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Editors' welcome

Dear readers,

In front of you lie nrs 3 and 4 of the 2nd volume of our recently established journal APSTRACT. It appears that there is a great need for a journal like ours. The reasons for that are the way the journal is connected to the field of research and the professional network that carries it.

Many researchers feel that the longer established scientific journals pay little attention to applied research in the field of agribusiness. Further, at present, the Network for the MBA in Agribusiness and Commerce (AGRIMBA) is a well established institution that connects numerous scientists in the field looking for an outlet of their research results. Often they are also engaged in lecturing in one of the MBA programmes. This makes APSTRACT an excellent medium to communicate recent research results to MBA students. Also the students themselves are invited to publish short versions of their theses. This is a stimulus for them to perform as good as possible and it provides good examples of subjects of theses for students who still have to write one.

The AGRIMBA network is growing and so does the number of readers of APSTRACT. That also shows in our Editorial Board. In order to improve the efficiency of the work we decided to split the Editorial Board into three parts: Deputy Editors, Executive Editorial Board and Honorary Editorial Board. Especially the excellent work of the Deputy Editors, András Nábrádi and János Lazányi, is gratefully acknowledged here. Further, I am happy to welcome a number of new members in our Honorary Editorial Board: Csaba Csaki (Budapest), Akimi Fujimoto (Tokyo), Peter Bielik (Nitra) and Danilo Tomic (Novi Sad), all four well known scientists in the field that we are covering.

Finally, I am confident that because of the quality of the articles, the excellent members of our Editorial Board, and its growing role as a medium of communication for the professional network, APSTRACT has a great future.

Wageningen, January 2009.

*Wim Heijman
Editor in Chief*

Efficiency indicators in different dimension

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Abstract: There are several variations of efficiency definitions and of course ratios concerned with efficiency. A better understanding of the notion of efficiency is critical to dissolve ambiguity about it. Many confuse efficiency with other supposedly synonymous notions such as profitability, successfulness, competitiveness, liquidity or productivity. This ambiguity originates not only in subjective reasons, but the lack of hierarchical order among certain ideas. The primary driver in our research is, to systematize efficiency in general, and formulate a new categorical approach of the efficiency in corporate level.

Key words: efficiency, corporate level, new categories

Introduction, key conceptual fields

A better understanding of the notion of efficiency is critical to dissolve ambiguity about it. Many confuse efficiency with other supposedly synonymous notions such as profitability, successfulness, competitiveness or productivity. This ambiguity originates not only in subjective reasons, but the lack of hierarchical order among certain ideas. The fact that different areas of science use different names for equal notions can also pose considerable problems, but the same ideas may also be interpreted in a distinct sense. The primary driver in our research is, among others, to systematize the above mentioned notions and ideas.

There are several definition can be found in different sources which reflected on that sometimes we speak about the same formula in different way or vice versa, we speak about different items based on the same definition. Let we show some examples:

Efficiency: Producing a desired results with a minimum of effort, expense or waste. (Webster's New World Dictionary 1995.) **Efficiency:** State or quality of being efficient (Hornby (ed.): Oxford értelmező kéziszótár. /Oxford dictionary/ Kultúra International, Budapest, 1989.) **Efficiency:** Getting any given results with the smallest possible inputs, or getting the maximum possible output from given resources. (A Dictionary of Economics. Second Edition. Oxford University Press, 2002.) **Efficiency:** Technical efficiency: a measure of the ability of manufacturer to produce the maximum output of acceptable quality with the minimum of inputs. Economic efficiency: a measure of the ability of an organization to produce and distribute its product at the lowest possible cost. (A Dictionary of Economics. Third Edition. Oxford University Press, 2002.) **Productivity:** A measure of the output of an organisation or economy per unit of input (labour, raw materials, capital etc.)

(A Dictionary of Economics. Second Edition. Oxford University Press, 2002.) It is sure, that the field of efficiency is not clear. Why this miserable situation? If we look around in the business textbooks about the efficiency we can find several ratios belongs to that big category. Efficiency ratios has five groups like: liquidity, leverage, activity, profitability and growth. (F.R. David Strategic management case and concepts. (2007). Within the categories we recognize logical correlations however sometimes if the ratio is bigger than we consider that is better, sometimes there are total opposite of our meaning. That is why the primary driver of our article, to systematize efficiency in general, and formulate a new categorical approach of the efficiency in corporate level.

Material and methods

Concerning with international textbooks we collect different efficiency definitions and efficiency ratios. Analyzing approaches we made three main categories. Using internationally accepted efficiency ratios in corporate level a new grouping method were initiated. Reorganizing former classification we have made a new formula for grouping efficiency ratios and definition. Our suggestion is that it will be extremely useful to add to the former categories four new elements reflected to the origin of the efficiency calculation. Finally analyzing efficiency ratios we strongly recommended for the decision makers: only one efficiency ratio is not enough for making judgement about a firm efficiency.

