some elements from the earlier understanding of networks, others affirm these goals are easier to accomplish in flexible networks built on trust (Powell & Smith-Doerr 1994; OECD 1996).

Latour (1986) sees networks as power relation sets where power lies in the links uniting actors and entities. Lowe et al (1995) follow this perspective to identify power asymmetries and hence the unequal benefits gained by local firms due to networks. Others state that: "a network is generally defined as a specific type of relation linking a defined set of persons, objects or events… Different types of relations identify different networks… The structure of relations among actors and the location of individual actors in the network have important behavioural, perceptual and attitudinal consequences both for the individual units and for the system as a whole" (Knoke and Kuklinski 1990:175-6). Essentially the network provides a good analysis framework. Some commentators further suggest that networks should be perceived as key innovational aspects and their existence or non-existence a key determinant in success or failure (Morgan and Murdoch 1998). So far there is little rural area empirical evidence relating to networks' role in facilitating learning and innovation. To support their perspective, the approach's proponents refer (in review articles) to the same set of examples. Nevertheless, from these few cases, the potential transfer of lessons has inspired many academics to analyse the importance of such networks.

The crucial issue, as Van der Ploeg and Long (1994) suggest, is the balance of 'internal' and 'external' elements. Therefore, the networks'contribution is to focus our "attention upon successful mixtures of 'internal' and 'external' economic linkages. Unlike the idea of the 'district', which tends to concentrate on local or 'bottom-up' development, the notion of 'network' forces us to identify how local and non-local linkages facilitate success. Although some networks might prove "regionally specific", they are likely, particularly in the EU, to be "linked into complex relations with other organisations outside the region" (OECD, 1996). Thus, even in remote areas, the network paradigm provides a dynamic and flexible structure in integrating the internal and external factors toward promotion of greater innovation and improved rural development. The challenge is to strike a balance between continuity of routines and creative change and between internal and external involvement.

To clarify these questions, Murdoch (2000) seeks to identify the networks' role in formulating rural development strategies. For this he identifies two axes of networks: vertical and horizontal. Vertical networks are, as a result of the food chain, political economic interdependencies that are formed with rural businesses. One finds working examples of these networks in European food and agricultural 'hot-spots', where intensive production and processing (often vertically integrated by multinational companies) have been and are likely to remain the local economy's dominant factor. Horizontal networks are spatially determined and imply coordinating a range of activities in a local area so to access markets. This entails "a strengthening of local productive capabilities in ways that benefit the rural economy as a whole" (Murdoch, 2000: 412). In successful rural districts one finds network examples where, without major external intervention, network-based local development could create a sound basis for competition in the global economy.

Nonetheless, Murdoch (2000) – rejecting the network paradigm as the 'third way for rural development' – doesn't link these two networks together into an integrated system, but only highlights where these networks are useful. He defines three types of rural areas. The first type ("clusters of innovation") is dominated by horizontal networks, small- and medium-sized enterprises, trustful relationships and co-operation – such as the 'Third Italy'. He suggests that in these areas the literature on innovation networks and learning regions is applicable and demonstrates how economic success can be maintained. The second type ("hotspots of standardisation") is dominated by vertical networks, intensive forms of agricultural production and food sector trans-national networks. These areas, based on mainly endogenous resources, can develop their economic and social structure and penetrate global markets. However, as Murdoch suggests, in these areas the new 'network paradigm' is not applicable as development and socio-economic processes are better explained by commodity chain analysis. In the third rural area type neither horizontal nor vertical networks work effectively. These areas (numerous European rural communities) during the industrialisation period lost their resources and became reliant on continued state assistance (in terms of both agricultural and non-agricultural support). Based on endogenous resources, they have little or no chance to improve their situation and need external intervention through rural development agencies. As stated by Murdoch, in these areas intervention complying with the network paradigm (support in capacity building, empowerment, soft infrastructure, etc.) is not necessarily appropriate, since it might reinforce existing weaknesses. Thus, besides the provision of 'soft infrastructure', more traditional state support should also be applied.

Another OECD study (1996) offers a different rural area typology, depending on their integration into the global economy. Three areas of rural diversity are outlined: integrated, intermediate and remote. In economically integrated rural areas there are extensive technically advanced firms that possess, even without government backing, the capacity to support vertically integrated networks and supplier networks. Nevertheless, since services, expertise and capital are in these areas easily accessible, firms may not view horizontal networks as critical as in less populated areas. In intermediate areas, with some production diversity, there are still likely to be stronger links between dominant sector firms, usually linked to commodity production. Traditional agricultural co-operatives choose to collectively establish processing and marketing measures. However, other firms outside traditional vertical networks may choose to form their own networks to provide better information, reduce transaction costs or to enter new markets. The least likely to develop networks are remote rural areas, but when they do, based on strong local relationships, they often create better linkages to external firms and customers. The study argues that the network approach offers numerous opportunities for

rural development, such as: adding value, creating economies of scale and scope, diversifying regional economies and creating synergy among micro-enterprises.

Many authors contend that the state (or the political/economic centre) has a role to play in promoting rural development: encouraging network development, entrepreneurial culture, and assisting with economic transformation and providing resources to enhance co-operation between local actors. At various points the government should intervene in the vertical network. However, in remote areas where vertical networks have previously been unsuccessful in contributing to local rural development, what sort of government intervention can stimulate successful networks' growth toward joint learning and knowledge transfer to allow future successful innovation and development? The OECD (1995) proposed four measures:

- Direct aid targets specific enterprises and assists in the form of subsidies, technological innovation aid , training and job creation;
- Indirect aid is defined to strengthen the local area's overall economic environment to benefit existing firms. Likely the most effective tool is providing services to facilitate technology transfer, marketing assistance and dissemination of information.
- Enhancing human resources entails policies and programmes that aim to improve education levels, encourage entrepreneurship, and training amongst the workforce; and
- Infrastructure programmes that usually involve the construction of roads, sewers, telephone lines and public buildings. Providing infrastructure should increase the local level of services and amenities and help establish economic enterprises.

Formal institutions need to identify important links toward local development potential. Bazin and Roux (1995) also emphasized this (1995) in their study on remote Mediterranean rural areas where they pinpoint numerous variables supporting local economic capacities. These include:

- Market position – avoiding dependence on state funding
- Self-reliance of local actors – due to small firms' local and small-scale structure
- There should be ***in house*** control of production, processing and marketing
- Use of available local resources during production: natural, biological and human
- Producer group cohesion and solidarity towards enhancing the image of local products.
- Positive interaction between local and external institutions regarding interventions.
- The successful introduction of local development often required grants, investments, technical assistance and co-ordination outside the target area.

4. Multifunctional agriculture as a way for rural development

According to a number of authors (Lowe et al, 2002; Durand and Huylenbroeck 2002; Bálint et al. 1999; and others) 'multifunctionality' constitutes a 'third way' toward rural development, as opposed to liberalist and interventionist models. Nevertheless, multifunctionality differs from the rural development approach (referred to by these authors as the 'new paradigm', the 'network paradigm' or 'integrated rural development') in that it remains primarily targeted toward agriculture and agricultural enterprises.

Some authors – underlining the agricultural sector's importance – assert that, although constructed under the new paradigm, agriculture and farmers remain vital to successful rural development. For example, Van der Ploeg et al (2000) through building on the literature and their practical experience agree that rural development processes can involve diverse actors, but don't accept that rural development can only proceed through the 'expropriation' of agriculture. They state that [integrated] "rural development can be constructed very effectively using the innovativeness and entrepreneurial skills present in the agricultural sector itself." (401) Furthermore, rural development is a "new development model for the agricultural sector" that "is reconstructing the eroded economic base of both the rural economy and the farm enterprise" (395); and constitutes "newly emerging livelihood strategies developed by rural households in their attempt to increase the 'pool' of livelihood assets at their disposal" (396) They contend that new rural development practices depart from modern day specialisation where agricultural production was excluded from alternative activities. For them development is a kind of 'repeasantisation' of European farming where "the highly diversified flow of outputs, the re-grounding of productive activities in relatively autonomous and historically guaranteed types of reproduction, and increasing control over the labour process, which all results in higher levels of technical efficiency" (403).

5. Towards a definition

The above review effectively shows that, although we do not yet have an exact definition, the literature provides elements for the 'new paradigm'. Those who pioneered the endogenous development paradigm (Bassand et al. 1986) already established the most important elements – such as endogenous resources, their marketing, process control, external relations, local participation and leadership, *subsidiarity*, economic sectors' integration, etc. (Brugger 1986, pp.47) Subsequent theories on various aspects of rural development also contribute to the paradigm. The 'endogenous paradigm', contradicting modernisation, mainly emphasizes the importance of participation, local actors' empowerment and the unlocking of local resources. This was considered the only way to simultaneously protect rural values and enhance the rural economy. Nevertheless, other than extra-local influences and possibilities (positive and/or negative), this approach may limit entire areas into low trajectories and miss the chance to explain important developments connected to global processes.

The 'rural districts' theory represents a similar school of thought. However, it emphasises the importance of long standing socio-economic networks and solid institutions to explain these areas' economic success and to clarify how their products can penetrate global markets. However, this approach is limited in scope since these local practices are not easily transferable and successful rural districts still constitute exceptions in European rural communities. The 'network paradigm', embracing previous exogenous and endogenous

approaches, offers 'a third way' as it highlights relationships between local and extra-local networks. It explains rural development as innovation, learning and external intervention. It interprets rural development as a set of relationships based on power: 'who holds control', is the most important factor for local areas. However, as critics say, this approach remains too tied to the endogenous paradigm, and extends little help to the most backward rural areas, which lack resources and/or human capacity and are almost incapable of developing sufficient networks or to be 'ahead of the game.' Multifunctionality and the 'cultural economy approach' present different routes for rural development, subsequently viewing progress as renewed agricultural production and related activities (small scale processing, the maintenance of environment, etc.) as well as marketing socio-cultural traditions. This can be done through ethno/green tourism and locally specific production. However, for rural development, these alternatives should be understood as complementary, rather than mutually exclusive.

Thus, formulating the new rural development paradigm benefits from existing practices and various theoretical considerations. The literature provides a number of rural development definitions, concentrating on various aspects and considerations. However, authors widely agree that the 'new rural development paradigm' is still a nascent concept derived from contemporary procedures and practices; thus, it is unwise to rush into exclusive, generalising definitions. Van der Ploeg et al (2000:396) believe that "the concept of rural development is above all a heuristic device. It represents a search for new futures and reflects the drive of the rural population. It goes beyond modernization theory where the problems of agriculture and the countryside were considered resolved. Definitive answers, however, are missing and if offered should be mistrusted. Rural development theory is not about the world as it is, it is about the way agriculture and the countryside *might be* reconfigured."

Still, we would like propose a working definition. Though not final or exclusive, it strives to give this study a broad framework and to indicate my approach to rural development, agriculture, EU policies and related matters. The definition which we call 'integrated rural development' is:

Integrated rural development is an ongoing process involving outside intervention and local aspirations; aiming to attain the betterment of groups of people living in rural areas and to sustain and improve rural values; through the redistribution of central resources, reducing comparative disadvantages for competition and finding new ways to reinforce and utilise rural resources. As opposed to central development - it is integrated because it is controlled and managed locally. However, contrary to local development, it parallels local resources as it relies on central professional and financial support. In other words, *integrated rural development* could be the 'new rural development paradigm' theory which endeavours to identify how local development and/or the reconfiguration of rural resources can be centrally assisted to benefit rural localities, while simultaneously maintaining rural values for the future.

'**This means that** *Integrated rural development systems'* constitute central and local institutions' particular setups (such as: administration, knowledge, information and decision-making systems, social networks), working together to further integrated rural development ideas.

References

1. **Amin, A. Thrift, N.** (1994) *Living in the Global* in: **Amin, A. Thrift, N.** (eds.) (1994) *Globalization, Institutions, and Regional Development in Europe* Oxford University Press
2. **Amin, A. Thrift, N.** (eds.) (1994) *Globalisation, Institutions, and Regional Development in Europe* Oxford University Press
3. **Bálint, J. Juhász, M. Nemes, G. Bálint, A.** (1999) *Javaslat a TEP = Technológiai Elôretekintési Program Magyarországon térség- és vidékfejlesztési fejezetére* OMFB. Budapest, www.omfb.hu ill. http://cosmos.kee.hu/department/curriculum/tep.doc
4. **Bassand, M. Brugger, E.A. Bryden, J.M. Friedman, J. Stuckey, B.** (1986) *Self-Reliant Development in Europe – Theory, Problems, Actions* Gower, Brookfield, Vermont
5. **Bazin, G. and Roux, B.** (1995) *"Resistance to marginalisation in Mediterranean rural regions"* Sociologia Ruralis 35 (3/4) pp. 335-347.
6. **Brugger, E.A.** (1986) *Endogenous development: A concept between Utopia and reality* **In**: **Bassand, M. et al.** (1986) *Self-Reliant Development in Europe – Theory, Problems, Actions* Gower, Brookfield, Vermont
7. **Brunori, G. Rossi, A** (2000) *Synergy and Coherence through Collective Action: Some Insights from Wine Routes in Tuscany* Sociologia Ruralis, Vol 40, Number 4, October 2000 pp. 408-423, Blackwell Publishers
8. **Brusco, S.** (1996) *rust, social capital and local development: some lessons from the experience of Italian districts* in: *Networks of Enterprises and Local Development* OECD, Paris
9. **Camagni, R.** (1995) *"Global network and local milieux: Towards a theory of economic space* in: Conti, S. Malecki, E. and Oinas, P. (eds) *The industrial enterprise and its environment: spatial perspective* Avebury, Aldershot
10. **Capello, R.** (1996) *Industrial enterprises and economic space: the network paradigm* European Planning Studies 4(4) pp. 485-498
11. **Cécora, J.** (1999) *Cultivating Grass-Roots for Regional Development in a Globalising Economy - Innovation and entrepreneurship in organised markets* Ashgate, Aldershot
12. **Cooke, P. and Morgan, K.** (1993) *The network paradigm: new departures in corporate and regional development'* Society and Space, Volume II, pp. 543 – 564.
13. **Cooke, P. Morgan, K.** (1994) *Growth Regions under Duress: Renewal Strategies in Baden Würtembeg and Emilia-Romagna* In.: **Amin, A. Thrift, N.** (eds.) (1994) *Globalization, Institutions, and Regional Development in Europe* Oxford University Press
14. **Durand, G. and Huylenbroeck, G.V.** (2002) *Multifunctionality and rural development: a general framework* in **Durand, G. and Huylenbroeck, G.V.** *Multifunctionality: A new paradigm for European agriculture and rural development?* Ashgate, Aldershot
15. **Edwards, W. Goodwin, J. Pemberton, S. Woods, M.** (1999) *Scale, Territory and Ruralilty, and the 'Government of Governance' in Rural Development.* Paper presented at the Congress of the European Society for Rural Sociology Lund, Sweden, August 1999

16. **Fanfani, R.** (1994) *"Agro-food districts: a new dimension for policy making and the role of institutions"* in: Centre for Rural Research (ed) *Restructuring the agro-food system: global processes and national responses* University of Trondheim, Norway

17. **Friedmann, J. and Douglass, M**. (1978) Agropolitan development: towards a new strategy for regional planning in Asia. In: Lo, F.C. and Salih, K. eds. Growth pole strategy and regional development policy. Pergamon Press, Oxford pp. 163-192.

18. **Helmsing, A. H. J.** (2001) *Partnerships, Meso-institutions and Learning New local and regional* **economic** *development initiatives in Latin America* Institute of Social Studies, The Hague, The Netherlands, http://www.wiram.de/toolkit/Downloads/Helmsing_partnerships.pdf

19. **Keane, J.M.** (1990) *Economic Development Capacity Amongst Small Rural Communities,* In.: Journal of Rural Studies Vol. 6. No.3. pp.291-301

20. **Kearney, B.** (1997) Operational Programme for LEADER II. Community Initiative Mid-Term Review Report, *Government of Ireland, Dublin*

21. **Knoke, D. & Kukilnski, J**. (1990) *'Network analysis: basic concepts'* in: **Thompson, G. (ed)** *Markets, hierarchies and networks* London: Sage.

22. **Latour** (1986) *'The powers of association'* in: **Law, J. (ed)** *Power, action, belief: a new sociology of knowledge?* London: Routledge.

23. **Letenyei László:** *Innovációs láncok falun. Két falusi esettanulmány a gazdasági újítások terjedéséről.* Szociológiai Szemle 2000 (4)

24. **Letenyei László**: *A falusi társadalom rejtett kapcsolatai*. In: Borsos Endre, Csite András és Letenyei László (szerk.): Rendszerváltozás után. Falusi sorsforduló a Kárpát-medencében. Budapest: MTA PTI és Számalk Kiadó 1999.

25. **Lipietz, A.** (1993) *"Social Europe, legitimate Europe: the inner and outer boundaries of Europe"* Society and Space 11. pp. 501-512.

26. **Lowe, P. Buller, H. Ward, N.** (2002) *Setting the next agenda? British and French approaches to the Second Pillar of the Common Agricultural Policy,* Journal of Rural Studies 18, 1-17

27. **Lowe, P. Murdoch, J. and Ward, N.** (1995) *Network in rural development: beyond endogenous and exogenous approaches* in: Van der Ploeg, J. D. and van Dijk, G. (Eds.) (1995) *Beyond modernization: the impact of endogenous rural development,* Assen, The Netherlands: Van Gorcum

28. **Lowe, P. Ray, C. Ward, N. Wood, D. Woodward, R.** (1998) *Participation in Rural Development: A Review of European Experience* CRE, University of Newcastle upon Tyne

29. **Lundvall, B.A** (1993) *"Explaining the interfirm co-operation and innovation: limits of te transaction cost approach"* in: Grabher, G. (ed) *The embedded firm: on the socioeconomics of industrial networks* Routledge, London

30. **Lundvall, B.A** (ed) (1992) *National systems of innovation: towards a theory of innovation and interactive learning* Printer, London

31. **Marsden, T., J. Murdoch, P. Lowe, R. Munton, A. Flynn,** (1993) *Constructing the countryside.* London: UCL Press

32. **Marshall, A** (1890) *Principles of Economics,* London, Macmillan

33. **Marshall, A.** (1927) *Industry and Trade,* 3rd edition, London, Macmillan

34. **Molle, W. Cappellin, R.** (1988) *Regional impact of community policies in Europe* Avebury, Aldershot

35. **Morgan, K. and Murdoch, J.** (1998) *Knowing Networks? - Knowledge, Power and Innovation in the Food Chain,* Paper for EGRG 'Capitalising on Knowledge' Session at RGS/IBG Conference, Guilford, Surrey January 1998

36. **Murdoch, J.** (1997) *Why do people move to the countryside? - A report for the Countryside Commission (manuscript)*

37. **Murdoch, J.** (2000) *Networks – a new paradigm of rural development?* Journal of Rural Studies 16/2000, 407 – 419.

38. **OECD** (1993) *Territorial development indicators and structural change: a new perspective on adjustment and reform* OECD, Paris

39. **OECD** (1995) *Creating employment for rural development: new policy approaches* OECD, Paris

40. **OECD** (1996) *Networks for Rural Development* Group of the Council on Rural Development OECD Paris

41. **OECD** (1996/2) *What Future for our Countryside? - A Rural Development Policy* OECD Paris

42. **Paloscia, R.** (1991) *Agriculture and diffused manufacturing in the Terza Italia: a Tuscan case study* in: Whatmore, S. Lowe, P. Marsden, T. (eds) *The rural enterprise* Fulton, London, pp 34-57.

43. **Picchi, A.** (1994) *The relation between central and local powers as context for endogenous development,* in. Van der Ploeg, D.J. and Long, A. (eds) 1994

44. **Powell, W. & Smith-Doerr, L.** (1994) *'Networks and economic life'* in: **Smelser, N. & Swedberg, R. (eds)** *The Handbook of Economic Sociology* London: Sage.

45. **Powell, W.** (1990) *"Neither market nor hierarchy: network forms of organisation"* in: Research in Organisational Behaviour 12 pp. 295 – 336.

46. **Raskó, Gy.** *„Földközeli" gondolatok a vidékfejlesztésről*. A Falu, 2003. XVIII. évf. 1. sz.

47. **Ray, C.** (1996) *The Dialectic of Local Development: The Case of the EU LEADER 1 Rural Development Programme* CRE Working Paper, University of Newcastle

48. **Ray, C.** (1997) *`Towards a theory of the dialectic of rural development* Sociologia Ruralis 27 (3) 345-362

49. **Ray, C.** (2000) *Endogenous socio-economic development and trustful relationships: partnerships, social capital and individual agency The Dialectic of Local Development: The Case of the EU LEADER 1 Rural Development Programme* CRE Working Paper (45), University of Newcastle

50. **Saraceno, E.** (1994) *Recent Trends in Rural Development and Their Conceptualisation* In.: Journal of Rural Studies Vol. 10 No. 4 pp. 321-330

51. **Shortall, S. Shucksmith, M.** (1998) *Integrated Rural Development: Issues Arising from the Scottish Experience* European Planning Studies Vol 6 (1). Pp 73 - 88

52. **SLEE, B.** (1994) *Theoretical aspects of the study of endogenous development.* In: **J.D. van der Ploeg and A. Long, eds.,** (1994) *Born from within: Practice and perspectives of endogenous rural development.* Assen: Van Gorcum, pp. 184-194.

53. **Stöhr, W.B. & Taylor, Fraser** (eds.) (1981) *Development From Above or Below? The dialectics of regional planning in developing countries* Chichester, UK: John Wiley.

54. **Van der Ploeg, D.J. Long, A.** (eds) (1994) *Born from within: practices and perspectives of endogenous rural development,* Assen, The Netherlands: Van Gorcum

55. **Van der Ploeg, J.D. Renting, H.** (2000) *Impact and Potential: A Comparative Review of European Rural Development Practices* Sociologia Ruralis, Vol 40, Number 4, October 2000 pp. 391-408, Blackwell Publishers

56. **Van der Ploeg, J.D. Renting, H. Brunori, G. Knickel, K. Mannion, J. Marsden, T. Roest, K. Sevilla-Guzman, E. Ventura, F** (2000) *Rural Development: From Practices and Policies towards Theory,* Sociologia Ruralis, Vol 40, Number 4, October 2000 pp. 391-408, Blackwell Publishers

57. **Ward, N. Nicolas, K.** (1998) *Reconfiguring rural development in the UK: Objective 5b and the new rural governance.* Journal of Rural Studies 14, 27-40.

Studies in Agricultural Economics No. 104. p. 19-32. (2006)

The relationship between agricultural structures and rural economies in Hungary

Alajos Fehér[1]

Abstract

We have defined rural economy as a special type of regional economy of which a detailed definition is provided. Utilising data listed for communities in the year 2000 census, indices for analysing rural and agricultural structures were calculated for two Hungarian macro-regions at the NUTS-2 level (the Northern Great Plain and Northern Hungary). Principal component analysis was carried out in several steps and the objective index was the value added per capita, meaning a general index for regional economic performance. The results highlight the fact that the problems facing agriculture, as revealed by these indices, are closely related to disruptions in the rural economies' normal stability and functioning in the two macro-regions. The situation is aggravated by backwardness and lack of stability in other sectors of the economy. This paper discusses the changes expected in agricultural in these Hungarian macro-regions after EU accession and the measures necessary to be taken. If adequate databases are available, the analytical method presented here can be applied both to estimate the effect of measures aimed at improving rural economies and to gauge the measures' actual effects.

Key words

Agricultural structures, rural economy, EU accession of Hungary

1. Introduction

The category of rural economy was first used in English-speaking countries in the nineties (Winter and Rushbrook, 2003). The category was interpreted as the „the sum of the economic activities… in rural areas." (PIU Report, 1999:21). Others emphasised the spatial approach for the category in question as opposed to sectoral definition. (Gardner and Rausser, 2002:1596)

According to the author's definition *rural economy* can be considered as a regional economy found in rural areas, with the emphasis mainly on land use, and involving the following:

- economic actors carrying out economic activities (production, services, management) in the given area and consumers of these activities'outputs
- the resources available in the area used for the above activities,
- the enterprises, companies, households, civil and official organisations and institutions providing the economy's organisational framework,
- the network of relationships between actors and organisations within and outside the area
- the structures (related to sectors, land use, resources, co-operation, co-ordination, etc.) representing the general framework for economic activities. (Fehér, 2005).

Like other regional economies, rural economies consist of various *economic sectors* united by common *economic structures*. In a wider sense, the term *economic structure*

[1] Regio Partner Ltd. for Research and Consulting of Rural Development, Kompolt, H-3356 Kompolt, Fleischmann u. 2. feher@regiocon.hu

is generally used to define the economy. It is traditionally measured in terms of sectoral distribution of the labour force, enterprises, consumption and incomes. However, for a more detailed, specific analysis of a given regional economy, these general data are insufficient, and it is necessary to analyse separately economic structures for each sector and divide them into *sub-structures*.

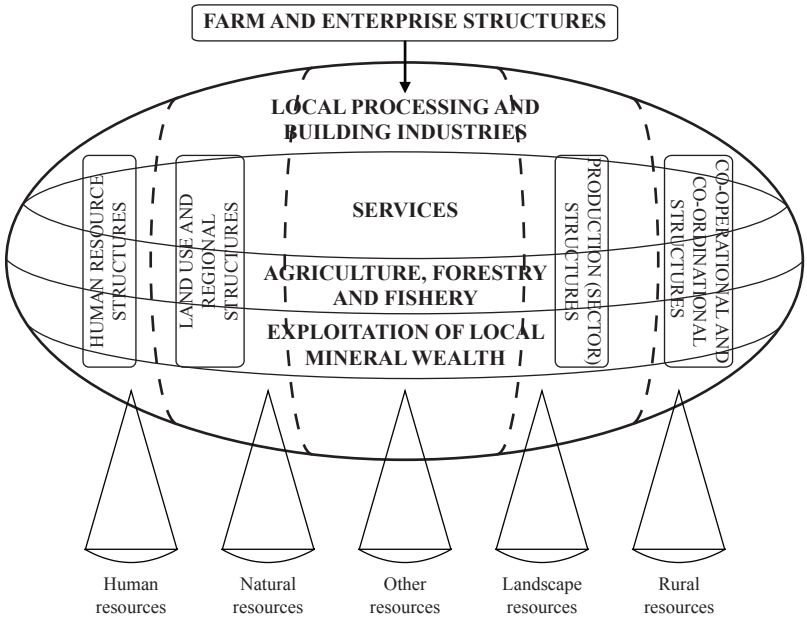
In rural economies the characteristic structure was interpreted as the distribution of resources and the interaction between the economic sectors (including their spatial distribution), as a combination of resource use, and as spatial economic relationships between the economic actors. The relationships between resources, sectors and economic structures are illustrated in *Figure 1*.

It can be seen from the figure that rural economies are based mainly on *resources* found within the area itself and only to a lesser extent on external resources. These resources are utilised by the actors in various *sectors of the economy* (enterprises, farmers, local governments, organisations, individuals).

Figure 1

Resources, Sectors and Economic Structures of the Rural Economy

Source: A., Feher, 2005: The Rual Economy and the Agriculture, Agorinform Publishment, Budapest



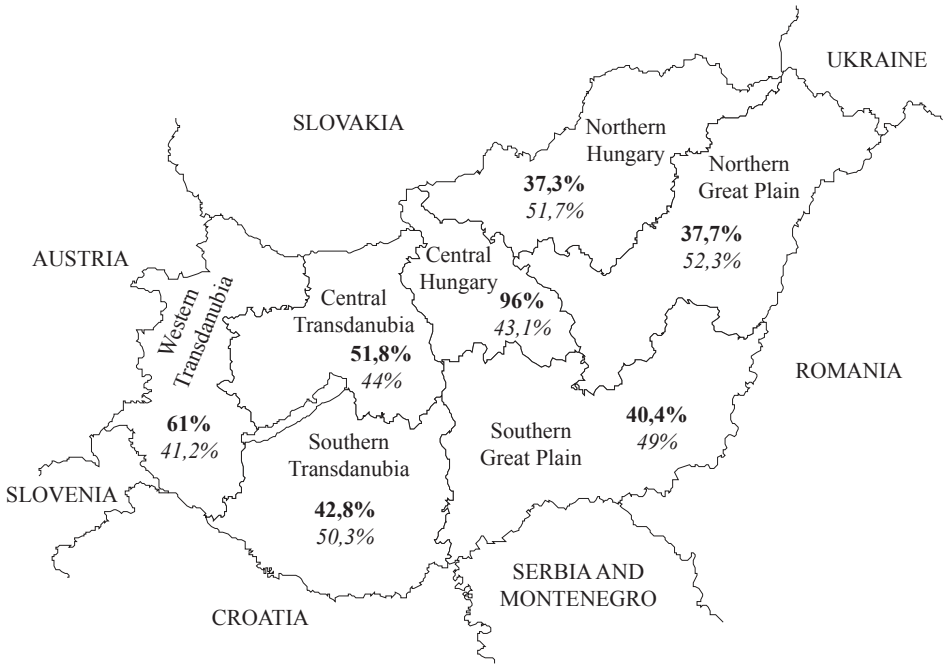
The framework for utilisation (distribution of inputs and outputs, combinations of resources, economic relationships between actors) is represented by the *structures*. These are, to a certain extent, independent, but they are usually closely connected to each other (which is why the term sub-structure is used). The various economic sectors are united by these structures, which provide a bare basis for relationships between them. In Hungary, services, agriculture and forestry, local processing and building industries, and the exploitation of local mineral wealth can be regarded as the most important sectors in rural economies. Our research proved that the following should be treated as major substructures: human resource

structure, land use and regional structure, farm and enterprise structure, production structure and the co-operational and co-ordinational structure. These sub-structures can be analysed in terms of natural parameters and aggregated indices suited to the particular sector.

On the basis of data for the year 2000 derived from Agricultural Census and General Census, the agricultural sub-structures will be analysed for two Hungarian macro-regions (the Northern Great Plain and Northern Hungary). It should be noted that these are among the ten poorest regions in the European Union. The Northern Great Plain has a pronounced agricultural character, while Northern Hungary is characterised by economic depression caused by the decline of large industries, combined with unfavourable conditions for agriculture and forestry. Their spatial location and differences in their regional economic dynamic and economic inactivity are presented in *Figure 2*. (In terms generally accepted in statistics, people are economically active if they are employed or, on the other hand, regi stered as unemployed. The *economically inactive working age population* is obtained by subtracting the employed and the registered unemployed from the total number of people of working age. If this number is divided by the total working age population, a useful *index of economic inactivity* is obtained. For rural economies in Hungary, *this index is thought to be far more important than*, for example, *the unemployment rate*.)

Figure 2

Location of Hungarian macroregions (NUTS 2), GDP per capita compared to EU-25 figures (bold) and the rate of economic inactivity (*italic*) in 2002



2. Methods

Using the SPSS Base 11.0 statistical program package, a principal component analysis was carried out for elimination purposes on the database of rural communities in two macro-regions. All variables considered to be relevant were used. This database enabled the "data sufficiency requirement" to be enforced, meaning the amount of data should be 10–15 times more than the number of variables. The aim of elimination was to calculate indices by using the variables with the greatest loadings and to continue analysis with them. As a result of elimination, the indices summarised in Table 1 were formed.

Table 1

Indices recommended and applied for the analysis of agricultural substructures

Substructure	Indices
1. *Land use and production (sectoral) structures*	1.1. Ratio of agricultural land
	1.2. Ratio of arable land within the agricultural land
	1.3. Ratio of grassland within the agricultural land
	1.4. Average area of fields (plots) in arable lands
	1.5. Ratio of fallow
	1.6. Ratios of major crops in sown areas
	1.7. Stocking rate
	1.8. Ratio of ruminants
	1.9. Aggregated index of agricultural diversification in farms of small and medium size*
	1.10. Aggregated index of non-agricultural diversification in farms of small and medium size**
2. Farm and farm-size structures	2.1. Distribution of farms by size of land
	2.2. Distribution of the land area of farms by farm size categories
	2.3. Ratio of fields owned by the farmers within the agricultural lands in farms of small and medium size
	2.4. Index of land availability (agricultural land per person involved in farm activities on farms of small and medium size)
3. *Human resources structure*	3.1. Average age of farmers
	3.2. Ratio of farmers with secondary and higher education
	3.3. Labour density index of people involved in farm activities on small and medium size farms
4.Cooperational and co- or di- national structure	4.1. Ratio of non-agricultural activities organised only for the processing of raw materials produced on farm
	4.2. Ratio of non-agricultural activities organised only for marketing purposes

* In the case of the diversification of agricultural activities (DA_{ag}) the incidence of alternative forms of crop production (e.g. strawberry, flower and ornamental cultivation, cultivation under glass or polythene, tree nurseries etc.), alternative animal species (e.g. rabbits, bees, buffalo, donkeys, mules, ostriches etc.) and organic farming was calculated separately for each size category and divided by the total number of farms in the given size category for each settlement, after which these sub-indices were added for aggregation purposes. This can be expressed in a simplified manner as:

$$DA_{ag} = \frac{\sum_{i=1}^{n} A_i}{\sum F}$$

Where:
A = the given alternative agricultural activity
i…n = the frequency of the activity within the group

The formula adapted to the non-agricultural diversification was published in (Fehér, 2003: 80)
** The logic behind the calculation of the non-agricultural aggregated diversification ratio (DA_{nag}) is similar, except that here the incidence of non-agricultural activities appears in the numerator.

Using the indices in table A, repeated PCA run was made. In this model value added per capita in each community was the objective variable. Among the principal components of the *value added per capita index* were those that exhibited significant values, meaning variables significant in themselves (having principal component loadings of more than 0.25 in the case of P=891 degrees of freedom and $a^2_{ij} \geq r_{5\%}$) were selected from the model (for further details, see Sváb, 1979). Using these indices as the variables, principal component analysis was repeated. Only the indices for agricultural structures were used. In the model a solution without rotat ion was applied. The communalties' values (h^2) were above 0.5, while the four principal components' cumulative eigenvalues (λ) were above 50%.

3. Results

The repeated principal component analysis results demonstrate how the objective variable, the value added per capita index, depends on the major agricultural structure indices. The final achievements for variables with the desired level of significance are presented in Table 2.

Table 2

The value added and personal income tax per capita and the agricultural structure indices significant correlated with them in the Northern Great Plain and Northern Hungary

P=891

	Principal components			
	1	**2**	**3**	**4**
Available value added per capita* (objective variable)	0.82	0.36	ns	ns
Taxable personal income per capita	0.81	0.36	ns	ns
Ratio of arable land	0.69	ns	ns	ns
Ratio of agricultural land	0.66	ns	ns	ns
Diversification of livestock farming involving the keeping of alternative animal species	0.53	0.31	ns	ns
Aggregated index of non-agricultural diversification	0.52	ns	ns	ns
Agricultural area per annual work unit of persons involved in farm activities on small and medium farms (AWU/ha)**	0.46	0.64	ns	0.38
Ratio of commercial farms of over 50 hectares	0.29	0.62	ns	0.50
Agricultural area per farm	0.30	0.60	ns	0.52
Stocking rate per hectare of arable and grassland	ns	0.51	0.25	0.64
Cumulative eigenvalue (λ), %	20.2	32.1	41.1	49.5

ns = non-significant

* The details of calculation see in (Fehér, 2003:76).

** The considerable part of persons involved in the activities of small and medium size farms can not be included in the categories of employees or entrepreneurs. For comparable calculation we used the workdays recorded in Agricultural Census 2000. After calculating man hours the amount of which was divided by 1800 and Annual Work Units (AWU) were obtained. AWU is in use also in EU agricultural statistics.

4. Conclusions

4.1. The economic performance and competitiveness of rural economy

The *indicator of the value added per capita is* capable of measuring the economy's accumulating and investing power in the given rural area, and the income available to the permanent population of these rural areas for household consumption, representing the financial basis for standard of living. This indicator can thus be considered as representative of the rural economy's general economic performance.

A rural economy can be considered to be *competitive* if:

- resources are, over the long term, used efficiently and sustainably.
- the economic structures promote the active adaptation of economic actors
- there is continual expansion of job opportunities and openings for enterprises, leading to a reduction in economic inactivity
- for the above reasons there is a durable increase in the value added per capita and in personal incomes.

Regional differences in competitiveness are considerable even within the Northern Great Plain and Northern Hungary, the macro-regions with the greatest disadvantages. There are relatively few micro-regions with competitive advantages, and these are mostly due to the secondary and tertiary sectors in various towns. *As a whole, the rural economy is at a competitive disadvantage.*

An analysis of the rural economies in the Northern Great Plain and Northern Hungary macroregions indicates that the processing industry is still not, to any great extent, linked to other local sectors and plays only a limited role in counteracting regional inequalities. An analysis of the technical literature suggests that in these two macro-regions less productive and poorer paid services are dominant, rather than more progressive business services. The acceleration of a concentration process in services may mean that the sector lays off more staff than it hires. Surveys carried out by the authors also revealed a concentration process in accommodation services and village tourism.

4.2. Agricultural sub-structures' role in the rural economy's competitiveness

As an objective variable, for the index of value added per capita, most important are the first and second principal components. The principal component loadings indicate not only the relationship with the objective variable, but also corrleation's strength between the variables. In the present case, it is especially important to stress the following circumstances:

- The ratio of both agricultural and arable land is in a relatively close correlation with the objective variable.
- The moderate correlation between land availability index (land area per capita), regional performance, incomes and diversification indicates the following on some farms: labour which has become 'superfluous' in traditional farming coupled with the possibility of employing family members had a positive effect regarding introduction and expansion of alternative, non-agricultural activities. The correlation also shows, however, that the *concentration of land does not improve the employment rate in agriculture*.
- The suggestion that alternative livestock farming and non-agricultural activities were characteristic on farms of over 50 hectares was only confirmed by a weak to moderate correlation.
- In the second principal component was expressed the weak correlation between stocking rate and the presence of alternative animal species. Worthy of mention is the correlation between the ratio of larger farms (with a higher land area per farm) and the regional performance was somewhat below the moderate level.
- A moderate correlation between land availability, stocking rate and the ratio of commercial farms was revealed by the fourth principal component. However, there was no significant correlation between this principal component and the objective variable.

The analysis and the model draw attention to the fact that there is a mutual, synergic relationship between the different sub-structures, or rather between the indices used to describe them. This relationship has an influence on the coherence of agricultural structures, but also affects the functioning of agriculture as a whole and, in a wider sense, that of the rural economy. This latter impact can be traced through the value added per capita index, as an economic performance indicator of the rural economy. The results for each agricultural substructure are summarised below.

1. *Land use and production structure*. As in other rural areas, a high proportion of land in rural communities in the two macro-regions is used for agriculture and forestry. This covers various land use categories (forest, arable, grassland, orchards, vineyards), depending on whether the land is flat or hilly.

   Examining the extent of non-cultivated *fallow land* indicates that the ratio is higher in hilly areas than on flat land. In these macro-regions the largest area of fallow land was recorded on farms with less than 10 hectares of land, followed by those with 10.1–50 hectares (where the ratio of land farmed by the owners is the highest and the mean field size the smallest). This suggests that *there has been a decline in the number of people renting such land, while the number of farmers who have stopped farming their own land is on the increase*.

   Regarding the *mean number of fields (plots) per farm*, special attention should be paid to the fact that the field size on larger farms has declined rapidly, and, as land ownership becomes more concentrated, this tendency is likely to continue, given that the mean field size on small farms is smaller. If these farms continue operating without land consolidation based on land exchange, it will lead to, on larger farms, to an *increasing and undesirable trend in field size reduction*.

   Within production structure several aspects were studied. These included the structure of crop production, the relationship between livestock farming and land use, the ratio of animal species consuming roughage and bulk fodder. Also studied were the presence of non-agricultural activities, the spread of organic farming, and the diversification of crop production and livestock farming.

   The ratio of land sown to various major crops seems to depend not only on the tendency towards uniformity, which entails a drop in the number of crops grown, but also, in the given area, on the farmers' adaptability and on the size of the land they farm.

   The index used to analyse the relationship between livestock farming and land use was the stocking density per hectare of arable and grassland. Throughout the macro-region the stocking density is extremely low, and this is especially true on larger farms. No regional differences could be observed between the districts studied, so within the macro-regions it appears that *the stocking density has evened out at a very low level*.

   The diversification of agricultural and non-agricultural activities is still in its infancy. However *in some micro-regions these activities have already had measurable effects on the value added per capita.*

   Within the studied macro-regions, regarding both land use and production structure, can be observed uniformity and simplification processes as well as numerous transitional period negative aspects (reduction in field size, long-term fallow, radical decline in stock numbers, unexploited grasslands, etc.) with regard to both land use and the production structure. The challenges raised by EU accession call for better adaptability and rapid changes. However, especially on a small farm, many of the conditions required for this are lacking. Nowadays, in these two macro-regions, land use and production substructures tend largely to have a negative effect on the performance of rural economies.