Results and Discussions

The premise of our investigation is the notion of efficiency defined in the widest possible sense.

Our hypothesis suggests that corporations are successful if they are efficient, liquid and competitive. What does efficiency stand for?

In economic terms, efficiency is the expression of the successfulness of management. It can be measured by collating input and output. *More poignantly, efficiency is the random combination quotient of output and input!*¹

Efficiency indicators can be subsumed into three main groups on corporate level:

- I. Based on derived data:
 - “Physical” efficiency
 - Economic efficiency
- II. Based on relations (I/O):
 - Labour productivity
 - Labour intensity
 - Endowment
 - Output-proportionality
- III. Based on input types:
 - Average efficiency
 - Additional efficiency
 - Marginal efficiency

I. Basically, there are two main categories of efficiency on the grounds of derived data. The first is the large group of “physical” efficiency and the second is economic one. We use the term of “physical” efficiency if in input-output relations both input and output are measures expressed in physical dimension.

In the SI system: mass (e.g. kg), distance (e.g. m), area (e.g. m²), capacity (e.g. Kw) etc. If any of the elements (input-output) are expressed in money value, economic or business efficiency is mentioned. Its measurement unit reflects the economic notion by including money value (e.g. €/kg, €/m², or their reciprocals).

The mostly used indicator groups can be calculated on the grounds of **relations**. The first group of indicators (I) is too general, the third (III) is in-plant one (field register, log of animal feed, etc.) Relation-based classification is used when the existence and measurability of several input-output relations are discussed on corporate level (*Figure 1*).

A realistic reflection of relations suggests that a certain input in the resource need of a company is the part of another input, therefore efficiency indicators can also be generated from input/input relations. This correlation can be found on the input side as well. A certain corporate output is the part of another output; consequently, output/output relations can generate efficiency indicators.

In the two basic category of efficiency (economic, “physical”) four groups of indicators are included. These are the following:

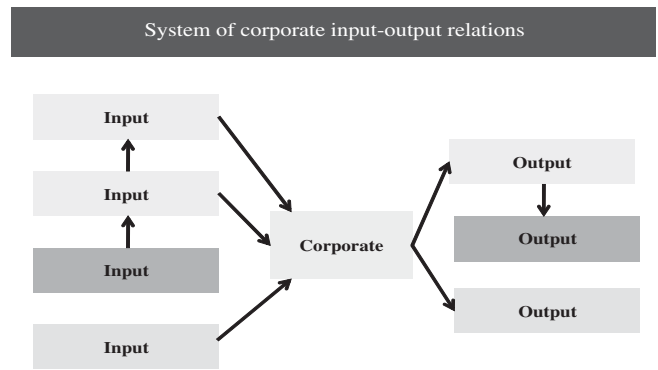


Figure 1. System of corporate input-output relations

- **Indicators of endowment**, which are the quotients of input/input,
- **Indicators of labour intensity**, which are the quotients of input/output results,
- **Indicators of labour productivity**, which are the quotients of output/input,
- **Output-proportionality indicators**, which are the quotients of output/output values.

The second criterion for achieving efficiency is corporate competitiveness, which, beyond efficiency, means adaptability to in-company and out-of-company factors (e.g. marketability, ecological factors etc.).

The third factor is liquidity. Liquidity means the capacity of a company to fulfil its payment obligations within the set deadline.

A business (activity) is successful, if it is efficient, compatible and liquid. This is presented on *Figure 2*.

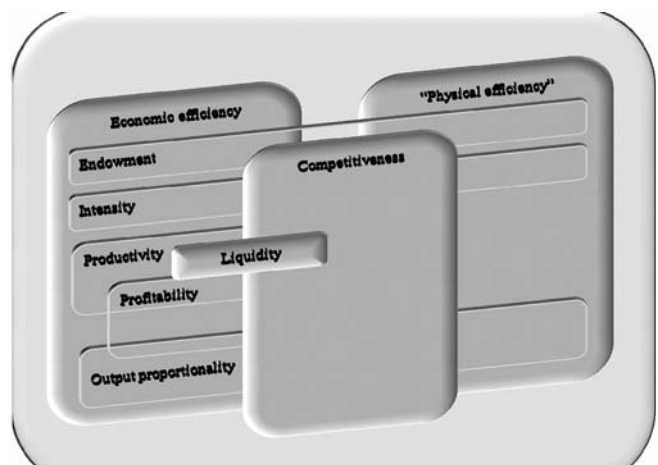


Figure 2. Dimensions for the notion of efficiency

Several authors in the past decades tried to interpret the notion of efficiency as it is in correlation with several areas, phenomena and representations of life. “Earlier, basically the system of central planning and distribution, ignoring the relations of reality, input-field-output, the negation of the

¹ The authors note here that earlier sources mentioned efficiency as a synonymous notion of economicalness. The latter notion should not be deleted from everyday language, but in technical language the use of efficiency seems to be more advantageous to express the same meaning for certain definitions.

potential of decreasing outputs, the insufficient knowledge of western technical literature and other sources etc. played a key role; whereas after the transformation of regime the potentials of money-making, market development, the disorders of liberalization and deregulation and the constant character of transforming, transitional conditions pushed profitability in the background.” [3].