2. *Farm size structure* was analysed using five categories. Among these, miniature holdings with less than 10 hectares of land *are not regarded as commercial farms*, while those with 10.1–50 hectares of land are regarded as *partially commercial farms*, since

the income gained from commodities grown on this area is not sufficient to support a full-time farmer and his family within the production structure widespread in Hungary at the turn of the millennium. A change in the farm-size structure can no longer be delayed. This could be bolstered by the support for semi-subsistent farms as foreseen by the National Rural Development Plan. It is stipulated that farms between 50.1 and 300 hectares are *medium-sized farms*, and those with more than 300 hectares are *large farms*. The farm size structure in the Northern Great Plain and Northern Hungary in 2000 can be seen in Table 3.

Table 3

Farm size structure in the Northern Great Plain and Northern Hungary in 2000

	Land area in hectares					
	<10	**10.1–50**	**50.1–100**	**100.1–300**	**>300**	
Distribution of numbers of farms in each category (%)	94,50	4,63	0,53	0,26	0,08	100,00
Proportion of the total land area used by farms in each category (%)	19,84	19,06	7,54	10,22	43,34	100,00
Average land area per farm, ha	1,05	20,64	71,47	196,23	2880,37	5,02

Source: Calculations based on the data for individual settlements from the Agricultural Census

It is clear from the table that miniature holdings compose a very large proportion of the number of farms, but their total land area is much more modest. The opposite is true of the large farms, while medium-sized farms, in 2000, did not constitute a major factor. However, potentially, they could play an important role and for this reason they merit a separate study. On the whole, in Hungary, the unhealthy bipolar farm structure is characteristic and not limited to the two macro-regions investigated.

The land areas available to *small and medium-sized farms* are summarised in Table 4.

Table 4

Land available to farms in the Northern Great Plain and Northern Hungary in 2000

	Land area in hectares		
	10.1–50	**50.1–100**	**100.1–300**
Average land area per capita	8,7	28,8	89,3
Land area per annual Work unit (AWU)	19,1	53,0	143,7

Source: Calculations based on the data for individual settlements from the Agricultural Census

In the principal component model (Table 2) it was observed that both the ratio of farms with more than 50 hectares of land and the land area per farm and per capita had a positive influence on the value added per capita. In EU member states, CAP stimulated land concentration along with with the need for regional competitiveness are expected to strengthen the process leading to larger farms. And this trend also holds true for Hungary. Table 2 data suggest that this land concentration will be accompanied by *a subst-*

antial increase in the land area per capita in farm activities, which in turn will influence the number of people acquiring income from agricultural rural economy activities.

3. Within the *human resources structure* and with other substructures, studies were done on agriculture's employment effects as well as on the average age and educational background of those farming on small or medium-sized areas.

   The labour density index, calculated as the reciprocal of the land area per capita or per annual work unit, gives the number of people employed on 100 hectares. On Table 5. this is illustrated.

Table 5

Work force per 100 hectares in the Northern Great Plain and Northern Hungary in 2000

	Land area in hectares		
	10.1–50	**50.1–100**	**100.1–300**
Number of participants in farm activities per 100 hectares	11,49	3,47	1,12
Annual work units per 100 hectares	5,23	1,88	0,69

Source: Calculations based on the data for individual settlements from the Agricultural Census

It is clear from the table that *land concentration is likely to cause a further substantial decline in the work force per unit area*, and also in the size of the farm work force.

In some micro-regions the farmers' average age was high (over 50). It was found, however, that this was influenced to a greater extent by the farms' land area than by the micro-regions in which the farmers lived. Those farming small farms were the oldest, while members of the younger generation were generally found on larger commercial farms, thus having a more favourable mean age.

Those farming on medium or large areas also tended to be better educated. In the Northern Great Plain region on farms of 10.1–50 hectares, one of the observed negative indices was the extremely low ratio of farmers with a secondary qualification in agriculture, while on farms with 100.1–300 hectares of land, the presence of graduates in agriculture varied considerably from one micro-region to the other.

4. In dealing with conflicts, *the co-operational and co-ordinational substructures* will be important. The terms co-operation and co-ordination are taken to mean the following:

   Co-operation means the distribution of work between agribusiness and other sectors of the regional economy. This co-operation is based on common interests and includes various types of organisational or institutional frameworks. *Co-ordination* means a system of management and control followed and accepted by the distinct majority of interested parties, including basic principles, ways and means, and the forms and institutional background of such co-ordination.

   Fundamentally, *bureaucratic, market-oriented, ethical and aggressive forms of co-ordination can be distinguished.* Within co-ordination's bureaucratic and market forms, both the horizontal and vertical approaches are widespread. Some authors consider that *integration is part of market co-ordination* (Horváth et al., 2001), and this view will form the basis of the discussion below.

At present, in the macro-regions co-operation between farmers is completely unorganised and generally of a low standard. Some farms that were previously co-operatives have become share-holding companies or limited companies, thus completely losing their co-operative character.

Marketing co-operatives (producer groups) have been formed by fruit and vegetable producers, and in vineyard areas wine-making co-operatives have been established. Despite the fact that the Hungarian legislature and the state subsidies system provide incentives for the formation of co-operatives, no significant progress has so far been made in this field (Ministry…, 2002, 2003).

4.3. Measures for improving agricultural structures

After EU accession, improvements in agricultural structures in the two regions could be achieved in the following ways, but of course the necessary measures need to be taken:

- *A reduction in uncultivated fallow areas*. EU accession's positive effects can even in the short term generate an increase in agricultural incomes, as well as "good farming practice", afforestation of agricultural areas, and the registration of farmers.
- *A reduction in the ratio of small fields (plots)*. Due to the previously mentioned land concentration, it will probably not be feasible in the medium term to exploit this potential, but in the long term, national and EU payments could be available for achieving positive changes.
- *Diversification of the crop production structure and the prevention of a further decline in the number of ruminants*. The SAPS system, in place until 2006, and the market outlet now favour the production of cereals and oil seeds, and to some extent beef cattle and sheep. This is likely to stabilise the crop production sector, which already occupies substantial areas, and slow the decline in the number of ruminant animals. However desirable it might be, due to Hungary's limited market for organic products and due to the moderate and regional nature of the measures taken, no large-scale diversification of agricultural activities can be expected in the medium term.
- *An improvement in the ratio of medium-sized farms and a resulting modification of the present bipolar farm structure.* At present in Hungary it is mainly spontaneous market processes that are dominant. The effects of early retirement and the state purchase of small farms have been extremely modest. It is likely to take a considerable time for these measures to make an impact.
- *Efforts towards employing or helping redundant workers in the agricultural sector.* In Hungarian rural economies the achievement of this goal is vital. Unfortunately neither non-agricultural farm diversification nor other sectors of the rural economy are sufficiently developed. *The development of on-farm non-agricultural diversification is indispensable.* During 2004-2006 funds available for this purpose appear to be too modest to make an impact. The introduction of the European Multifunctional Agricultural Model could contribute to finding a solution, but so far very little progress has been made.
- *Improvements in human resources and their structure.* In the studied regions, an aging population, low levels of education, deteriorating health, poverty, and the inadequate organisation of local rural communities were characteristic of the

rural population. The changes needed in this field will obviously not be restricted to those employed in agriculture. Due to the substantial differences between the regions, horizontal measures will not produce solutions.

- *Progress in the fields of co-operation and co-ordination.* Here potential is closely related to improvements in the structure of human resources and to the rural economy's general standard of development. Even if adequate measures are taken, real results can only be expected in the long term.

These studies draw attention to the fact that the agricultural structures' problems in the two macro-regions, revealed by the indices discussed above, result in disruptions in the rural economies' equilibrium and functioning, which results in a loss of competitiveness. The situation is aggravated by backwardness and lack of equilibrium in other sectors of the economy. A change in agricultural structures, under the present conditions in Hungary, will only be possible if changes are also made in the structures of other sectors within the rural economy. If adequate databases are available, the analytical method presented here can be applied both to estimate the measures' actual impact on developing rural economies.

References

1. Fehér, A. (2003): Farmdiversification in SAPARD-microregions of the Northern Great Plain in Hungary, Studies in Africultural Economics, No 99, 80.p.
2. Fehér, A. (2005): A vidékgazdaság és a mezőgazdaság, Agroinform Kiadó, Budapest, 40.p.
3. Gardner, B. L. and Rausser, G. C. (2002): Handbook of Agricultural Economics, Elsevier, 1596.p.
4. Horváth, B. – Kósa, C. – Szabó, G. G. (2001): Élelmiszer-gazdasági koordináció és a tranzakciós költségek kapcsolata, Acta Agraria Kaposváriensis Vol. 5, No. 4, 65-76.p.
5. Ministry of Agriculture and Rural Development decree No. 85/2002. (IX.18.) on production groups,
6. Ministry of Agriculture and Rural Development decree No. 3/2003 (I.24.) on subsidies for agricultural and rural development purposes in the 2003 budget, § 82–91,
7. PIU Report, 1999: Rural Economies, Performance and Innovation Unit, London, 1999. December, 21. p.
8. Sváb J. (1979): Többváltozós módszerek a biometriában, Mezőgazdasági Kiadó, Budapest, 63.p.
9. Winter, M and Rushbrook, (2003): Literature review of the english rural economy, Final report to DEFRA, http://www:defra.gov.uk/rural/pdfj/research/lit_rev_rural_econ.pdf .

Studies in Agricultural Economics No. 104. p. 33-42. (2006)

Distributional impacts of EU accession on Hungarian food consumers

Carmen Hubbard[1] and Szilárd Podruzsik[2]

Abstract

This paper focuses on estimating EU accession's short-term economic impact on different deciles of Hungarian food consumers, and on identifying those most vulnerable to food price changes. Using Slutsky's technique, the impact was calculated by Laspeyres indexes and by a Compensating Variation per decile per person per month. The results show that EU accession has had, at least in the short run, a negative impact on all groups of Hungarian food consumers. This is particularly true for the poorest food consumers, who need a 2 per cent (or 1.56 euro/month) increase in their net income in order to remain as well off as before accession. This group is the most susceptible to food price changes as food comprises a large part of their total monthly expenditures. In contrast, the high-income deciles need only a small increase in their net income to maintain the same standard of living as before accession.

Key words

Hungary, accession, price, food, consumption, economic welfare effects, compensating variation

1. Introduction

In 2004 accession to the European Union (EU) by Central and Eastern European Countries (CEECs) meant that the new members had to adopt the Common Agricultural Policy (CAP) within the Single European Market, which led to price convergence at EU levels. In general this meant an increase in food prices. It is well known that the CAP, even after recent reforms, leads to higher prices for agricultural products than under free market conditions. Although the CAP does not have a direct effect on food prices, higher prices for agricultural raw materials mean higher retail food prices, and hence higher costs for consumers. Agricultural policies typically entail monetary transfer from consumers (and taxpayers) to farmers.

Hungary, which is one of the ten new EU countries, has achieved considerable economic and social progress since transition to a market economy (Lakner and Hajduné, 2002). Although the economic performance indicators show that agriculture's total contribution to the economy has decreased since 1990 (when it represented 12.5 per cent of the GDP), the sector still plays an important role. In 2003 its contribution to GDP and total labour force accounted for 3 per cent, and 6 per cent respectively www.fvm.hu). Moreover, Hungary is still a net agricultural exporter.

However, despite the overall economic progress (e.g. increased economic growth, decreased inflation and low unemployment), food still entails a large share of the average household's total expenditures; in 2004 this amounted to about 29 per cent compared to advanced EU economies' 17 per cent. Indeed in the new member states, the percentage spent

[1] Carmen Hubbard is a Research Associate at the Centre for Rural Economy, University of Newcastle upon Tyne, UK

[2] Szilárd Podruzsik is a lecturer at the Department of Food Economics, Corvinus University of Budapest.

on food is nearly twice the average as in the old member countries. Given the constant nature in demand for food, a rise in food prices, ceteris paribus, will be reflected, at least in the short run, in higher expenditure on food and a decline of consumers' real income (standard of living). Previous studies demonstrated that, in general, EU accession has involved higher food prices for new members. For example, Georgakopoulos (1990) showed that in Greece accession increased the price of food by 8.5 per cent, causing a bout of inflation of 3.5 per cent. Total food consumption changed its structure and decreased by about 1 per cent. Renwick and Hubbard (1994) estimated the CAP's total average cost per UK household as between 2.4 per cent and 3.7 per cent of gross income. In the Netherlands, Kol and Kuijpers (1996) estimated that, in a four-person household, CAP total costs were about 7 percent of average disposable income. Mészáros's et al. (2001) pre-accession study estimated that, as a result of accession, higher Hungarian producer prices would cause a 4.5 per cent increase in food prices for consumers.. However, given the expected post assession rise in real income, they argued that accession would not create a price shock for the Hungarian population. In the medium to long term this argument is sustainable.

This paper focuses on estimating EU accession's short-term economic impact on the welfare of various groups (deciles) of Hungarian food consumers, and on identifying those most vulnerable to food price changes. The paper is structured as follows: in Section 2 there is a short overview of food consumption and prices since transition to a market economy. Section 3 contains the theoretical background and methodology. In Sections 4 and 5 are results and some concluding remarks.

2. Brief description of Hungarian food prices and consumption

The Hungarian economy's transition to a market economy has involved radical structural changes. Since 1990 food prices have increased rapidly and, in general, exceeded the inflation rate. Over the last ten years, prices for the principal food products rose between 100 and 300 per cent. In 1993 consumer subsidies were abolished and a Value Added Tax (VAT) of 10 per cent was introduced for food products. As the economy has developed, the proportion food plays in total expenditures by an average Hungarian household has decreased gradually, from about 34 per cent at the beginning of the 1990s to 29 per cent in 2004 (Table 1).

Table 1. Structure of consumption expenditure (%), Hungary

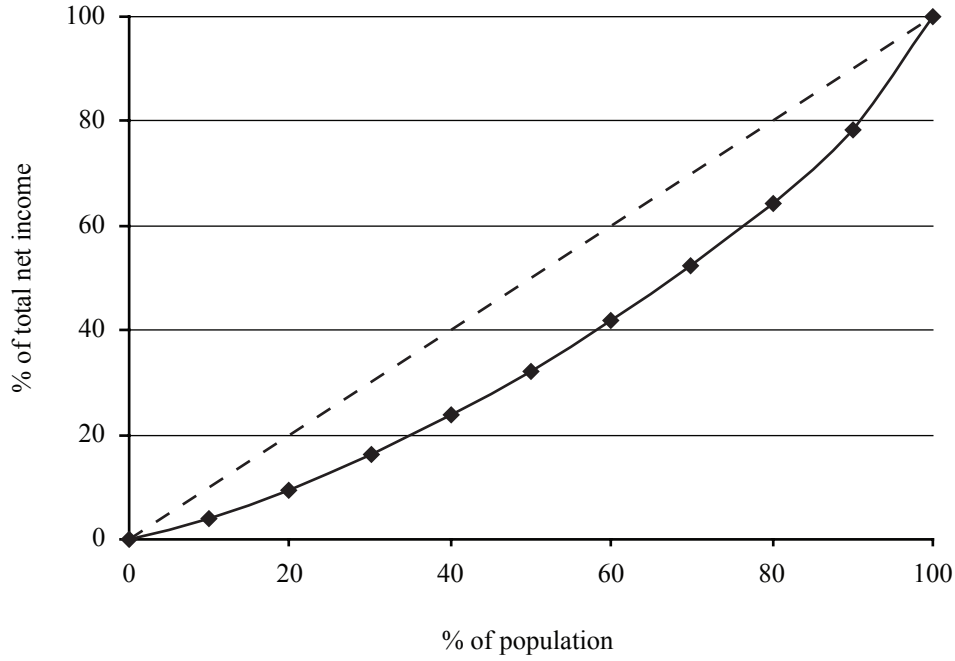
	1993	2002	2003	2004
Food	33.7	33.2	30.5	29.1
Maintenance of dwellings	14.1	20.1	21.5	23.2
Other consumption expenditure of which:	52.2	45.9	48.0	47.7
- Clothing	7.5	5.7	5.7	5.2
- Health, personal care	3.8	5.9	6.3	6.4
- Transport and communication	13.1	15.6	16.3	18.6
- Education, culture, recreation, entertainment	6.1	6.5	7.0	7.2
Total consumption expenditure	100	100	100	100

Source: HCSO (2005b, 2004)

However, the role food expenditure plays in total expenditures is very much tied to income, i.e. the higher the income, the lower the share. Hence, a decile analysis on the basis of income and expenditure will give a more accurate view of across the board impact. A Lorenz curve (Figure 1) and the associated Gini coefficient (of 0.257) show a relatively low degree of income inequality in Hungary.

Figure 1

Lorenz Curve of Income Inequality by Deciles, Hungary, 2003



Various Hungarian studies have studied household food consumption and expenditure pattern since transition to a market economy. Using quintiles Bernát and Szivós (2004) studied Hungarian household consumption. Their study showed that, in 2003, food expenditure rose, in nominal terms, by 42 per cent compared with the year 2000, with an average household spending a little more than HUF 35,000 (€138) per month on food products. The study also revealed that in, total food consumption, the proportion of personally produced food is signifcant, and thus households which consume food they have personally produced can 'save' a monthly average of HUF 29,000**.** However, it can be argued that in (economic) theory it is the opportunity cost of the imputed value of food consumption which matters, and thus its importance should not be neglected, particularly if it represents an important share of total consumption.

Lajos (2004) studied the relationship between food consumption patterns in terms of two prevailing factors: demographic changes and income. The results demonstrated that changes in population and its actual structure do impact not only on consumption level but also on the quality of food consumed. Not surprisingly, the study demonstrated the significance of income related to food consumption, as the quantity and composition of food consumption is highly dependent on income level. In the same vain, Mikesné-Menző (2003) examined the correlation between food consumption, prices and income, and Forsyth *et al*. (1994) reaearched household

food consumption patterns for different income categories. Mikesné-Menző's study noted that in the last decade, the consumption of products such as eggs, milk and sugar has decreased considerably as compared to 1989. Futó (1998) examined 30 food products using prices and quantities consumed between 1989 and 1997. The results showed that price changes impact significantly on food consumption: e.g. an increase in food consumption is linked to those products whose prices are increasing more slowly than the average food price-index, and vice versa. Another recent study carried out by the Hungarian Economic Research Pls indicated that Hungarian consumer behaviour does not change easily. Hungarians traditionally consume potatoes, poultry, milk, and fruits and vegetables, indicating that consumers' habits have only slightly shifted towards higher processed quality products.

3. Theoretical background and method

The most common method used in applied welfare economics for estimating gains or losses to consumers due to price fluctuations is the Marshallian consumer surplus method[3]. However, this measure does not represent, except in rare circumstances (i.e. zero income effect), the exact measure of a change in consumer well-being. A negligible income effect requires that income variability related to demand for a given product be very small or that money spent on the product represents a minor share of a consumer's total expenditures. Introduced by Hicks, the appropriate theoretical measures for gauging consumer surplus (Willig, 1976) are thought to be the Compensating Variation (CV) and Equivalent Variation (EV) consumer surplus. In applied welfare economics, these two measures constitute key concepts (Just *et al.*, 1982; Currie *et al.*, 1971).

Hicks (1956, p.99) defined the CV as "the amount of compensation, paid or received, that will leave the consumer in his initial welfare position following the change in price if he is free to buy any quantity of the commodity at the new price". Nevertheless, Hicks's technique of analysing consumer surplus by computing CV (and EV) on the basis of ordinal indifference curves has been criticised for its lack of real world applicability, i.e. our inability to measure utility. It is therefore impossible to determine exactly how much the consumer's real income should be altered to keep him or her on the original indifference curve. This is done to compensate for the impact on real income deriving from a price change for a given product. (Laidler, 1980; Miller, 1978).

Slutsky introduced an alternative approach to the Hicksian technique, and approximated a consumer's real income as the ability to purchase the same package of goods before the price changes (Laidler, 1980). This approximation does not refer to an indifference curve, and hence eliminates the criticism given the Hicksian approach[4], making possible the empirical calculation of the amount of money (income) that maintains the consumer at a constant level of consumption (satisfaction). However, either because it is difficult to compute them, or because empirically they are unobservable (Kola, 1993), CV (and EV) are not often used. Deaton and Muellbauer (1980) have argued that there are several straightforward methods to calculate CV (and EV) that don't involve the Marshallian measure. Based on information about price and quantities, both can be easily determined by constructing index numbers (e.g. Laspeyres and Paasche indexes). In this respect, CV (and EV) are typically viewed

[3] It represents the area under the demand curve and above the price market, and is defined as the extra amount of money (price) a consumer is willing to pay over that he actually pays rather than to go without the thing (Marshall, 1930).

[4] The Hicksian real income is defined as the ability of achieving (or maintaining) a given level of utility.

as alternative welfare measures to gauge changes in the cost of living (Mansfield, 1982; Laidler, 1980). They can thus assess to what extent a consumer's real income transforms (i.e. a given income's real purchasing power) when a product's price changes or to what extent the consumer's standard of living alters when price fluctuates. CV estimates the minimum amount of money (i.e. expenditure) necessary for a consumer to maintain (or attain) a given standard of living (i.e. level of utility with Hicks or the same package of goods with Slutsky).

Given the above arguments and that, in Hungary, food still represents a major share of total household expenditure (29 per cent in 2004), one can conclude the following: the Slutsky CV approach (based on Laspeyres indexes) is the appropriate way for measuring EU accession's impact regarding price changes and their economic welfare effects on different deciles of Hungarian consumers.

The data was collected by deciles, and were taken from the Hungarian Central Statistical Office's 2005 Yearbook of Household Statistics. Also utilised were the 2003 and 2004 Household Budget Survey Reports. The included sample from the Household Budget Survey's is nationally representative. During each quarter approximately 2,500 households (or 0.07 per cent of total households) are randomly chosen. Collected monthly is information on income, expenditures, food consumption and consumption from a consumer's personal resources.

To estimate the minimum income that a person in each decile has to pay or receive to maintain his/her standard of living before price change takes place (i.e. CV), a food consumption model, based on Firici (2003). was constructed For each decile, 19 food products were chosen to represent commonly consumed items: bread, wheat flour, sugar, sunflower oil, pork, poultry, beef, milk, cheese, cream, butter, margarine, eggs, potatoes, rice, onion, carrots, apples and oranges. Collected for each decile and each product were the average quantities consumed monthly per person for the year 2003; also collected were 2003 prices (pre-accession) and 2004 (post -accession). For all deciles a number of assumptions were made: (i) across the deciles food prices are the same; (ii) prices for all other goods (non-food and services) remain constant; (iii) all food products are considered everyday products.

For each decile, pre-accession expenditures (individual consumption, monthly average, multiplied by price) were calculated for each product, and then aggregated in order to obtain *total pre-accession food expenditures*. New expenditures were computed product by product, using the initial quantities (2003) and the new prices, and then summed at the decile level as *total post-accession food expenditures*. Using total pre-accession expenditures, total post-accession food expenditures and non-food (including services) expenditures (which were assumed to remain constant at the 2003 level), Laspeyres price indexes (L_j) were calculated to show the overall cost of living impact for each decile. On the basis of these indexes and initial money income (i.e. net 2003 income), compensating variation was computed for each decile as follows:

where I_j represents the net income earned by a person in each decile j (j = 1,10)

3. Results

The analysis shows that EU accession brought significant price changes for the 19 food products. The overall average increase in food prices was 8.7 per cent. Table 2 exhibits the post-accession 2004 food price changes as compared with the 2003 pre-accession prices. Of the 19 food products included in the analysis, ten products recorded a price rise, between 5 per cent for cream and 23 per cent for sugar. For meat products, pork had the highest increase (20 per cent). The price of oranges (used in this exercise as a proxy for citrus fruits) also increased by 20 per cent. Maybe not surprisingly, milk is one of the products which after accession declined in price. This is because prior to accession milk rose to above the EU level price (see Mikesné-Menző, 2003; Futó, 1998).

Table 2

Hungarian Food Prices Changes due to Accession

Products/Price	**2004** HUF/UM (monthly average)	**2003** HUF/UM (monthly average)	**Price Change (2004/2003) %**
Bread (kg)	178	156	14
Wheat Flour (Kg)	85	74	15
Rice (kg)	184	167	10
Sugar (kg)	222	180	23
Sunflower Oil (l)	273	284	-4
Pork (kg)	925	773	20
Poultry (kg)	512	462	11
Beef (kg)	979	890	10
Milk (l)	156	160	-3
Butter (kg)	1,432	1,280	12
Margarine (kg)	586	540	9
Cheese (kg)	1,252	1,330	-6
Cream (kg)	425	405	5
Eggs (piece)	21	19	11
Potatoes (kg)	86	103	-17
Onion (kg)	112	135	-17
Carrots (kg)	122	174	-36
Apples (kg)	146	149	-2
Oranges (kg)	327	269	22

Source: HCSO, Yearbook (2005) and authors' estimates

The estimated results for the short-term impact of EU accession are presented in Table 3; these highlight, in the form of Laspeyres indexes, the cost of living increase per person for each decile due to the change in food prices. It also shows the minimum amount of money that a person from each decile should receive or is willing to accept (i.e. CV), on average per month, in order to remain as well off as before the food price changes (i.e. to consume the same package of goods as before accession).

Table 3

Laspeyres price indexes and Compensating Variation per deciles

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Laspeyers Index (%)	101.9	101.5	101.4	101.3	101.2	101.2	101.0	100.9	100.8	100.5
CV (€/person/month)	1.56	1.78	2.09	2.23	2.18	2.42	2.38	2.39	2.33	2.26
CV (HUF/person/month)	395	450	529	564	552	614	603	607	590	574

Source: authors' estimates

As all Laspeyres indexes are above 100, a rise in the cost of living is recorded for each decile. The cost of living percentage increase varies between 0.5 per cent for the highest income decile (D10) and 1.9 per cent for the lowest (D1). On average, each decile will have to increase its total income by 1.2 per cent or Euro 2 per person per month to be able to consume the same package of goods as before the food price changes. Naturally, the first decile is the most vulnerable to food price changes: a 2 per cent net income increase is necessary for a person in this decile to compensate for his/her decline in welfare. This is due to food's large share of general expenditures (22 per cent)[5] in terms of total net income (Table 4).

Table 4

Total net income and percentage of food expenditure, Hungary 2003

	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10
Total net income (HUF/person/month)	21027	30896	36874	41910	46553	51515	57524	64881	77004	119126
Total net income (€/person/month)	83	122	145	165	184	203	227	256	304	470
% of food expenditure in total net income	22	17	16	15	13	13	12	10	9	6

Source: authors' estimates. The exchange rate is the average for 2003: **€**1 = **HUF** 253.51

The minimum amount of compensation for each person in each decile (if compensation is paid) to remain as well off as before the food price changes varies between 1.56 euro/person/month (or HUF 395) for decile 1 and 2.42 euro/person/month (or HUF 614) for decile 6. Although one might expect that the larger the (net) income, the bigger the compensating variation, in fact the highest income deciles (e.g. D9 and D10) require less compensation. It may be that a person from these deciles eats out more (e.g. in restaurants, fast-foods) and, due to lack of data, this particular food consumption pattern was not included in our research.

[5] It refers to the 19 food products included in this research.

5. Concluding remarks

This paper estimates food price chanages' short-term impact on different groups of food consumers as a result of Hungary's accession to the EU in May 2004. Using Slutsky's technique, the distributional welfare effects were calculated in the form of Laspeyres indexes and CV per deciles per person per month.

The results show that EU accession does have, in the short run, a negative impact on all groups of food consumers, particularly the poorest, who need a 2 per cent (or 1.56 euro/month) increase in net income to maintain their standard of living. This group is the most susceptible to food price changes due to food's high share of their total expenditures. In contrast, the high-income deciles need a small increase in net income to maintain the same standard of living as before accession. People in these groups also seem to eat out more often. Recent official statistics (HCSO, 2005c) estimate that eating out went up from 9 per cent in 2002 to 12 per cent in 2004, and very likely this occurred in the higher income bracket.

It can be argued that, on total income, a mere 1.2 per cent average increase's negative impact is rather small. This could be explained by a number of reasons. First, the analysis of 19 food products covers on average only 52 per cent of total food expenditures. Thus, the estimated CV could be doubled if the same level of average price increase (i.e. 9 per cent) applies to the 48 per cent of food expenditure not covered in the analysis. Secondly, Hungarian pre-accession food prices could have already been high. One reason for this is that food prices might have risen in anticipation of accession. Indeed, official statistics (HCSO, 2005c) show that between 2000 and 2003 the general consumer price index rose by 32 per cent. In the medium and long-term, higher food prices' negative impact may be offset by higher real incomes stemming from EU accession. However, here this possibility is not analysed.

References

1. Currie, M. J., Murphy, J.A. and Schmitz, A. (1971). The concept of economic surplus and its use in economic analysis, *Economic Journal*, **81**, 741-799.
2. Bernát, A. and Szivós, P. (2004). *Characteristic of consumption in general and in two major group of consumption*. In Kolos, T. et al. Társadalmi riport, Tárki, Budapest, 290-305
3. Deaton, A. and Muellbauer, J. (1980*). Economics and Consumer Behaviour.* Cambridge University Press, Cambridge.
4. Firici, M.C. (2003). Distributional Impacts of Common Agricultural Policy Adoption by Romania. PhD thesis, University of Aberdeen.
5. Forsyth, A., Anderson, A. and Macintyre, S. (1994). Diets for Disease–Urban Food Choices. *Appetite* **22**. 259-274
6. Futó, P. (2000). Price and income changes on food consumption, 1989-1997. *Statisztikai Szemle*, **(78) 2-3**, 118-141
7. Georgakopoulos, T.A. (1990). The impact of accession on food prices, inflation and food consumption in Greece, *European Review of Agricultural Economics*, **17**, 485-495.
8. Hungarian Central Statistical Office (HCSO) (2005a). The Yearbook of Household Statistics, Budapest.
9. HCSO (2005b). Household Budget Survey Report, Quarter I-IV 2004, Budapest.
10. HCSO (2005c). Hungary, 2004. Budapest.
11. HCSO(2004). Household Budget Survey Report, Quarter I-IV 2003, Budapest
12. Hicks, J.R. (1956). *A Revision of Demand Theory*. Oxford University Press, Oxford.
13. Just, R. E., Hueth, D.L. and Schmitz, A. (1982). *Applied Welfare Economics and Public Policy*. Englewood Cliffs, Prentice-Hall.
14. Kola, J. (1993). Efficiency of supply control programmes in income redistribution, *European Review of Agricultural Economics*, **20(2)**, 183-198.
15. Kol, J. and Kuijpers, B. (1998). The Common Agricultural Policy of the European Union: Effects and Reforms: an Economic Evaluation with Special Reference to the Position of Developing Countries, *EU/LDC News*, **5(2)**, Erasmus University, Rotterdam.
16. Laidler, D. (1981). *Introduction to Microeconomics* (2nd edition), Camelot, Southampton.
17. Lajos, A. (2004). Effect of the Main Demographic Moments and Income Relations on the Consumption of Foods., *Gazdálkodás,* **(48)5**, 74-80
18. Lakner, Z. and Hajduné, I. (2002). *The Competitiveness of Hungarian Food Industry*. Mezőgazda Kiadó, Budapest
19. Mansfield, E. (1982). *Microeconomics: Theory and Applications*. Fourth Edition, Norton.

19. Marshall, A. (1930). *Principles of Economics.* Macmillian and Company Ltd, London

20. Mészáros, S., Spitálszky, M. and Udovecz, G. (2001). Expected impacts of accession on Hungarian agriculture – new estimates, *Studies in Agricultural Economics* **94**, 19-28.

21. Mikesné-Menző, B. (2003). *Food consumption of households relating to the income*, Thesis, Statisztikai szervező elemző felsőfokú szakképesítés

22. Miller, R.L. (1978). *Intermediate Microeconomics. Theory, Issues and Applications*, McGraw-Hill.

23. Renwick, A.W. and Hubbard, L.J. (1994). Distributional Aspects of the UK Costs of the Common Agricultural Policy, *Food Policy* **19 (5)**, 459-468.

24. Willig, R. (1976). Consumer's Surplus Without Apology, *American Economic Review,* **66 (4)**, 589-597.

Studies in Agricultural Economics No. 104. p. 43-64. (2006)

Comparing competitiveness in major wine-producing countries

Dániel Györe[1]
Teréz Radóczné Kocsis[2]

Abstract

In considering competitiveness among major wine-producing countries, we analysed those countries' strengths and weaknesses for production and trade. We prepared a ranking list for wine-producing countries' in terms of competitiveness and then, after adding up the ranking numbers, we prepared the final ranking list. Included in the survey were: France, Italy, Spain, Hungary, USA, Australia, Chile, Argentina, and South Africa.

In competitiveness the USA ranked first. This was due to an advantegeous mixture of varieties, efficient land utilisation, large-scale production, strong brand names and to the popularity of its wines. A developing and open internal market with significant growth potential also enhances production. U.S. strength is also thanks to the to the low US dollar.

In last place came Hungary. This was because of serious structural problems and lack of efficiency. Other problems hampering competitiveness are: product adulteration, unpopular wine, and a lack of resources for marketing coupled with an unfavourable exchange rate.

Key words

Wine production, competitiveness, production resources, concentration of enterprises, market portfolio, price segmentation, market development

Introduction

On the international wine market, production and consumption are not balanced as there is an annual surplus of between 30 and 50 million hectolitres. Despite measures to curb production and distillation the surplus mainly originates in the European Union. This can be explained by weather conditions, decreasing wine consumption, stagnant exports to third countries, and to continually growing imports from third countries. However, New World producers (USA, Australia, New Zealand, Chile, Argentina and South Africa) are continually increasing their capacities and acquiring an expanding market share in the largest wine consuming countries, putting heavy pressure on traditional East and West European producers.

The aim of this paper was to **describe competitiveness factors regarding the largest wine-producing countries and Hungary** and, on the basis of their competitive advantages and disadvantages, **to determine these countries' positions.** We also prepared a competitiveness **ranking list** for these countries. Included in the survey were: France, Italy, Spain, Hungary, the USA, Australia, Chile, Argentina, and South Africa.

Among **factors** analysed **related to production resources** were the scale of production resources, their fluctuations, a mixture of varieties, and efficiency in land utilisation. In terms of marketing, we studied the following topics: the wine companies' market strength, domestic

[1] Agricultural Economics Research Institute (AKI), 1093 Budapest, Zsil u. 3-5. e-mail: gyored@akii.hu
[2] Agricultural Economics Research Institute (AKI), 1093 Budapest, Zsil u. 3-5. e-mail: radocznekt@akii.hu

market size, exposure to import competition; the volume and value of export and their fluctuations. In German and British retailing we also studied the price segmentation of wines from the countries in the survey. **For governmental intervention measures** we considered support mechanisms for export development and the impact of government exchange rate policies on wine exports. To evaluate competitiveness we tried to consider all factors for which we could acquire same source data of identical content to be used for comparison.

Some of the data and information required for the analysis were provided by the FAO database. Other sources were the USDA's Foreign Agricultural Service wine market reports and studies by ONIVINS and Rabobank.

1. Trends in the Scale of Production

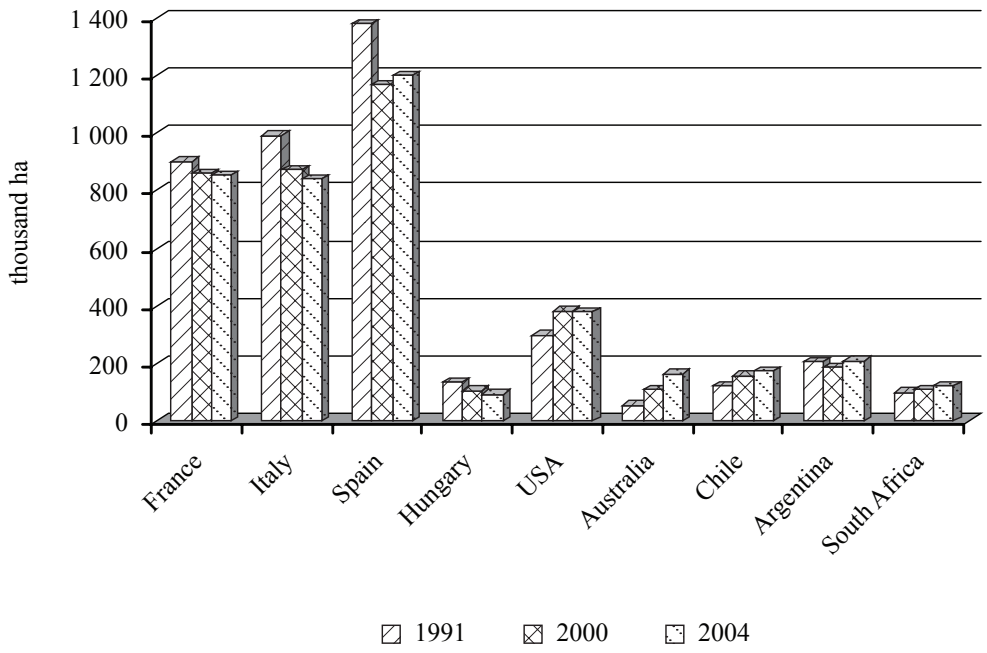
The largest wine growing areas can be found in Spain (1200 thousand hectares in 2004), **France** (854 thousand hectares) **and in Italy** (840 thousand hectares). However, in these traditional wine-producing countries consumption is continually decreasing due to changing consumer preferences, especially among younger consumers: during the last 30 years wine consumption in France, Italy and Spain decreased by 50%. This means that in the three countries total wine consumption of 150 million hectolitres dropped to 77 million hectolitres. Given that these countries accounted for half of international wine consumption the drop impacted heavily on international demand for wine and of course overproduction.

With the overall aim of decreasing the number of vineyards and subsequently overproduction, in 1976 the European Union introduced restrictions on vineyards and reduced support schemes. Despite EU changes regulating the wine market, these measures remain in force and still result in fewer and fewer vineyards.

From the beginning of the 1990s to present vineyard area has decreased in France by **48 thousand (-5%), in Italy by 53 thousand (-15%), and in Spain by 179 thousand hectares (-13%) (Figure 1).**

Figure 1

Vineyard area in the largest wine-growing countries (1991-2004)



Source: FAO

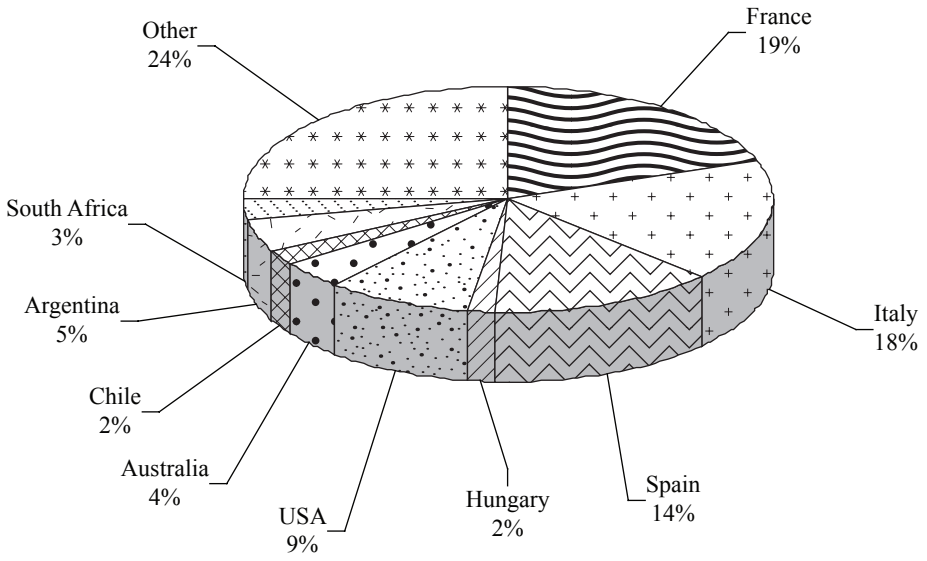
However, – fuelled mainly by exports – **vineyard areas in New World wine-growing countries has exploded**. Among these countries growth in Australia was the most at 200%; but the extent of new vineyards in the USA and Chile was also considerable. In Argentina the creation of new vineyards was hindered by the economic crisis. However, conditions in Argentina are excellent for wine growing and investors are keen. Spanish, Chilean and French wine growers have established themselves in Argentina's major wine-producing areas (Pirovano, 2005). As a result of recent New World vineyards today total area exceeds 1 million hectares, which has sparked strong competition for consumers.

In Hungary since the beginning of the 1990s vineyard area hasdecreased by more than 40 thousand hectares, meaning almost one-third of vineyards.