Efficiency – as a notion – is generally the comparison of certain event category and certain input category. It leads to conclude **that efficiency is a relative category, and the calculation of a single formula or its result is not enough to declare whether a corporation or a farm is efficient or not.** Accordingly, the general formula of efficiency can be given as follows:

$$\begin{aligned} \text{Efficiency} &= \text{Output/Input, or} \\ \text{Efficiency} &= \text{Input/Output, or} \\ \text{Efficiency} &= \text{Output/Output, or} \\ \text{Efficiency} &= \text{Input/Input.} \end{aligned}$$

In most cases, efficiency is discussed exclusively as the measurable, quantifiable result of activities, however, the authors elucidate efficiency can be examined in terms of **national economy, society, regions, corporations and in-corporation units as well.** Consequently, efficiency can not only be discussed in general, but in concrete partial terms as well.

Analysis of partial efficiency and its indicators

The definition of the efficiency in worldwide is not the same as we have discussed in the introduction part of this article. However dictionaries and textbooks approaches very often are different in national level governments are fixed the basic definitions. We can see an example in Hungary: The interpretation of efficiency, on the basis of the Government Regulation 217/1998 (XII.30.) amended by the governmental regulation of 280/2003 (XII.31.) is the following: products, services and other output produced in the course of a given activity and the correlations of resources used for their production. Another interpretation claims that an economic activity is efficient, if it is successful in respect of a set objective. Objectives (output) may include outputs, gross production value, net production value, added value, revenue and the growth of profit. The resources (input) of economic activities may subsume: the use of living labour, assets and land [11]. The analysis of partial input is demonstrated on *Figure 3.*

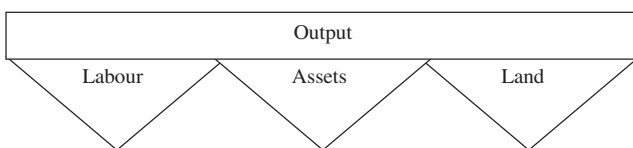


Figure 3. Areas of partial efficiency

As the figure indicates, the simplest interpretation of efficiency is that certain resource (labour, assets, land) is compared to some category of the production value (net production value, gross production value, added value) and the efficiency of the given resource may be calculated in this way. The following section details these calculations, their procedures, indices and interpretations.

1. Productivity of labour (efficiency of labour) and labour intensity

The productivity of labour shows the volume of manufactured products, production value during a unit of working time.

$$\text{Labour productivity} = \text{Net production value/ Labour force}$$

The reciprocal of labour productivity is labour intensity, which shows the volume of labour for the production of a unit of product.

$$\text{Labour intensity} = \text{Labour force/ Net production value}$$

Labour intensity can be influenced by the following factors:

- Technical equipment of labour
- The organization of work
- Monetary interest

These indicators are the following: agricultural output for an annual unit of labour, operating (business) output for an annual unit of labour, net production value per capita, added value per capita etc.

2. Efficiency and intensity of assets

The indicators of asset efficiency express the generation of new (added) value by locked-up tangible and intangible assets in the form of a quotient. The quotient of asset efficiency can be calculated if the net production value is divided by the adequate asset and then this value is multiplied by 100:

$$\text{Asset efficiency} = \text{Net production value / Assets} * 100$$

Such asset efficiency indicators can be the following: net production value for 100 HUF of activated tangible assets, net production value for 100 HUF of stock, net production value for 100 HUF of “total” assets etc.

The indicators of asset intensity are the reciprocals of asset efficiency. These can be calculated if activated tangible assets, stocks and “total assets” one by one are divided by net production value then they are multiplied by 100. The tendency of these indicators is favourable if they show a decreasing value, i.e., the lower the value of the indicator than 100 is, and the more favourable the value of the indicator is.

$$\text{Asset intensity} = \text{Assets/ Net production value} * 100$$

Such are the following: tangible assets for the production of 100 HUF net production value, funds necessary for the production of 100 HUF net production value and “total assets” required for the production of 100 HUF net production value.

3. Territorial efficiency

Territorial efficiency is determined by the quotient of production output and agricultural area. This is primarily influenced by the quality of production, as it is reflected by the following formula:

$$\text{Territorial efficiency} = \frac{\text{Production output}}{\text{Agricultural area}}$$

From another viewpoint, the conceptual sphere of partial efficiency can be expanded by further indicators as well.

4. Stock management

Stock management primarily focuses on the velocity of turnover and the revolution of stocks. These indicators are suitable for the comparison of the annual data of certain sectors or the same businesses. Generally speaking, the faster the velocity of turnover for a stock, the shorter the duration of one revolution and the more positive the stock management of a corporation. Data on the velocity of turnover, which are higher than the standard values of a given industrial sector, can indicate the insufficiencies of asset management and the resulting low efficiency.

The velocity of stock turnover in days shows the number of days required by stocks for obtaining sales revenues.

$$\text{Velocity of turnover (Fs)} = \frac{\sum \text{Average stock of intangible assets (Fá)} * \text{number of period days (T)}}{\text{Revenues (É)}}$$

The higher the velocity of turnover in a given sector, the fewer assets are required for the production activities. The revolution of assets (in turns) shows how many times stocks are refunded in revenues.

$$\text{Number of turns (S)} = \frac{\text{Revenues (É)}}{\text{Average intangible asset stock (Fá)}}$$

5. Wage efficiency and wage intensity

The indicator of wage efficiency expresses the potential of the corporation to create the new (added) value of used (paid) wages, which can be calculated if net production value is divided by wage costs.

$$\text{Wage efficiency} = \frac{\text{Net production value}}{\text{Wage costs}}$$

It is favourable if it takes high values. The value of the indicator is also suitable to compare the subdivisions of corporations and corporations themselves.

The indicator of wage intensity is the reciprocal of the above mentioned value and shows the necessary volume of wage costs (living labour), which is indispensable for the production of a unit of net production value. The value of the indicator is favourable if it stays low.

$$\text{Wage intensity} = \frac{\text{Wage costs}}{\text{Net production value}}$$

6. Capital efficiency, capital-related corporate revenue

Capital efficiency (equity profitability) reflects the volume of production value, profit or loss after taxation that a capital unit outputs for a corporation, i.e. the efficiency which operates (equity) capital invested in a corporation.

$$\text{Capital efficiency} = \frac{\text{Production value}}{\text{Equity capital}}$$

Capital-related corporate revenue is also included here, which shows how much corporate revenue can be realized by using a unit of equity capital.

$$\text{Capital-related corporate revenue} = \frac{\text{Corporate revenue}}{\text{Equity capital}}$$

7. Level of production cost

Production cost can be calculated if production cost (in the formula: material cost, the cost of used services, the cost of other related services, staff costs, depreciation) is divided by gross production cost. It shows what cost level is needed to achieve a unit of production value.

$$\text{Level of production cost} = \frac{\text{Production cost}}{\text{Gross production value}}$$

8. Indicator of currency extraction

The indicator of currency extraction shows the volume of internal input needed to receive a unit of currency in the course of selling a certain product abroad, at given world market prices. It is used if the internal input and foreign trade price of products that can be potentially taken into account in terms of foreign trade are known.

$$\text{Indicator of currency extraction} = \frac{\text{Total direct cost of export sales (HUF)}}{\text{Revenue in currency (USD, Euro)}}$$

If, for example a product that can be produced from 100 HUF can be sold for 2 USD in the international market, the currency extraction indicator of the given product is 50 HUF/USD [12].

Analysis on complex efficiency and its indicators

As it has been mentioned earlier in this study, efficiency cannot be evaluated by a single indicator. The realistic evaluation of efficiency requires the joint analysis of several indicators as single indicators are merely suitable to express the economicalness of a given resource. (For example, the efficiency of the use of tangible assets, the efficiency of the use of source materials, the efficiency of the use of labour etc.). There are some indicators which facilitate the efficient and economic use of other inputs and resources. Such indicators are the indicators of complex efficiency, which are used for the analysis of corporate financial statements. They primarily examine how efficiently corporations operate.

1. Resource (Locked-up production factors) – efficiency

This indicator can be applied to measure the development and efficiency of a given corporation and to compare it to other companies. The value of the indicator is influenced not only by output expectations but by the development of asset/wage ratio as well. The multipliers in the denominator of the indicator express the average output expectations for certain resources, which are usually determined by the companies but there exists a system which is used by everybody. If all the assets are used, the expectable output is 20% and the efficiency level of wages is about 1.8. The activity of the corporation can be regarded of average efficiency, if the indicator is about 100%.

$$\text{Complex efficiency} = \text{Net production value} / (0.2 \text{ Value of assets} + 1.8 \text{ Wage costs})$$

Complex efficiency shows the volume of net production value produced by a unit of living labour and objectified labour, taking the adequate output expectations into consideration. Therefore, the applied multipliers express the average output expectations related to the given resources. If the rate is lower than the minimal value of complex efficiency (1) and the tendency is decreasing, the process is unfavourable as the corporation is unable to realize higher new (added) value than its locked-up property and wages, and it is also unable to consolidate its existing level.