Despite a decrease in wine-production area, EU major wine-producing countries account for the largest share in total international wine production. In 2000-2003 on average France produced about 54 million hectolitres, 19% of total international wine production. Italy, the second largest international wine producer, produces 49 million hectolitres; In third place comes Spain with 39 million hectolitres, meaning 18% and 14%, respectively of international wine production. Among the New World countries US production stands outs at 25 million hectolitres, which accounts for 9% of world production. In coming years, because of increased New World cultivation (mainly in Australia) a significant increase in wine production can be expected, and this might further disrupt the market. (Gordon, 2005).

Figure 2

World Wine production per Country (2000-2003 averages)



Source: FAO

Hungary with a wine production of 4.2 million hectolitres accounts for only 2% of total international wine production, and its vineyards account for 1.3% in the area under cultivation.

2. Production Potential Competitiveness

Due to oversupply in the European Union it is forbidden to increase vineyard area. However, in the long term support provided for the restructuring existing vineyards will lead to an increasing share in competitive vine varieties.

Launched in the wine market year 2000/2001 restructuring support schemes resulted, until 2005/2006, in the improvement of at least 375 thousand hectares (105 of the EU-25's vineyards) reaching a value of 2.2 billion euro.

In the European Union limitations on new cultivation rights are not efficient enough to eliminate the subsidy created surplus. At the same time the scheme is inflexible as it slows down producers' ability to react to market demand and inhibits competitive producers from enlarging their production. Compared to the **New World, EU Member States are at a disadvantage due to restrictions on new cultivation;** in the **New World** new vineyards are created in relation to market demand and local climatic conditions.

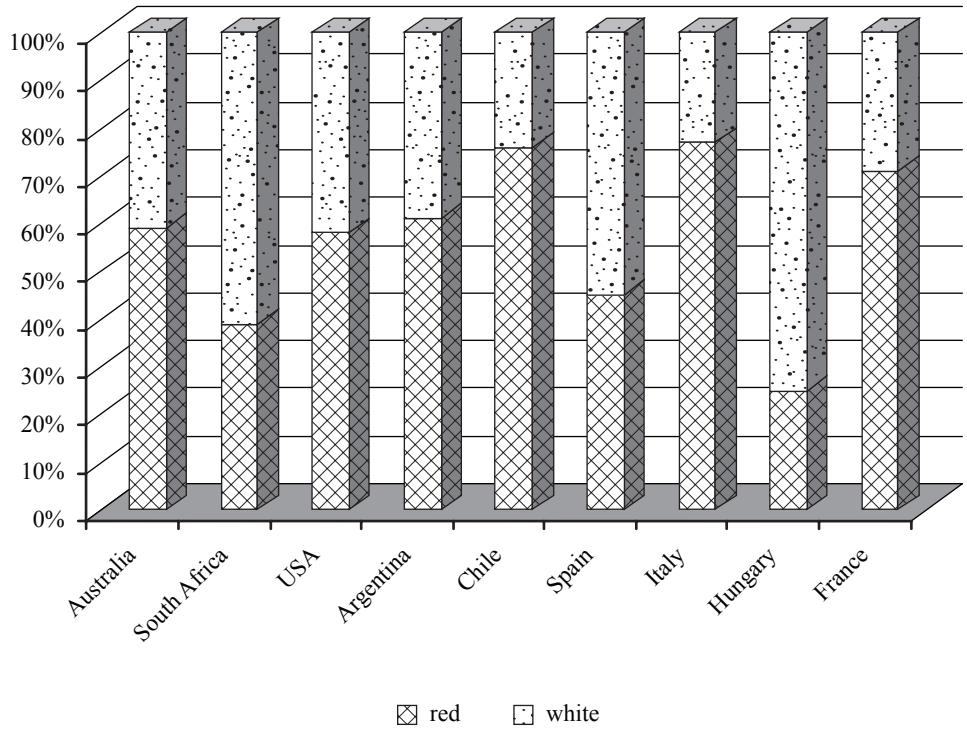
During the last 15 years in the New World countries a great amount of money and energy has been spent on transforming the old cultivated areas and establishing new vineyards.

In Europe due to the special nature of inheritance policy the majority of vineyards are small. Therefore, the SMEs' main aim is, with external financing, to establish large-scale competitive enterprises (ONIVINS, 2004). However, in the New World countries property structure is concentrated. In the European market the New World countries are only present as exporters. Due to market conditions and regulations, they are not involved in production (Hoffmann, 2005).

During the 1990s consumer preferences have shifted from white to red wines. Among several wine-producing countries white wine grapes predominate (New Zealand, South Africa, Germany, Spain and Hungary) (Figure 3).

Figure 3

Distribution of the area of vineyards by colours (%)



Source: Onivins – Facteurs de compétitivité sur le marché mondial du vin

With over 70% in Italy and Chile red grape varieties predominate; in France it is also about 70%. In the USA, Australia and Argentina cultivation is more balanced and the share of red grape varieties accounts for about 60%. In Argentina the area of red grape varieties doubled between 1990 and 2004 (Pirovano, 2005).

In the new cultivated areas the use of grape varieties – in addition to market demand – are mainly determined by ecological conditions. Shifting production structure could prove

risky as consumer preferences might change. For example in the European Union there are significant doubts whether the market will be able to absorb red grape variety products planted during restructuring. (Innova SpA, 2005).

Strengthening competition in the wine market could be advantageous for international varieties (Merlot, Cabernet Sauvignon, Pinot Noir, Syraz, Chardonnay, Sauvignon). Each year from these varieties wine growers can produce excellent wines, which isn't the case for local varieties. Producers and consumers prefer wines from international varieties as they are accustomed to their *standard* taste, which doesn't depend on the location, producer, or vintage, rendering information and selection easier. Since consumers are increasingly used to this "globalized" flavour and introducing a new type of wine is a long process that requires an extremely expensive marketing campaign.

Almost half of recently cultivated New World areas contain international grape varieties. Regarding New World production, Cabernet Sauvignon increased by 150%, Syraz by 314%, Merlot by 172%, and finally Chardonnay by 54%.

In Chile and Australia two-thirds of cultivated areas contain international varieties. In the USA international varieties entail 60%, in South Africia 44%, and in Argentina 30%. Characteristically on the international market New World countries try to also sell traditional varieties; for example: Argentine Malbec (red), American Zinfandel (red) and South African Pinotage (red). In fact, they are obliged to because, due to similar production structures among New World producers, price competition among international varieties is strengthening In Europe, at 33%, the French hold the highest share of international varieties. In Italy it is 8%, and in Spain 2%. In the EU the extent of international varieties is lower than in Third World countries because in the EU over the last twenty years the main objective has been not to ship international varieties but to improve wine quality. Moreover, in European wine-producing countries, due to a well-developed viticulture, traditional varieties are also important when compared to international varieties. In 1990 **in Hungary the international varieties' share** was 7% and **by 2001 11%**. From 1996 in new cultivated areas high quality international varieties (Chardonnay, Szürkebarát, Sauvignon blanc, Cabernet sauvignon, Cabernet franc, Merlot, Pinot noir) increased several fold (Balikó-Tóth, 2004). Prominent Hungarian grape growers producing excellent wines have also attained success with international variety wines.

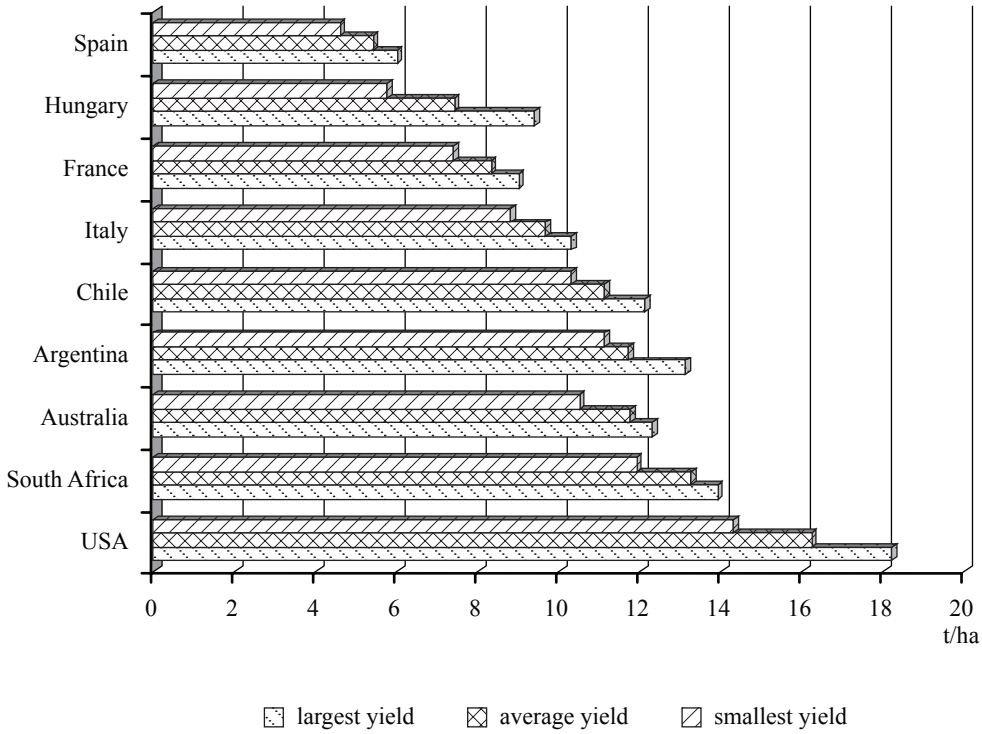
3. Efficiency of the wine growing areas

In New World countries the average grape yield is higher than for the European competitors (Figure 4). Among major wine-producing countries the yield per area is largest in the USA. There the yield per hectare reaches 17-18 tonnes. In southern hemisphere countries the average yield is 11-13 tonne/hectare.

In major EU wine-producing countries yield per hectare varies. It is highest in Italy where the five-year average was 9.7 tonnes per hectare. In France it was 8.3 tonne and in Spain, due to the dry weather and to poor soil quality, it was between 5-5.5 tonnes/hectare, but it is increasing. In Spain 10% of vineyards can be irrigated and the increasing yield is due to improvement in vineyards and to more modern production techniques (Innova SpA, 2005). In Hungary between 2000-2004 yield averaged 7.4 tonnes/hectare.

Figure 4

Average yields among major wine-producing countries (average of 2000-2004)



Source: Author's own calculation based on FAO data

In New World countries high yields are due to an in increase international varieties, modern production technology, large property concentration, and to good climatic conditions. In Europe the irrigated area is very small while in South Africa, Argentina, USA and Chile lack of water is compensated by sprinklers. In Chile the irrigated area entails about 75% (Hennicke, 2005). Moreover, pathogens are most frequent in Europe and Oceania and disease prevention means increased costs. On the Hungarian plain a frequent problem is damage from winter weather.

During the last 5 years in most wine-producing nations the yield fluctuated between 12-18%. In the USA, due to an exceptionally high average, yield fluctuated more than average (22%). In Spain, due to extreme weather, it was 22%. **In Hungary during the period analysed, the variation well exceeded its competitors'** fluctuation and reached 39%. This high figure stems from old and widely dispersed vineyards, extreme weather conditions, and failure to observe production restrictions.

4. How Wine Companies Can Access the Market

To gauge wine companies' market strength one measures the increase in vineyard area in terms of market concentration. Based on this one can determine the companies' market strategies (increasing quality and efficiency to improve market position).

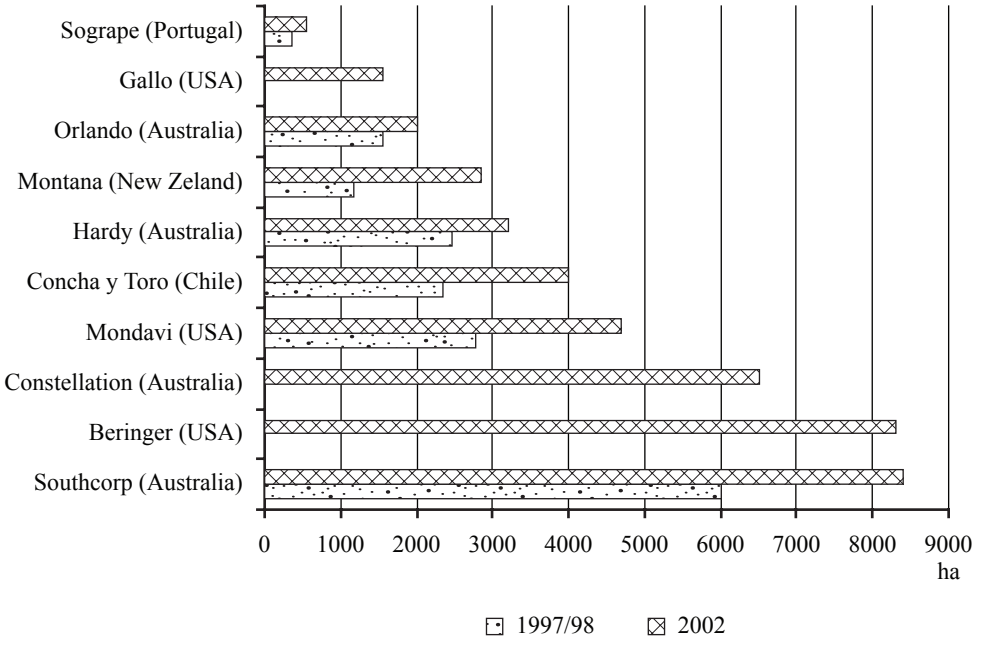
During recent years in New World countries companies invested significant capital in vineyard areas. (Figure 5).

For example, in 2000 Constellation (USA) had 6500 hectares of land and also acquired a 3200 hectare area from Hardy (Australia). Beringer Blass (alcoholic beverages, wines and Foster beer) has 8300 hectares of vineyard area in the USA and Australia. The Australian Southcorp in five years time increased its area by 40%, which by 2002 reached 8400 hectares. Between 1997-2002 Concha Y Toro of Chile (4000 hectares) increased its area by 67% and Mondavin of California by 68%.

In Europe various cooperatives control the largest areas. The Italian CAVIRO cooperative has 19 thousand members and 40 thousand hectares while the French Val d'Orbieu has 4 thousand members and 14 thousand hectares in vineyards (ONIVINS, 2004).

Figure 5

Vineyards areas of the largest wine-producing companies

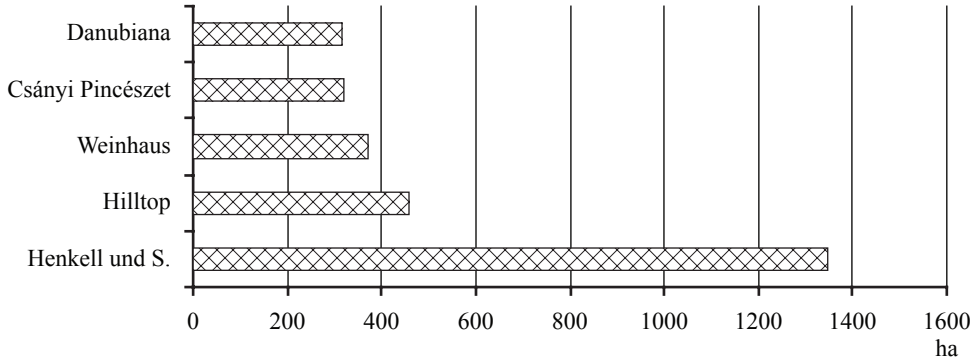


Source: Onivins – Facteurs de compétitivité sur le marché mondial du vin

In Hungary the largest wineries either have small vineyards or none at all. Only Henkell und Söhnlein with 1000 hectares is significant while all the others are far behind. (Figure 6).

Figure 6

Owners of the most important vineyards in Hungary

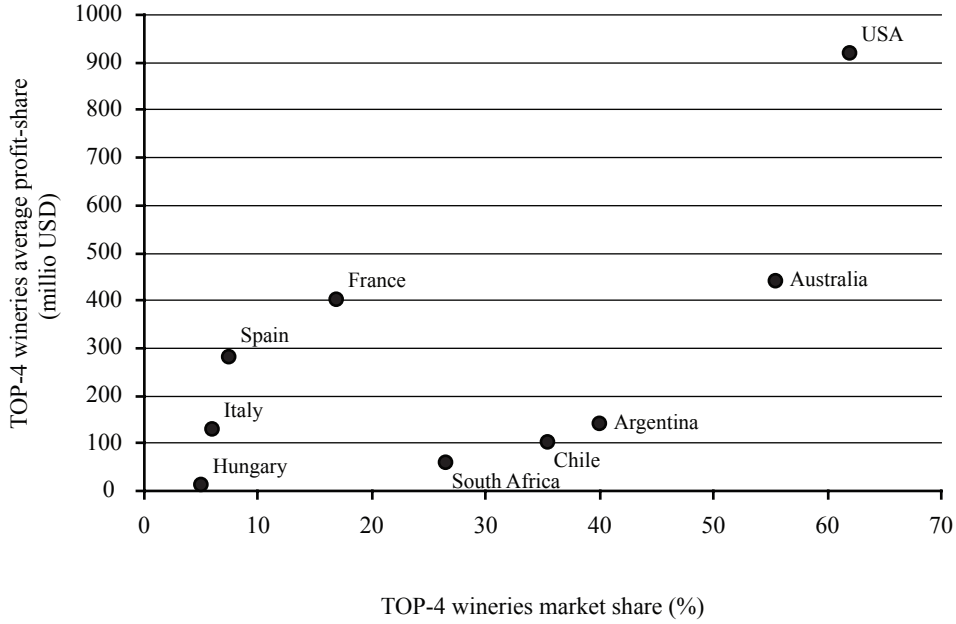


Source: Author's own calculations based on L. Alkonyi: Properties and Wines (2001-2002)

Wine-producing countries competitiveness is shown **by the volume share distributed by the largest wine companies and by the annual average revenue**. Market concentration is most significant in the USA where the share of the four largest market players exceeds 60% and their annual average result exceeds USD 900 million (Figure 7).

Figure 7

The wine sector's four major players' market share and the average yields in the major wine-producing countries (2003)



Source: Rabobank, APEH (Tax Office)

The situation is similar in Australia where the Top Four's share is 55%, but their revenue does not reach even half the US share. Argentine, Chilean, and South African wine production is also very concentrated but the largest wine companies' average revenues don't even approach those in Australia and the USA. Regarding Europe's traditional wine producers, production concentration is rather low. 17% in France, 7.5% in Spain and 6% in Italy. However, despite the low concentration the top four's average revenue is considerable.

The results indicate that in the **New World wine industry market concentration is pronounced but most wine growers in Europe** – due to high consumer prices – on average **generate higher revenues.** The USA is an exception because despite the top four's market share average revenues are also large.

The Hungarian big wine companies' market share and their average revenues don't even approach the major international producers. In Hungary the top four's market share isn't even 5% and their annual average revenue is only USD 13.6 million. This indicates that not only vineyards but the entire wine sector are poorly organized. Establishing major international wine companies is discouraged by poorly structured vineyard areas and by temporary measures banning land acquisition by foreigners and by legal residents.

After 2000 the following trends in international capital flow were detected:

- For example, in 2005 increased concentration was brought about by the establishment of a major new company when BRL Hardy (the major Australian wine producer) acquired shares in Constellation Brands (USA). There was also the merger of two Australians, Foster's Group and Southcorp Wines, which established the largest producer of premium wines with an annual production of 3.6 million hectoliters. With a value of USD 2.6 million, they have 20 wine companies and more than 12 brand names, including Penfolds, Lindemans, Wynns, Rosemount, Wolf Blass (Darby, 2005);
- Permanent market expansion through increased selection of wines. The British Allied Domecq continually engaged in international property acquisition regarding alcoholic beverage distribution, champagne, and wine;
- Spanish Freixenet continued to expand internationally, and, in the French still wine market acquired, in 2001, the Yvon Mau company. In Australia and Spain they purchased vineyards and also increased their share in the wine container producer Chandon-Espagne.
- Multinational companies are placing increasing emphasis on wine production services. Hotels and entertainment generated 18% of Foster's revenue. Investments in e-commerce are increasingly profitable: for example, in their Japanese operations, the American Southcorp and Gallo used the web to distribute wine. (ONIVINS, 2004).

5. Market portfolios

An increasing share of wine produced (currently one third) is consumed in the source country. In export markets increasing wine supply coupled with decreasing consumption means greater competition, and countries with a strong domestic market are in a favourable position. However, market liberalisation and changing consumer demand entail opening domestic markets to competitors. **Wine exporting countries that gear their production to a growing, lucrative, yet choosy open domestic market can remain competitive.**

Countries with a strong domestic market

In Italy domestic consumption accounts for 60% of total production and Italy exports 30% of its production while the remainder is used by the industry. In Spain, due to smaller domestic consumption (40%), distillation volume is greater. Among the major European wine producers, Italian consumption stabilized around 51 litres/capita (Perini, 2004), while in Spain a further decrease is predicted.(Perez, 2003).

Due to healthier lifestyles and anti-alcohol campaigns in the traditional wine-producing nations, alcohol consumption is decreasing and losing ground to mineral water. Wine drinkers are often older while young people tend to prefer soft drinks.

Argentines consume 90% of their domestic production and thus exports account for only 10%. South Africians drink half of their domestic wine production and exports represent only one third of production. Hungarians consume 80% of their wine produced and exports are in continual decline.

Among these countries the domestic market is either stagnating or in decline. Competition from imports is not significant as imports only represent a minor percentage of domestic consumption.

Wine-producing countries with an open market

In France domestic consumption accounts for almost 60% of total wine production. The remainder is used by the industry. Imported wine volume represents 4.5-5 million hectolitres, meaning 15% of domestic consumption. In France both consumption and volume of imported wine are decreasing (Gauthier, 2004).

The US domestic market is large and still increasing and consumption equals 23-24 million hectolitres, meaning more than 90% of the annual production.

The US exports 15% of its total wine production (3-4 million hl) and imports double (6 million hl). The share of imports in domestic consumption accounts for 25% and it is increasing.

Exporting countries with a poor or small domestic market

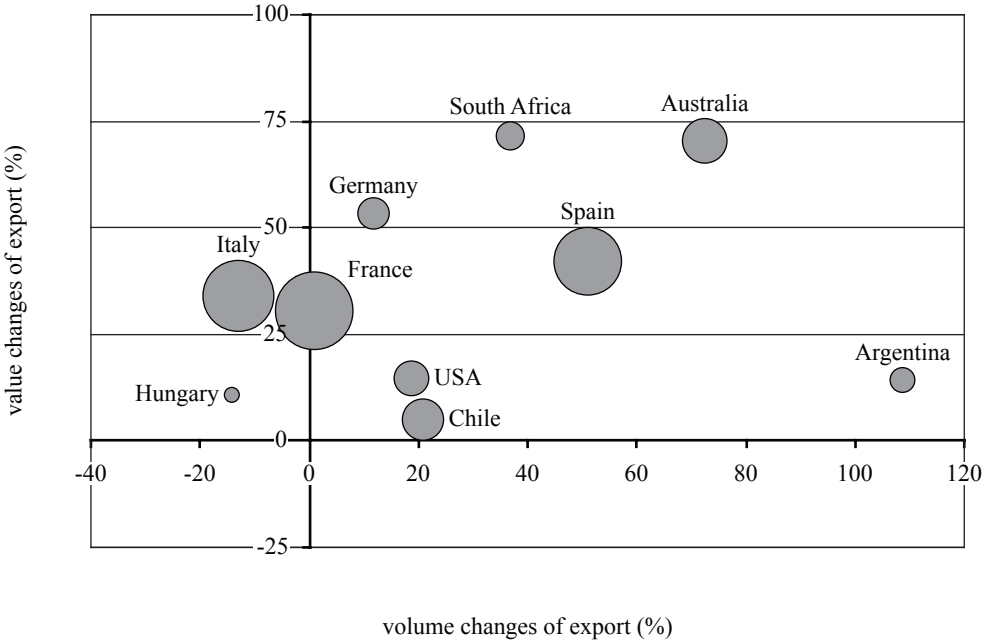
In Chile 70% of the production is exported, and a small import volume supplements decreasing domestic consumption, which is mainly low quality wine from Argentina (Hennicke, 2005). In Australia domestic consumption accounts only for only one third of total production, while exports exceeds 60%. Due to strong economic development and current lifestyles domestic consumption is significantly increasing.

Wine export development

Between 2000-2003 – based on FAO data – international wine exports have increased from 61 million hectolitres to 67 million hectolitres, an increase of 10%. From the eight largest exporting countries (France, Italy, Spain, Australia, Chile, USA, South Africa, Argentina) **only Italian wine volume decreased and this by 13%; in the other countries export volume increased** (Figure 8).

Figure 8

World wine exports (2000-2003)



Remark: The sizes of the circles indicate the countries' market share.
Source: Author's own calculations based on FAO data.

Between 2000-2003 – in addition to the increased sales – only French and South African, wines' average price increased. This was because only in these two countries did the increase of import value exceed that of volume. Besides substantial export growth the average price of Australian and Spanish wines decreased slightly. During the period surveyed, among New World countries US and Chilean exports increased slightly. During the surveyed four years, export increase was the most substantial in Argentina where the volume of exported wines doubled but the value of exports increased only by 14%.

During the same period **in Hungary there was a continual decrease in exports.** The increasing value of wine sold on external markets can be considered as positive although the average price of exports was dwarfed by that in the main wine-producing countries

6. Retail wine price segmentation in major import countries

Generally in the wine-producing countries, wine import volume compared to domestic production and consumption is low. **In countries where there is no wine production competition is sharper .** However, Germany is an exception as there the volume of exported wine is almost equal to that of imported wine. In 2003 the volume of imported wine was 12 million hectolitres; it is the world leader for wine imports. Regarding import value Germany is in third place, after the UK and the USA.

Ubifrance surveyed the volume of wine available on the German and British retail market by price categories and countries of origin.

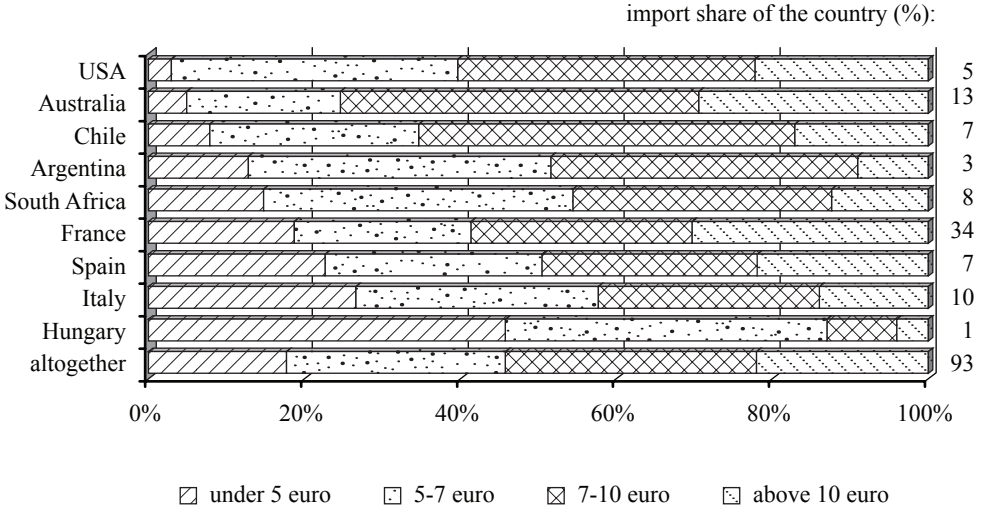
In Europe British consumers are willing to pay the most for a bottle of wine. In Great Britain 60% of retail wine cost EUR 5-10/bottle (Figure 9). The most popular wines in the New World countries cost EUR 7-10/bottle. About half of the wines from these countries are sold at this price level, indicating that **the New World can,** thanks to lower production costs, **generate higher income from the British market than their European competitors**. Approximately 30% of Australian and French wines cost more than EUR 10/bottle; however, in this category one also finds Spanish, Chilean, and American products. In this category the Hungarian wines' share is 1% and in general they are in the low price category: 46% of Hungarian wines are sold for less than EUR 5/bottle and 42% between EUR 5-7/bottle.

In the German market the amount of wines sold for less than EUR 5/bottle accounts for 70%. Hungary is in the forefront regarding average price wines. 95% of the wines exported to Germany are sold for less that EUR 5/bottle. **France sells the most *upmarket*** wines (more than EUR 10/bottle), while Australia is the top seller of wines for less than EUR 5/bottle. On the German market – due to the lower price level – New World wine represents only a small volume, but in the future its market share will increase.

A wine's price is determined by quality, presentation, and facility of replacement. Other factors include the brand name's strength, and reputation as well as the product's origin. It is vital for a quality product to come in an appropriate volume. This enhances the seller's negotiating power and the efficiency of supplementary inputs (costs of certifying origin, advertising and promotion) as well as the amount of the value added.

Figure 9

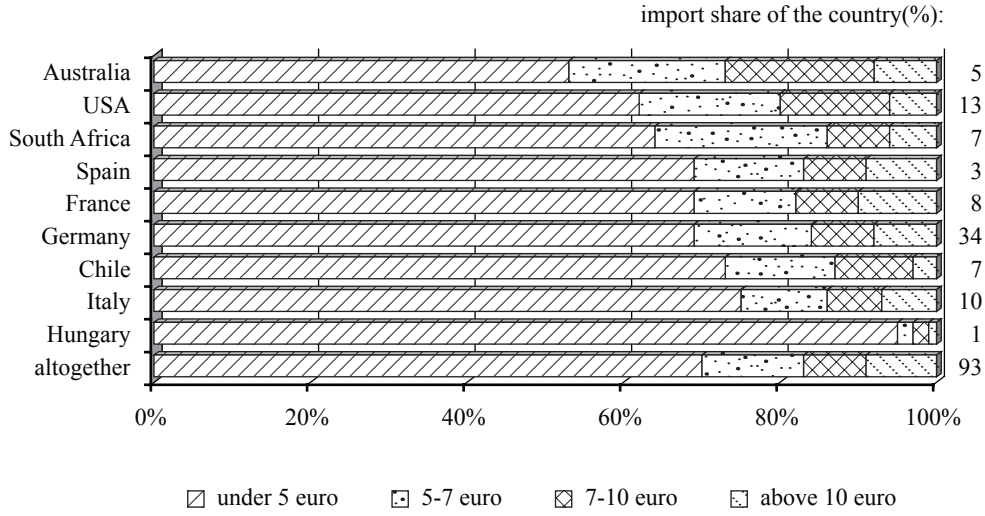
U.K. retail wines' price segmentation



Source: Onivins' calculations based on Ubifrance analysis

Figure 10

Retail wines' price segmentation in Germany



Source: Onivins' Calculations based on Ubifrance's analysis

7. Subsidies for export development

ONIVINS have estimated **that government expenditures on marketing a product unit**. This amount includes the costs for establishing permanent offices in the countries with a substantial consumer markets. Australia established, for example, 6 agencies in London, Frankfurt, Stockholm, New York, Toronto, and Tokyo and Chile did so in the UK, Germany and the USA (Hennicke, 2005).

In 2003 the French spent EUR 10.3 million on promotion campaigns. However, combined with additional expenditures that involved inter-professional organisations and government subsidies it amounted to EUR 40 million. The programmes focus mainly on making quality wines more popular (Gauthier, 2004). The Italians don't have a special wine marketing program as this is part of presenting Italian food products and beverages. It is estimated that EUR 20 million is spent annually on wine tasting, presentations, and sales incentives (Perini, 2004). In the 5-year period starting in 2004 the Spanish government has provided EUR 50 million on promoting premium wines (USDA, 2004).

Toward 2020 Argentina's wine strategy entails expenditures of USD 15 million on domestic and export promotion (USDA, 2004). By 2020 the Argentines hope to increase the export market share by 10% (In 2003 it was only 3%.). With an annual budget of USD 6 million Chile's ''Tastes of Chile'' marketing campaign has been successful. The state contributes 15% of the budget (Hennicke, 2005).

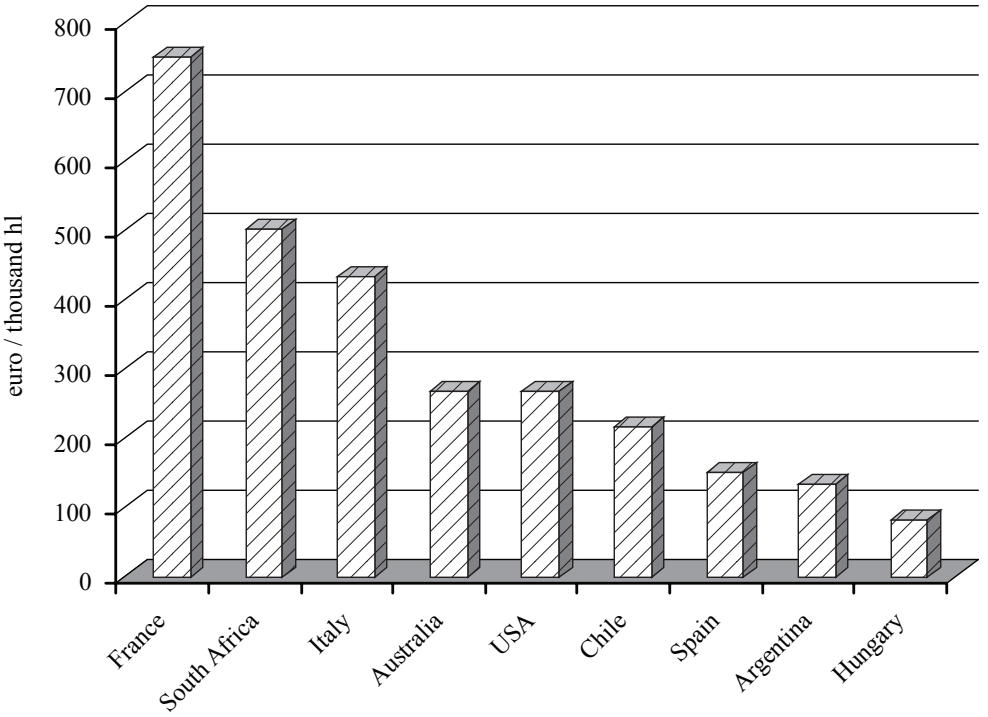
Among wine-producing countries **France spends the most per product unit on marketing its wines.** Regarding promotion costs South Africa and Italy are also in the forefront while Hungary remains far behind (Figure 11).

The Agricultural Marketing Centrum (AMC) provides Hungarian wine producers with financing for marketing. The AMC provides financing for the participation in exhibitions and fairs abroad, supports sales incentive programmes, and helps in the presentation of Hungarian wines abroad. The AMC does not organise consumer marketing campaigns as this would require a much larger budget. Until 2001 the AMC had a local office in London, the country's major foreign market, but due to government cutbacks the office was closed.

In 2006 the AMC's tasks were taken over by the Hungarian Wine Marketing Kht. The agency's revenue source is the excise tax of HUF 8/litre (contribution to be paid in proportion to sales) and 60% of this amount will be spent on marketing. This entails approximately HUF 1 billion to be spent on marketing.

Figure 11

National budgets provided for financing community marketing (2002-2003-2004)



Source: Onivins – Facteurs de compétitivité sur le marché mondial du vin

8. The influence of the exchange rates

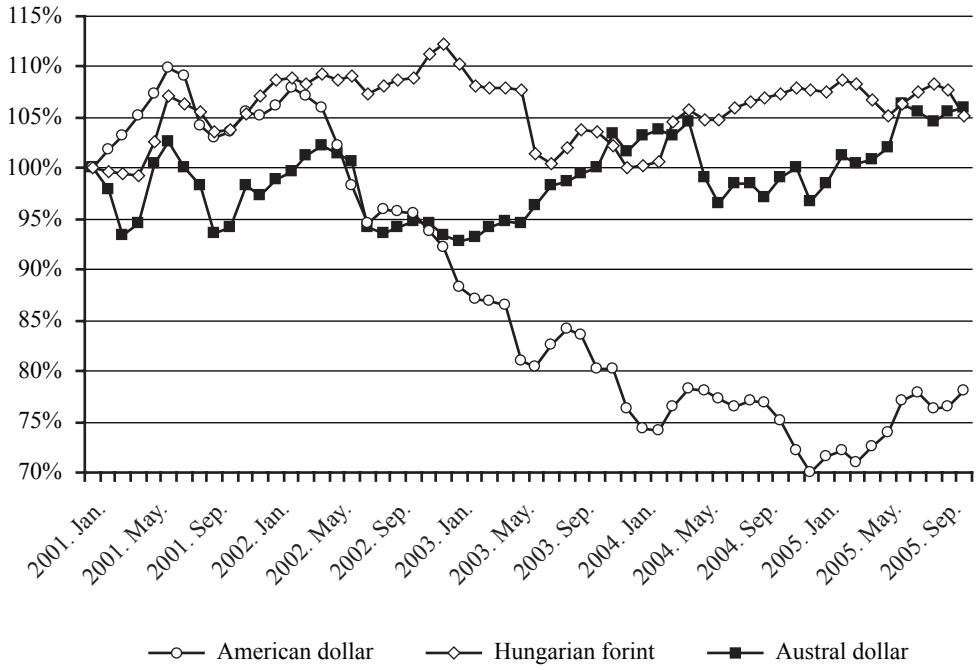
Between June 2001 and January 2005 the USD exchange rate decreased by almost 40% against the Euro causing an increase in the price of European wine and simultaneously a drop in the price of U.S. wine in Europe (Figure 12). Keeping pace with the Euro, the Hungarian forint within the same interval fluctuated yet there was no pronounced deviation between the two currencies. However, given that since 2001 the HUF exchange rate has continually increased and in October 2005 gained 5% against the euro which caused Hungarian wines to lose competitiveness. The Australian dollar exchange rate during the analysed period fluctuated between +/- 7% against the euro.

During the 2001-2002 Argentine financial crisis in a few months the peso decreased by 40% (Figure 13). Following the Argentine crisis foreign investors took advantage of low land prices and labour costs to purchase vineyard areas, which encouraged Argentine wine production and export. Against the Euro the Chilean peso decreased in January 2003 by 30% and only in April 2005 did the Chilean currency start to rebound.

In 2001 the South African rand decreased by 30% against the euro.

Figure 12

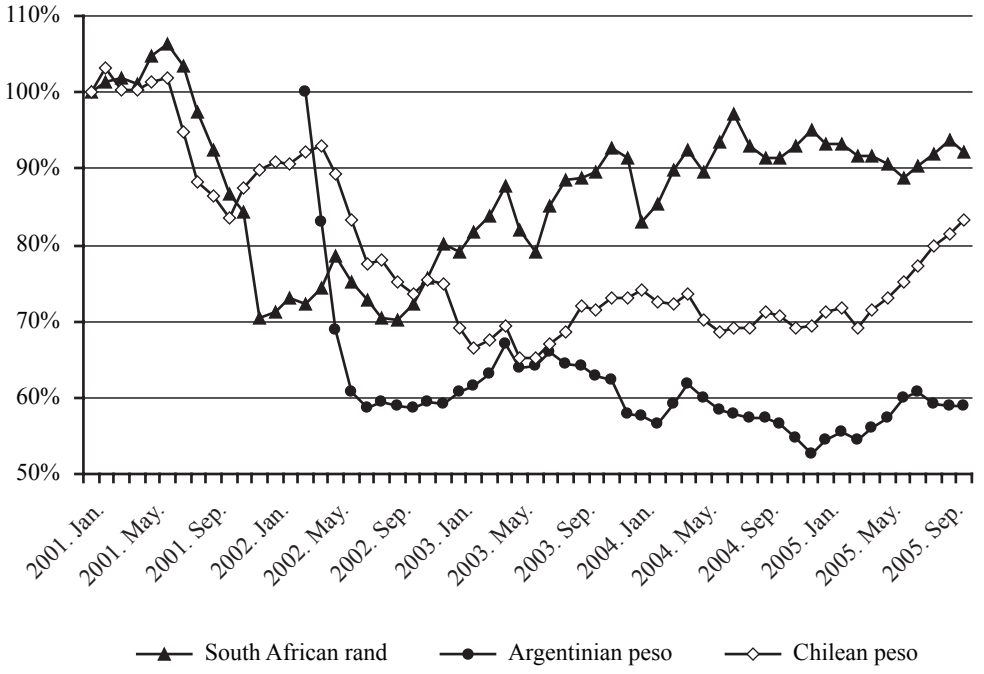
Australian and Hungarian exchange rates against the euro
(January 2001 – October 2005)



Source: Surveyed countries' central banks' data

Figure 13

Chilean, Argentine and South African exchange rates against the euro (January 2001 – October 2005)



Source: Central Banks of the surveyed countries

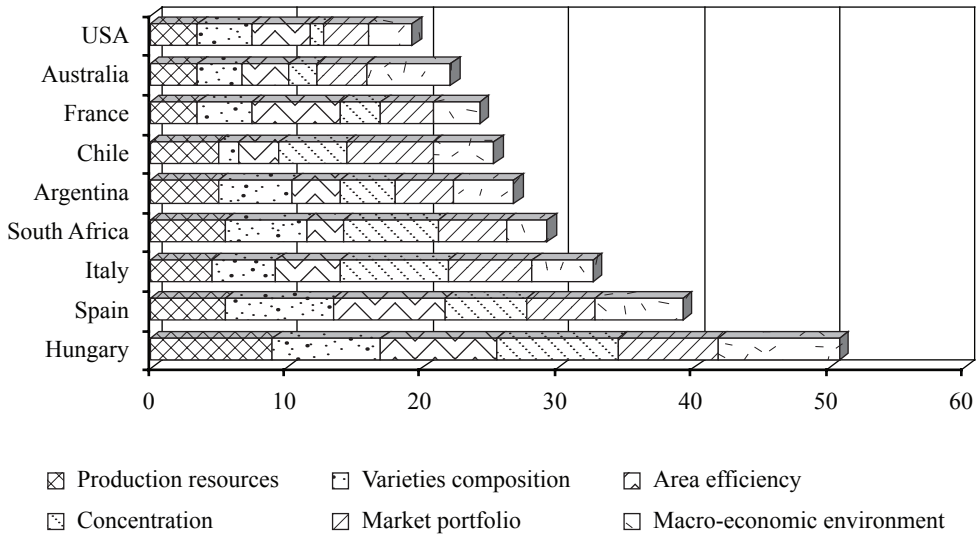
To sum up one can state that the euro's high exchange rate – except against the Australian dollar – both within the EU and within third countries greatly **weakened European producers' market position.** During recent years the exchange **rate trend was primarily advantageous to the USA and to South American wine-producing countries**. The strong Forint caused **Hungarian wine prices to increase.**

9. Evaluating results

For each competitiveness factor we prepared a ranking list and, based on performance, we assigned a ranking for each country between 1 and 9. The best wine producer received a number 1 ranking and the worst number 9. Where we didn't detect any significant difference for a given factor we assigned wine producers, based on the ranking numbers' average, identical scores. By summarising the countries' scores we tabulated the final results. (Figure 14).