2. Efficiency of inputs

It expresses the output-growing effect of inputs and examines the direction, the positive or negative quantity and quality of output change or its value in terms of money caused by the efficient inputs. The elements of living and objectified labour, staff costs, depreciation and other inputs may be included in the group of material-type inputs.

$$\text{Input efficiency} = \frac{\text{Net revenue}}{\sum \text{Living and objectified labour input}}$$

Depending on the wider or more restricted interpretation of certain inputs or input categories, there are several categories:

- Average efficiency: Total output/ Total input
- Additional efficiency: Surplus output / Surplus input
- Marginal efficiency: quantified output change caused by the last measurable input unit

The complex efficiency of a corporation can be measured by the analysis of its resource efficiency and input efficiency. The benefit of the complex efficiency indicator is that it is suitable for the analysis and the comparison of highlighted corporate subdivisions and similar companies as well. However, its severe disadvantage is that it is difficult to interpret and sometimes to compare in the case of different companies, as for a high-standard company with living labour, wage costs would be of primary significance whereas if a company offers services with high asset demand, the value of assets would become significant.

The determination of multipliers in the denominator of the indicator is subjective, it can vary from company to company; therefore, this formula cannot be widely applied to avoid misunderstandings.

The efficiency of social efficiency and its indicators

The notion of social efficiency is difficult to determine, several authors have already given different interpretations. “The notion of efficiency is easy to interpret on individual level: within given limits, the highest output is the efficient one. However, on community or society level the solution is not as easy. For the evaluation of social efficiency economist apply Pareto’s theories. Society prefers processes which increase and improve the well-being of individuals or groups without causing harm for others. Community resources are used optimally if resources cannot be allocated to improve the well-being of certain groups without deteriorating the situation of others. In other words, a certain group’s situation can only improve at the expense of some other group” [15].

In economic terms, and the production of an economy is effective if nobody’s well-being can be enhanced without pushing other groups into unfavourable situations [6].

Samuelson – Nordhaus (1988) elucidated that “when each producer maximizes his profit selfishly and each consumer maximizes his own benefits, the system is quite efficient” or “the exclusion of losses or with other words, the use of economic resources, which leads to the maximum well-being of economic players with a given volume of resources and technological level. This is the brief expression of allocation efficiency.”

Economically speaking, this interpretation of efficiency has been accepted by many: “Pareto-efficiency is merely related to consumers. Though its interpretation covers complex activities, from this point of view only the consumers’ final value judgement is decisive. If allocation is efficient, somebody’s situation can only be improved to the detriment of another consumer. It should also be noted that not the mechanism, but the environment plays a role in the

definition of efficiency. This observation is in the focus of our further studies. The notion of efficiency is not related to the issues of distribution either. If an allocation gives everything to one consumer, this allocation can be regarded efficient as well.” [2].

A Pareto-efficient situation is a case when the utility or the satisfaction of a single person cannot be enhanced without the re-grouping or the exchange of goods without decreasing somebody else’s utility or satisfaction. Under certain restricting conditions perfect competition leads to Pareto-efficiency. From non-Pareto situations contributions shall be made towards Pareto-efficient ones. [13].

When the distribution of goods among economic players is modified in a society, Pareto-improvement is performed if at least one player’s well-being is improved without decreasing someone else’s condition. The distribution is Pareto efficient, if Pareto improvement cannot be performed. Pareto-efficient distribution is called Pareto-optimum [14].

A better understanding of social efficiency is critical to understand its sub-divisions such as unemployment, poverty and environmental pollution. These areas are in correlation and they can be examined on individual level – how efficient a certain citizen is – or on social level – as the impact of the total efficiency of individuals on society. Consequently, these areas also possess social efficiency, but they are not efficient. *Samuelson – Nordhaus* (1988) assert that “The sources of poverty are the following: the lack of education, training, discrimination and disadvantageous family background, overcrowding and insufficient nutrition. In a certain sense, poverty originates in the circumstances of poverty. If the vicious circle of insufficient education, large-scale unemployment and low income levels is broken, education and human capital are enhanced for the poor, the efficiency of the future is intensified.”

If we possess this knowledge it can be claimed that social efficiency is the sum total of individual social utilities.

Efficiency on national level

The system of national accounts (SNA) provides numerical information on the processes of economy, certain economic sectors and branches. National accounts describe goods and services that are generated and transformed and also the generation, distribution and re-distribution of revenues. They depict the use of these revenues for consumption and accumulation. The national accounts illustrate the processes of financing, the roles of banks and other financial institutions and property.

The various accounts of the national system of accounts can be divided into four groups:

- production accounts,
- revenue accounts,
- capital accounts,
- property accounts.

1. Gross output

In the case of national accounts the reasonable starting point is **gross national output (GO)**, which is the total value of all the products and services in a country in a given period of time. Therefore, total output on the commodity market, the total production of an economy. Output is not equal with the sold quantity, as it includes stocks as well. Output expresses the sphere of consumer goods, capital goods, goods and services for government procurement.

Gross output subsumes items which are not for final use, but serve as the source materials for other products.

2. Gross domestic product, GDP

$$\text{GDP} = \text{GO} - \text{intermediate consumption} = \text{Added value}$$

If intermediate consumption is deducted from the total output of all the corporations and sectors, i.e. the value of gross output, the value of disposable products for final use is received. Actual final consumption is the value of those products and services, which are consumed by households and the community independently of the source of financing. On the level of national economy, it equals with final consumption expenditures.

The value of final use for a business is expressed by added value, which is the surplus of gross output above intermediate consumption. Macro-economic models identify commodity market output with the volume of added value.

GDP can be analyzed from three sides:

- production;
- use;
- revenue (*Table 1.*).

Table 1. GDP from different aspects

Production: GDP =	+ the sum total of added value calculated at basic prices; + tax on products; – subsidies for products; – financial intermediation services, indirectly measured (FISIM)
Use: GDP =	+ household final monetary expenditure; + final monetary expenditure of the state budget + final monetary expenditure of non-profit institutions; + gross fixed capital formation; + export; – import.
Revenue: GDP =	+ wages and salaries; + social contribution; – production aid ; + tax on production; + gross operating surplus, mixed revenues.

3. Gross national income, GNI

At the same time, added value is also the income of producers: realized gross income. Gross national income is the total primary income realized by the citizens of a country in a given year, a modified form of GDP.

4. Net domestic product, NDP

Net domestic product is the sum total of net incomes in a given country. In terms of income, NDP is the sum of new, primary incomes in a given year.

$$NDP = GDP - \text{amortisation}$$

5. Net National Income, NNI

A gross national income is a modified form of gross domestic product, it is clear to see that net national income can be deduced from gross national income.

$$NNI = GNI - \text{amortisation}$$

$NNI = GDP - \text{foreigners' domestic income} + \text{citizens income from abroad}$

6. Gross National Disposable Income, GNDI

Income generated in the national economy is not equal with the volume of income that can be actually used, as it is influenced by transfers to or from the rest of the world, as secondary income transfers. If the indicators of national income are corrected with international transfer movements, the disposable indicators of national income are received:

$$GNDI = GNI - \text{income to the rest of the world} + \text{income from the rest of the world}$$

7. Net National Disposable Income, NNDI

NNDI is the net match of GNDI i.e. the amortised part of the gross disposable national income.

$$NNDI = GNDI - \text{amortisation}$$

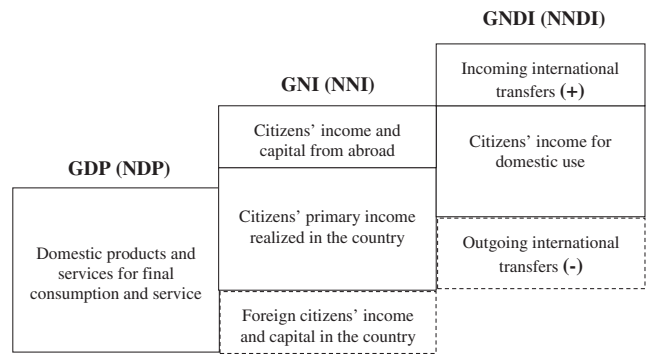
The above indicators can be summarized in the following table: (Table 2.)

2. Table The summary table of SNA indicators

	Half-net type indicators ("gross") in their names	Net-type indicators
Produced income	GDP	NDP
Income from primary distribution	GNI	NNI
Income for final use	GNDI	NNDI

Figure 4. illustrates the correlations of SNA indicators:

The above indicators are absolute numbers, which do not clarify clearly which countries are more efficient in terms of e.g. production. The production of a smaller country can considerably lag behind that of a bigger one, but it does not necessarily mean that the given country has higher development. The above indicators become the landmarks of efficiency if they are compared to some factors. The following tables (Tables 3., 4.) demonstrate that if the base value is the absolute sum of the GDP, then Slovakia produces



Source: 1998 Tömpe F. 1998

Figure 4. Correlations of SNA indicators

more than Slovenia. The same examination for one citizen shows reverse results, i.e. GDP for one person in Slovenia is higher, so production is more efficient.

In other words, the indicators of national economy per one inhabitant give an indicator of efficiency, which is decisive to identify which is more effective country in terms of production.

Efficiency on regional level

From production side, the GDP of a country equals with the sum of the gross added value (the difference of gross output and ongoing intermediate consumption) and the undistributed balance of taxes on products, deducing the undistributed service charges, the margins [9].

The above indicators are quite problematic to use at regional level. Problems are posed by the following reasons:

1. For theoretical reasons, indivisible activities below country level include: activities of public administration e.g. foreign affairs and national defence, handling of public debt and environmental protection.
2. Activities which cannot be localised below country level, which include activities requiring movement e.g. transport, telecommunications, post electricity supply.
3. Rendering the surplus value of organizations with several premises to one area.
4. Taking activities performed out-of-premises into consideration, e.g. construction services, repair-maintenance, delivery of patients, animal health, competitive sport, film production, news agencies.
5. The validity and preciseness of statistical reporting.
6. Relation of regional GDP and incomes. The difference of GDP and incomes is primarily caused by the fact that capital owners' residence and the location of production are different and labour has to commute regularly.
7. Interpretation of data. [4].