Figure 14

Competitiveness ranking among wine-producing countries



Source: Calculations made at the Market Information Department of the Agricultural Economics Research Institute (AKI)

Based on selected competitiveness factors **the USA ranks first.** As a result of intensive vineyard cultivation the present mixture of varieties has proven lucrative. A large, growing, and open domestic market bolsters production. Large-scale enterprises facilitate strong competitive brands that can also accommodate industry concentration. American wines are *upmarket* and the industry is demanding and profitable. Efficient land use and a low dollar allow the US to hold its own against competitors.

Three countries follow the USA: Australia, France, and Chile. In terms of strengths and the weaknesses these countries differ from each other.

Australian competitiveness is based on new large-scale vineyard areas, exemplary international varieties, high and regular yields, and a strong market position among large-scale wine companies. Other factors are export expansion, strong brand names, and high prices for Australian wines. The **French** wine sector's strengths are the following: extensive production resources, an excellent mélange of red grape varieties, a wide range of quality wines from prestigious companies, a positive market image and government support for the promotion of quality wine export. Its weaknesses are inefficient land use and intense competition in export markets coupled with a high euro. The Chilean range of varieties is excellent and there is an abundance of red grape and international varieties. In the group its production is the most balanced, explained partly by irrigation and partly by an absence of infections. Its weaknesses are due to the sector's small size. Another weakness is a limited domestic market and a high percentage of bulk wines for export.

Two countries are getting closer and closer to Group 2: South Africa and Argentina. In South Africa the wine sector's move toward red grape varieties will soon bear fruit. Moreover, the South African government supports the sector by helping growers take

advantage of international market opportunities. After its economic downturn **Argentina** was able to penetrate export markets due to a favourable exchange rate and by focusing attention on quality wine production.

Among traditional wine producers Italy and Spain rank near the bottom. Italy's poor position is mainly caused by widely dispersed small-scale farms, a low share of international varieties, and declining domestic consumption. Between 2000-2003 Italian exports dropped due to the elimination of grape crops and, because of poor weather, to insufficient stock for export. In **Spain** the mixture of varieties is not lucrative and yields are low and volatile. Also the domestic market is small and shrinking. In spite of an inadequate variety mixture its exports are expanding thanks to penetration of the Italian market, a trend which is furthered by slightly cheaper prices. In Italian and Spanish production there is a large percentage of bulk wines which engender a low export price.

The survey results show that **at present Hungary cannot compete with the largest wine-producing countries**. In almost every analysed factor Hungary comes in **dead last.** The amount of vineyard area is plummeting but wine production, because of volatile yields, isn't following the same trend. It is crucial to utilise EU support schemes to replace and modernise old vineyard areas.

Viticulture structure is widely dispersed and integration and organisation are poor. Supplying a share of the domestic market decreases production risks, but product adulteration hampers fair competition, lowers prices, and curtails legal producers' income. Market liberalisation and increasing demand could deform the very nature of customer demand and further threaten imports. From the 1990s new vineyard areas have meant growth in international varieties and this could create a new export strategy. Despite this Hungarian wine exports are declining and post-Accession large volume markets (United Kingdom, Germany) have steeply declined. Hungarian wines are scarcely able to satisfy external market requirements and are thus in a weak position. However, there are some top quality wines but volume is limited. Export growth is discouraged by a strong HUF and by limited resources provided for wine marketing. Public perception is mixed on Hungarian wine due to widely differing origins, grape growing area structure, and highly dispersed production and varieties. It is thus difficult for consumers to fully judge Hungarian wine.

Figure 14 indicates that in terms of production resources and market players Hungary is in a weak position when it comes to competing with the top world producers. The US example reveals that market conditions coupled with state intervention impact well on producers' competitiveness even when production resources are inadequate. The Hungarian wine industry's future could be determined through cooperation among national producers and also through assistance provided to the industry. Also essential is developing an appropriate overall strategy and this entails cleaning up the domestic market.

References

1. Alkonyi, László. (2001). **Properties and Wines** (in Hungarian). **2001-2002.** Mezőgazda Kiadó: Budapest
2. Balikó, Eszter – Tóth, Imre. (2004). The use of grape varieties in Hungary between 1973-2003 (in Hungarian). Manuscript
3. Darby, Mike. (2005). **Australia. Wine Annual.** USDA Foreign Agricultural Service. http://www.fas.usda.gov
4. Gauthier, Roselyne. (2004). **France. Wine Annual.** USDA Foreign Agricultural Service. http://www.fas.usda.gov
5. Gordon, Wayne. (2005). 'Wine outlook to 2009-10. Returns to improve in the medium term', **Australiancommodities,** vol. 12, no. 1, pp. 48-57.
6. Heijbroek, Arend – Rubio, Anres. (2003). **The Chilean wine industry.** Rabobank International
7. Heijbroek, Arend. (2003). **Wine is business. Shifting demand and distribution: major drivers reshaping the wine industry.** Rabobank International
8. Heijbroek, Arend. (2004). **The South African wine industry.** Rabobank International
9. Hennicke, Luis. (2005). **Chile. Wine Annual.** USDA Foreign Agricultural Service. http://www.fas.usda.gov
10. Hoffmann, Dieter. (2005). 'Der Markt für Wein', *Agrarwirtschaft*, no. 1. pp. 85-88.
11. Innova SpA. (2005). **Ex-post evaluation of the Common Market Organisation for wine.** (Material prepared for the European Commission)
12. L'Agence française pour le développement international des entreprises. http://www.ubifrance.fr
13. ONIVINS. (2004). **Facteurs de compétitivité sur le marché mondial du vin.** http://www.onivins.fr
14. Perez, Diego. (2003). **Spain. Wine Annual.** USDA Foreign Agricultural Service. http://www.fas.usda.gov
15. Perini, Sandro. (2004). **Italy. Wine Annual.** USDA Foreign Agricultural Service. http://www.fas.usda.gov
16. Pirovano, Francisco. (2005). **Argentina. Wine Annual.** USDA Foreign Agricultural Service. http://www.fas.usda.gov
17. USDA Foreign Agricultural Service. (2005). **World Wine Situation and Outlook.** http://www.fas.usda.gov

Studies in Agricultural Economics No. 104. p. 65-84. (2006)

How Hungarian agricultural producers reacted during EU Accession

Henrietta Kovács[1]
Szabolcs Vágó[2]

Abstract

In recent years changes in market trends have been more radical than before and EU Accession's impact on the institutional regulatory framework has generated pressure to adapt. In this regard our institute performed an analysis of producers' reactions and their subsequent investments. We processed 300 questionnaires and performed 50 in-depth interviews.

In summary, we are able to conclude that farmers have responded to the new challenges through modest measures, which have been largely insufficient. Moreover, farmers have been indecisive when it comes to making strategic decisions. In the future it will be indispensable for Hungarian agricultural producers to ameliorate their ability to adapt.

Key words

Producer response, EU-accession, adaptability, farm prices, investments

1. Introduction and methods

Hungarian EU Accession not only raised expectations but also a challenge for Hungarian agricultural economics. However, our research has confirmed that the Hungarian agricultural economy was not able to capitalize on all opportunities provided by the given situation Potori, Udovecz, 2005). In the initial post-Accession period, losses and missed opportunities were caused by the producers' and agricultural policy makers' inability to accurately gauge changes regarding internal/external legal and economic factors as well as their subsequent effects. **In 2005 we conducted a survey of producers' reactions toward legal and economic regulation. Based on the survey, we wished to formulate recommendations.**

In a given economic structure, prices' primary role is to transmit market information (Buzás, 2003). Prices are also important because, in the long run, a sector's equilibrium can only be ensured if the price ensures proportionate income distribution, which provides appropriate income yet remains sufficiently flexible to respond to market developments.

Gábor Hajmási analysed price trends for the post-EU Accession period and he contends that in the long run there will remain differences between Hungarian and European price levels. However, he also asserts that agricultural prices will become more predictable. (Hajmási, 2003). Orbánné stated that, except for a few products, during the last ten years EU prices did not coincide. This is a major consideration as Hungary might be expected to attain a *fictional* EU unit price. Factors generating price changes are only indirectly or not at all linked to Accession (Orbánné Nagy Mária, 2002, 2003).

[1] Agricultural Economics Research Institute, H-1355 Budapest 55. POB 5. e-mail: kovacsh@akii.hu
[2] Agricultural Economics Research Institute, H-1355 Budapest 55. POB 5. e-mail: vagosz@akii.hu

In 1929 Bean had already thoroughly analysed producers' reactions to price changes. Previously it had been assumed that producers reacted to price changes only by modifying operation size (crop area, livestock number) and yield changes were attributed to changing weather[3]. Later several other authors also found that the producers reacted to price changes by altering yields (J.P. Hauck - P. W. Gallager, 1976).

One can analyse producers' reactions at the macroeconomic level by applying supply functions and at the microeconomic level by conducting interview analysis. The macroeconomic analysis is based on long-term time row analysis and for microeconomic analyses we utilise a cross section at the given date. The former mainly provides information on the trend and extent of the reaction. In our analysis the interview method is a broader sociological survey and provides an overall picture on the producers' specific behaviour.

In agriculture it is reasonable to apply a one year delay in supplying functions between the year when the price change occurred and when producers reacted: this represents the minimal time required for the producers' course of action to be implemented. Sándor Mészáros proved that in Hungary two years are required to represent producers' reactions. (in international literature: Tweeten, 1969) Between 1961 and 1982, based on time row calculations, Mészáros indicated that from among those farms engaged in slaughtering pigs, the smallest farms were the most price sensitive. Our own analyses – carried out much later – confirmed this. In our research Mészáros's statement constituted the starting point, meaning producer prices impact not only on income regulation but also on production structure development. (Mészáros, 1985).

In Hungarian agricultural economic research analysing producers' reactions is by no means new. During the late seventies, Kapronczai, Rideg and Szénai had already developed a relevant macroeconomic methodology and in this field undertook research (Kapronczai-Rideg-Szénai, 1980). Foremost it is pertinent to survey managers who excel in decision-making. For this in-depth interviews are the most appropriate analytical method.

The topic can be approached using two versions of the interview method (i.e., in-depth interviews and questionnaires). During our research we utilized opportunities presented by both interview versions. The sample was selected from the Farm Accountancy Data Network holdings (FADN) and the statistical range comprised holdings over 2 ESU (92,000 holdings).

From the multitude the arithmetical mean was obtained from the numbers of holdings in the cells by proportionating and by applying the Neyman formula (Zrínyi, 2000). This was necessary because only considering the holdings' proportionating meant that the number of holdings in the largest size class were too low. Conversely, if we considered only the FADN final selection plan, then the number of large-scale holdings would be too great. Therefore, we employed a statistical method also utilised in Finland[4]. Among the farms that completed the questionnaires, 75% were individual farms and 25% were corporations.

Eventually, we were able to process 300 questionnaires and conduct 50 in-depth interviews. A weighting factor was allocated to the farms completing the questionnaires, indicating the number of similar farms it represented; based on this the analysis was conducted.

[3] K. D. Meilke for example examined only acreage response for wheat, barley, and oat in the Canadian praire provinces. (Meilke, 1976)

[4] The FADN selection plan for Finland. Agricultural Economics Research Institute, Helsinki 1996. (Manuscript)

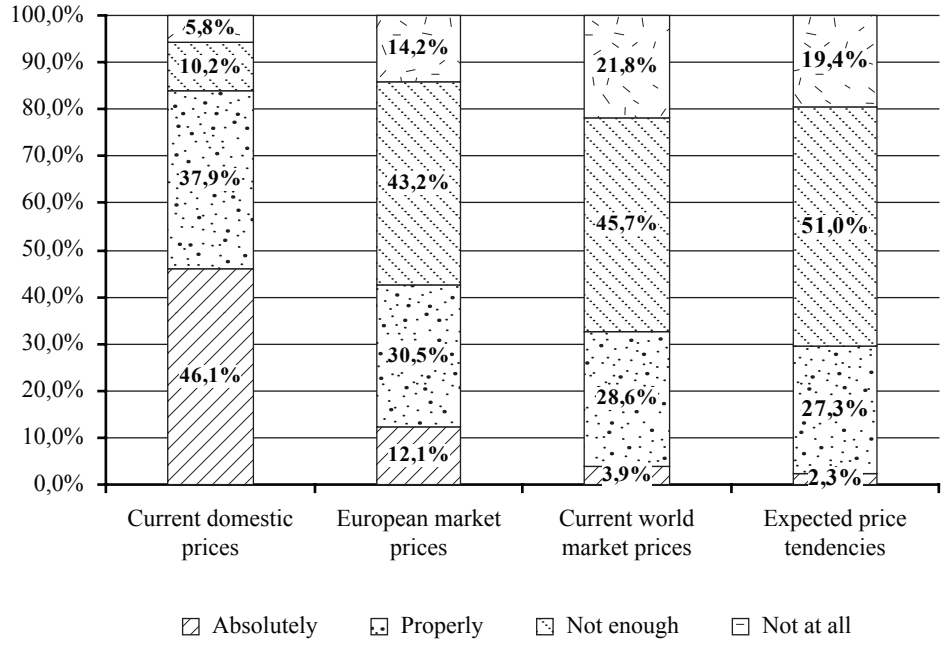
2. Producers' reactions to price developments in the Hungarian agricultural economy

2.1. Farmers were only informed about domestic prices

Based on the interview results, one can conclude that **the farms are relatively well-informed about current domestic prices**. 85% of the producers considered themselves well-informed or adequately informed. Due to fixed price contracts, almost 15% of the farms lack adequate information about domestic prices because they are not affected directly by current prices. Some producers have personal contact with given buyers and sell to them, which is contrary to the national trend. Grain producers without storage capacity have to sell their products at current market prices. Only half of producers felt they were informed regarding European market prices (Figure 1)

Figure 1

How well producers are informed about their product prices



Only one-third of the producers gave information on the current world market prices and on expected price trends. In most cases the producers are not interested in world market prices as they think they have only a slight or no effect at all on their operations. **Most would like to learn about expected price trends but almost totally lack access to the information.** Clearly information is needed on market and anticipated price trends.

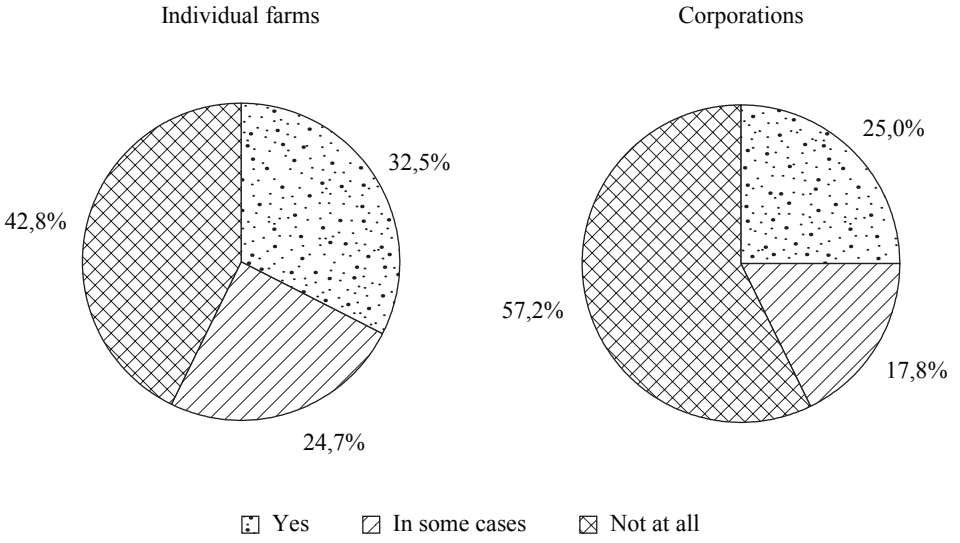
2.2. Reactions to price changes

Generally, an increase in prices[5] favors producers. When this happens the basic reaction is to increase output. The extra income can potentially cover operations expansion and modernisation. However, overproduction often results from expanded operations which cause prices to decrease. Thus, by overreacting to price changes, market players tend to create business cycles.

Lack of capital is prevalent in Hungary and price decreases threaten the very survival of producers; and can cause a panic reaction. In the short run selling at giveaway prices can aggravate the crisis. A panic response results in bold, accelerated price decreases that outstrip price increases. When this occurs compulsive behaviour and feelings of helplessness are determining factors. In most cases producers lack adequate financial reserves to survive the crises, and thus cut back on all unessential expenses. However, later this can produce negative consequences (delaying modernisation, operations expansion etc.). Given that price decreases most often stem from overproduction, a reasonable reaction is to curtail production.

Figure 2

The role seasonal and business cycles play in producers' calculations



Our survey showed that **between 2002-2004 more than half the farms kept track of seasonal trends and their products' business cycles and adjusted their production and sales accordingly**. The answers indicated that individual farms are more flexible and aggressive in capitalizing on market trends (Figure 2).

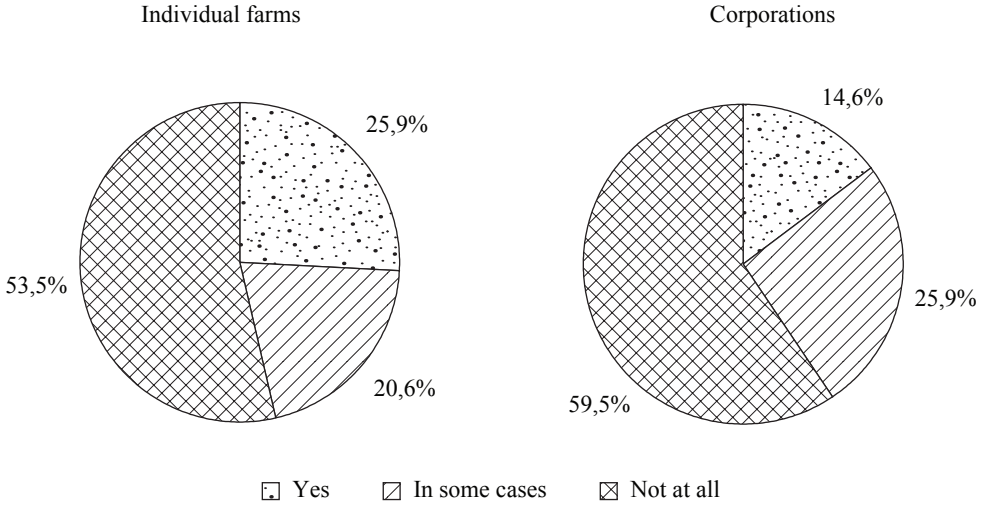
More than half of the interviewees did not modify production technology in relations to expected price change. The milk, fodder, eggs, and cattle sectors were the least flexible while adjustments were possible in the fruit and vegetable, pork, poultry and cereals sectors. To meet market demand technological changes are not needed to alter the number of sheep.

[5] Apart from the reasons of price increase, in most cases the reason is not the increase of the demand but the decreased supply as a result of the low yields.

Concerning expected price trends, few prod gativeucers are adequately informed; this could explain why in relation to price forecasts few producers ceased producing a given product, but the forecasts may not have been pessimistic enough to warrant it. Livestock, dairy, and fodder were more often listed as being disadvantageous. **In terms of livestock, the egg sector seemed the most stable** because during the analysed period market trends affected this sector the least. During in-depth interviews producers stated that due to production quotas and high fixed costs reducing dairy cow numbers makes sense. Only entire farms can be closed down, but this takes several years. Existing capacity cannot be directed to other purposes and cannot be sold and converting to beef cattle is difficult (lack of pastures, and other species would be required etc.). Interviewees predicted that in the future more producers would utilise the governmental quota purchase.

Figure 3

The extent producers modify production technology due to price trend forecasts.



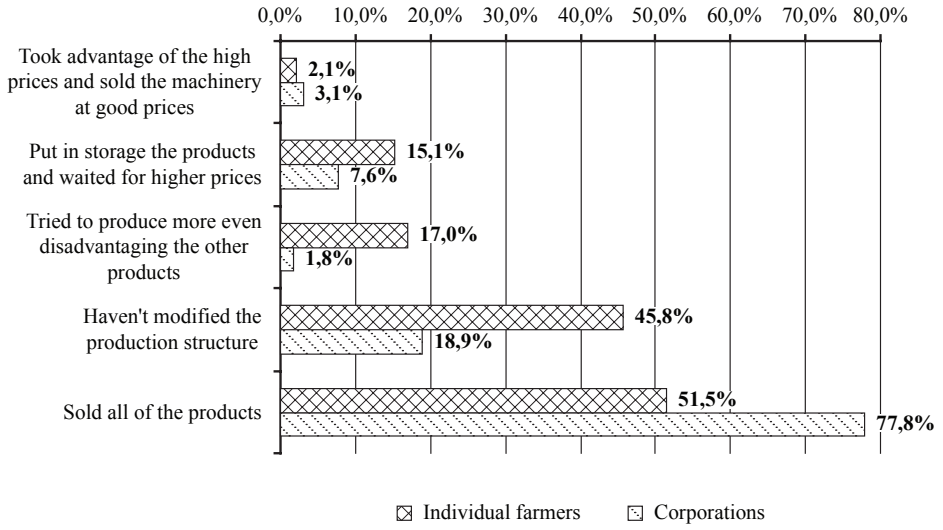
In crop production the producer can annually decide what to sow and where to sow it. However, **production is dictated by rotation demand and the fact that cereals cannot be replaced by other crops.** In raising crops it is generally possible to modify technology and the use of raw materials by omitting certain technological phases and by cutting back on the use of pesticides and fertiliser. In order to economize, some of the producers use self-produced seeds or trade with other producers. To ensure high quality others always use the optimal amount of fertiliser and pesticides. Organic production entails long-term commitment since obtaining official organic status is a lengthly process. Therefore, those who have already obtained organic status stick to organic farming even when conditions are bad.

2.3. Delaying strategic decisions

Our survey showed that when **prices increase the most frequent reaction is to sell as soon and as much as possible**. 54% of individual farms and 81% of corporations replied that price increases meant they modified production structure. The answers indicate that **farms react little by little to current challenges, which is usually less efficient than an overall reaction**. The is mainly because farm producers hesitate when it comes to **making strategic decisions**. In only 15% of the cases was this due to lack of **storage capacity** (Figure 4).

Figure 4

Producers' reaction to price increases*



*More than one answer could be marked.

When price decreases occurred almost **50% of individual farms and corporations altered production structure. It was generally corporations that undertook investments targeted at reducing costs;** one-third of every corporation responded in this manner.

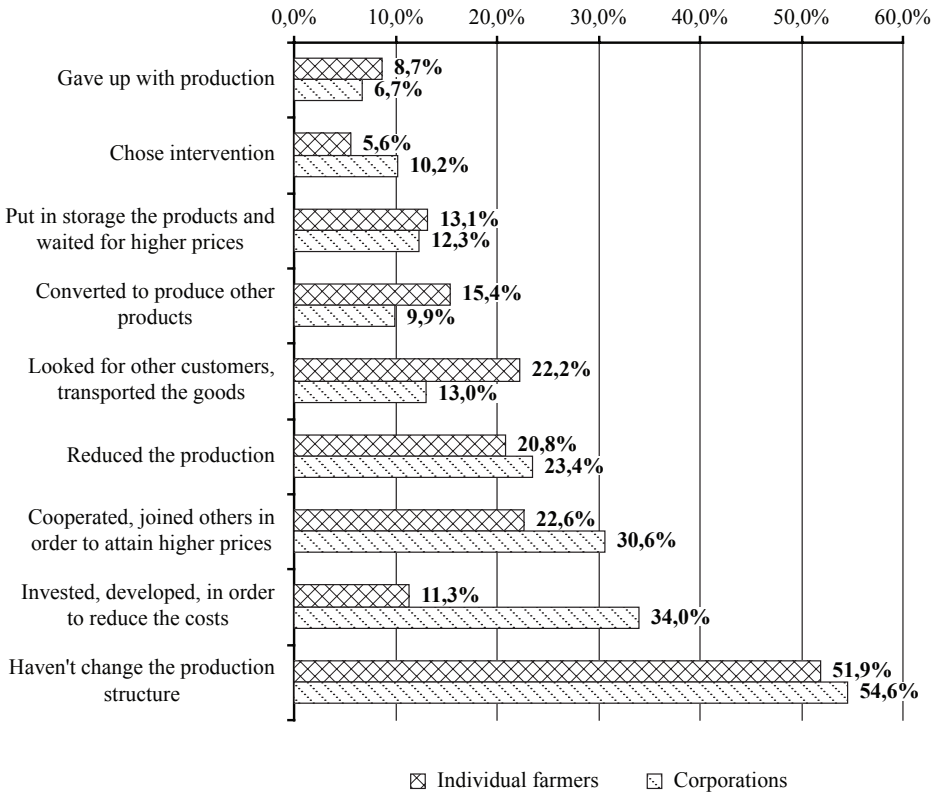
At 25%, cooperation and joint ventures ranked third among answers. **Due to decreasing demand more than 20% of the farms reduced their output;** moreover, 15% began producing another species (variety). A mere 15-20% of the farms opted for storage or transported their products to more distant markets. More than individual farms, corporations responded to better conditions[6] by relying on state intervention. (Figure 5).

When faced with income shortfall due to decreasing prices **the most frequent reaction was to curtail unnecessary expenses**. Noteworthy is that more individual farms (67%) than corporations (42%) have ''rainy day funds'' to deal with market downturns, which is explained by the individual farms' general vulnerability. Another reason corporations have fewer ''rainy day funds'' is that they receive better terms for their loans. **48% of corporations and 13% of individual farms took out liquidity loans. A smaller percentage (5.5%) took more drastic steps** and **sold their machinery** or land and 2.5% sold personal belongings to continue farming.

[6] Mainly due to the regulation determining a minimal volume.

Figure 5

Producers' reaction to decreasing prices*



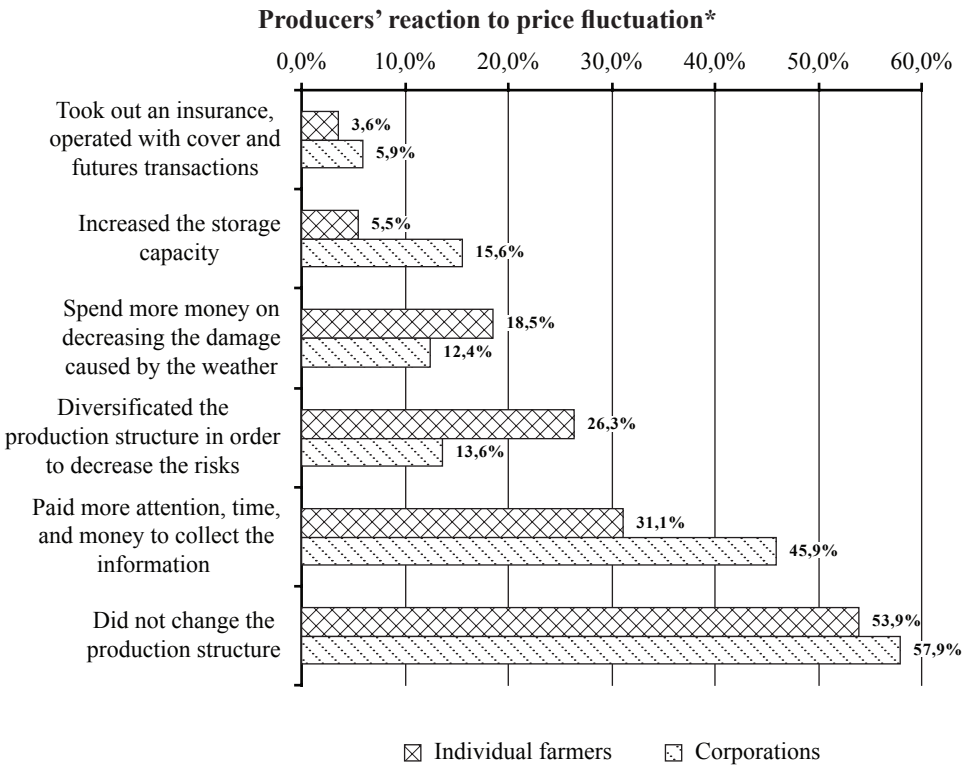
*More than one answer could be marked.

Price uncertainty resulting in probable losses means that many farmers try to reduce risks and diversification[7] offers one way to accomplish this. With **commodities trading on the Budapest Commodity Exchange (BCE) price fluctuation risks are not difficult to avoid** as the futures market provides hedging opportunities.

Because the **BCE** futures component indicates traders' valuations it plays an important role in price forecasting, and this information could also assist producers with decision-making. In Hungary, however, producers very rarely take advantage of this (Figure 6).

[7] This means that a farmer produces various species (varieties) of various ripening periods and of various water requirements, produces both crops and animal products or is also engaged in other activities (tourism, production of processed products, or even financial investments).

Figure 6



*More than one answer could be marked.

Almost half of the farms considered these aspects when formulating their production structure. To obtain useful information, one third of farmers spent money and endeavoured to be more observant. Their ''rainy day funds'' are limited and **only 17% could (or wanted to) generate further reserves to survive hard times**, which constitutes a rather small share. Due to risks inherent to agriculture, it is necessary for all producers to accumulate additional funds for expedient access regarding income and expenditures.

One-fourth of producers opted for product diversification. 18% of farms reduced bad weather risks[8] through greater expenditures. 13% of small-scale farms and 34% of the large farms applied this method, which is explained by the differing technical range between the two types. Because of regulatory difficulties, a significant portion of farms do not irrigate their land. The in-depth interviews indicated that many more farmers would like to irrigate but don't because the procedure is so complicated and the costs are so high.

A mere 4% of farms took out insurance, operated with coverage, and were engaged in futures trading. With **futures trading and insurance** there is substantial room for progress and the figures show that none of the small-scale farms, 5% of the medium, and 21% of the large-scale farms were actually involved **A large part of the interviewees wish to take out insurance but they find it too expensive and inaccessible.** A natural disaster could seriously threaten the farms' very existence and it is thus vital for the problem to be resolved. An important step would be the establishment of a **Catastrophes Fund.**

[8] The performance of certain tasks, spreading of fertiliser, selection of the varieties, irrigation, heating, lightening, etc.

3. Lack of capital in Hungarian agriculture

In order to increase the sector's competitiveness and to improve the quality and economic factors in production, technological and technical renewal would be required. To increase production and improve quality additional and more modern (that is, more expensive) technical equipment would be required. For competitive, profitable production modern technical equipment and production resources are required.

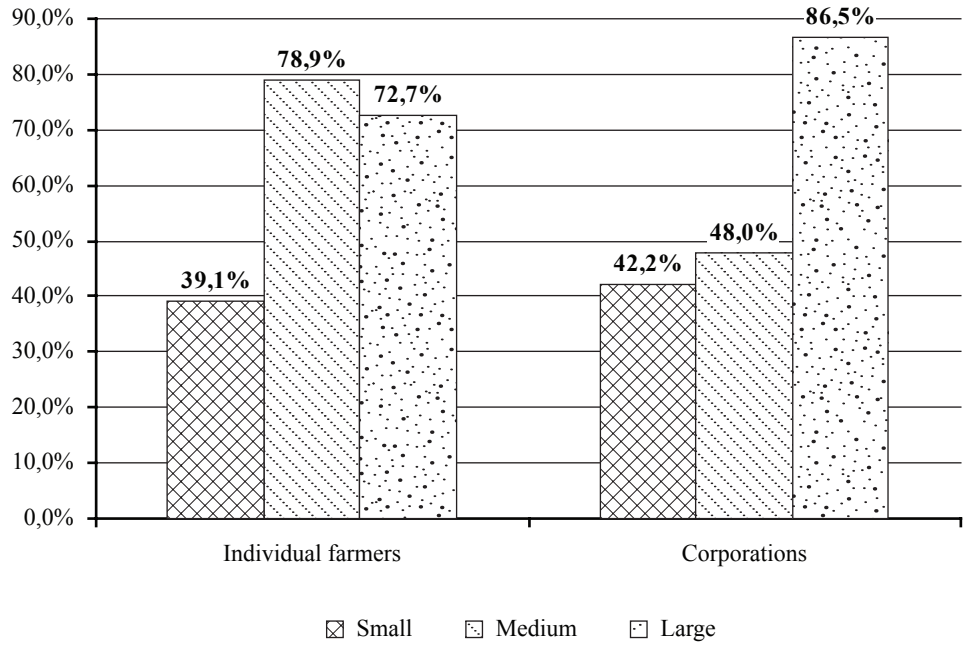
However, practical experience shows that in farm management most problems arise from investment decisions and the process surrounding these decisions. The reason is that in general the investments require long-term capitalization and limit farming potential. Consequently, faulty strategy or an ill-considered major investment might endanger the entire farm's stability.

3.1. What kind of farms undertook investments?

On the basis of our research 55% of the farmers undertook investments during the EU Accession year and during the two years' prior to Accession. Among individual farms it amounted to 50% and among corporations 68%. We also analysed the investments according to farm size. 45% of the small farms and 77% of the large undertook investments. **Consequently, the investment opportunities for medium and large farms were more lucrative** (Figure7).

Figure 7

Investments according to legal description and farm size between 2002-2004



Government subsidies are a significant factor in financing and in encouraging the investments. We analysed the share government subsidies played in total investments as well as the farms' distribution in terms of legal description and sizes. Government subsidies

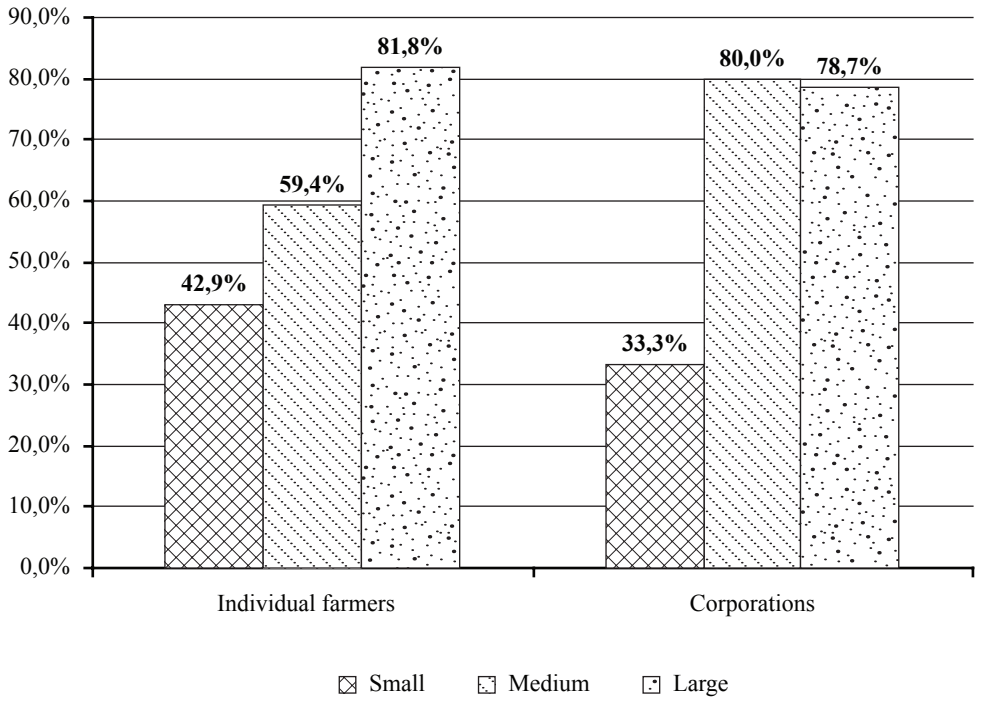
contributed **64% for individual farms and 76% for corporations. For small farms it was 43% and 59% and 82% for medium large farms respectively.** Analysis of individual farms revealed a similar tendency while for corrporations only one-third of the small farms and almost four-fifths of the medium and large farms relied on subsidies for investments.. **The larger the farm, the greater the subsidies.** (Figure 8).

During the personal interviews we observed that excessive bureaucracy hindered subsidized investments. This is one of the reasons why small farms avoid subsidized investments. The other problem is that preparing the proposal is also expensive and if the proposal isn't accepted the money goes to waste. (According to one producer, the cost of preparing the proposal amounts to 10% of the total subsidy and for this reason he wanted subsidy payments guaranteed).

The reason investment initiatives are feeble among small farms is that subsidies only cover the purchase and installation of new machinery, equipment, technology, and material bought from dealers or from manufacturers. **The small farms** – depending on their position – **purchase second-hand equipment,** making the investment even cheaper than if they had received subsidies.

Figure 8

The share of subsidised investments in total investments between 2002-2004



3.2. Factors affecting the decisions

The motives behind investment decisions as stated by J. Alvincz and M. Guba are the following:

- financial and physical depreciation of the equipment
- maintaining or creating new jobs
- Improving income through investments,
- meeting specific market access requirements
- availability of required resources (Alvincz - Guba, 2003)

Since the 1950s foreign experts have analysed the motives behind investments. Cromarty (1959), Griliches (1960), Heady and Tweeten (1963), Fox (1966), Rayner és Cowling (1968). All operated on the assumption that farmers strive for maximum income and thus attain the required ”investment level” and the optimal ”servicing level” to be extracted from the investment. They thought that the investment ratio between equipment or machinery price and goods manufactured constituted a major decision-making factor. (Peter and Lindon, 2001).

From the above authors only Griliches (1960) felt there was a significant relationship between interest rates and investment volume. According to Rayner and Cowling (1968) the ratio between farm ”salary level” and tractor price was vital in farm investment decisions.

During our research we also endeavoured to determine what lies behind farm investment decisions and to what extent it affects decision-making.

Table 1 data indicate that, in practice, there aren’t widely differing **motives behind investment decisions.** 30-39% of the investors decided to invest because sufficient subsidies were available or to reduce production costs. 36% invested to meet EU animal welfare, plant protection, environmental and food safety requirements, and 33% felt that without investing they would have to retire due to obsolete equipment; 28% were confident the investment would mean increased income.

Table 1

The reasons behind farms investments between 2002-2004

The investment was implemented because…	**Share of farms**
It was properly subsidised.	39.3%
By the investment the production costs could be decreased	38.9%
The new regulations and partly the EU regulations on the animal welfare, plant protection, environment and food safety had to be met	35.9%
The equipment is so obsolete that without the investment the activity should have to be abandoned.	33.4%
By the investment the income can be increased.	28.3%
By the investment marketable services could be performed	26.8%
Equipment could be purchased at fair prices.	26.4%
The loan construction attached to the investment was favourable	23.5%
He wanted to make use of the opportunity provided as he knew that after the EU Accession investment subsidies would be reduced.	22.0%
No investment was implemented because…	
Had no money	62.6%
It was not required	27.9%
The investment could only be implemented by taking loans of high interest rates, and he could not take it.	24.7%
Anyway the farm was declining and it was not worthwhile to invest „I do it as long as I can”	21.7%
Has not received any investment subsidies	7.5%

*More than one answer can be marked.

27% of the producers were motivated to invest because greater capacity meant marketable services could be provided. 26% were able to purchase equipment at fair prices and capitalized on this opportunity. 22% thought that they should benefit now as after EU Accession investment subsidies would be reduced.

By analysing how factors impacted on investment decision-making, we would like to highlight two conclusions. By analysing the above factors' weighting numbers we observed that the majority of investment decisions were **strategically based (57%) but in 43% of the cases the decisions were made for other important motives** – e.g., attractive prices, obtaining loans, subsidy opportunities, etc. Consquently we believe that during the anlaysed period **”over investment” and ”backwardness ”**[9] **were equally present.** We contend that in the Hungarian agricultural economy the problem lies not with the **amount of the subsidies** but rather with efficiency in using them and with the very structure of the subsidy schemes.

[9] In the interviews several farms mentioned that as a result of the attractive subsidies they have overdeveloped mainly regarding the power machines, and hardly any money was spent on other machinery. In addition to the investment subsidies and own capital they have also taken loans. The producers did not take into account the capital tie-up and consequently, the money available for financing the current assets was not sufficient. In order to finance the current production the role of external resources had to be increased, therefore, these investments led them into indebtedness.

Investment subsidy efficiency could be improved by projecting this issue into the development plan which should be prepared regarding agricultural strategy. Under this strategy, ideal production, farm and property structure have to be defined. **The subsidy schemes should publicize their objectives** so vacant concepts or vacillating concepts can be avoided.

Our other conclusion was that – and the in-depth interviews confirmed this – **due to increased subsidies or following increased subsidies, machinery dealers increased their prices.** . Therefore, part of the subsidy ended up in the dealers' pockets.

On 63% of the farms the reason for not investing was lack of money. Only 28% did not need new equipment, and 25% refused to invest due to high interest loans. 8% of the farms refused because there was no available subsides.

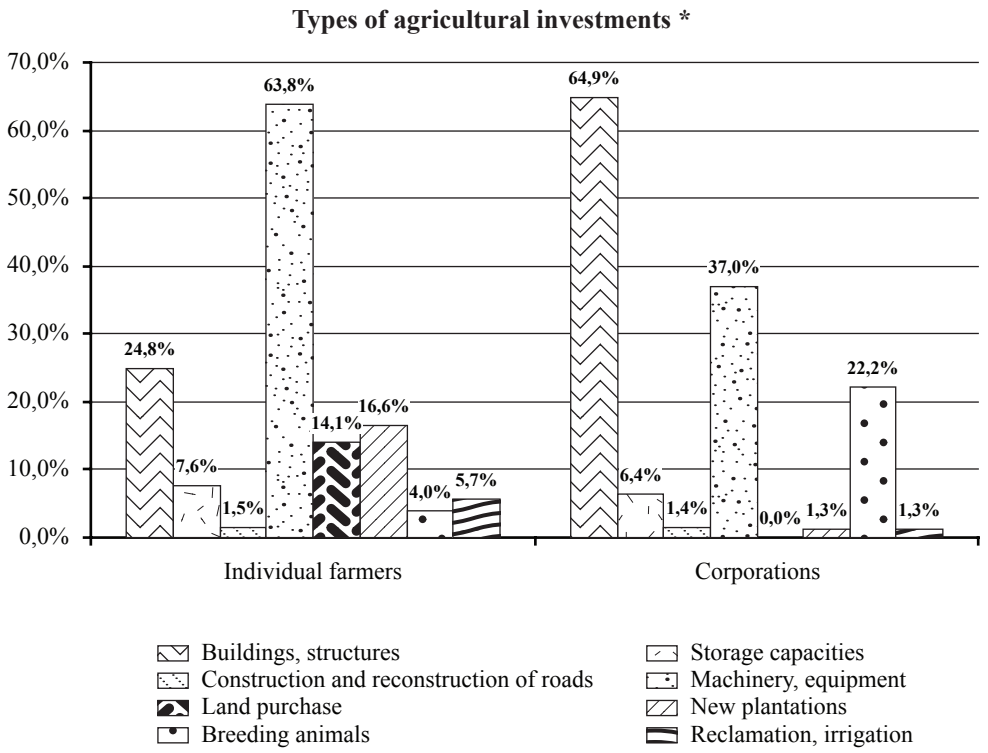
3.3. Structure of the investments

Our analyses showed that on 59% of farms investments were channeled into machinery, equipment, or vehicles. Investments in buildings and other structures entailed 32%. For individual farms the most significant investments were for machinery, equipment and vehicles(64%) as well as for buildings and other structures (25%). Lack of machinery is an obvious need for individual farms and this was one area where they channeled their investments. As for corporations, these two investments are also the major ones, but in the opposite order. (Figure 9).

Each year among machinery purchases heavy equipment prevailed. Their share in total machinery investment was between 55-66%. The resources spent on purchasing machinery and other equipment accounted for 34-45% (based on Agricultural Machinery Institute data) Such statistics are typical in **developing countries**. In developed countries the share spent on modernizing machinery is greater..

Our results confirmed our earlier statements: because of major investments in machinery, the state of Hungarian machinery and the general technical level of Hungarian agriculture improved. However, this was inadequate to fundamentally alter the old and dubious quality that had for decades prevailed. Bridging the technical gap with EU Member States has already started but Hungarian agriculture is still not able to compete with Member State producers. Hungarian agriculture's **technical level still lags behind its Western competitors** (Antal - Guba - Kovács, 2004)

Figure 9



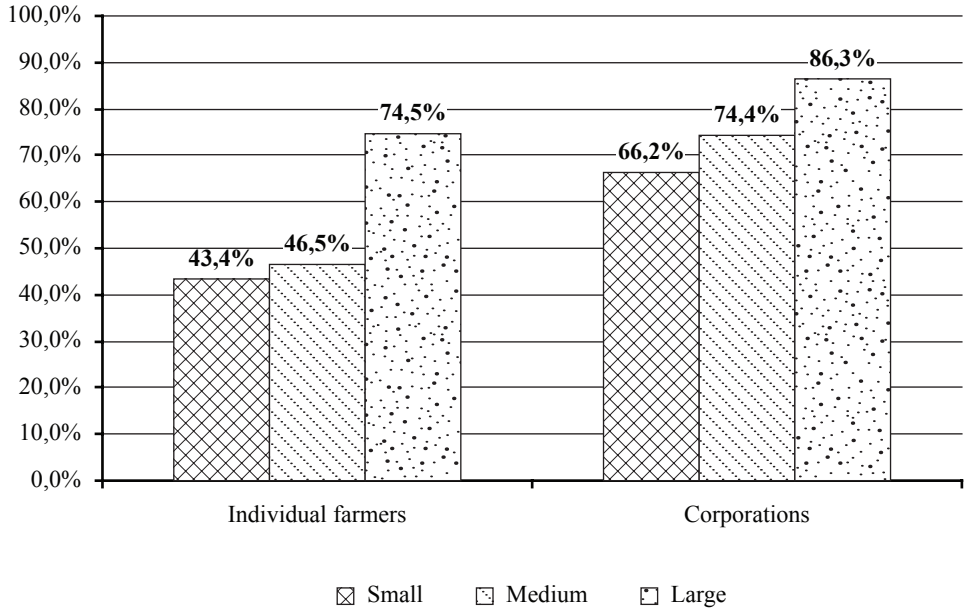
*More than one answer can be marked.

In general within the European Union new initiatives do not result in capacity increase or production that oversteps quota stipulations. Preference is given to investments for more economical and environmentally friendly production related to food safety and animal welfare regulations. But how will these measures impact on Hungarian producers and how will they modify their investment plans? Therefore, prior to Accession, Hungarian producers had (would have had) to undertake planned investments which naturally resulted in capacity increase. Therefore, we tried to determine if the farms that undertook investments between 2002-2004 generally increased their capacitiy or also undertook modernisation initiatives.

54% of the initiatives chiefly resulted in capacity increase. On individual farms this amounted to 50% and with corporations to78%. The larger the farm, the greater the share of capacity increasing investments. This clearly illustrates the concentrated nature of production. We should add that capacity increasing investments also resulted in modernisation but their primary aim was to boost production. (Figure 10).

Figure 10

Share of investments for capacity increase between 2002-2004



3.4. Financing

In the above-mentioned paper the most significant factors toward financing the investment are as follows(Antal - Guba - Kovács, 2004):

- depreciation of tangible assets;
- after tax income;
- tax benefits;
- governmental subsidies for investment purposes;
- investment loans from financial institutions, loans from proprietors (members), increase of subscribed capital.

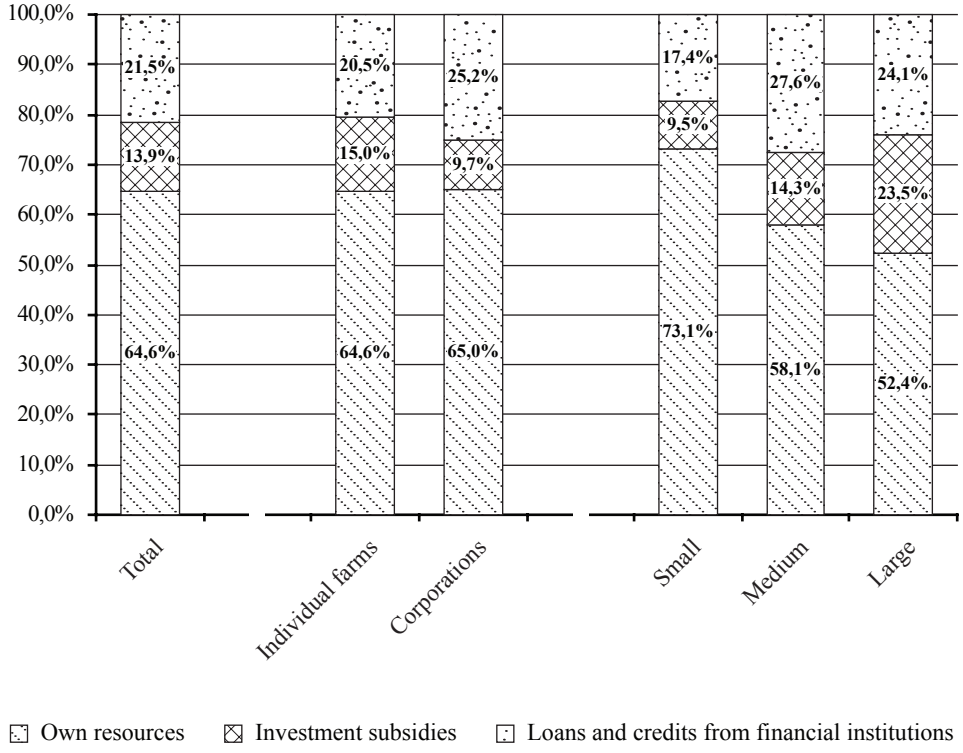
During our research we analysed the role played by personal equity, governmental subsidies, and financial institution loans for financing investments. Between 2002-2004 we discerned that in total investments the producers' private capital was paramount[10] in financing investments. On average the producers' private capital accounted for 65% of investment cost (Figure 11).

In investment financing loans and credits from financial institutions amounted to a relatively low share, meaning a 21% annual average for 2002-2004. One of the reasons for this was that for low cost purchases the farmers wished to avoid bank loan procedures. One must add, however, that banks were reluctant to grant loans because some farms were financially sick and presented high credit risks.

[10] In the questionnaire I asked for data on the three most important investments but in most farms this number indicated the total number of the investments between 2002 and 2004 since from the three columns of the questionnaires only 1 or two were filled in.

Figure 11

Composition of the resources in agricultural investments between 2002-2004



We also analysed financing in terms of legal description and farm size. We could not find any significant difference between the individual farms and corporations but when it came to farm size there were obvious trends. **The larger the farm, the smaller the private capital; as well larger farms relied more heavily on investment subsidies, loans, and credit.** On small farms private capital accounted for 73% and on large farms it decreased to 52%. On small farms investments subsidies came to 10% and on "large" farms 24%. As for loans this trend increases from 17% to 24%.

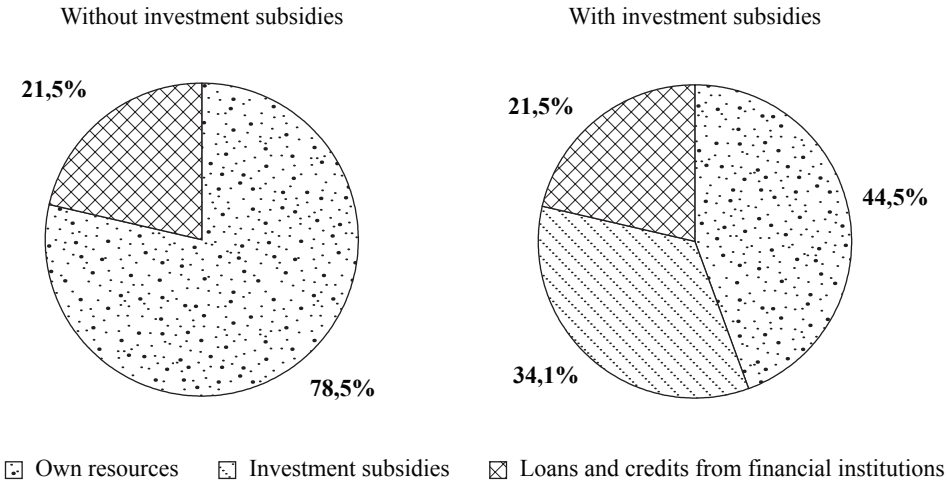
In our survey it was determined that 47% of the farms financed 100% of their investments from their private resources[11]. We observed major differences among size classes. 65% of small farms, 32% of medium farms and 165 of the large farms financed 100% of their investments from their own private resources.

In the *investment* section we analysed those farms which used investment subsidies and those which did not. Among those that received no subsides almost 80% relied on their own private capital. Among investors who received some subsidies, their own private capital amounted to 45% of investments while subsidies were at 34% and loans and credits 22% (Figure 12).

[11] In most cases the expression of "at least one investment" meant that in fact at least one investment was implemented during the 3 years of the analysis.

Figure 12

Composition of the resources of agricultural investments implemented without and with investment subsidies



Based on our research we concur with those experts who contend that, to create a competitive agricultural sector, **subsidies, including investment subsidies, should focus on farms that are viable in the long term.** Presently producers are unable to solely rely on their personal resources and even financing their current operations requires significant external resources. Improved income enhances the role of personal financial resources but in addition to these external resources can finance new initiatives (Borszéki, 2003). Therefore, as long as producers' own private capital is insufficient for new initiatives it is logical to increase the list of subsidy related preferential loans.

Conclusions

Based on farmers' answers, we can conclude that their response to economic conditions substantially varied. On the one hand, the process was positive since it contributed to a more competitive economic structure. Farms with costly production mechanisms yet devoid of financial resources were eliminated and only a handful of financially solid well-run farms survived. However, the numerous crises have had serious social consequences. One of the reasons for this is that Hungarian producers cannot adequately respond to new circumstances. The government's task and responsibility is not only to support current goals (storage capacity, mechanisation) but to introduce concrete targets. By limiting excess regulations and helping farmers to respond to new circumstances it can bolster agriculture, which is currently in a difficult situation. A different approach is required. Otherwise, some producers will continue to say: ''We have no other choice so we just hang on."

References

1. Alvincz, J. – Guba, M. (2003): Investments and income generation in the agriculture at the turn of the century (in Hungarian). Gazdálkodás, Vol. XLVII, 2003. No. 1, p. 40-51
2. Antal, K. – Guba, M. – Kovács, H. (2004): situation of the agriculture following the application of the act on agriculture (in Hungarian). Studies in Agricultural Economics, 2004. No. 3, Budapest. Agricultural Economics Research and Information Institute. p. 150
3. Borszéki, É. (2003): profitability and accumulation in agriculture (in Hungarian). Gazdálkodás, Vol. XLVII, 2003. No. 4, p. 2-14
4. Bean, L.H. (1929): The farmers' response to price. Journal of Farm Economics, 11, pp. 368-385.
5. Buzás, Ferenc Ede (2003): Economic analysis of the milk and sugar sectors (in Hungarian). PhD Thesis. PhD course of Multidisciplinary Social Studies, Debrecen
6. Griliches, Z. (1960): The demand for a durable input : Farm tractors in he United States, 1921-57. In: The demand for durable goods. Ed: A. C. Harberger. (University os Chicago Press, Chicago) pp. 181-210.
7. Hajmási, Gábor (2003): Hungary' inflation perspectives after the EU Accession (in Hungarian). Gazdálkodás, 2003. No. 5, p. 42.
8. Hauck, J. P. – Gallager, P. W. (1976): The price responsiveness of U.S. Corn yields. American Journal of Agricultural Economics, 1976. No. 4, pp. 731-734.
9. Kapronczai, I. – Rideg, M. – Szénai, L. (1980): The main conclusions of the regulation-reaction analyses in the cooperatives (in Hungarian). Budapest. Research Institutes of Cooperatives. p. 64.
10. Meilke, K. D. (1976): Acreage response to policy variables in he praire provinces. American Journal of Agricultural Economics. 1976. No. 3, 572-577. p.
11. Mészáros, Sándor (1985): Analyses for determining the price flexibility of agricultural products (in Hungarian). Statisztikai Szemle, 63: 765-77. p.
12. Orbánné, Nagy Mária (2002): Producer and consumer prices of the Hungarian food sector in view of the prices of the European Union (in Hungarian). Studies in Agricultural Economics, 2002. No. 1. Agricultural Economics Research and Information Institute.
13. Orbánné, Nagy Mária (2003): Convergence of food consumption and consumer prices between Hungary and the EU (in Hungarian). Studies in Agricultural Economics, 2003. No. 5. Agricultural Economics Research and Information Institute.
14. Peter, J. B. – Lindon, J. R. (2001): Agricultural finance: credit, credit constraints and consequences. In: Handbook of Agricultural Economics. North-Holland. Volume 1A. Agricultural Production. Ed: Bruce L. G., Gordon C. R. 513-571. p.
15. Potori, N.- Udovecz, G. (2005): An assessment of the short-term impact of EU integration on Hungarian agriculture. Studies in Agricultural Economics, No. 102. 5-14. p.
16. Rayner, A.J. – Keith, Cowling (1968): The Demand for Farm Tractors in the US and the UK. American Journal of Agricultural Economics. 896-912. p.

17. Tweeten, L. G. (1969): Positivistic measures of aggregate supply elasticities: Some new approaches. American Journal of Agricultural Economics, 1976. 2. szám. 342-352 p.

18. Zrínyi, M. (2000): Presentation and application of the Johnson–Neyman method-. Statisztikai Szemle, May 2000. pp. 373-384.

Studies in Agricultural Economics No. 104. p. 85-108. (2006)

Potential for efficiency improvement of Hungarian agriculture

Tibor Varga[1]

Abstract

In the following study we attempt to introduce, in the context of Data Envelopment Analysis (DEA) economics, a useful methodology to identify production potential for efficiency improvement. Using this method and the Hungarian FADN's 2004 annual expenditures[2] and cost data, we did calculations for four sectors (wheat, corn and sunflower production, and pig raising.)

Allocative efficiency is a key component in untapped production resources. On each farm it is revealed by unit price variations in expenditures (e.g., labour cost). Regionally potential for efficiency improvement reveals the largest variation. Larger firms tend to work with lower potential for efficiency improvement and more comprehensive efficiency, which however, do not necessarily result in scale efficiency. With the exception of corn production, among various types of farm operations one does not find significant differences in potential for efficiency improvement.

Key words

DEA, efficiency, efficiency-component, isoquant, isocost, production function, FADN

Introduction

Hungary has long lacked resources, and, as a new member of the European Union, Hungarian now faces the challenge of internal EU competition. Because of this Hungarian farm competitiveness must receive even more attention in the sector's overall objectives. An array of studies focus on measuring competitiveness, identifying its component parts and potential for improvement[3]. The majority of these studies concur that the secret to successful competition lies in production efficiency. An investigation of domestic farms' relative efficiency/inefficiency enhances better understanding which guides us toward future success.

Using a currently favored method by economists for measuring (in)efficiency-components, which the professional literature defines as 'Data Envelopment Analysis' (DEA), we shall attempt to contribute to agricultural operations' efficiency-analysis; we will introduce the above method and publish a Hungarian FADN study's database results. Utilising similar production volumes or cost structures, the DEA method quantifies unexploited potential for efficiency improvement and efficiency-components for comparable farms as measured against top performers within the category. In this context, the method may supplement already successfully used efficiency analyses which are still likely to be used in the future.

[1] Research Institute for Agricultural Economics, H-1335 Budapest 55. POB 5. e-mail: vargat@akii.hu

[2] Expenditures is a use of a given production factor in natural measurement.

[3] A list of a few recently published studies on the topic: Gyula Módos (editor): Aspects of competitiveness and its measurement methods in the meat industry. AGROINFORM, Budapest, 2004. Norbert Potori (editor): Survival and competition requirements for major agricultural sectors. AKI, Budapest, 2004. Gábor Udovecz: The competitive chances of Hungarian agriculture in the European Union. Magyar Tudomány, year 47, issue no. 9, 2002, pp. 1173-1180. Gábor Kovács–Gábor Udovecz: Hungarian agriculture's first year in the European Union. Gazdálkodás, year 49, issue no 5, 2005. pp. 1-10.

DEA methodology's Economic Foundations

The idea behind Data Envelopment System comes from Farrell (1957). Farrell based his method on microeconomic principles, and, as suggested in the introduction, resolved the quantification of capacity reserves in firms' efficiency and morevor that of certain efficiency-components against the highest expected value. Charnes, Cooper and Rhodes (1978) worked out the method's mathematical model. During the decades following initial publication, the method has been refined making it more manageable and suitable for practical application (improving several procedures). In various economic sectors the method is used. At the September 2004 meeting of the 91st Seminar of the European Organization of Agricultural Economists, over half the presentations mentioned the methodology's agricultural applications. Sándor Mészáros [1990] first introduced the methodology to Hungary and adapted it for the study of agricultural inefficiency-components.

The method's economic basis for microeconomics relies on the well-known correlation between the production function, the isoquant curve and the isocost line.

Production function: "the technical/economic correlation between production factors' possible input combinations and a set of maximum output potentials[4]" (Kopányi et al., 1989, 128.o.).

Isoquant: "the geometrical location of points along a production function curve that indicates all potential input combinations related to production level Q" (Kopányi et al., 1989, 130.o.).

Isocost: "the geometric location of a combination of production input where total costs are equal" (Kopányi et al., 1989, 146.o.).

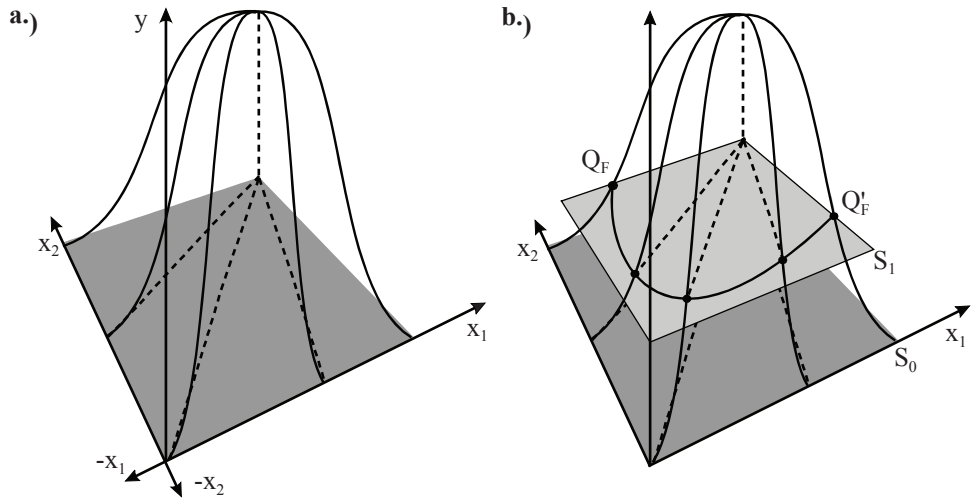
Along with potential input combinations, by definition the production function also includes output maximum-points. Due to output maximums, the function has a surface shape and, thanks to input combinations, it describes a curved plane. The production function that specifically includes two input and one output variants (being three dimensional) can be represented spatially. By choosing this approach we may say that if input variables are represented in a binary system of co-ordinates while the output is placed perpendicular to the resulting graph, the production function diagram is a three-dimensional plane with the positive plane of the system of co-ordinates acting as its base (see Figure 1a). Values of the production function are arranged on the surface "one quarter up the slope of the hill"[5].

[4] The „maximum output potential" in the definition refers to the fact that while firms may produce less, the interpretation does not extend to these. At the same time, in terms of this interpretation the production function assumes the highest output-efficiency or, in the case of several firms, the aggregate thereof. In this sense, instead of describing all units, it is a general function containing the most efficient production (frontier) units.

[5] The hill-top format assumes that the two-variable production functions are 'S'-shaped growth functions. These, besides being the most commonly used by manuals, are also the best reflections of real conditions.

Figure 1

Relationship between the production function and the isoquant curve



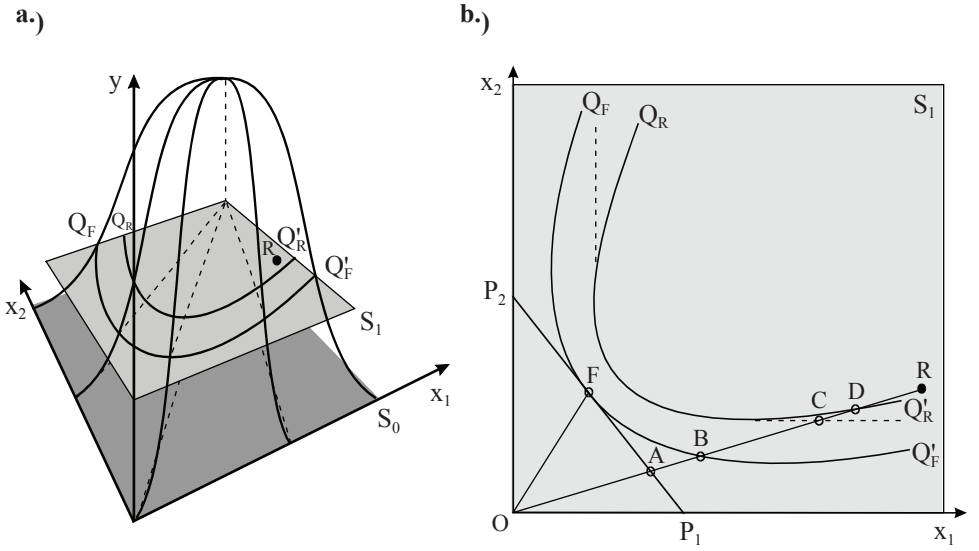
In terms of the isoquant curve definition, in the case of a three-variable (two input and one output) production function, its points are located on the surface perimeter created by the parallel section of the hill-top, along axis *'y'*s Q output value and the line defined by the two input values. ($Q_F Q_F^{'}$) (Figure 1b). As these points are production functions' component parts, obviously, on plane S_1 with identical outputs, these demarcate firms with the highest potential efficiency with the lowest expenditures[6] (best practice threshold) provided such units exist. If there are no such units in reality (in the sample under review), the isoquant curve describes an "**expected efficiency level**" for firms operating at the same output level.

Firms can be expected to deliver this efficiency level only if all production factors are available in the same quantity and quality at the opportune time. However, this rarely happens. In the short term, some production factors are a given, i.e., production is hence a given. Consequently, in the short term, there is a suboptimal production process (taking best production practices as optimal technology) which in the case of a non-threshold firm represents a **"reasonably expectable efficiency level".** Based on the above, a non-threshold firm has a "subisoquant" curve ($Q_R Q_R^{'}$), i.e., its own benchmark (see Figure 2a) that, by definition, cannot be considered a true isoquant curve. This represents the optimal level of efficiency possible given the available technology.

[6] Hereinafter efficiency shall stand for natural efficiency, until the introduction of the concept of economic efficiency.

Figure 2

Potential for efficiency improvement identified using input-oriented DEA-methodology



As one moves along the isoquant curve, one observes that the applicable input combinations change. This change also represents potential substitution of production factors. Keeping production rationalization in mind, one ascertains that factors can be interchanged as, when by increasing the volume of one factor, the volume of another one may decrease (generally, at least one other factor's volume decreases). Since the isoquant curve represents all potential input combinations belonging to production level 'Q' (and, as well, this holds for a subisoquant curve), it also contains points where this is not the case. Consequently, the curve has some sections where points group together indicating a combination of factors where **in creasing the volume of one factor, does not result in the other factor's decreasing, and it may even increase** (in general: at least that of one other factor). In this case expenditures are wasteful; the isoquant (or subisoquant) curve should be interrupted at this point and production should be stopped or continued at a higher production level. When this does not happen, management that fails to identify technologically unjustified extra expenditures can be criticized or, alternatively, commended if a conscious decision has been made for profitability considerations. On the isoquant (or subisoquant) curve those points indicating extra expenditures are found on the so-called re-curling arm s that, from the '*y'* axis perspective, are the farthest from the connecting tangent points running parallel to input axes (e.g., the subisoquant curve slanting from the broken lines on Figure 2b ($Q_R Q_R^{'}$) is a good example).

There are instances where a firm **cannot even meet its own efficiency expectations**. Then, looking from the '*y'* axis, the efficiency point (*R*) representing the entity falls below its own subisoquant (Figure 2a). As a rule, this shortfall is considered, due to management performance, a hidden efficiency reserve. So far we have identified potential for efficiency improvement in the area of natural efficiency. Production factors substitution provides further room for efficiency improvement as cost-optimum ratios regarding expenditures can be defined.

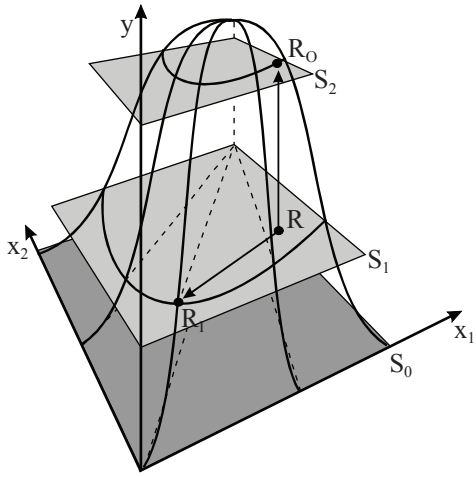
The isocost line expresses an input combination that can be purchased from a fixed total-cost amount. Since total cost is a linear function (sum) of factor costs, in the case of two production factors the function is described by a line where the angle of incidence is expressed as a negative number by a ratio of factor unit prices. Taking unit prices as a constant (when the pitch of the isocost line does not change) and allowing for a variation in total expenditures, compared to its previous position the line shifts in a parallel direction. Moving total expenditures up to the isocost line (P_1P_2) where it becomes an isoquant angent, at the point of contact (F) we get the **cost proportionate optimum of expenditures** (see Figure 2b). With this we expanded the range of inefficiency with the 'price-efficiency' component. We treat full efficiency as an 'economical efficiency'.

Input-minimizing and output-maximizing efficiency variations

A firm that is not top-rated (a non-surface value on the production function-hill) has infinite possibilities for becoming top-rated (a surface value) as from any direction an interior point may reach the surface. However, only two shifts have mathematically logical definitions (see Figure 3). One of these characteristic shifts is possible along the horizontal plane in towards axis *'y'* ($R \rightarrow R_1$). In this case the output level remains unchanged and an input combination with minimum expenditures is obtained by the firms represented by the point. This case may be described as an "input-oriented efficiency variation". The other characteristic shift may occur in a vertical direction. In this case, upon reaching the surface, the value is located on the prevailing isoquant ($R \rightarrow R_0$), and firms located at that spot are in a position to reach a higher production levels with an unchanged input bundle. This case may be described as an "output-oriented efficiency variation". In the first case the phenomenon is described as input minimizing, the latter as output maximizing.

Figure 3

Input-minimizing and output-maximizing efficiency variation



Using DEA methodology, because of the above described absence of potential changes we quantify inefficiencies. For the above explained reasons, the procedure has two basic versions: input-oriented and the out-put-oriented efficiency analyses.

In terms of the above-discussed microeconomic correlation, the **input-oriented DEA method** can be used to differentiate between four types of inefficiencies. These inefficiencies have the following content (see Figure 2b):

1. allocative inefficiency ($\overline{AB}$)
2. scale inefficiency ($\overline{BC}$)
3. congestion inefficiency ($\overline{CD}$)
4. pure technical inefficiency ($\overline{DR}$),

Through reduction, one may calculate the following two categories:

- technical inefficiency ($\overline{BR}$)
- cost inefficiency ($\overline{AR}$)

The quantification of these inefficiencies as differences has the drawback that their sum does not equal cost inefficiencies. When we consider specific efficiency reserve types as inefficiency-components, the matter becomes problematic. However, in cases where we define the inefficiency values as rounded to 1, starting from origo (O) and moving toward the firm's point (R) as an efficiency-quotient[7], the product of these quotients (relative efficiency levels[8]) will equal the actual cost efficiency level that expresses the essential interdependence of components. Therefore, Farrell (1957) introduced the 'radial measure' concept that displays the inefficiency-components and combined categories with efficiency-quotients in a radial direction. These are as follows[9] (see Figure 2.b):

- **Allocative inefficiency**: $(1 - \frac{OA}{OB})$. Content: conditionally, the deviation of the firm's expenditure-combinations arranged on the isoquant from the cost-proportionate substitution optimum of production factors.
- **Scale inefficiency**: $(1 - \frac{OB}{OC})$. Content: conditionally, the deviation of the firm's production technology efficiency from that of the most efficient firms (arranged along the isoquant).
- **Congestion inefficiency**: $(1 - \frac{OC}{OD})$. Content: conditionally, the deviation of the efficiency of a firm (positioned behind its own subisoquant; in fact, beyond its substitution segment) from the efficiency of firms arranged along the subisoquant.
- **Pure technical inefficiency**: $(1 - \frac{OD}{OR})$. Content: conditionally, the deviation a firm's efficiency (positioned behind its own subisoquant) from the firms' efficiency arranged along the subisoquant.
  - **Technical inefficiency**: $(1 - \frac{OB}{OR})$. Content: sum (product) of scale, congestion and pure technical inefficiencies.
  - **Cost inefficiency**: $(1 - \frac{OA}{OR})$. Content: sum (product) of scale, congestion and pure technical and allocative inefficiencies.

[7] The ratio of efficiencies: $\frac{Y}{OB} \Big/ \frac{Y}{OA} = \frac{OA}{OB}$.
As, for instance, if : $Y=7$, $OA=2$ and $OB=4$, then: $\frac{7}{4} \Big/ \frac{7}{2} = \frac{2}{4} = \frac{OA}{OB}$.

[8] The relative efficiency level refers to a ratio, i.e., the rate of efficiency of the firm under review to the actual or fictive efficiency of a comparable benchmark firm.

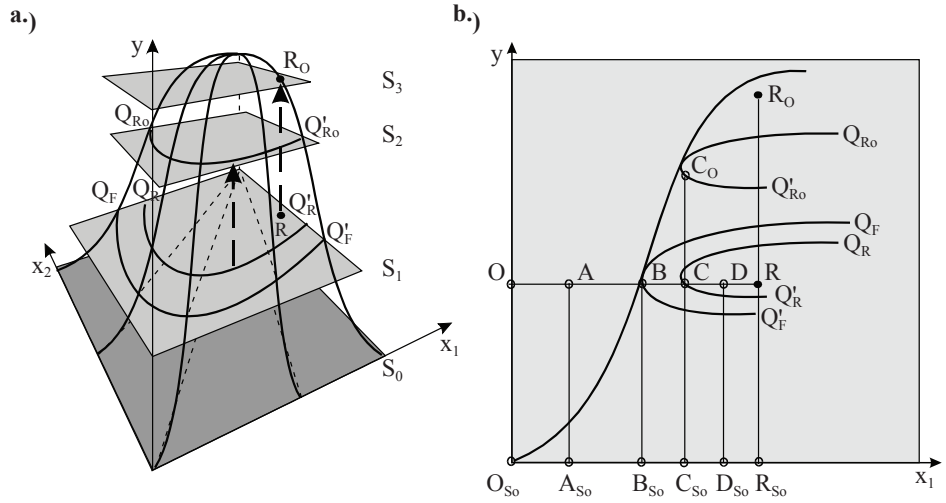
[9] In defining efficiency reserve-components, most emphasis was laced on content, while the meaning of the original English definition was largely ignored.

The **output-oriented DEA method** also can differentiate among the four potential for efficiency types and their aggregate, albeit with different content. These are as follows (Figure 4b):

- Allocative inefficiency ($\overline{B\ B}$)
- Scale inefficiency ($\overline{C\ Co}$)
- Congestion inefficiency ($\overline{D\ D}$)
- Pure technical inefficiency ($\overline{R\ Ro}$)
  - Technical inefficiency ($\overline{C\ Co}$, $\overline{R\ Ro}$)
  - Cost inefficiency ($\overline{C\ Co}$, $\overline{R\ Ro}$)

Figure 4

Potential for efficiency improvement identified using the output-oriented DEA-method



As we have seen above, output-oriented efficiency-components were defined using fixed input and maximized output values. Consequently, we cannot assign potentially more efficient conditions for firms cost- and expenditure components, as these cannot change. Following the system described in the input-oriented method, in defining the components we compare these efficiency-components with themselves, and give these a value of 1. Output-oriented efficiency reserve-components are as follows (Figure 4b):

- **Allocative inefficiency**: $(1 - \frac{B\ B_{So}}{B\ B_{So}} = 0)$. Content: conditionally, the deviation of a firm's outgoings-combination on the subisoquant from itself.
- **Scale inefficiency**:$(1 - \frac{C_O\ C_{So}}{C\ C_{So}})$. Content: conditionally, the deviation of the firm's production-technology efficiency (at a higher output value) from that of the most efficient firms (located along the isoquant).
- **Congestion inefficiency**: $(1 - \frac{D\ D_{So}}{D\ D_{So}} = 0)$. Content: conditionally, the deviation of the efficiency of a firm (positioned behind its own subisoquant, in fact, beyond its substitution segment) from its own efficiency.

- **Pure technical inefficiency**: $(1 - \frac{R_O\ R_{So}}{R\ R_{So}})$.Content: conditionally, the deviation of the efficiency (at a higher output value) of a firm positioned behind its own subisoquant from the efficiency of firms arranged along the isoquant.
  - **Technical inefficiency**: $(1 - \frac{C_o\ C_{So}}{C\ C_{So}} \times 1 \times \frac{R_O\ R_{So}}{R\ R_{So}})$. Content: scale, congestion and pure technical inefficiencies (series).
  - **Cost inefficiency**: $(1 - 1 \times \frac{C_o\ C_{So}}{C\ C_{So}} \times 1 \times \frac{R_O\ R_{So}}{R\ R_{So}})$. Content: sum of scale, congestion and pure technical– and allocative-inefficiencies (series).

It is apparent (and our calculations will confirm this) that in the input-oriented method all four efficiency components can be calculated, while in the output-oriented version only the technology and management components[10] can be calculated. This becomes obvious when we consider that the potential for change at fixed output values (input-oriented version) is open for all four input components, but in determining inputs (output-oriented version), input volumes and their unit costs cannot be moved.

Mathematically, the DEA method is a linear programming system. Bunkóczi and Pitlik (1999) discussed its detailed mathematical application toward application options in agriculture. Subsequent criticisms and ideas toward further improvement point to mathematical solutions. The parametric approach (the regression estimate of the isoquant function) is one of the typical mathematical solutions (Charnes et al., 1994), (Knox et al., 2000). Färe and Grosskopf (1996) studied inefficiency quantification as it changed through time. We observe a similar attempt related to the systemic integration of time where, instead of the observed firms, decision-making units are defined by time, e.g., months (Charnes et al., 1994).

The scope of data used in the research

As mentioned in the introduction, for required data we relied on the Hungarian FADN's database. We opted for the database as it provides, on farm operations, the most detailed sector-by-sector expenditures and cost-structure registration.

Based on their 2004 expenditures and cost data, we studied the **wheat, corn, sunflower production, and pork** sectors.

As it was the first major DEA analysis regarding domestic agricultural efficiency, the study attempted to pinpoint potential applications. Consequently, we ascertained the study's scope regarding the crop production and pork sectors. Thus, first to be studied were pig raising methods and wheat production. As the results indicated peculiar inefficiency-component ratios, research was also extended to corn and sunflower production to establish whether these extreme ratios should be considered the normal. At the same time, when selecting the sectors to be studied, we also had to keep in mind the available data volume as we planned to perform more detailed calculations (e.g., by county). Again this was done to identify the method's applicability.