The statistical body of the European Union, EUROSTAT does not provide data on territorial units below NUTS II. level. However, KSH (Central Statistical Office) has calculated country level data in Hungary since 1995.

Table 3. The formation of GDP from country to country

	2000	2001	2002	2003	2004	2005	2006
	Million EUR (from 1 January 1991), Million ECU (until 31 December 1998)						
EU 27	9 159 613.0	9 535 688.2	9 893 476.7	10 057 392.7	10 555 180.7	10 990 754.4	11 583 402.5
EU 25	9 105 562.3	9 475 534.5	9 828 412.1	9 987 012.9	10 474 463.3	10 889 320.7	11 461 184.7
EU 15	8 721 848.7	9 043 791.6	9 369 575.8	9 533 908.5	9 982 975.0	10 326 045.0	10 838 650.7
Euro region	6 586 449.2	7 003 957.6	7 246 974.4	7 459 875.5	7 760 642.5	8 025 485.2	8 402 778.1
Euro region (13 countries)	6 733 466.5	7 026 380.6	7 271 108.6	7 485 203.5	7 787 381.6	8 053 737.2	8 433 231.9
Euro region (12 countries)	6 712 341.2	7 003 957.6	7 246 974.4	7 459 875.5	7 760 642.5	8 025 485.2	8 402 778.1
Hungary	52 025.0	59 511.8	70 713.7	74 681.6	82 321.8	88 913.9	89 901.0
Slovenia	21 125.2	22 422.9	24 134.2	25 327.9	26 739.1	28 252.0	30 453.9
Slovakia	22 095.5	23 570.3	26 033.7	29 228.6	33 862.9	38 113.2	43 945.4
USA	10 629 060.2	11 308 619.9	11 071 912.0	9 689 533.2	9 394 565.5	9 994 293.1	10 508 681.1
Japan	5 056 699.5	4 579 680.7	4 161 546.7	3 743 559.6	3 706 697.4	3 663 443.2	3 476 875.1

(Source: EUROSTAT)

Table 4. GDP for one inhabitant at par value

	2000	2001	2002	2003	2004	2005	2006
	GDP for one inhabitant at par value (Euro)						
EU 27	19 000.0	19 700.0	20 400.0	20 600.0	21 600.0	22 300.0	23 500.0
EU 25	19 900.0	20 600.0	21 300.0	21 500.0	22 500.0	23 300.0	24 400.0
EU 15	21 800.0	22 600.0	23 300.0	23 500.0	24 400.0	25 200.0	26 300.0
Euro region	21 900.0	22 400.0	23 000.0	23 100.0	23 900.0	24 800.0	25 900.0
Euro region (13 countries)	21 600.0	22 400.0	23 000.0	23 100.0	23 900.0	24 800.0	25 800.0
Euro region (12 countries)	21 700.0	22 400.0	23 000.0	23 100.0	23 900.0	24 800.0	25 900.0
Hungary	10 700.0	11 600.0	12 600.0	13 100.0	13 800.0	14 500.0	15 300.0
Slovenia	15 000.0	15 600.0	16 600.0	17 000.0	18 300.0	19 400.0	20 800.0
Slovakia	9 600.0	10 400.0	11 100.0	11 400.0	12 200.0	13 400.0	14 700.0
USA	30 200.0	30 600.0	30 900.0	31 400.0	33 100.0	34 700.0	36300 ^(t)
Japan	22 300.0	22 600.0	22 900.0	23 200.0	24 400.0	25 500.0	26700 ^(t)

(Source: EUROSTAT)

In August 2001 in the governmental report entitled "Report on the development of the infrastructure system of Hungarian regions, counties and small regions and on the demarcation of regions", the regions were analysed by 7 indicators. Efficiency indicators are the following out of them:

- taxable income for one person
- the number of operating corporations for one thousand inhabitants
- GDP per capita.