[10] Figure 4b depicts a section where Farrell's radial measurement cannot be observed. Moreover, the 'OR' line represents a horizontal , while the contained isoquant - and subisoquant curves are depicted on a tilted plane for better viewing. However, as a result, their actual points of intersection depicted on the 'OR' line cannot follow the curves. Still, this figure is the most suitable in demonstrating why in the output-oriented procedure change is feasible only in the case of two efficiency reserves (technology and management).

Analyzing sectors using the DEA method, we worked with the following crop production and pig fattening **sectoral data**:

Production of wheat, corn and sunflower	**Pigfatening**
1. production; kg, HUF	1. Body mass growth; kg, HUF
2. Harvested area (owner occupation and rented land); ha, HUF	2. installation to fattening (purchased and self produced); db, HUF
3. Seed cost; HUF	3. Grain fodder (purchased and self produced); kg, HUF
4. N-fertiliser cost; kg, HUF	4. Fodder mix (purchased and self produced); kg, HUF
5. K-fertiliser cost; kg, HUF	5. Hay (purchased and self produced); kg, HUF
6. P-fertiliser cost; kg, HUF	6. Ferment fodder (purchased and self produced); kg, HUF
7. Crop protection; HUF	7. Green fodder (purchased and self produced); kg, HUF
8. Irrigation; m3, HUF	8. other massfodder crops (purchased and self produced); kg, HUF
	9. Pasturing cost; HUF
9. Direct marketing cost; HUF	10. Direct marketing cost; HUF
10. Drying cost; HUF	11. Achievement-control; HUF
11. Heating cost; HUF	12. Veterinary cost; HUF
12. Direct insurance cost; HUF	13. Direct insurance cost; HUF
13. Other direct variable cost; HUF	14. Other direct variable cost; HUF
14. Manure cost; HUF	
15. Cost of motor fuels and lubricants and maintainance costs of tractor; HUF	15. Variable machinery cost; HUF
16. Cost of motor fuels and lubricants and maintainance costs of carrier machine; HUF	
17. Cost of motor fuels and lubricants and maintainance costs of harvesting machine HUF	
18. Other machinery cost; HUF	
19. Fixed cost of maintainance and branch work; HUF	16. Fixed cost of maintainance and branch work; HUF
20. Cost of paid services; HUF	
21. Paid and unpaid input; hours	17. Paid and unpaid input; hours
22. Paid and unpaid labour input HUF	18. Paid and unpaid labour input HUF
23. Common charge of labour; HUF	19. Common charge of labour; HUF
24. Depreciation; HUF	20. Depreciation; HUF
25. Other variable cost; HUF	21. Other variable cost; HUF
26. General cost of activity; HUF	22. General cost of activity; HUF
27. General cost of farm; HUF	23. General cost of farm; HUF

We deliberately ignored the nature of production factors (owned, purchased or leased) or, to be more precise, amalgamated them and assigned them an identical unit cost (e.g., farmer's own and purchased grain feed). In the same vain, we consolidated labour expenses into a one-hour of work statistic and calculated the average of these costs weighted against the work hour. At the same time, we did not consolidate the cost of using the farmer's own or leased machinery, as we assumed that these refer to mutually complementary activities.

The cost of machinery for crop production and for raising pigs both contain the costs of expended fuel and lubricants, as well as those for regular maintenance and repairs. Other energy costs for raising pigs (e.g., heating and lighting) are listed under other direct costs.

The 'general farm costs' includes in part 'related farm costs' for the given activity.

Where not available on the database, we defined the producer's own labour value by averaging the available data on farms under study.

We calculated the annual cost of agricultural land expenditures with the rental fees paid by the given farm, for owned and leased land alike. In cases where the farm wasn't leasing land, we calculated its annual expenditures for the land it owned based on the average of the available data for other farms under study.

We calculated unit costs from cost data projected for expenditures, and used these according to DEA-analysis inputs.

To make things manageable, we worked with a single output and product average cost. In other words, we consolidated sold and unsold product volumes and assigned the average sales price to the results.

The evaluation of DEA-analysis findings

For the four above-discussed sectors we performed both input-oriented and output-oriented analysis. We established sector specific average potential for efficiency improvement (cost inefficiency) and broke these down into the four previously discussed efficiency components: allocative, scale, congestion, and technical inefficiencies. As a direct result, the calculation provides relative efficiency levels in percentages (tables 1-4). Among the components'[11] adjustment levels one finds, in a fractional form, the product coherence that may offer proof of the calculation's accuracy. For instance, wheat production's input-oriented efficiency adjustment level calculated for the sector as a whole: A_I=73.5%, S_I =98.9%, CN_I=100.0% and T_I=98.5% fractional products equal the fractional product of O_I=71.6% (table 1).

To make calculations, the applied program requires that the user establish groups of firms producing at the same level. Within the crop producing sector, we reduced (beyond the nearly equal output levels) the group of comparable farms by dividing them further in terms of soil quality (using brackets of "3 gold-crown" difference). We did this with the assumption that local soil quality is a given that cannot be changed, i.e., it does not represent genuine

[11] In referring to components, we use the accepted English abbreviations. Legend: O=cost, A=allocative-, S=scale-, CN=congestion- and T= pure technical inefficiency, actual level; I=input-oriented and o=output-oriented are the indices of the procedure; Prim.producer=Primary producer, Agric.entrepr.=Agricultural entrepreneur, Deposit comp.=Deposit company, Lim.liab.comp.=Limited Liability Company, Joint st. comp.=Joint stock company, Agr. cooperat.=Agricultural cooperation.

potential for efficiency improvement. Through this method we developed groups containing between 20 and 50 farms and, within each group, defined the efficiency (isoquant) curve of the most successful ones that serve as a benchmark for other farms within the group.

Multiplied by the FADN's representative weighted values, the farm by farm results were turned into national and regional group values for economic size and for type of operation[12].

In respect to the sectoral average of calculated **potential for efficiency improvement** values, initially one can establish that, fluctuating between 25 and 46%, they can be **considered significant**[13]. Higher potential for efficiency improvement was found in corn and sunflower production (46.4% and 40.5%). In contrast, wheat production's 28.4% and pork's 24.7% values refer to the specific nature of the sector's inefficiencies.

In this study **disproportionate component sizes** constitute a noteworthy element**.** Those results stipulated as non-domestic and as not exclusively limited to farms put the cost inefficiency item at around 20% (and this is about four times the technological component's value). Compared to the 3% technological component not attained in any of the sectors, the 24 and 44% cost in potential for efficiency improvement are significant. In no sector do the technical inefficiency components exceed 3%.

Among the above stipulated input-oriented calculation's low technical inefficiency components, the low values of **congestion inefficiency** (between 0.3 and 2.3%) suggest that one would find very few cases where production factors are squandered (when a farm increases one of its expenditures without reducing other expenditures and thus its output remains stagnant). This could be the result of a positive factor (i.e., the farmer's professionalism) or a negative one (i.e., limited resources that typically limit wasteful expenditures).

The similarly low values for **scale inefficiencies** (between 0,8 and 2,2%) indicate that the farms' production technologies with similar outputs do not differ significantly from each other. Within the studied farm groups, minor technological differences are observed for both advanced and out-of-date technology. In itself this fact does not refute or confirm the existence of scale efficiency[14]. However, due to Hungary's small size and generally uniform farming conditions, results indicate that varied technology represents varied outputs and there is no rational for using different technology to produce similar outputs. Similarly, we do not expect to see cases where a farm using more advanced technology, but lacking in expertise, would not be able to reach higher outputs. If such inefficiency exists, it would correspond with the above described few percent in technical inefficiency within the studied sectors. This conclusion coincides with Béládi's and Kertész' position (2004), stating that in wheat production "a fairly uniform production technology is applied nationwide".

[12] Economic size expresses potential profit generating capacity. Its size equals the farm's total standard gross margin, its approximate added value. Its unit of measure (taken into account at the establishment of size categories) is the European Union Measure (EUME). 1 EUME~HUF 300 thousand.

[13] In connection to the analysis of the weight of efficiency-components applied to a circle of operators beyond those in agriculture, a foreign study found that overall efficiency reserve-components we also examined can be established at around 25%. (Berger et al, 1993). Even by a conservative comparison, the efficiency reserves of Hungarian agriculture exceed these figures by a wide margin.

[14] We shall return to the relation between scale efficiency and inefficiencies when we examine economic size categories.

Thirdly comes the **pure technical inefficiency** component. Since the two previous components (congestion and scale) are related to and can be mainly traced to management performance, the management potential for efficiency improvement is a "residual type" component. Wasteful expenditures and the under utilization of technology have already been quantified and identified as production potential. However, due to the logic of the method, one cannot calculate the significance of its impact. In all sectors this appears to be supported by the extent of its value, meaning less than 0.05%. Morevoer, this negligible potential may actually place farm-management in a favourable light.

As mentioned above, **allocative inefficiency** is one of cost inefficiency's key components. At the farm level the main reasons for agricultural inefficiency are the unfavorable long- term trends for output prices and expenditures. However, this does not enter into allocative inefficiency. Potential for improvement for specific farmers are generated by highly differentiated unit prices for available resources. At the same time, the variation in resource unit prices per farm is the only factor resulting in allocative inefficiency. Variations in expenditures calculated with the same unit price simultaneously represent changing expenditures that, rather than for costs, lead to changes in the technical inefficiency category. For expenditures, the unit price for soil, labour and fertilizer show the largest variation. Allocative inefficiency's high values are caused by these unit prices. With respect to a number of expenditures, we unfortunately lack individual farm unit prices; however, based on professional experience, one can expect significant differentiation[15]. Consequently, actual allocative inefficiency may be higher than currently estimated.

The variability of specific unit prices per farm (or per region) is related to a local market's particular nature in terms of these production components. As these conditions apply to everyone, production's unit price components within a consolidated national market (e.g., fuel and lubricants) vary little or not at all per farm. The question arises whether the existence of a lower price from an distant source should be considered as allocative inefficiency, i.e., as potential to improve efficiency. The answer is not obvious as it is a function of allocation. For exmaple, it is likely not worth hiring labour from a distant location, but purchasing fertilizer from the same location may be justified. Of course, this requires further clarification of the concept of inefficiency. One shouldn't expect a backward farm to reach a top-rated farm's efficiency level, even when they are producing at the same volume. However, this should be a desired goal and trend toward efficiency improvement. Agricultural policy must assume a more effective role in market control (in normative economics this constitutes a justified form of intervention[16]) to eliminate so-called "market failure", a permanent feature of market production components.

In other words, inefficiency is unutilized capacity where exploitation is largely left up to the farmer and to the state; however, it is by no means obvious that this potential will be harnessed. Here, rather than a firm requirement, inefficiency is an objective unit of measure.

[15] The cost of production is determined by a number of non-material outgoings as well, e.g., interest costs, cost of services (Béládi – Kertész, 2004)

[16] Market failures can occur under fully free market conditions, provided market players act rationally. For market failures are economic situations where economic rationality and economic efficiency fail to coincide. As the market is unable to handle these conflicts, the schools of normative economics consider state intervention permissible to prevent and/or remedy market failures. (Nagy, 2004).

Due to variable factors influencing prices in local production-component markets, results using the output-oriented method are more modest. Thanks to the methodology's logic (efficiency improvement potential being calculated at fixed inputs and simultaneously fixed input unit prices), only technological and management efficiency improvement potential may eventually be tapped. While the calculated potential for minimizing input is between 25 and 47%, and that for maximizing output is less than 5%. The dominance of expenditure unit prices in shaping inefficiencies is reinforced by the results (those above 100% of the adjustment levels constitute but a few percentage points) of output-oriented calculations. (tables 1-4).

As mentioned earlier, inefficiencies, including cost inefficiency, are highly differentiated. The values for the two potential efficiency improvement factors discussed are 24.7% and 23.7% for raising pigs, 28.4% and 26.5% for wheat production, 40.5% and 40.1% for sunflower production and 46.4% and 43.9% for corn production. Unfortunately, identifying sectoral differences would require greater scope than that of the present study. However, the analysis of measured farm values under the categories of economic scale, location and farm operation type may offer additional useful information.

By increasing scale, input-oriented cost inefficiency adjustment levels (calculated on **scale categories)** (tables 1-4) clearly rise in the crop production sector. This also means that at the same rate inefficiency declines. This suggests that, in the higher category, less efficient farms do not lag as far behind the most efficient farms as in lower categories. As this trend is also evident for allocative inefficiency, the phenomenon indicates that, compared to smaller farms, larger farms more effectively pursue a market policy that serves their interests. Our stated conclusions on the development of inefficiencies by scale still fail to prove or disprove the existence of scale efficiency. This is because in the higher categories inefficiency is lower and because of this the efficiency level is more widespread, but it can even develop at lower efficiency levels. The tables also show that expenditures and congestion inefficiency are smaller on larger farms, confirming that technology, technological discipline, and professionalism play a greater role in the latter category. Although they don't guarantee more effective production, these features may certainly contribute to it[17]. Consequently, one can only make tentative and speculative statements. In respect to raising pigs, the smallest potential for efficiency improvement is found on farms falling in the 12 to16 and 16 to 40 EUME brackets.

In a regional grouping **by counties,** evidence shows that in traditional wheat growing regions (i.e., Békés, Csongrád, Hajdú-B. and Jász-N.-Sz. counties) potential for efficiency improvement is lower than average, while in other areas (i.e., Zala, Somogy, Nógrád, Vas and Veszprém counties) it is considerably higher. Therefore, in wheat growing areas there is a smaller technological gap and production costs are also more even. From county to county, there is substantial potential for efficiency improvement, lying between 7 and 50%.

In sunflower production, regionally based inefficiency is similar to that in wheat production. Typically, one finds farms with less potential for efficiency improvement in traditional wheat growing regions and those with higher potential in areas where little wheat is produced. The county categories are almost identical to those established for wheat production. The difference is that variation in potential for efficiency improvement is even wider than in the wheat sector (between 11 and 72%).

[17] Szűcs and Mrs. Farkas, M. Fekete (2004) are similarly ambivalent in establishing scale advantages when they state: specific costs and more effective production management favor larger operating size, while smaller environmental load an lower shipping costs smaller production units.

Classifying counties in terms of corn production potential for efficiency improvement, above and below average scores differ somewhat from what we have seen so far. Baranya, Békés, Fejér, Komárom - E. and Nógrád counties show exceptionally low potential for efficiency improvement, while higher values were measured in Heves, Somogy, Szabolcs-Sz., Veszprém and Zala counties. For counties variation in potential for efficiency improvement is narrower than for other crops (between 31 and 59%).

On a county basis, potential for efficiency improvement figures for raising pigs follow regional differences. Minimal potential for efficiency improvement is seen in Győr- M.-S., Veszprém, Tolna and Bács-K. counties, and maximum values have been measured in Borsod-A.-Z., Heves, Szabolcs-Sz. and Baranya counties. Potential for efficiency improvement values range between 1 and 73%.

Regional analyses' results reveal that within each county there are marked differences in potential for efficiency improvement. Potential for improvement is significant, particularly in the pork sector. Efficiency shortfalls are obvious when one considers that the top-rated farms' benchmark rating is indeed relative and that they may lag behind other top-rated national farm groups or behind EU competition.

We also analyzed variation in potential for efficiency improvement in terms of **farm operation types** (tables 1-4). Primarily, we looked for variations among private farms and partnerships. We found no substantial differences in potential for efficiency improvement in wheat production where values range between 25 and 30%. Among private farms higher potential for efficiency improvement was identified. The same cannot be said for corn production. In this sector potential for improvement is widespread, and much higher among private farms (47-50%) as opposed to partnerships (1-20%). While not as extreme, variations are still high in the sunflower sector. Here, values for private farms range between 38 and 42%, while among partnerships that operate as joint stock companies, the potential for improvement does not reach 20%. By contrast, the pork sector is characterized by uniformity with values ranging between 23 and 27%, and lacks the typical differences among other farm groups.

The above argument reveals the advantages and drawbacks of the **DEA-analysis**. It provides supplementary information for efficiency analysis by quantifying inefficiency and breaking it down into its component elements. At the same time, the method does not assign a numeric value to the efficiency level. Among other things, we have observed that it is not suitable for providing a definite answer regarding the existence of scale efficiency. **The method's place in efficiency analysis is clear: rather than replacing it, it can serve as a supplementary tool.**

References

1. Béládi, K.– Kertész, R. (2004): A tesztüzemek főbb ágazatainak költség- és jövedelemhelyzete 2003-ban, Agrárgazasági Információk, 5.sz. AKI.
2. Berger, A. N. – Hunter, W. C. – Timme, S. G. (1993): The efficiency of financial institutions: A review and preview of research past, present and future Journal of Banking and Finance, Volume 17, Issues 2-3, April 1993, pp. 221-249
3. Bunkóczi L. – Pitlik L.(1999): A DEA (Data Envelopment Analysis) módszer felhasználási lehetőségei üzemhatékonyságok méréséhez, Agrárinformatika ’99, Debrecen.
4. Charnes, A. – Cooper, W.W. – Lewin, A. – Seiford., L. (1994): Data Envelopment Analysis: Theory, Methodology and Applications, Kluwer Academic Publisher.
5. Charnes, A. – Cooper, W.W. – Rhodes, E. (1978): Measuring the Efficiency of Decision-Making Units. European Journal of Operational Research 2, pp. 429-444.
6. Färe, R. – Grosskopf, S. (1996): Intertemporal Production Frontiers: With Dynamic DEA, Kluwer Academic Publishers.
7. Farrell, M.J. (1957): The measurement of productive efficiency, Journal of the Royal Statistical Society, Series A, General, 120, Part 3, pp. 253–281.
8. Knox Lovell, C. A. – Kumbhakar, S.C. (2000): Stochastic Frontier Analysis, Cambridge University Press.
9. Kopányi, M. (ed.) – Bara, Z. – Berde, É– Lehoczki, Zs. – Martin Hajdu, Gy. – Tóth, F. – Vági, M. (1989): Mikroökonómia, Aula Kiadó.
10. Mészáros, S. (1990): A gazdasági hatékonyság értelmezése, mérése, nemzetközi összehasonlítása és növelésének tényezői a magyar élelmiszer-termelés főbb vertikumaiban, OTKA-tanulmány (I. II. III. fejezete).
11. Nagy, A. (2004): Bevezetés a közgazdaságtanba I. (alapfogalmak és mikroökonómia) 1-7. előadások
12. Szűcs, I.– Farkasné Fekete, M. (2004) : A magyar mezőgazdaság nemzetközi versenyképessége. Tézisek, AGROINFORM Kiadó, Budapest.

Table 1

Relative efficiency levels - the efficiency components of wheat production

	Input-efficiency components							Output-efficiency components				
County	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Baranya	51	63.5	63.8	99.5	100.0	100.0		100.5	100.0	100.4	100.0	100.1
Bács-K.	107	73.5	75.7	98.9	98.1	100.0		103.1	100.0	101.6	100.0	101.4
Békés	80	93.4	93.6	99.8	100.0	100.0		100.2	100.0	100.2	100.0	100.0
Borsod-A.-Z.	49	66.2	67.2	98.9	99.6	100.0		101.5	100.0	101.3	100.0	100.2
Csongrád	68	85.7	87.2	99.3	99.1	100.0		101.7	100.0	100.9	100.0	100.8
Fejér	73	68.0	70.8	98.4	97.8	100.0		103.7	100.0	102.1	100.0	101.6
Győr- M.- S.	85	78.5	80.3	99.1	98.7	100.0		102.3	100.0	101.4	100.0	100.9
Hajdú-B.	68	83.6	84.6	99.3	99.6	100.0		101.1	100.0	100.8	100.0	100.3
Heves	33	81.5	82.8	99.5	98.8	100.0		101.7	100.0	101.4	100.0	100.2
Komárom - E.	35	64.7	67.4	97.9	97.7	100.0		104.5	100.0	102.0	100.0	102.5
Nógrád	29	50.2	56.4	95.7	92.5	100.0		113.0	100.0	108.4	100.0	104.3
Pest	86	70.5	72.3	98.6	98.9	100.0		102.6	100.0	101.2	100.0	101.3
Somogy	42	52.6	54.8	98.2	97.8	100.0		104.2	100.0	102.5	100.0	101.7
Szabolcs Sz. B.	55	56.0	60.7	97.3	94.8	100.0		108.4	100.0	105.1	100.0	103.1
Jász.-N.-Sz.	69	97.1	98.1	99.6	99.5	100.0		101.0	100.0	100.6	100.0	100.4
Tolna	54	71.5	73.2	99.1	98.5	100.0		102.4	100.0	102.0	100.0	100.4
Vas	31	54.8	55.5	99.9	99.0	100.0		101.0	100.0	100.7	100.0	100.4
Veszprém	32	54.1	55.4	98.4	99.3	100.0		102.4	100.0	100.9	100.0	101.5
Zala	33	59.9	60.7	99.7	99.0	100.0		101.3	100.0	100.4	100.0	100.9

	Input-efficiency components							Output-efficiency components				
Size (EUME)	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
1 - 2	0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
2 - 4	79	65.7	69.9	97.9	95.7	100.0		106.7	100.0	103.5	100.0	103.1
4 - 6	76	66.8	69.5	98.7	97.4	100.0		104.0	100.0	102.2	100.0	101.8
6 - 8	79	66.1	67.9	98.4	98.8	100.0		102.8	100.0	101.3	100.0	101.4
8 - 12	133	67.3	69.8	98.3	98.0	100.0		103.7	100.0	102.5	100.0	101.1
12 - 16	116	70.0	71.8	98.8	98.6	100.0		102.6	100.0	101.4	100.0	101.2
16 - 40	320	72.6	74.5	98.9	98.5	100.0		102.6	100.0	101.6	100.0	101.0
40 - 100	156	78.9	79.3	99.6	99.9	100.0		100.5	100.0	100.4	100.0	100.1
100 - 250	58	72.4	73.5	99.6	99.0	100.0		101.4	100.0	100.9	100.0	100.5
250 <	63	84.4	84.9	99.7	99.8	100.0		100.5	100.0	100.4	100.0	100.2
Type of holding	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Prim. producer	214	70.0	73.0	98.2	97.6	100.0		104.3	100.0	102.3	100.0	102.0
Agric. entrepr.	155	73.6	75.8	98.7	98.3	100.0		103.1	100.0	101.6	100.0	101.5
Family farm	450	71.3	73.1	99.0	98.6	100.0		102.5	100.0	101.6	100.0	100.9
Deposit comp.	17	70.5	73.0	98.2	98.5	100.0		103.4	100.0	102.9	100.0	100.4
Lim.liab.comp.	96	74.8	75.5	99.4	99.6	100.0		101.0	100.0	100.7	100.0	100.3
Joint st. comp.	21	74.4	74.7	100.0	99.8	100.0		100.2	100.0	100.1	100.0	100.1
Agr. cooperat.	53	73.8	75.1	99.0	99.3	100.0		101.7	100.0	101.5	100.0	100.2
Merged farm	69	69.2	70.3	99.5	98.3	100.0		101.6	100.0	101.0	100.0	100.6
other	5	75.8	75.8	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Sector	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
	1080	**71.6**	**73.5**	**98.9**	**100.0**	**98.5**		**104.6**	**100.0**	**102.8**	**101.7**	**100.0**

Table 2

Relative efficiency levels – the efficiency components of corn production

	Input-efficiency components							Output-efficiency components				
County	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Baranya	45	62.4	62.6	99.7	100.0	100.0		100.3	100.0	100.3	100.0	100.0
Bács-K.	110	55.6	56.6	99.2	98.9	100.0		101.8	100.0	101.4	100.0	100.4
Békés	63	60.2	60.7	100.0	99.2	100.0		100.8	100.0	100.2	100.0	100.6
Borsod-A.-Z.	33	51.2	52.9	98.2	98.6	100.0		103.3	100.0	101.6	100.0	101.7
Csongrád	55	69.4	72.5	97.8	98.1	100.0		104.2	100.0	101.7	100.0	102.4
Fejér	66	63.9	66.9	96.8	98.7	100.0		104.5	100.0	103.3	100.0	101.1
Győr- M.- S.	71	55.3	59.5	95.8	97.1	100.0		107.5	100.0	103.9	100.0	103.5
Hajdú-B.	79	52.5	53.4	99.2	99.2	100.0		101.7	100.0	101.2	100.0	100.5
Heves	17	43.8	45.0	98.5	99.0	100.0		102.5	100.0	100.2	100.0	102.3
Komárom - E.	31	61.3	65.3	99.3	94.6	100.0		106.5	100.0	104.2	100.0	102.2
Nógrád	9	63.1	63.7	99.1	100.0	100.0		100.9	100.0	100.9	100.0	100.0
Pest	73	48.2	51.8	95.4	97.4	100.0		106.6	100.0	103.8	100.0	102.8
Somogy	47	41.4	42.7	98.6	98.4	100.0		103.0	100.0	102.0	100.0	101.0
Szabolcs Sz. B.	75	42.0	48.3	95.2	91.4	100.0		115.0	100.0	109.1	100.0	105.5
Jász.-N.-Sz.	61	54.5	59.0	96.5	95.8	100.0		108.1	100.0	105.8	100.0	102.2
Tolna	56	51.2	53.6	97.6	98.2	100.0		104.2	100.0	103.0	100.0	101.2
Vas	22	51.1	52.1	99.1	98.9	100.0		102.0	100.0	101.6	100.0	100.4
Veszprém	17	43.6	46.6	98.3	96.9	100.0		104.9	100.0	102.3	100.0	102.5
Zala	29	43.7	44.9	99.8	99.4	100.0		100.7	100.0	100.4	100.0	100.4

	Input-efficiency components							Output-efficiency components				
Size (EUME)	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
1 - 2	0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
2 - 4	74	45.7	49.3	96.7	96.1	100.0		107.6	100.0	105.1	100.0	102.4
4 - 6	76	46.7	48.9	98.4	97.1	100.0		104.7	100.0	102.9	100.0	101.8
6 - 8	68	47.6	51.2	96.8	96.6	100.0		107.0	100.0	103.9	100.0	103.0
8 - 12	113	39.9	42.6	96.8	96.4	100.0		107.1	100.0	104.1	100.0	103.0
12 - 16	97	49.8	52.2	98.3	97.4	100.0		104.5	100.0	103.2	100.0	101.2
16 - 40	284	53.0	54.7	98.3	98.6	100.0		102.9	100.0	101.5	100.0	101.3
40 - 100	135	61.6	63.9	98.6	97.8	100.0		103.7	100.0	102.0	100.0	101.7
100 - 250	47	66.7	70.0	96.8	98.5	100.0		104.8	100.0	103.4	100.0	101.4
250 <	65	95.6	99.0	97.7	98.8	100.0		103.6	100.0	103.2	100.0	100.4
Type of holding	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Prim. producer	210	50.6	53.7	97.5	96.8	100.0		105.9	100.0	103.5	100.0	102.3
Agric. entrepr.	121	49.9	52.2	98.8	97.1	100.0		104.2	100.0	102.4	100.0	101.8
Family farm	392	49.3	51.5	97.8	97.9	100.0		104.4	100.0	102.8	100.0	101.5
Deposit comp.	9	49.9	49.9	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Lim.liab.comp.	91	79.9	83.1	97.5	98.3	100.0		104.3	100.0	103.1	100.0	101.2
Joint st. comp.	22	98.4	100.3	99.3	98.9	100.0		101.8	100.0	101.4	100.0	100.4
Agr. cooperat.	43	77.0	80.5	96.6	98.8	100.0		102.8	100.0	101.5	100.0	101.3
Merged farm	64	40.9	43.4	97.5	97.0	100.0		105.6	100.0	102.8	100.0	102.7
other	7	30.6	30.6	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Sector	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
	959	**53.6**	**56.1**	**97.8**	**100.0**	**97.7**		**102.6**	**100.0**	**101.6**	**101.1**	**100.0**

Table 3

Relative efficiency level – the efficiency components of sunflower production

	Input-efficiency components							Output-efficiency components				
County	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Baranya	21	40.4	40.4	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Bács-K.	75	58.9	59.2	99.5	100.0	100.0		100.6	100.0	100.2	100.0	100.4
Békés	17	88.8	90.6	98.2	100.0	100.0		101.8	100.0	101.8	100.0	100.0
Borsod-A.-Z.	37	45.6	45.9	99.3	100.0	100.0		100.7	100.0	100.7	100.0	100.0
Csongrád	28	77.3	77.4	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Fejér	55	76.0	76.9	99.6	99.3	100.0		101.1	100.0	100.6	100.0	100.5
Győr- M.- S.	38	65.8	68.2	97.2	99.1	100.0		104.0	100.0	102.9	100.0	101.0
Hajdú-B.	25	46.2	47.7	97.5	99.4	100.0		103.2	100.0	103.0	100.0	100.2
Heves	30	68.9	68.9	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Komárom - E.	22	67.1	67.1	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Nógrád	11	44.5	44.5	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Pest	72	65.5	66.8	99.0	99.2	100.0		101.9	100.0	101.5	100.0	100.3
Somogy	12	38.4	38.9	97.8	100.0	100.0		102.2	100.0	102.2	100.0	100.0
Szabolcs Sz. B.	33	44.2	44.7	99.1	99.7	100.0		101.1	100.0	100.9	100.0	100.2
Jász.-N.-Sz.	61	77.1	77.2	99.9	100.0	100.0		100.1	100.0	100.1	100.0	100.0
Tolna	30	53.3	54.1	98.9	99.6	100.0		101.5	100.0	101.3	100.0	100.2
Vas	10	31.3	32.2	99.8	97.8	100.0		102.4	100.0	101.2	100.0	101.1
Veszprém	10	37.3	37.3	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Zala	7	27.5	27.5	99.6	100.0	100.0		100.6	100.0	100.6	100.0	100.0

	Input-efficiency components							Output-efficiency components				
Size (EUME)	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
1 - 2	0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
2 - 4	21	51.3	51.4	99.9	100.0	100.0		100.1	100.0	100.1	100.0	100.0
4 - 6	34	56.3	57.6	99.0	98.6	100.0		102.4	100.0	101.4	100.0	101.0
6 - 8	40	60.5	61.3	98.9	100.0	100.0		101.1	100.0	101.1	100.0	100.0
8 - 12	65	65.4	66.2	99.0	100.0	100.0		101.1	100.0	101.0	100.0	100.0
12 - 16	53	67.6	68.4	99.2	99.7	100.0		101.2	100.0	100.5	100.0	100.7
16 - 40	186	56.2	56.7	99.6	99.7	100.0		100.8	100.0	100.5	100.0	100.3
40 - 100	108	51.7	52.3	99.0	99.7	100.0		101.3	100.0	101.2	100.0	100.1
100 - 250	38	60.5	61.5	98.9	99.4	100.0		101.8	100.0	101.4	100.0	100.3
250 <	49	80.1	80.9	99.2	99.7	100.0		101.0	100.0	100.9	100.0	100.1
Type of holding	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Prim. producer	75	61.9	62.5	99.2	99.9	100.0		100.9	100.0	100.8	100.0	100.1
Agric. entrepr.	81	59.8	60.4	99.2	100.0	100.0		100.8	100.0	100.8	100.0	100.0
Family farm	265	58.2	58.7	99.4	99.7	100.0		100.9	100.0	100.6	100.0	100.3
Deposit comp.	14	54.7	57.8	99.0	95.8	100.0		105.4	100.0	103.6	100.0	101.7
Lim.liab.comp.	62	61.7	62.4	99.0	99.7	100.0		101.2	100.0	101.1	100.0	100.1
Joint st. comp.	18	81.1	84.7	97.8	98.1	100.0		104.2	100.0	103.2	100.0	101.0
Agr. cooperat.	42	68.1	68.5	99.4	100.0	100.0		100.6	100.0	100.6	100.0	100.0
Merged farm	33	42.2	42.4	99.1	100.0	100.0		100.9	100.0	100.9	100.0	100.0
other	4	99.0	99.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Sector	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
	594	**59.5**	**59.9**	**99.2**	**100.0**	**99.7**		**101.1**	**100.0**	**100.9**	**100.2**	**100.0**

Table 4

Relative efficiency levels – the efficiency components of raising pigs

	Input-efficiency components							Output-efficiency components				
County	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Baranya	19	41.4	43.9	94.9	100.0	100.0		105.4	100.0	105.4	100.0	100.0
Bács-K.	35	95.6	95.6	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Békés	38	77.2	77.3	99.8	100.0	100.0		100.2	100.0	100.2	100.0	100.0
Borsod-A.-Z.	3	26.5	26.5	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Csongrád	42	76.0	78.6	97.7	98.9	100.0		103.5	100.0	102.8	100.0	100.7
Fejér	21	74.4	74.4	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Győr- M.- S.	26	97.1	99.3	99.1	98.8	100.0		102.2	100.0	102.0	100.0	100.2
Hajdú-B.	14	51.1	52.5	97.0	100.0	100.0		103.1	100.0	103.1	100.0	100.0
Heves	4	41.3	41.3	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Komárom - E.	19	86.7	86.7	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Nógrád	2	72.7	72.7	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Pest	24	65.2	65.2	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Somogy	12	69.6	69.6	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Szabolcs Sz. B.	8	46.7	47.6	100.0	98.3	100.0		101.8	100.0	100.1	100.0	101.7
Jász.-N.-Sz.	31	95.6	97.1	99.0	99.4	100.0		101.6	100.0	100.6	100.0	101.1
Tolna	14	99.5	99.5	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Vas	8	54.4	54.4	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Veszprém	7	95.3	95.3	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Zala	6	83.0	83.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0

		Input-efficiency components						Output-efficiency components				
Size (EUME)	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
1 - 2	0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
2 - 4	37	69.6	69.6	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
4 - 6	37	76.0	76.4	99.8	99.6	100.0		100.6	100.0	100.2	100.0	100.4
6 - 8	34	68.8	71.1	97.1	100.0	100.0		103.0	100.0	103.0	100.0	100.0
8 - 12	56	68.5	69.5	98.7	99.7	100.0		101.7	100.0	101.1	100.0	100.6
12 - 16	40	82.1	83.5	98.2	100.0	100.0		101.8	100.0	101.8	100.0	100.0
16 - 40	79	84.2	85.5	99.4	99.0	100.0		101.6	100.0	101.2	100.0	100.4
40 - 100	23	72.0	72.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
100 - 250	9	59.1	59.1	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
250 <	18	79.4	79.4	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Type of holding	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
Prim. producer	105	74.7	75.6	99.3	99.4	100.0		101.2	100.0	100.8	100.0	100.4
Agric. entrepr.	38	72.6	74.8	97.4	100.0	100.0		102.7	100.0	102.7	100.0	100.0
Family farm	128	77.1	77.8	99.5	99.6	100.0		100.9	100.0	100.6	100.0	100.3
Deposit comp.	2	43.4	43.4	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Lim.liab.comp.	19	65.2	65.2	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Joint st. comp.	6	75.4	75.4	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Agr. cooperat.	8	74.2	74.2	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Merged farm	26	77.9	80.1	97.2	100.0	100.0		102.9	100.0	102.9	100.0	100.0
other	1	68.0	68.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0
Sector	**pc**	**O_I**	**A_I**	**S_I**	**CN_I**	**T_I**		**O_O**	**A_O**	**S_O**	**CN_O**	**T_O**
	333	**75.3**	**76.3**	**99.1**	**100.0**	**99.7**		**101.2**	**100.0**	**101.0**	**100.2**	**100.0**

Studies in Agricultural Economics No. 104. p. 109-128. (2006)

Farm factors and clusters in Hungary

Tamás Mizik[1]

Abstract

The Hungarian FADN database contains detailed microeconomic information about farms. Aggregating and processing these data could prove beneficial for the entire agricultural sector. Important data categories are the balance sheet, profit and loss statement, value of livestock and variation in livestock numbers, areas sown, average prices, revenues and expenditures etc. Such data analysis could make possible the use of multivariate exploratory technics. Over a two-year study period, based on the same variables, I have used profitability ratios and factor and cluster analysis to examine the pertinent factors and clusters. My aim is to show whether there are permanent factors and/or clusters in Hungarian agriculture.

Key words:

FADN, profitability, cost correction, factor analysis, cluster analysis

Introduction

In the study of databases factor and cluster analysis are frequently used methods. During recent years several studies using these methods have been published[2] and have provided the basis for various PhD dissertations[3]. This has also been the case in Hungary. For past research (Mizik, 2004/c) I also used factor and cluster analysis but only over a one-year period, so in this study I decided to expand the term to at least two years. Here my objective is to explore whether there are permanent factors and/or clusters in Hungarian agriculture. The research was conducted from 2002 and 2004. Using identical variables and methodology tools I endeavoured to discern similarities between factors and clusters.

Database and methodology

Calculations are based on the Hungarian FADN, an information database created by the Research Institute for Agricultural Economics (AKI). In 1965, within the European Union, the Farm Accountancy Data Network (FADN) was established. The system's central objective is related to income changes among various facets of agriculture, and by tracking and analysing these changes and how they are managed, the system hopes to bolster Common Agricultural Policy (CAP). **The database's major advantage is the utilisation of absolute numbers, which renders easy useful calculations.**

In 1995, on behalf of the Hungarian Ministry of Agriculture and Rural Development, the AKI started work on the FADN system. Other than information for strictly national purposes, officially compiled information was to be transmitted to the European Commission for the year 2004. Work on the system started in 1996 and by 2001 it already covered every Hungarian county (in 1999 six counties were not covered but in 2000 this had been reduced to two). Obviously this entailed continual growth in the number of units. By focusing on individual farms the goal was to efficiently define the given area's economic structures and examine management structure, farm size and farm business trends. (Kovács et al., 1999)

[1] Research Institute for Agricultural Economics, H-1355 Budapest 55. POB 5. e-mail: mizo@akii.hu

[2] For example: Szelényi – Neszmélyi (2000)

[3] For example: Strén (2004)

To analyse profitability I used five different ratios.

$$1,\ \text{Return on gross production } (\%) = \frac{\text{Profit before taxes}}{\text{Gross production value}} * 100$$

$$2,\ \text{Return on liabilities } (\%) = \frac{\text{Profit before taxes + Interest paid}}{\text{Liabilities}} * 100$$

$$3,\ \text{Return on net worth } (\%) = \frac{\text{Profit before taxes}}{\text{Net worth}} * 100$$

$$4,\ \text{Return on work (1000 HUF/AWU)} = \frac{\text{Profit before taxes + Staff costs}}{\text{Annual Work Unit}}$$

5, Average Cash-Flow (1000 HUF) = Consolidated profit + Depreciation.

For the analysis I used a statistical software package called Statistica, version 6.0, which is made by StatSoft. StatSoft is based on the COM (Component Object Model) and is similar to Microsoft Excel. With Statsoft it is possible, without making any conversions, to import data from Excel. The method used was called "K-means clustering". In general, this method creates *k* different clusters providing the maximum distinction between clusters and at the same time the minimum variance within the clusters themselves. During the process the individual data (observations) are only placed in another cluster if it reduces the variance within the clusters (Hartigan – Wong, 1979).

Initially the term *cluster analysis* was used by Tryon (1939). This method encompasses various classification algorithms. Frequently researchers face the challenge of how to organize data into meaningful structures. Hartigan (1975 and 1979) precisely summarized the many published results and created the "K-means clustering" method. Using this method we attained maximal homogeneity within the groups and maximal heterogeneity between the groups (Hair et al., 1998). According to Kovács (2004), the cardinal idea is that the groups with similar (close) items can, even with unknown classification, be examined. However, in identifying the variables for cluster formation, analysis could be hampered by multicollinearity among the variables. To avoid this Ketchen and Shook (1996) suggested two techniques: Mahalanobis distance and factor analysis. I opted for the latter using varimax rotation, which represents the most common orthogonal transformation process (Füstös et al., 1986).

For Kovács (2004) the two principal questions regarding clustering are determining the adequate number of clusters and if the variables are important for classification. In the first case Euclidean distance between the groups and within the groups could help, while in the second case analysis of variance could prove useful.

From reading the AKI's FADN publications and the author's previous work (Mizik, 2004/a and 2004/b), one can conclude that cost accounting is not necessarily the same for individuals and corporate holdings. A detailed cost analysis (Mizik, 2004/c) illustrated that for agricultural ventures it is not only labour and rent that entail the two major expenditures, but keeping accounts for them can represent major differences in terms of individual ownership or a co-partnership. The reasons are simple: large corporate organisations almost solely used a paid labour force and leased property, meaning they were not able to follow the "self-exploiting" strategies of individual producers (Gorton et al., 2003). Taking into account the two input factors' alternative cost makes comparing the results much more viable. For this reason I corrected labour cost and calculated rental fees for privately owned land[4]. The correction values were: for the year 2002, 8.88 thousand HUF/ha for rent and 1651.5 thousand HUF/AWU for labour cost. In 2004, 14.64 thousand HUF/ha and 1960.1 thousand HUF/AWU (Keszthelyi – Kovács, 2003 and Keszthelyi, 2005). Regarding the corrections, all cluster analysis values were weighted according to AKI methodology.

For Cash-Flow (C-F) – because of its non-linear relation – it is difficult to quantify the effect of the profit before taxes changes on consolidated profit. Morever, agriculture's special nature generates greater instability than the average for Cash-Flow calculations (Checkley, 1982). Though it can be assumed that, due to lower profit, the average C-F values would also decrease.

Results

During competitiveness analysis I first observed the variables and then, using factor analysis, arranged them into groups. Kovács (2004) asserts that if there exists a statistical model backing the analysis then specific factors made by variables could also explain the variables' variance. Contrary to principal component analysis, factor analysis always produces a result, which we cannot, however, always accept. I personally opted for a solution (which I deemed acceptable) that encompassed both statistical aspects (high eigenvalue; explaining most of the variance) and also economic aspects (the range of variables). The factor and cluster analysis variables are located in annex 1.

The variables cover all major lines in the balance sheet, the profit and loss statement, and the simple indexes that are based on the above data; for example, the proportion of arable production constitutes net revenue, leverage, Family Work Unit share and the proportion of rented land. By using dummy variables I strived to ascertain the company's structure (limited company and co-operatives) and the production direction (crops, animal breeding, mixed production)[5]. Among the variables are the previously introduced profitability indicators.

[4] It is acceptable if every producer has to pay rental fee for the land, then they will probably produce in a different way. Hypothetically it may be presumed that they try to reach the maximum and compared to the corporate holdings the reason for their better results is the non-paid rental fee. To make the picture complete, it should be stated that corporate holdings tend to show a smaller profit in order to avoid profit tax. However this is impossible to even estimate.

[5] Qualitative and discreet variables are also commonly used. In the case of company from individual producers were the reference group, while every chosen type of production excludes the two others. The use of factor analysis with qualitative variables could cause problems which require correspondence analysis. Correspondence analysis is a descriptive/exploratory technique designed to analyze dual and multi-faceted tables containing some measure of correspondence between the rows and columns. The results provide information similar to those produced by factor analysis techniques using the principal component algotithm analysis as in 6.0 version of Statistica.

Factor analysis, 2002

In the 2002 sample a seven-factor solution was adopted[6]. This solution explains 77.5 percent of the data set's total variance, which is in the satisfactory range. The results are tabulated in annex 2. The numbers in bold indicate that a given variable appears acceptable (factor loadings are greater than |0,5|[7]). Within the columns the bold print represents values that are part of same factor. The last two rows show the eigenvalues and the variance distribution between the factors.

The tables reveal that the co-operatives' and leverage dummy variable are not deemed acceptable; however, as in the first case, only a small fragment was missing (the value was 0,4813 at the fourth factor level). In the latter case the value was quite far off (the highest value was 0,2166 also at the fourth factor level).

The **first factor** variables are definitely connected to **size**. Based on how close the connections are, the following order has been established: liabilities (assets), gross production, net revenue, labour costs, net worth, long and short-term liabilities, interest paid, AWU, depreciation, subsidies, average Cash-Flow, UAA and rent. Here the variables group apply to the balance sheet; the profit and loss statement as well as the size, which is based on the two most prominent elements (labour and land). It is not surprising that Cash-Flow formation is closely related to farm size. To sum up, this factor is the most explanatory as it explains almost half (38.2 %) of the entire variance (77.5 %).

The **second factor** indicates **specialization in animal husbandry.** In order of prominence are: the dummy for animal husbandry, the proportion of arable production (negative value), the dummy for crop specialization (negative value), average Golden Crown value (negative value). Based on the variables it can be seen that this factor focuses on animal breeding specialization; obviously if the given farm is so oriented, it certainly cannot be crop specialized. It is clear that the crop farm ratio as related to price income is not significant, and that the Golden Crown measurement for land quality used by the economic unit is secondary.

Thirdly comes the **result factor** containing the consolidated profit and the profit before taxes. The relationship between the two numbers is simple. The third variable represents the average Cash-Flow (with a lower value than with the first factor), primarily because one of its components is consolidated profit.

The **fourth** is the **legal form factor** (Ltd). The variables' order is as follows: proportion of rented land, the dummy for limited companies, family work unit share (negative value). Clearly, based on the relationship's strength, the rented areas ratio comes first, but also that land rental cannot be separated from a joint company's inherent structure. The accessory variable for the company's legal organisational structure is only slightly less than the 0.5 limit but it would also fall within that factor. It is easy to understand that, at the joint farm level, the family work unit has a negative value as there unpaid labour is negligeable. For enterprises the two major agricultural input factors are located here.

[6] Solely choosing the factors that present an eigenvalue greater than 0,95.

[7] The cut-off used for interpretation purposes entailed factor loadings greater or equal to 0,5 (Gorton et al., 2003).

Fifth comes the first **profitability factor** based on the return on net worth and liabilities (moreover, both of them have an extremly high value). Among these percentage indicators a common thread is the centered balance sheet, liability approximation; both net worth and liability details are on the right side of the balance sheet (Liabilities).

The **sixth factor** is solely based on the **mixed production** accessory variable. From the three variables (crop farming, animal breeding, mixed production) which were created to track farm operation trends, two of them have already constituted an individual factor allowing them to be listed below.

The **seventh factor** is the second one which constructed on profitability ratios, particularly those for the return on gross production and work. Contrary to the fifth factor, here it is difficult to detect a common thread between the two indicators as the gross production value and the allocation of labour in AWU greatly diverge. Thus the factor description is simply termed as **profitability**.

Cluster analysis, 2002

In cluster analysis (related to factor analysis) I created seven groups in order to form seven separate clusters[8]. The table below presents the Eucledian distances between the clusters.

Eucledian distances[9] and its squares, 2002

Cluster numbers	1	2	3	4	5	6	7
1	0	49845	49972	49501	51490	50334	50961
2	223,26	0	7363	2952	9202	9664	17473
3	223,54	85,81	0	7810	12436	12118	10706
4	222,49	54,33	88,37	0	7227	10004	15573
5	226,91	95,93	111,52	85,01	0	9223	6765
6	224,35	98,31	110,08	100,02	96,04	0	21861
7	225,74	132,19	103,47	124,79	82,25	147,85	0
Distance	**1346,30**	**689,82**	**722,79**	**675,02**	**697,65**	**776,65**	**816,29**

Source: author's calculation based on AKII FADN database 2002.

From the table one observes that the distances between (heterogenity) and inside (homogenity) clusters. A general trend is revealed: in a cluster the smaller the number of units, the greater the distance from the other clusters.

Annex 3 contains the results of the calculations. In the **first cluster are located large corporate holdings**, which essentially indicate and illustrate (and also the most illustrative) the factor displayed from the factor analysis. On average they produce net revenue of almost

[8] The equal number of factors and clusters is not a common principle!

[9] The Eucledian is the most commonly used type of distances, practically a geometrical distance in the given multidimensional space. It can be calculated between two optional items (x and y): $\sqrt{\sum_{i=1}^{n}(x_i - y_i)^2}$. One of the greatest advantage is that the outliers have no affect on it. Its square makes the distance bigger between the more distant items.

1,2 billion HUF from which crops represent only 11.8 percent. However among the clusters they have the greatest liabilities, but also the greatest assets (average 1.9 billion HUF) and net worth (1.1 billion HUF/farm). Based on this their leverage comes to 66.6 percent. Their average AWU is huge (125.2 AWU/farm) and of course is totally paid for (devoid of any family work component). The UAA is 2104.7 hectares from which 96.9 percent is rented. They have slightly better quality land than average (19.9 golden crown/hectares). Their percentage of corrected profitability ratios are the second best, falling between 5.7-8.0 percentages. Among the clusters their return on work is the highest (2.6 million HUF/AWU after the corrections) as is the average Cash-Flow. One can conclude that **the cluster represents lucrative and stable economic activity coupled with market-based inputs** (human resources and land).

In the **second cluster** came the **small, effective private farms that are crop specialized** (71.4 percent of the output is from crops). These farms are typical small private units with extensive family labour (72.5 %) and little rented land (49.7 %). Although their gross production value and net revenue are low, among the clusters their profit before taxes ranked in third place. Their leverage is only 18.9 percent. The UAA is 38.5 hectares/farm with high (22.5) golden crown value. Their Cash-Flow – mainly because the depreciation – is low. Their production is the most profitable (profitability ratios 13.8, 8.0 and 8.8 percent and the return on work is also pronounced, almost 2 million HUF/AWU). This cluster encompasses the fifth and seventh factors, because, compared to the other clusters, their profitability indexes are the best. Their after corrections profitability is remarkable, and by **market measures their input utilisation is most efficient.**

The **third cluster** is characterized by **medium-sized, especially corporate holdings**. Although some individual producers are in the cluster, the proportion of rented land is the highest (99.5 %) and family work share is minimal at only 1.3 %. However the majority are crop-specialized farms where the proportion of arable production from net revenue is under 50 percent (36.6 %). The leverage level is similar to the first cluster (67.0 %) but conversely has smaller assets. As for input, their average AWU is medium-sized, while UAA is high (338.3 hectares/farm) and almost entirely rented. Their land is relatively good at 21.6 golden crown/hectare, which among clusters ranked second. After corrections their profitability percentage ratios were slightly negative except for the return on liabilities and this was due to interest paid. The relatively high profit before taxes can be found in the consolidated profit. The latter grouped with depreciation resulted in above average Cash-Flow. For them **cost-efficiency could be the best strategy.**

The **fourth cluster** contains **small, private farms which are crop-specialised**. Their balance sheet and profit and loss statement values are the smallest. Their average net revenue is only 4.8 million HUF and 30.2 percent of this comes from crop production. The biggest problem is that profit before taxes is negative, so they are operating at a loss. Probably this explains the lowest leverage rate (15.1 %) among the clusters, because these farms cannot provide a secure living and, moreover, their everyday farm operations are inadequate for loan repayment. Their AWU is low and family work constitutes the bulk of labour activity (64.4 %). Mostly these farms are crop specialised but their average UAA is low (26.7 hectares), from which 22.9 percent is rented (6.1 hectares). Their land quality is inferior to the average, only 14.9 golden crown/hectares. Before corrections their percentage profitability ratios are below zero, while after corrections return on work is also negative. Among the clusters average Cash-Flow is the smallest. Its positive value means that depreciation exceeded the negative consolidated profit. In this regard they are not competitive, meaning commercially viable

production is, even in the short term, barely possible. **Part-time farming offers a potential solution.**

Like the previous cluster, the **fifth cluster** contains **small private farms**; however, they are **husbandry specialised**. In terms of factor analysis, this group most clearly meets the second factor requirements, meaning husbandry is the primary activity for all farms. This is substantiated by the small proportion of income from crops (2.7 %). Both their leverage (32.8 %) and employment level (1.5 AWU/farm) are low, the latter revealing a high extent of family work (68.3 %). Before corrections their pre- tax profit is positive (almost 1 million HUF), as are their profitability ratios. Here the average UAA is the smallest (less than 25 hectares) but because of specialisation this is insignificant. Without corrections the percentage profitability ratios are higher than average, but after corrections they became negative (except for the return on liabilities, because of the previously mentioned effect of interest paid). From start to finish their return on work is below average but still remains above zero. Because of the two positive components, the average C-F is 1.3 million HUF. Their current situation is acceptable, but when one considers the SAPS (Simplified Area Payment Scheme) it is not so promising in terms of this sector. On the whole, one can conclude that **the cluster's main aim** is not **competitivity** but rather **survival.**

The **sixth cluster** entails **small-scale mixed production holdings that are struggling to survive.** Since farms with mixed production belong to this group, the criterion for "creating clusters" is the sixth given factor given within factor analysis. Crop revenue is 20.6 percent (0.6 million HUF/farm) profit before taxes. The leverage is 25.4 percent which is manageable on the assets side. Their workforce is small and 53.4 percent constitutes family work. The average UAA is 37.5 hectares of which 61.2 percent is rented (23,0 hectares). Land quality is adequate (19.1 golden crown/ha). Before corrections their profitability percentage ratios are acceptable, but after corrections they fall to second last. Among the clusters the return on work and average Cash-Flow are smaller then average. One can therefore state that **they should take serious steps to operate with marketed inputs**.

Lastly the **seventh cluster** consists of **large, ineffective corporate holdings which are specialised in animal husbandry**. Their averages in terms of size are relatively high. For example, gross production value is 211.3 million HUF/farm and net revenue is 168.1 million HUF/farm. Due to specialisation, the revenue coming from crop products is predictably small (4.8 %) Despite the relatively high net revenue, profit before taxes is negative (-0.6 million HUF) which constitutes a tremendous problem. Moreover, this is coupled with the highest leverage (94.8 %). Because they are corporate holdings, the farms in this cluster do not use family work and almost all their land is rented (91.1 percent). However here the average UAA is high (367.6 hectare), with a land quality average of 8.2 golden crown/hectare. Before corrections the return on gross production and on net worth is negative, while only the interest paid (because of the high leverage) could "salvage" the return on liabilities which is almost 3 percent (2.6 %). The return on work approaches average while, because of depreciation, Cash-Flow is high. Because they lack the part-time farming option, their situation is actually worse than the fourth cluster's. Here the majority are pig farms which, because of the new payment system (SAPS), does not constitute an advantage. It can be concluded that **they should radically restructure to improve profits.**

Factor analysis, 2004

In the 2004 sample an eight-factor solution is adopted[10]. The solution explains 80.2 percent of the total data set variance, which is satisfactory. Compared to year 2002 the increase can be derived from the higher number of factors. The results are tabulated in annex 4. The numbers in bold indicates the acceptability of the given variable (factor loadings are greater than |0,5|). The bold figures within the columns indicate that the values form part of the same factor. The last two rows show the eigenvalues and the distribution of variance between the factors.

The table shows that the dummy variable for average golden crown value is not deemed acceptable, but, as in the third case, only a small fragment was missing (the value was 0.4230 at the third factor).

The variables in the **first factor** are again size related, and only the variables' order has been changed. At 36.2 percent its demonstrative power was the highest.

The **second** is the **result factor**, which moved up on the demonstrative power list but contains the same variables as in 2002 (consolidated profit and profit before taxes).

The **third factor** is **animal husbandry specialisation** without the average golden crown value. However only a small fragment was missing because its value was 0.4230 here.

The **fourth factor** is the **legal form** (Ltd) which is the same both in order and composition as in 2002.

The **fifth factor** is **profitability** but compared to 2002 it has a slightly different composition. The return on net worth constituted a factor containing the return on gross production and on labour.

The **sixth is the leverage factor** which contains net worth return (negative value) beside the leverage. There is a direct relationship between the two variables, because the net worth can be found in both denominators but with an opposite meaning.

The **seventh** is the **mixed production factor** which is the same as the 2002 sixth factor (based only on a mixed production dummy variable).

The **eighth factor** is a totally new one based on a dummy related to **co-operatives**.

Cluster analysis, 2004

In the cluster analysis process – in relation to the factor analysis – I created eight separate clusters. The table below presents the Eucledian distances between the clusters where the above introduced relationships can be observed (heterogenity-homogenity, number of units-distance from other clusters).

[10] The criteria of eigenvalue of the factors is the same as it was for 2002 (eigenvalue is greater than 0,95).

Eucledian distances and its squares, 2004

Cluster numbers	1	2	3	4	5	6	7
1	0	5361	19578	42932	32580	47895	51774
2	73,22	0	4938	20025	12715	23140	25747
3	139,92	70,27	0	5252	1829	6775	8183
4	207,20	141,51	72,47	0	962	170	480
5	180,50	112,76	42,77	31,01	0	1587	2297
6	218,85	152,12	82,31	13,04	39,84	0	8080
7	227,54	160,46	90,46	21,91	47,93	89,89	0
Distance	**1232,4**	**833,63**	**557,56**	**515,16**	**514,6**	**485,28**	**636,44**

Source: author's calculations based on AKII FADN 2004 database.

Annex 5 contains the calculations' results. Compared to 2002 one observes that the results are less distinct as high values among the clusters are not as pronounced while the lower values are not as small.

The **first cluster** contains **large corporate holdings that are crop specialised.** Though weaker than in 2002**,** its relationship to the first (and most illustrative) factor is obvious. However their average sizes are still noteworthy but the difference to the other cluster averages is not multipled. The low level of family work unit (12.4 %) and the high level of rented land (84.9 %) reflects the dominance of large corporate holdings. Here the average labour input is the highest (6.2 AWU/farm). Compared to their average sizes the leverage seems to be easily manageable (53.1 %). The average UAA is high (224.7 hectares), which, given the specialisation, is predictable. Quality leaves something to be desired but, on the other hand, the paid rent is the lowest. In terms of agriculture and especially in terms of crop production 2004 was prosperous so all five profitability ratios are excellent. The clusters' after corrections percentage profitability ratios remained above 10 percent (12.7, 12.1 and 14.4 %), better than the usually accepted agricultural return. **Their prospects are excellent**, **even with fully marketed inputs** they can attain **high profitability.**

In the **second cluster are found** mainly **medium-sized husbandry holdings**. This group most clearly fills the third factor requirements in terms of factor analysis. Although after the two corrections their profit before taxess are negative, it still remains the second best value. Because of specialisation, crop revenue, at 22.7 %, is of secondary importance. Values relating to size are medium but the 76.3 % leverage is high. These farms are typical 0 corporate holdings and thus the family work share is low (18.3 %) and the rented land share is high (76.9 %). However, noteworthy is the land quality which at 21.1 golden crown/ hectare is remarkably good. After the corrections the percentage profitability ratios – except the return on liabilities – becomes slightly negative (-0.03 and -0.05 %). **But with frugality and efficient production techniques these entities could markedly improve.**

In the **third cluster** are the **medium-sized, inefficient corporate holdings**. After the first correction their profit before taxes became negative and the leverage is the highest among the cluster averages (85.7 %). The extent of labour is higher than the sample average (3.3 AWU/farm) of which, due to the small number of individual producers in the cluster, only 18.5 % entails family work. The share of crop production is 22.9 % at 65.1 hectares/farm

UAA. The land quality is average (15.8 golden crown/ha) and land is mainly rented (82.5 %). Except for the return on liabilities, their percentage profitability ratios are low. The reason is simple: the high leverage interest paid on stock raised the ratio's numerator. This effect is significant and the ratio, after corrections, placed second (3.0 %). **This performance, coupled with high leverage, means their situation is most insecure**, and this is especially true because 2004 was a very good year for agriculture. Efficient use of above-average Cash-Flow is essential for the members of this cluster.

The **fourth cluster** contains **small, private crop-specialised farms.** After the first correction their profit before taxes remains positive. Here the leverage is the smallest (39.4 %). With family work at 36.0 percent of the total 1.7 AWU, they farm on average 120.5 hectares. Also land quality is adequate (20.1 AK/ha) and only 24.0 % is rented. Without corrections, expect for Cash-Flow, their profitability ratios come second. **Their future prospects are stable**.

The **fifth cluster** was essentially formed by the fourth factor. Here are contained **medium-sized corporate holdings**, generally *limited* corporate entities. Their profitability is not remarkable, but the inputs are decisively market-based, meaning the corrections' effect was minor. It must be stressed that they received significant subsidies (4.8 million HUF/farm). The leverage is 54.0 percent. Because of the large share of corporate holdings family work share is low (18.9 %), while the share of rented land is high (79.1 %). Their percentage profitability ratios are not elevated, but both, after the first correction, remain positive. **Despite an adequate year their performance was modest and the high subsidy level entails an additional risk factor** as subsides are not guaranteed on an annual basis.

In the **sixth cluster are found small, private, crop-specialised farms.** Though similar to the fourth cluster, the big picture is negative. They have the second worst results. Their profit before taxes is around the sample average but after corrections it plummets. This also holds true for their percentage profitability ratios which become negative (in order -4.9, -0.8 and -4.0 %). The leverage is among the lowest (39.8 %). This is due to an increased debt burden. The family work share is extensive (36.4 %) which means there are several individual farms; however, more than 50 % of their land is rented (59.8 %). Nevertheless the average UAA is low (55.3 hectares) and specialisation worsens it. For them **full-time, commercial production is only remotely possible and part-time farming offers a solution**.

Finally comes the **seveth cluster** which largely contains the ***dead last*** category, meaning **small private farms that are struggling to survive.** From almost every performance aspect they have the worst results: after the corrections the profit before taxes exceeded the 1 million HUF threshold. Their average subsidy level is only 1.5 million HUF coupled with non market-based inputs. The reasons for this items from the labour calculation aspect where the cost is the lowest among the clusters (1064.5 thousand HUF/AWU of which the family work component is 43.6 %). Basically their percentage profitability ratios are above average indicating that the cost of family labour clearly has not been accounted for. This is obvious after the first correction (for example the return on gross production declines from 5.5 to -8.0 percent). Not only are their percentage profitability ratios the worst, but so is the return on work (only 406.9 thousand HUF/farm after corrections). Given that this poor performance followed a prosperous year and that on the input side they lack any potential for efficiency improvement, **a bad year could ruin them.**

Conclusions

Changes in the given sample render impossible comparison of the same farms in each of the years. Moreover, it is doubtful that such a comparison would be representative. Given the calculations, different conclusions can be drawn from the Hungarian Farm Accountancy Data Network database for the factors and clusters.

The dual factor analysis, based on the same variables, had similar results. For both years **the size, the result, the animal husbandry specialisation, the legal form, and mixed production factor were the same.** In the profitability factor there were observable similarities since one of its variables was the same (return on liability). However in 2004 there was no other profitability factor because the return on net worth constituted a combined factor with leverage which the latter dominated. The reason for the difference between the profitability factors is undoubtedly due to the differing production circumstances in the given two years. Moreover we should consider that in 2004 an eight-factor solution was adopted, but none of the clusters was formed by the co-operatives' factor. In 2002 there is a relationship lacking a small fragment (the value was 0.4813 at the fourth factor) for this dummy variable. It was reasonable to **use the dummy variables for the legal form and production specialisation**, because in 2002 and 2004 they were factor forming criteria.

In the case of the cluster analysis the picture is more mixed. Naturally there are linkages regarding the size (small, medium-sized and large), the production orientation (crop production/animal husbandry), the legal form (individual/corporate holdings) and the performance (efficient, inefficient, failing), but **the clusters differ in the two analysed years**. In 2004 there are smaller differences between the cluster averages: however first cluster size averages remain considerable but the difference to the other cluster averages is not multipled as it was in 2002, or more clusters were formed by medium-sized farms. In the more prosperous year (2004) the gap among the farms decreased, while in the less prosperous (2002 – inland inundation) it was more pronounced. This indicates remaining differences between production, efficiency and performance.

It stands to reason that small farms formed more clusters, because their number is greater (most producers have small farms). It is also follows that from the fourteen clusters for the two-year period only one was effective, and this one was crop-specialised and generally composed of small farms. For crop production (mainly arable crops) scale efficiency is essential as at 30-40 hectares production cannot be economical. For those corporate holdings that are inefficient, failing, or money losing part-time farming offers a solution because their inputs are generally not market-based. Obviously this option does not exist for the corporate holdings and their very survival is at risk.

For clusters, given the similarity of factors formed by the same variables, one can state that the differencies between **the fiscal years cause more disparities**. Thus, **factors of the two years seem to be more or less consistent, but in the case of clusters it only represents a similarity**.

Annex 1

Variables included in the factor and cluster analysis

Variable	Definition
LEGALLTD	Dummy for limited companies
LEGALCO	Dummy for co-operatives
NETREV	Net revenue
PROCROP	Proportion of arable production
GROSSPROD	Gross production value
EBIT	Profit before taxes (and interests)
SUBNET	Subsidies
INTPAID	Interest paid
TOTSOURC	Total liabilities (or total assets)
NETWORTH	Net worth
TOTLIAB	Long and short term liabilities
LEVERAGE	Leverage
TOTSTAFF	Staff costs
TOTAWU	Annual work unit
PROAWU	Share of family work unit
CONSPROF	Consolidated profit
DEPR	Depreciation
GCROWN	Average Golden Crown value
TOTUAA	Total utilised agricultural area
PROUAA	Proportion of rented land
LANDRENT	Paid rent
TYPECROP	Dummy for specialised on crops
TYPEANIM	Dummy for specialised on animal husbandry
TYPEMIX	Dummy for mixed production
PROFOUT	Return on gross production
PROFSOURC	Return on liabilities
PROFWORTH	Return on net worth
PROFAWU	Return on work
PROFCF	Average Cash-Flow

Annex 2

The results of factor analysis, 2002

factor loadings, N = 1785

Variables/factors	1	2	3	4	5	6	7
TOTSOURC	**0,963**	0,043	0,115	0,096	-0,014	0,021	0,004
GROSSPROD	**0,950**	0,051	0,188	0,140	0,002	0,057	-0,005
NETREV	**0,930**	0,053	0,191	0,159	0,002	0,057	-0,007
TOTSTAFF	**0,929**	0,008	0,119	0,111	0,002	0,134	-0,029
NETWORTH	**0,921**	0,017	0,123	0,088	-0,009	0,069	-0,006
TOTLIAB	**0,916**	0,076	0,097	0,104	-0,019	-0,046	0,017
INTPAID	**0,914**	0,035	0,138	0,110	-0,008	-0,004	-0,004
TOTAWU	**0,909**	0,026	0,122	0,157	0,002	0,142	-0,045
DEPR	**0,899**	0,043	0,159	0,066	-0,012	-0,002	-0,005
SUBNET	**0,892**	0,030	0,174	0,101	0,002	0,008	0,008
PROFCF	**0,735**	0,023	**0,646**	0,061	0,020	0,014	0,040
TOTUAA	**0,697**	-0,099	-0,319	0,116	0,015	0,032	0,040
LANDRENT	**0,611**	-0,198	0,156	0,332	0,019	0,195	-0,027
TYPEANIM	0,021	**0,844**	0,021	0,053	0,012	-0,118	0,072
PROCROP	-0,122	**-0,774**	0,012	-0,120	0,014	-0,325	0,105
TYPECROP	-0,117	**-0,735**	-0,050	0,005	0,012	-0,604	-0,070
GCROWN	0,055	**-0,544**	0,013	0,136	-0,080	0,191	0,246
CONSPROF	0,399	0,000	**0,891**	0,040	0,042	0,023	0,067
EBIT	0,435	-0,005	**0,869**	0,031	0,054	0,011	0,100
PROUAA	0,221	-0,254	0,062	**0,710**	-0,007	0,107	0,046
LEGALLTD	0,124	0,246	0,180	**0,604**	-0,042	-0,334	0,085
PROAWU	-0,332	-0,132	-0,035	**-0,787**	-0,014	0,029	0,097
PROFWORTH	-0,008	0,039	0,007	-0,011	**0,973**	-0,009	0,023
PROFSOURC	-0,014	0,017	0,066	-0,002	**0,957**	-0,008	0,185
TYPEMIX	0,125	0,059	0,042	-0,059	-0,027	**0,876**	0,014
PROFAWU	-0,011	-0,134	0,047	0,019	0,067	-0,065	**0,759**
PROFOUT	-0,009	-0,001	0,072	-0,037	0,111	0,058	**0,747**
LEGALCO	0,195	-0,121	-0,169	*0,481*	0,049	0,363	-0,186
LEVERAGE	0,012	0,128	-0,088	*0,217*	-0,028	-0,131	0,157
Eigenvalue	11,448	2,413	2,409	2,082	1,899	1,661	1,349
% of variance (total: 77,54%)	38,16%	8,04%	8,03%	6,94%	6,33%	5,54%	4,50%

Method: Statistica software – factor analysis with the algorithm of principal component analysis, rotation procedure: varimax

Source: author's calculation based on AKII FADN database 2002.

Annex 3

Average values of competitiveness clusters formed by factor analysis, 2002

Measure: thousand HUF if not marked

Averages	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
Number of units (number)	32	449	277	414	240	292	81
Number of represented units (number)	153	18332	3811	34420	9765	18115	713
Distance (without dimension)	169,64	32,59	62,18	34,26	35,14	48,91	92,05
Gross production value	1546273,31	7360,56	106012,43	5750,11	13264,16	10628,32	211286,17
Profit before taxes	94994,66	2019,03	3751,51	-259,84	954,20	562,42	-557,70
Profit before taxes corrected with stuff costs	88746,25	1198,61	-124,16	-1518,17	-462,43	-717,12	-3818,63
Profit before taxes corrected also with rents paid	88231,86	1013,67	-163,88	-1720,66	-569,25	-852,93	-4107,40
Net revenue	1197862,28	6081,19	88473,86	4782,61	11365,38	8383,27	168112,06
Revenue from arable production	141868,28	4340,01	32345,06	1444,95	311,08	1726,33	8025,37
Proportion of arable production (%)	11,84	71,37	36,56	30,21	2,74	20,59	4,77
Subsidies	131350,42	769,32	9673,18	448,42	659,41	888,25	19167,92
Net worth	1108053,17	11582,53	63743,15	11720,42	14534,00	12884,15	107055,17
Liabilities (Assets)	1895610,44	13771,73	108635,06	13530,31	19315,69	16236,52	214339,22
Long and short term liabilities	738292,43	2185,81	42728,91	1765,67	4769,65	3268,83	101455,56
Leverage (%)	66,63	18,87	67,03	15,06	32,82	25,37	94,77
Interests paid	57869,64	86,20	3284,40	47,28	173,23	200,87	6097,56
Staff costs	243547,10	533,21	14430,17	828,08	1006,42	1542,12	27339,99
Annual Work Unit (AWU)	125,22	0,79	10,40	1,25	1,45	1,62	16,74
Staff costs/AWU (th HUF/AWU)	1944,92	672,98	1386,89	659,84	694,91	949,26	1633,41
Share of Family Work Unit (%)	0,00	72,47	1,28	64,35	68,29	53,43	0,00
Total area (UAA) (ha)	2104,72	38,51	338,29	26,65	22,22	37,53	367,58

Averages	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
Rented land (ha)	2039,40	19,14	336,46	6,10	10,88	22,98	334,82
Proportion of rented land (%)	96,90	49,70	99,46	22,89	48,96	61,23	91,09
Paid rent	15901,70	153,33	3247,20	36,17	41,40	187,25	1203,59
Paid rent/rented land (th HUF/ha)	7,80	8,01	9,65	5,93	3,81	8,15	3,59
Golden Crown value (GC/ha)	19,89	22,49	21,62	14,93	12,42	19,06	8,22
Consolidated profit	81123,69	922,60	3211,20	-425,58	375,28	244,00	-1803,37
Depreciation	104387,10	618,30	5708,04	858,99	911,27	827,92	11342,11
Return on gross production (%)	6,14	27,43	3,54	-4,52	7,19	5,29	-0,26
- corrected with staff costs	5,74	16,28	-0,12	-26,40	-3,49	-6,75	-1,81
- corrected also with rents paid	5,71	13,77	-0,15	-29,92	-4,29	-8,03	-1,94
Return on liabilities (%)	8,06	15,29	6,48	-1,57	5,84	4,70	2,58
- corrected with staff costs	7,73	9,33	2,91	-10,87	1,50	-3,18	1,06
- corrected also with rents paid	7,71	7,99	2,87	-12,37	2,05	-4,02	0,93
Return on net worth (%)	8,57	17,43	5,89	-2,22	6,57	4,37	-0,52
- corrected with staff costs	8,01	10,35	-0,19	-12,95	-3,18	-5,57	-3,57
- corrected also with rents paid	7,96	8,75	-0,26	-14,68	-3,92	-6,62	-3,84
Return on work (th HUF/AWU)	2703,52	3221,26	1747,45	452,79	1353,76	1295,46	1600,09
- corrected with staff costs	2653,62	2185,78	1374,96	-549,88	375,61	507,83	1405,27
- corrected also with rents paid	2649,52	1952,36	1371,14	-711,23	301,85	424,24	1388,02
Cash-Flow	185510,79	1540,90	8919,24	433,41	1286,55	1071,92	9538,74

Source: author's calculation based on AKII FADN database 2002.

Annex 4

The results of factor analysis, 2004

factor loadings, N = 1858

Variables/factors	1	2	3	4	5	6	7	8
TOTSOURC	**0,969**	0,104	0,028	0,083	-0,016	-0,006	0,009	-0,013
GROSSPROD	**0,967**	0,137	0,065	0,092	0,010	0,008	0,025	0,047
NETREV	**0,952**	0,125	0,079	0,098	0,012	0,008	0,016	0,045
TOTSTAFF	**0,951**	0,009	0,041	0,041	-0,005	0,007	0,049	0,100
TOTAWU	**0,943**	-0,030	0,066	0,094	-0,009	0,011	0,056	0,106
TOTLIAB	**0,941**	-0,033	0,039	0,114	-0,016	-0,002	-0,005	-0,030
DEPR	**0,933**	0,092	0,044	0,065	-0,027	-0,002	-0,001	-0,031
SUBNET	**0,919**	0,158	-0,023	0,128	0,019	0,002	0,054	0,127
INTPAID	**0,910**	0,031	0,026	0,124	0,002	-0,000	0,010	-0,005
NETWORTH	**0,909**	0,218	0,015	0,054	-0,015	-0,010	0,023	0,009
PROFCF	**0,722**	0,654	-0,017	0,071	0,063	-0,001	0,004	-0,006
LANDRENT	**0,701**	0,365	-0,089	0,182	-0,000	0,004	0,075	0,194
TOTUAA	**0,585**	0,076	-0,064	0,013	-0,005	-0,001	0,010	0,064
CONSPROF	0,215	**0,950**	-0,071	0,048	0,127	0,001	0,007	0,021
EBIT	0,230	**0,937**	-0,060	0,064	0,157	-0,004	0,001	0,011
TYPEANIM	0,051	-0,083	**0,892**	-0,002	0,078	0,047	-0,138	0,039
PROCROP	-0,080	0,028	**-0,778**	-0,094	0,247	0,019	-0,184	0,005
TYPECROP	-0,097	0,048	**-0,730**	0,021	-0,002	-0,024	-0,630	-0,044
LEGALLTD	0,111	0,046	0,107	**0,860**	-0,038	0,010	-0,028	-0,290
PROAWU	-0,283	-0,075	-0,132	**-0,742**	0,154	0,014	0,079	-0,247
PROUAA	0,257	0,058	-0,213	**0,668**	0,101	0,062	0,082	0,321
PROFOUT	-0,019	0,055	0,013	-0,034	**0,781**	-0,020	-0,003	-0,045
PROFSOURC	-0,045	0,236	-0,066	0,031	**0,750**	-0,067	-0,033	0,012
PROFAWU	0,008	-0,009	-0,069	-0,045	**0,518**	0,010	-0,050	-0,033
PROFWORTH	0,002	-0,011	0,019	0,013	0,062	**-0,895**	0,009	-0,030
LEVERAGE	0,002	-0,014	0,035	0,047	0,008	**0,895**	0,001	-0,034
TYPEMIX	0,072	0,026	0,005	-0,026	-0,081	-0,018	**0,970**	0,015
LEGALCO	0,169	0,027	0,009	0,079	-0,065	-0,010	0,024	**0,921**
GCROWN	0,092	0,008	*-0,423*	0,018	0,373	0,051	0,215	0,185
Eigenvalue	10,503	2,558	2,240	1,892	1,617	1,472	1,744	1,226
% of variance (total: 80,17%)	36,22%	8,82%	7,73%	6,52%	6,01%	5,58%	5,08%	4,23%

Method: Statistica software – factor analysis with the algorithm of principal component analysis, rotation procedure: varimax

Source: author's calculation based on AKII FADN database 2004.

Average values of competitiveness clusters formed by factor analysis, 2004

Measure: thousand HUF if not marked

Averages	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
Number of units (number)	29	34	52	209	90	462	923
Number of represented units (number)	484	1286	2812	7945	2922	18967	52898
Distance (without dimension)	175,34	163,22	150,07	68,74	82,64	37,33	28,62
Gross production value	70452,55	33168,09	44080,19	18147,31	34833,09	19956,17	12707,56
Profit before taxes	13051,22	1566,71	958,50	1714,41	1692,23	1316,29	702,80
Profit before taxes corrected with stuff costs	9347,66	168,50	-307,51	103,46	133,42	-690,09	-790,82
Profit before taxes corrected also with rents paid	8925,29	-11,45	-484,60	-195,78	-128,21	-979,26	-1019,93
Net revenue	53888,98	26596,53	33926,86	14327,40	26851,53	15931,65	9472,88
Revenue from arable production	22602,99	6036,05	7770,53	4994,13	9004,43	4729,91	2825,18
Proportion of arable production (%)	41,94	22,69	22,90	34,86	33,53	29,69	29,82
Subsidies	10141,51	4081,47	4709,31	2287,80	4774,64	2359,06	1524,12
Net worth	61930,98	22622,83	28457,96	21471,03	29768,75	24559,95	17065,98
Liabilities (Assets)	95155,26	41042,97	53319,87	30361,77	46190,75	34470,69	24178,91
Long and short term liabilities	32904,72	17264,08	24399,58	8449,35	16083,06	9774,00	6909,03
Leverage (%)	53,13	76,31	85,74	39,35	54,03	39,80	40,48
Interests paid	2630,09	1102,66	2100,93	487,66	1285,54	704,52	413,41
Staff costs	9150,50	4006,09	5864,68	2008,88	5126,70	2302,19	1651,04
Annual Work Unit (AWU)	6,20	2,63	3,33	1,72	3,16	2,12	1,55
Staff costs/AWU (th HUF/AWU)	1476,22	1525,19	1758,94	1166,56	1624,60	1087,76	1064,53
Share of Family Work Unit (%)	12,36	18,31	18,46	35,96	18,94	36,43	43,57
Total area (UAA) (ha)	224,68	72,67	78,92	120,53	93,93	55,31	37,68

Averages	Cluster1	Cluster2	Cluster3	Cluster4	Cluster5	Cluster6	Cluster7
Rented land (ha)	190,66	55,84	65,13	28,96	74,31	33,09	19,99
Proportion of rented land (%)	84,86	76,85	82,52	24,03	79,12	59,84	53,05
Paid rent	1449,27	795,39	1112,40	437,44	1240,59	399,39	245,55
Paid rent/rented land (th HUF/ha)	7,60	14,24	17,08	15,10	16,69	12,07	12,28
Golden Crown value (GC/ha)	15,05	21,11	15,77	20,11	15,80	15,29	16,69
Consolidated profit	11597,43	781,62	628,86	935,02	1093,70	647,34	224,49
Depreciation	4633,83	1939,80	2931,08	1687,23	2205,57	1707,97	1268,65
Return on gross production (%)	18,52	4,72	2,17	9,45	4,86	6,60	5,53
- corrected with staff costs	13,27	0,51	-0,70	0,57	0,38	-3,46	-6,22
- corrected also with rents paid	12,67	-0,03	-1,10	-1,08	-0,37	-4,91	-8,03
Return on liabilities (%)	16,48	6,50	5,74	7,25	6,45	5,86	4,62
- corrected with staff costs	12,59	3,10	3,36	1,95	3,07	0,04	-1,56
- corrected also with rents paid	12,14	2,66	3,03	0,96	2,51	-0,80	-2,51
Return on net worth (%)	21,07	6,93	3,37	7,98	5,68	5,36	4,12
- corrected with staff costs	15,09	0,74	-1,08	0,48	0,45	-2,81	-4,63
- corrected also with rents paid	14,41	-0,05	-1,70	-0,91	-0,43	-3,99	-5,98
Return on work (th HUF/AWU)	3581,72	2121,67	2046,41	2162,12	2160,85	1709,69	1517,67
- corrected with staff costs	2984,24	1589,34	1666,71	1226,64	1666,88	761,70	554,63
- corrected also with rents paid	2916,10	1520,83	1613,60	1052,87	1583,97	625,07	406,92
Cash-Flow	16231,26	2721,43	3559,94	2622,25	3299,27	2355,32	1493,14

Source: author's calculation based on AKII FADN database 2004.

References

1. Checkley, K. (1982): Finance for farming – a guide for the lending banker. Chartered Institute of Bankers, p. 164.
2. Füstös, L. – Meszéna, Gy. – Simonné, M. N. (1986): A sokváltozós adatelemzés statisztikai módszerei. Akadémiai Kiadó, Budapest, p. 525.
3. Gorton, M. – Davidova, S. – Iraizoz, B. – Kovács, B. – Mizik, T. – Ratinger, T. (2003): An analysis of the performance of commercially oriented farms in Hungary. Post-Communist Economies, vol. 15, no. 3, September, pp. 406-416.
4. Hair, J. – Anderson, R. – Tatham, R. – Black, W. (1998): Multivariate Data Analysis (Fifth Edition). Prentice Hall International, Upper Saddle River (New Jersey), p. 768.
5. Hartigan, J. A. (1975): Clustering Algorithms. Wiley, New York, p. 351.
6. Hartigan, J. A. – Wong, M. A. (1979): A k-means clustering algorithm. Applied Statistics, no. 28, pp. 100-108.
7. Keszthelyi, Sz. (2005): A tesztüzemek 2004. évi gazdálkodásának eredményei. Agrárgazdasági Információk 2. szám, AKI, Budapest, p. 137.
8. Keszthelyi, Sz. –Kovács, G. (2003): A tesztüzemek 2002. évi gazdálkodásának eredményei. Agrárgazdasági Információk 2. szám, AKII, Budapest, p. 135.
9. Ketchen, D. – Shook, C. (1996): The application of cluster analysis in strategic management research: an analysis and critique. Strategic Management Journal, vol. 17(6), pp. 441-458.
10. Kovács, E. (2004): Pénzügyi adatok statisztikai elemzése. Tanszék Kft., Budapest, p. 148.
11. Kovács, G. – Kertész, R. – Keszthelyi, Sz. – Pátkai, J. (1999): A tesztüzemek 1998. évi gazdálkodásának eredményei. Agrárgazdasági Információk 1. szám, AKII, Budapest
12. Mizik, T. (2004/a): A jövedelmezőség és az üzemméret kapcsolatának vizsgálata a magyar mezőgazdaságban. IX. Nemzetközi Agrárökonómiai Tudományos Napok – „Versenyképesség és jövedelmezőség a többfunkciós mezőgazdaságban”, Gyöngyös, 2004. március 25-26.
13. Mizik, T. (2004/b): A jövedelmezőség és az üzemméret kapcsolatának vizsgálata a magyar mezőgazdaságban II. X. Ifjúsági Tudományos Fórum, Keszthely, 2004. április 29.
14. Mizik, T. (2004/c): Jövedelmezőség és versenyképesség a tesztüzemi rendszerben. Budapesti Közgazdaságtudományi és Államigazgatási Egyetem, Ph.D. értekezés, p. 133.
15. Strén, B. (2004): A magyar gabonaágazat a klaszterelmélet tükrében. Ph.D. értekezés, Budapesti Corvinus Egyetem, p. 146.
16. Szelényi, L. – Neszmélyi, A. (2000): A multivariate analysis of the European Union’s agricultural expenditures in 2000. Studies in Agricultural Economics, No 102, pp. 49-65.
17. Tryon, R. C. (1939): Cluster analysis. Edwards Brothers, Ann Arbor, p. 347.

Studies in Agricultural Economics No. 104. p. 129-142. (2006)

Synchronisational problems in organisational motivation in agriculture

Csilla Juhász - Csaba Berde[1]

Abstract

Based on research into motivation conducted by Berde and Juhász, organisational success depends on the interaction of three main factors, which can be considered as three individual sets. The first set, provided by the organisation, entails motivational possibilities ; the second entails factors, considered by managers to be appropraite as well as motivating; the third consists of overlapping factors deemed apt to motivate. In our research these three sets only partly complement each other. In the segments one can detect differences in synchronisation or harmony. There are segments where there is no synchron at all. Our theory to describe these relationships is called "motivational harmony" or the "motivational synchronisational" model.

Key words

Motivation, synchronisational model, organisation, management, HRM

Persuading someone to act as he wants does not require managerial skill and knowledge. But persuading someone to do what he does not want to do is a real managerial chall enge. Persuading subordinates to work and behave differently, learn and perform better is a special aspect of motivational techniques and, moreover, appears to cost nothing. But the absence of expense is only virtual, as a good motivational system has its costs. It has long been known that only humans can influence human productivity. Beside internal motivational factors, external and managerial motivation techniques also play an important role.

Motivation is a basic managerial method because, through influencing behaviour and conduct, it is possible to get members of an organisation to improve performance, gain enthusiasm toward their tasks, and enhance their ambitions and loyalty. Porter - Lawler (1968) found that the psychological climate, reflected by individuals' perceptions of their work environment, has a significant relationship with individuals' work attitudes, motivation, and performance. When subordinates are better motivated, managing becomes easier and more successful as it improves the work climate, and prompts managers to trust their subordinates more. Supervision time can be shortened, and reprimands are fewer. It enables the application of more democratic and liberal managerial methods. Instead of managerial methods based on autocracy, enforcement and control, more and more managerial theories and trends favour those procedures where successful management is linked to subordinates' enthusiasm, ambitions, individuality and loyalty. These managerial trends contend that subordinates must have a say in decision making, and this should be carried out where enforcement and control are redundant, meaning motivation itself determines their activity and pe rformance. (Maslow 1970; Herzberg 1974; Tosi 1986; McClelland 1965, 1987; Mitchell 1997; Skinner-Belmont 1993; Ingledew et al. 2005)

[1] University of Debrecen, Department of Management Sciences, Debrecen; jcsilla@agr.unideb.hu, berde@agrunideb.hu

Our motivational examinations were carried out by the research program of the Department of Management, University of Debrecen. The aim of our research was to study the nature of managerial motivational tasks in agriculture. Hereby, we examined how managers and subordinates judge the effectiveness of certain motivational factors. What methods are favoured in motivational work, what motivational factors are preferred by managers, and how often they are used. Moreover, we wanted to determine whether organizational potential and corporate success influence the organizational motivational project.

The research program was named ”The functional study of corporate management”. This method is regarded as functional as it starts out from the examination of managerial tasks, and, based on their results, strives to deduce general statements. (Berde, 2000) This research is also empirical, as it is based on organisations’ and managers’ real experience. Therefore, on the one hand, this methodology is functional because it examines managerial tasks, while on the other, it is empirical as it is based on real managerial and organizational tasks.

Our research was based on questionnaires. The interview entails three parts. To collect company data, we prepared a separate datasheet called the “general data collector”. Here, we collected information about a company’s scale, production volume, profitability, operational method and structure. These data, or the analysis of collected data and/or summaries, allow for comparative analysis of companies’ different scales, structures, operational structures and profitability.

“Interviewed person identifying data” relates to the person interviewed. In this questionnaire, for example, we ask for the age, level of education and position of the interviewee. These data enable researchers to examine and categorize data at the managerial level as for position and function, and then compare these results for managers and their subordinates. The data also make it possible to evaluate the pertinent elements’ impact according to education level and age.

In the questionnaire, we prepared questions for examining 12 groups of manager-related problems. For each group, we devised factors to be ranked from 1 to 5 by individuals, based on their importance, effect and influence. Questions could be answered by the same points, too. When the interviewee lacked the necessary experience to answer a question, or if the question was not relevant to the particular organisation, we asked him to put down zero. On the basis of the given scale, interviewees did unidirectional, free evaluation (Babbie, 1998). Therefore, questions and answers were defined to make unidirectional evaluation and, by doing so, evaluations were easier. For bidirectional examinations (such as those rating dissatisfaction or satisfaction), questions were repeatedly asked to make contrasting evaluation. We carried out this research between 1997-2003 among Hungarian food industrial and agricultural organizations.

In the research there were two target groups. Among subordinates separate examinations were carried out. The survey between managers and employees enabled comparisons and analysis, and was suitable to indicate coincidations, controversions and differences in the preference systems. Subordinates were classified as those who did not have subordinates and did not perform managerial tasks. Interviews were carried out by field workers and this proved to be a reliable interviewing method. It removed possible conceptual misunderstanding, and the ratio of completion improved by doing this, establishing the conditions for a subsequent answer. Sample taking was made by designated statements, and field workers were previously informed about which statement to survey. Interviewees were selected at random.

Based on the data of the collected interviews, we performed the following research: an examination of self-motivation among managers, and among subordinates. We also investigated management's view of their subordinates' motivation. Also examined were satisfaction and dissatisfaction, and how frequently managers utilized motivation techniques. As both managers and subordinates were included in the assembled data, some problems were examined from different points of view. Concerning interviews with managers, interviews were conducted with appropriate managers for the particular question. These examinations were termed managerial self-motivation.

The same motivation factors were evaluated based on managers and how managers, based on their experience, motivated their subordinates. Considering the examination of subordinates, they themselves qualified the survey factors based on their motivational effect, meaning self-motivation for subordinates. The sample included 389 managerial interviews, and 393 people took part in the detailed subordinate survey.

The motivational factors were taken from the traditionally accepted motivation techniques found in management literature.

Managerial motivational examinations in agriculture

In the first part of the motivation questionnaire, managers themselves had to appraise the factors that motivated them. We wanted to analyse the motivational framework of managers in the studied organisations to determine whether there was a difference in managers' opinions, and if there was, then how significant the difference was. We wanted to know what motivated the manager himself or herself. So in this examination the main motivational factors related to managerial self-motivation are indicated. Regarding self-motivation, Table 1 shows that for job related factors generally managers most preferred individuality, plus recognition of work and responsibility. In our studies they were least motivated by punishment, followed by influence, reward, promotion prospects and self-training. Moderately effective factors were financial opportunities, improved work conditions, job variety and work organization.

Table 1

Managerial evaluation of self motivational factors

Motivational possibility	Value	Effectiveness
Individuality	4,43	
Responsibility	4,43	
Acknowledge of work	4,35	Most
Job variety	4,14	
Financial possibilities	4,10	
Job security	4,05	
Organization of work	4,02	
Work conditions	3,95	Moderate
Chances for self education	3,86	
Chances for promotion	3,73	
Reward	3,67	
Influence	3,11	
Punishment	2,32	Least

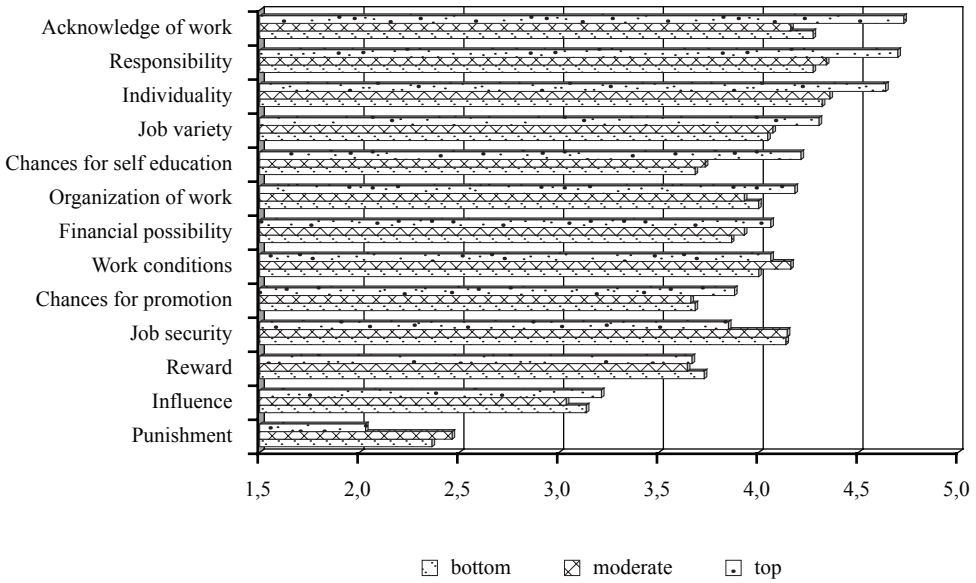
***Source*: author's own research**

To explain the above facts, we think factors that depend on the managers themselves are most effective because, other than economic factors, only the manager is responsible for personal self-reliance and assumption of responsibilities. These are followed by approval given and material incentives, but they are related, as the more self-reliant a person is, the more positive an influence approval can play. Moderately effective factors are either satisfactory or they are atypical, which means they cannot be evaluated in terms of a given manager's everyday tasks. Regarding reprimands or punishment, most managers are immune to these, especially when they are in a top managerial position. Only very basic forms of punishment, such as dismissal, have an influence and, based on research results, these do not have a direct motivational effect. Data suggest that other factors are either satisfactory or not advantageous for top level managers.

In our research we strived to learn how managerial motivation is influenced by his/her position in the organizational hierarchy. We thus distinguished between three managerial levels: lower, middle, and top managers. Results of the examination are indicated in Figure 1.

Figure 1

Managerial motivation by managerial levels in agriculture



Source: author's own research

Lower or operative managers are least motivated by punishment, external influence, and promotion. This level is best motivated by an ability to make independent decisions and receive approval, followed by taking responsibilities, and finally job security. Moderately effective factors were financial opportunities, and improved work conditions. As for middle level managers, punishment, external influence, reward and promotion prospects were also the least effective factors. They most preferred the chance to act independently, responsibility, approval, and the salary. These are followed by job security, job diversity, job organization, and self-training. For top managers, punishment, external influence and prospective rewards are also the least effective. For them the least effective factors are job security and promotion.

Still, the most effective factors are approval, assuming responsibilities, increasing job independence, and job diversity. Moderately effective factors are financial opportunities, promotion, and job diversity.

Organizational motivation

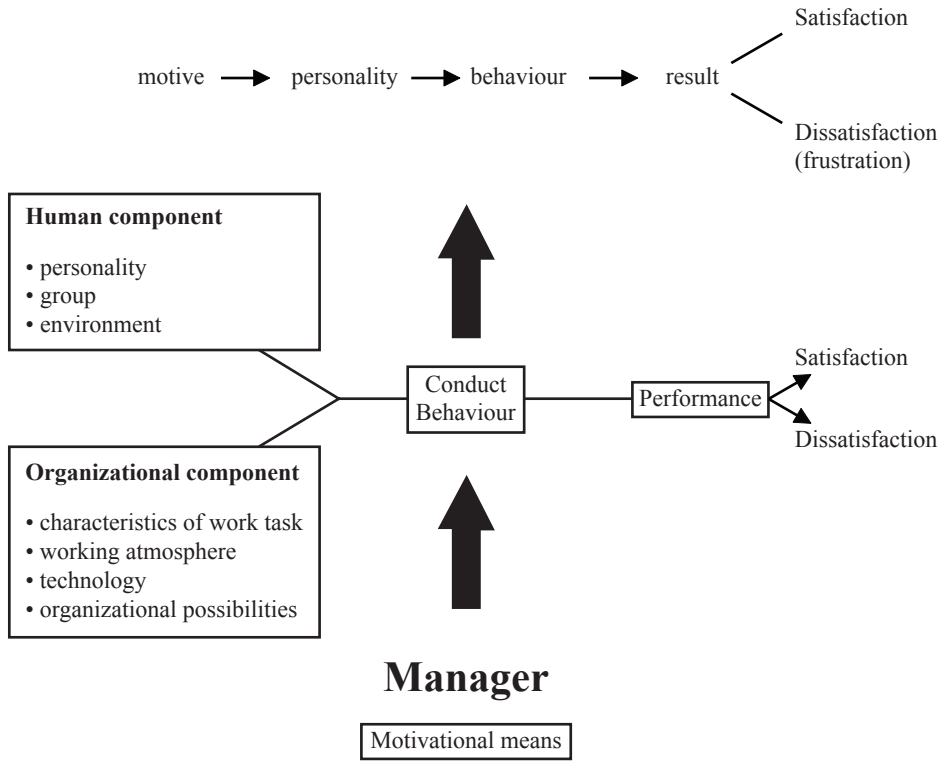
Hypotheses are one part of motivational theories, but they were only partially supported through targeted research. Theoretical assumptions and theories are hard to validate, and some are only right in a given situation.

All explain something about one field of human behaviour, and contribute to the better understanding of one part of the complex process of human motivation. These theories are not at all incompatible. To sum up, all organizational and psychological processes can be combined as follows (Figure 2):

The figure shows that a key factor of organizational motivation is the leader itself, who in the process acts as the catalyser; he mediates the motivational effects and means, that can influence the behaviour of organization members. The upper part of the figure summarizes the motivation process, according to how a particular motivating factor influences the person, resulting in a given behavioural reaction.

Figure 2

The process of motivation



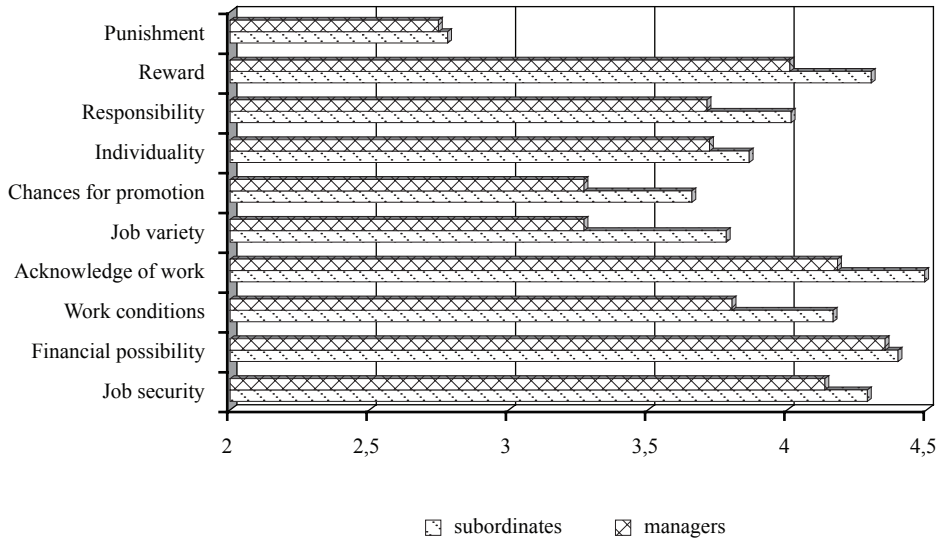
Source: Tosi et al., 1986.

As a result of a given behaviour, motivational need is either satisfied, or, in the case of dissatisfaction, it results in frustration. In fact, in the motivational process, there are three forms of input: the person himself combined with his personal skills, as well as group and environmental conditions, meaning the entire person's motivation. The other form of input stems from organizational factors. Still, motivational means are mediated by the manager who selects, from the available options, a given motivational method. Regarding motivation, managerial decisions are largely determined by the manager's personality, his/her preferences, values, and experience.

In organizational motivation a separate category is designated for the motivation of subordinates. Regarding this category questions were analysed on the basis of diverse criteria. For successful organizational motivation, it is paramount that motivational methods, used to influence the behaviour, conduct and performance of subordinates, are available and applied by the management in order for the three factors complement each other. Accordingly, we completed separate studies on how the given factors' motivational significance are rated by managers and subordinates.

Figure 3

Motivational means by subordinates and managers in agriculture



Source: author's own studies

Apart from a few factors, Figure 3 indicates that the effect and significance of examined motivational methods were rated differently by subordinates and managers. Strangely, the impact of these methods got the second worst rating by managers. A possible explanation being that satisfaction does not promote motivation. It is possible that managerial functions exert their own particular influence.

Job security and a good salary are important for both groups. However, subordinates rated them slightly higher as an incentive factor. Though the difference is insignificant, work conditions and peer approval are important for managers. Managers consider independence, responsibility taking and peer approval the most important motivating factors while

subordinates deem salary and job security the most important. Subordinates rated reward as highly important, and this differed considerably from their management colleagues. For managers the fourth most important motivation was job variety, but subordinates ranked it among the last three factors. Perhaps job variety is poorly administered making the final outcome doubtful and perhaps even negative. Despite the fact that literature stresses the importance of inclusion in decision making, subordinates only rated it moderately, and for this category management and subordinates differed significantly. Moreover, managers rated promotion prospects and training higher than subordinates did. Regarding independent decision making and the chance to take on responsibility, subordinates rated these factors far lower than management.

The results were supported by the Kruskal Wallis Test and the Chi-square test. (Kruskal Wallis Test ($P < 0,05$): Praise $p = 0,00$; $df = 1$; value = 72,03; Punishment $p = 0,800$; $df = 1$; value = 58,23; Work conditions $p = 0,027$ $df = 1$; value = 4,86, Job variety $p = 0,001$;$df = 1$; value = 11,13. Chi-square Test: Praise $p = 0,00$; $df = 5$; value = 87,25; Punishment $p = 0,00$; $df = 5$; value = 76,16; Job variety $p = 0,00$; $df = 5$; value = 22,15.)

For managers and subordinates, experimental results show considerable difference in rating motivational methods. Consequently we can conclude that there is often a significant difference between management and subordinates when it comes to rating motivational methods.

Examaning the application of motivational methods.

In examining motivational methods we also wanted to know how frequently studied methods were utilised by those managers questioned. They had to choose among those factors (motivational options) which they had earlier rated in terms of how successful these were in motivating subordinates.

As Figure 4 shows two thirds of managers (73,26%) use peer approval as a motivational means. 59,3% use praise and 58,14% use greater earning potential to motivate. These most frequently applied methods are followed by the opportunity to take responsibility (45,35%) and the ability to act independently (44,19%). Almost a third of managers utilized inclusion in work projects (37,21%), punishment and reprimands (36,05%), attractive work conditions (36,05%), job security (33,72%) and a better understanding of the company's production process (29,7%). Less than one third of managers (16,28%) use promotion prospects and further training while slightly more than one tenth used the job variety (10,2) as a motivating factor. In the previous studies both managers and subordinates rated punishment and reprimands as the least effective motivational method. It is noteworthy that 36,05 % of them acknowledged using it so was the seventh most frequent motivational tool.

This survey allows, through the respective frequency of motivational tools, (Table 2) a comparison of managerial opinions about on what motivates subordinates. Most managers use peer approval, ranked second, followed by praise. However, not all managers rate this factor due to its frequency, instead categorizing it as a motivational factor. Although ranked third, managers thought subordinates were most motivated by financial opportunities. Another dominant factor was opportunities for personal growth within the organization. In the methods indicated below there is a relatively significant difference between application frequency and managerial evaluation regarding subordinates' motivational methods.

The ability to take responsibility, inclusion in the structural hierarchy, and punishment and reprimands are more frequently used by managers which contrasts with their views on their actual effectiveness. Regarding punishments and reprimands, it is noteworthy that management still uses them even though they realise that they are not sure to be effective. It is apparent that these methods are linked to a given manager's personal viewpoint.

Table 2

Comparison of the use and efficiency of motivational means

Managerial evaluation of motivational means affecting subordinates (from least to most)	The order of frequency of means used (from least to most)
Punishment	Job variety
Job variety	Chances for self education for promotion
Chances for self education for promotion	Describing the work process
Participation in work organization	Work conditions
Describing the work process	Job security
Responsibility	Punishment
Individuality	Participation in work organization
Work conditions	Individuality
Praise	Responsibility
Job security	Financial possibilities
Acknowledgement of work	Praise
Financial possibilities	Acknowledgement of work

Signs and abbreviations: Most Moderate Least

Source: own examinations (1998-2003)

Apart from financial possibilities, job security and working condition are less frequently applied than it would be justified according to its motivational effect. The reason for that is these factors do not solely depend on the manager, skills of the organization interact. External environment and macroeconomic processes interact in the application of possibilities inside. Also, the restriction of organizational possibility is the reason for that there are managerial means for motivation, such as punishment, responsibility taking and participation, which are used, still it is known that these do not have serious motivating effect.

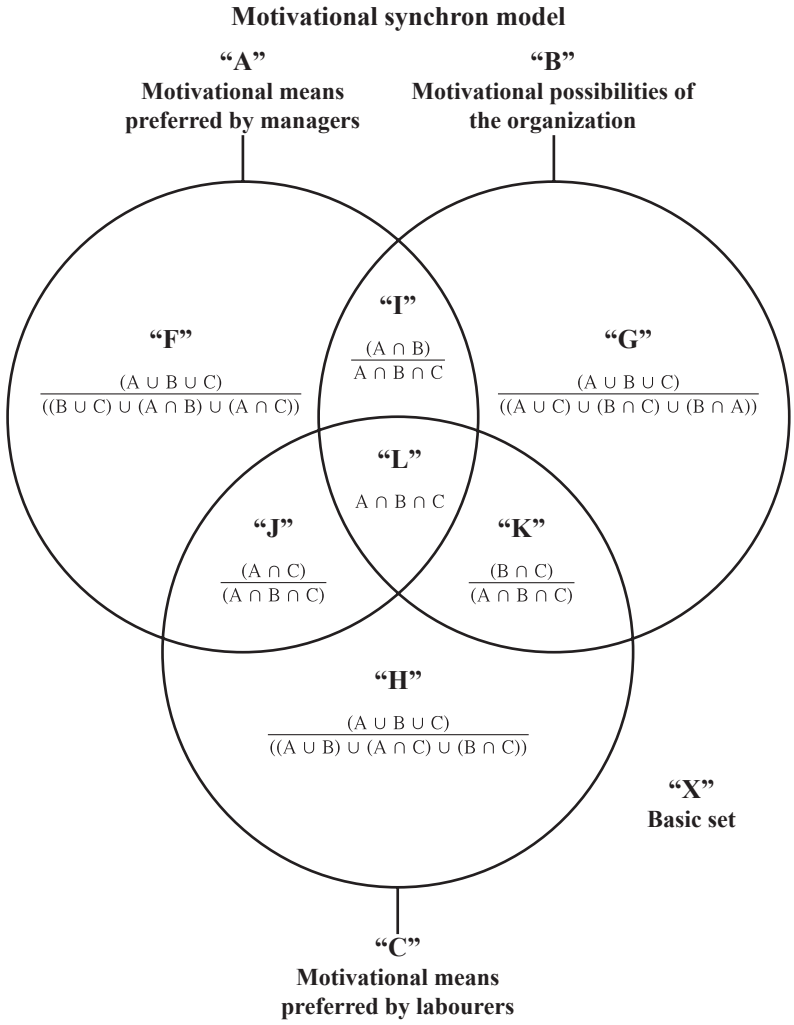
These motivational means, regarded as less effective, were highlighted in the motivational activity, as they do not require expenditures. The restricted economic possibilities of the Hungarian organizations, the income producing skill, which is more valid for food-industry organizations compared to other sectors, do not enable the application of more expensive motivational means. One group of factors of motivation is constituted by the motivational possibility of the organization. It is highly influenced by the profitability of the production. More efficient production enables better chances for motivation. By the strenghtening motivation, productional results improve. This process, according to Juhász (2003) can generate a self-strenghtening spiral, which she refers to as motivational spiral.

Beside succesful production, organizational motivation possibilities are highly influenced by other organizational factors, such as organizational and labour culture, traditions, and structural setup of the organization.

Motivational synchron model

Based on the results and experiences of our examinations described above, the composition of a logic model is necessary.

Figure 5



Source: own examinations

In the organizational motivation, 3 group of factors interact. These are: factors managers use and consider suitable for stimulation, means proper to stimulate workers and set of motivational possibilities provided by the organization. The three group of factors were defined by the connexions of the set theory. The three sets only partially cover each other based on our experimental results. In the subordinates' evaluation of means managers considered effective, considerable differences can be experienced as we showed earlier.

Available means in the organization largely depend on the economic conditions. It is possible, that not all motivational possibilities are available, which were considered effective, or affect subordinates. To explain the controversaries and similarities, we worked out a logic model suitable for explaining the theoretical definition. (Figure 5)

A set can be definied as union of F, I, J and L subsets ($A = F \cup I \cup J \cup L$)and includes motivational means preferred by managers. B set is the union of G, I, K and L subsets ($B = G \cup K \cup L \cup I$) and includes motivational means of the organization. The sum of H, J, K, L subsets results in C set ($C = H \cup K \cup J \cup L$), which means the effective means of the motivation of workers. In the segments and subsets the coincidation and differences of motivational factors of the 3 sets (synchron) can be indicated.

Set $F = (A \cup B \cup C) / ((B \cup C) \cup (A \cap B) \cup (A \cap C))$ represents those motivational means, which are preferred by managers, but subordinates do not consider effective and are not available. This group can be called the set of idealized, ineffective, and non-available" motivational factors. Here asynchron is experienced, as these chances do not coincide with the factors of the other two sets. Its fantasy name is „idealized". (Figure 6)

Set $G = (A \cup B \cup C) / ((A \cup C) \cup (B \cap C) \cup (B \cap A))$ does not have common elements with the other two basic sets. This represents those possibilities, which do not affect subordinates, and managers do not prefer. This set includes „available, ineffective and non-preferred" elements. In this case asynchron is experienced again. These are redundant factors of motivation.

Set $H = (A \cup B \cup C) / ((A \cup B) \cup (B \cap C) \cup (C \cap A))$ contains those elements, which would be suitable for motivating subordinates, but are not preferred by managers and are not available. This include „effective, non-preferred, not available" means. These are the desirable factors.

The elements of set $J = (A \cap C) / (A \cap B \cap C)$ are part of the set A and set C, but do not have common elements with set B. So snychron for the elements of the two sets is valid, but the organization cannot provide it. Those elements are involved, which are preferred both by managers and subordinates, but are not available. These factors are missing from the motivational repertoire of the organization.

Set $I = (A \cap B) / (A \cap B \cap C)$ includes those factors, which are preferred, available, and applied. According to the model, these do not play an important role in motivating subordinates. So these are means, which are preferred, available but non-effective. Its fantasy name is „applicable".

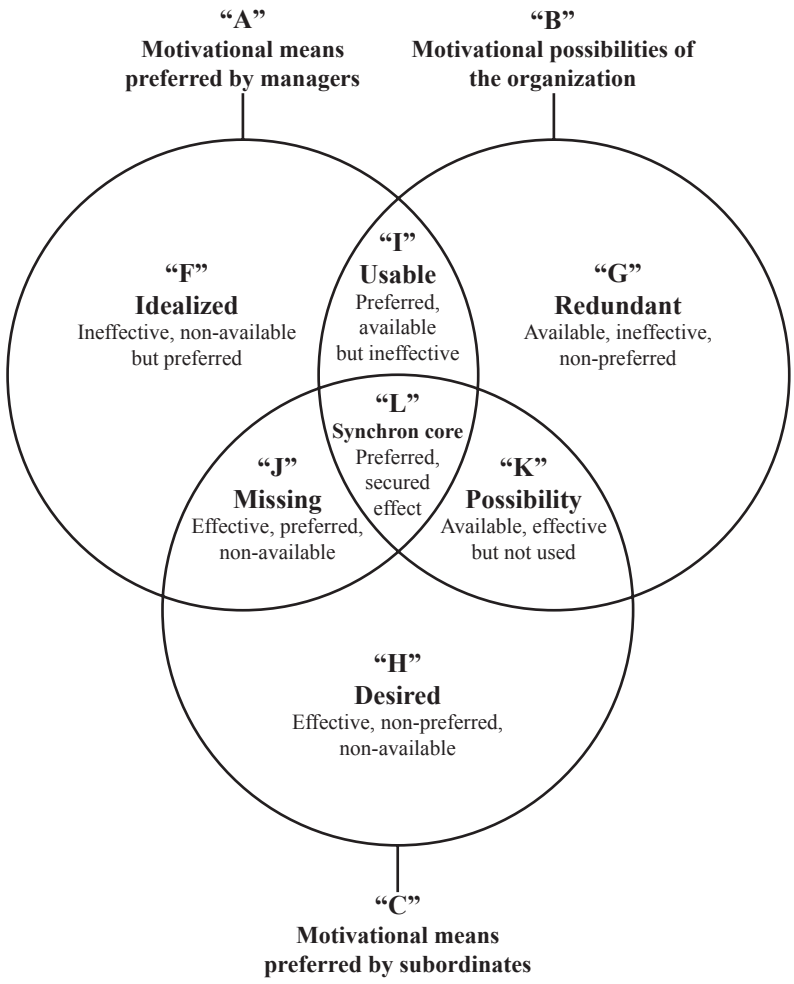
Set $K = (B \cap C) / (A \cap B \cap C)$ includes such elements, which are considered effective by subordinates and available, but not preffered by managers, so they are not applied. These factors represent „possibility", as these can be used succesfully anytime, only managerial behaviour and attitude have to change.

For F, G, and H sets, there is no synchron at all, they do not have any common elements with any other defined sets. For I, J, and K synchron is partial, as elements of these subsets are identical considering two sets, but do not have identical elements with the third subset.

Considering L set the synchron is total, we can call it „synchron core". It includes those elements, which are preferrred by managers, these are available and effective in motivating subordinates.

Figure 6

Contentual explanation of the synchron model.



Source: model based on privates hypothesis

The organizational motivation improves with the size of the synchron core. In ideal case (theoretical approach), it can occur that all the three sets cover each other completely, so managerial preferred factors coincide with factors affecting subordinates, and these are available in the organization, so these can be applied. Based on our results, in the experimental organizations these groups of factors do not coincide, so in segments synchron and asynchron also occur.

The motivational synchron or motivational harmony model described above enables the examination, study and modelling of internal motivational possibilities and work. This model was created and based on the explanation of experinced controversaries and theoretical assumptions. The motivational synchron model is a theoretical hypothesis, which creates a suitable frame for further research and analysis of organizational motivation.

References

1. BABBIE, E. (1986): The Practice of Social Research. Wadsworth Publ. 4. ed. Belmont California
2. BERDE Cs. (2000): A vállalati menedzsment funkcionális vizsgálata. (habilitációs eljárás tézisei, kézirat) DE ATC Debrecen, 3. p.
3. GOLDSMITH, A.H. – VEUM, J. R. – DARITY, W. (2000): Working hard for the money? Efficiency wages and worker effort. Journal of Economic Psychology Vol 21. No 4. 351-385.p.
4. HERZBERG, F. (1968): One More Time: How Do You Motivate Employees? In: Harvard Business Rewiew, Vol. 81. No. 1. 2003. Jan. 57-78.p.
5. INGLEDEW, D. K. - WRAY, J. L. - MARKLAND, D. - HARDY, L. (2005): Work-related Goal Perceptions and Affective Well-Being. Journal of Health Psychology Vol. 10. No. 1. 101-122.p.
6. JUHÁSZ Cs. (2003): A motivációs lehetőségek vizsgálata az élelmiszer-gazdaságban. PhD értekezés, Debrecen
7. MASLOW, A. (1970): Motivation and Personality. Macmillan, New York
8. McCLELLAND, D.A. (1987): Human Motivation. Cambridge University Press. Cambridge
9. McCLELLAND, D.A. (1965): Toward a Theory of Motive Aquisition. American Psychologist. vol. 20. New York, 845-852.p.
10. MITCHELL, T. R. (1997): Matching motivational strategies with organizational contexts; Research In Organizational Behavior, Vol 19, 309-338.p.
11. SKINNER, A. – BELMONT, M. (1993): Motivation in the Workplace. Journal of Psychology, Vol. 85, No. 4., 251-264.p.
12. PORTER, L. W. – LAWLER E.E. (1968): Managerial attitudes and performance. Homewood, Dorsey Press
13. TOSI, H.L. – RIZZO, J.R. – CARROL, S.J. (1986): Managing Organizational Behavior. Ballinger Publishing Co. Cambridge.

INSTRUCTIONS
for the authors of „Studies in Agricultural Economics”

1. **Author(s).** Name(s),employer(s), mail and e-mail addresses are required. In case of more authors please indicate contact person.
2. **Conditions.** The material in the mannscript has not been published elsewhere. The paper has to contain some new results (new analysis, projection, theory or method, etc). Previous results should be summarized (reffered) and clearly delimited from the author's own results.
3. **Abstract.** A short summary of the problem, analysis and results not exceeding 100 words at the beginning of the paper.
4. **Keywords**. Maximum five words expressing characteristics of problem (object), methods and results. They should be listed after the abstract.
5. **Content.** Every paper ought to contain the following parts. 'Introduction', 'Database and methods', 'Results' (and their discussion), and 'Conclusions'. The introductory part should deal with the research task (problem), the previons results and listing those main questions to be answerd by the author(s).
6. **Citations**. A generally accepted principle is to refer authors instead of editors e.g. in case of referring a chapter (contribution) of a book. Examples of referreing.

   (Koester, 1988:12) indication of page
   (Harris et al., 1983) if there are more than two authors
   (Koester, 1988 a, 1988 b) two papers in the same year.
7. **Figures.** Only white and black, high quality figures are accepted. In case of overtaking figures from other publications permission of the author(s) or the owner of copyright is neccessary.
8. **Tables.** Place each table at the end of the manuscript supplying with number and title. Source of the data should be indicated in footnote(s).
9. **Mathematical notation**. Number of mathematical formulas should be restricted in the text of the paper. In case of longer denonstration or model description place it rather in an appendix.
10. **References**. Only referred sources should be listed.
11. **Acknowledgement.** Short appreciation of work of contributing persons in research, of reviewers or those who gave financial support for the research.
12. **Submission**. **Three printed copy (with length of maximum 15-20 pages) plus one floppy disc.**

ÚTMUTATÓ
A „Studies in Agricultural Economics” szerzői részére

1. **Szerző(k):** neve, munkahelye, levelezési és e-mail címe. Kéziratokhoz kérjük megadni, több szerző esetében pedig *-gal kérjük megjelölni azt a szerzőt, akihez a különlenyomatért, vagy egyéb levelezéssel fordulhatnak (tudományos fokozat és egyéb rang nem szükséges).

2. **Eredetiség:** Legalább három kritériumát kell megkívánni. A szerző(k)-nek (legalábbis azonos változatban, formában) **más helyen (idegen nyelven) nem publikált** dolgozata legyen a kézirat. Adjon a szakmának valamilyen **új tudományos eredményt** (új elemzés, prognózis, koncepció, módszer, stb.). Sorolja fel az **előzményeket** (hivatkozások) és világosan határolja el a saját hozzájárulást.

3. **Összefoglaló** (abstract): A probléma, a vizsgálat és az eredmények lényegét összegező tömörítvény, maximum 100 szavas, a közlemény elejére kerüljön.

4. **Tárgyszavak** (key words): Maximum 5 szó, amely a referálás és számítógépes keresés számára jelzi a dolgozat témáját: a problémát, a vizsgálat tárgyát, módszerét. Az összefoglalás (abstract) után sorolandók fel.

5. **Tagolás, tartalom:** Minden kéziratot lehetőség szerint a következő részekből kell felépíteni: bevezetés, adatbázis és módszer(ek), eredmények (és megvitatásuk), következtetések. Ezeket természetesen inkább logikai részekként kell alkalmazni, nem feltétlenül alcímekként (de alcímekként is lehetségesek). A „Bevezetés”-nek legalább három dolgot kell tartalmaznia: a problémafelvetést, az előzményeket, és hogy mely kérdésekre kíván választ adni az adott tanulmány.

6. **Hivatkozások:** Főként az előzmények felsorolásakor és az eredmények megvitatásakor szükségesek. Nemzetközi gyakorlatban elfogadott alapelv, hogy – lehetőség szerint – a szerző(k)-re kell hivatkozni (nem elegendő a szerkesztőkre, pl. könyvfejezet esetében). Hivatkozási minták:

   (Koester, 1988:12): idézés esetében az oldalszám feltüntetése.
   (Harris et al., 1983): kettőnél több szerző esetében az „és társai” jelölés
   (Koester, 1988 a, 1988 b): azonos évben két munkára történő hivatkozás esetén.

7. **Ábrák:** Csak fekete-fehér ábrákat tudunk közölni. Csak géppel másolható, jó minőségű ábrákat fogadunk el. Más publikációból átvett ábra közléséért írásbeli engedélyt kell előzetesen kérni a szerzőtől, vagy a copyright-tal felruházott központtól.

8. **Táblázatok:** A táblázatokat a közlemény végére kell csatolni, sorszámozva és a szövegben a soszámokra hivatkozva. Az adatok vagy a táblázat forrását lábjegyzetben meg kell adni.

9. **Képletek:** A matematikai formulák számát a szövegben – az olvashatóság érdekében – korlátozni kell. Szükség esetén mellékletben lehet megadni a modell részletesebb leírását.

10. **Irodalomjegyzék:** Csak a hivatkozott forrásokat – az első szerző családnevének kezdőbetűje szerinti ABC-sorrendben – kell felsorolni. Minták:

Könyv:

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

Könyvrészlet:

Tarditi, S. and Croci-Angelini, E. (1987). Efficiency and equity components of sector policy analysis and evaluation. In: I Y. Leon and L. Mahé (eds), **Income Disparities among Farm Households and Agricultural Policy.** Kiel: Vauk, 43-80.

Folyóirat cikk:

Mergos, G.J. and Yotopoulos, P. A. (1988). Demand for feed input in the Greek livestock sector. **European Review of Agricultural Economics** 15(1): 1-17.

Disszertációk, jelentések, konferencia anyagok

Koester, U. (ed) (1988). Disharmonies in the EC and US Agricultural Policy Measures. Report prepared for the Comission of the European Communities. Brussels: EC Commission.

11. **Köszönet:** Rövid köszönetnyilvánítás a kutatásban közreműködő (nem szerző) személyeknek, lektoroknak, finanszírozóknak.

12. **Kézirat benyújtása: Magyarul és angolul, gépelve 3 példányban és 1 pld. floppy discen, maximális terjedelem: 15-20 oldal (kivéve az ismertető cikkeket).**