Indicators suitable for the analysis of the efficiency of a region can be divided into 5 groups (under Parliamentary regulation 0/1997. (IV.18 and Parliamentary decree 24/2001. (IV.20.)),

In the examination of the efficiency of regional development programs, further E/R indicators can be generated, but this nomenclature differs from the previous ones. Four indicator groups can be separated as the basic elements of efficiency indicators:

- resource or input indicators, which practically express the volume of financial resources,

– output indicators, which express the results/output of

Table 5.: Indicators for the analysis of the regional efficiency

Demographical indicators	– population density
Indicators of employment	– rate of active agricultural working population – rate of industrial working population – rate of working population in tertiary sector
Economic indicators	– personal income tax for one inhabitant – taxable income for one person – GDP for one person
Indicators of infrastructure	– rate of flats connected to water supplies – rate of telephone main stations for 1000 inhabitants – rate of motor vehicle stock for 1000 inhabitants – rate of business organizations for 1000 inhabitants – number of retail shops for 1000 inhabitants – rate of flats connected to gas supplies
Indicators of social-societal situations	– general education level of population

activities e.g. the length of bicycle paths built, the number of flats built, the number of subsidized corporations,

- result indicators, which express the immediate result of programs, e.g. reduction of costs, fall in the number of accidents,
- effect indicators, which can either be direct effects occurring after the program's time due to the program itself, or general, long-term, indirect effects, which point beyond the program.

At the evaluation of regional development programs the indicators of output, result and effect are related to resource (input) indicators.

Efficiency on corporate level

Corporate level efficiency has been defined by many, from basically similar approaches. Here we present a bunch of these, making the scope of definitions more colorful.

Essentially, efficiency is an economic term. The actors of economy usually measure efficiency in terms of production output or money, since their aim is mostly to maximize the difference (also in financial terms) between revenues and expenditures. Efficiency can be approached from two different directions: in the case of given input, larger output is more efficient than smaller output. Inversely: variant "A", producing a given output with less input is more efficient than variant "B" requiring more input than that.

Efficiency is always a relative concept. At least two events, possibilities, ratios or one specific basis for comparison are required to define it, and even these are not enough" [5].

„Efficiency is the ratio of input and attainable output (input-output ratio), which can mainly be used for the comparison of different possibilities." [8].

„Efficiency: key indicator: Efficiency = Output (yield of production, production value, revenue) / input (resources in a wider sense, expenditure, production cost). Direct efficiency indicators are the indicators in the numerator or denominator of which there is an output category (yield, production value, revenue). Indicators of direct efficiency are partly direct, partly inverse indicators. If the yield, production value and revenue expressing the output are in the numerator of the index, we get direct efficiency indices; if they are in the denominator, we get inverse ones. Direct efficiency indices include the ones which are the most

important for the analysis: the indicators of regional productivity, labour productivity, asset efficiency, cost efficiency and profitability. Indirect indices express land demand, labour demand, asset demand, input demand, cost demand, production cost and cost level. If neither the numerator, nor the denominator of the efficiency index contains the yield, production value, or revenue reflecting the output, and only input categories in the wider sense relate to each other, these are indirect efficiency indicators. These include land supply, labour supply, asset supply, input supply and cost supply indices." [1].

On the whole it can be stated that most authors consider efficiency as the ratio of output and input. However, in our opinion, the concept cannot be reduced to the input and output quotient. In addition to the input-output relation, output-output as well as input-input relation indicators are also to be taken into consideration.

On the basis of this, we can form productivity indicators from output-input ratios, demand indicators from input-output ratios, output-proportion indicators from output-output ratios and supply indicators from input-input ratios. Such relations – even though not exactly in the above grouping – are shown in Figure 5.

Output and input can also be expressed in naturalia and money value. If there is a natural unit both in the numerator and denominator of the efficiency index, we speak about natural/technological efficiency. If either the numerator or the denominator is given in money value, we consider it economic efficiency.

Efficiency indicators can also be grouped on the basis of the given input volume. If the total output is contrasted with the total input, we speak about average efficiency. (Figure 6)

Counter / Denominator	Resources			Input (I)	Production Cost (C)	Yield (Y)	Production Value (V)	Profit (P)
	Land (L)	Labour (Lr)	Assets (A)					
Land (L)	$\frac{L}{L}$	$\frac{Lr}{L}$	$\frac{A}{L}$	$\frac{I}{L}$	$\frac{C}{L}$	$\frac{Y}{L}$	$\frac{V}{L}$	$\frac{P}{L}$
Labour (Lr)	$\frac{L}{Lr}$	$\frac{Lr}{Lr}$	$\frac{A}{Lr}$	$\frac{I}{Lr}$	$\frac{C}{Lr}$	$\frac{Y}{Lr}$	$\frac{V}{Lr}$	$\frac{P}{Lr}$
Assets (A)	$\frac{L}{A}$	$\frac{Lr}{A}$	$\frac{A}{A}$	$\frac{I}{A}$	$\frac{C}{A}$	$\frac{Y}{A}$	$\frac{V}{A}$	$\frac{P}{A}$
Input (I)					Price per Unit (Input Price)			
Production Cost (C)								
Yield (Y)	$\frac{L}{Y}$	$\frac{Lr}{Y}$	$\frac{A}{Y}$	$\frac{I}{Y}$	$\frac{C}{Y}$			
Production Value (V)	$\frac{L}{V}$	$\frac{Lr}{V}$	$\frac{A}{V}$	$\frac{I}{V}$	$\frac{C}{V}$			
Profit (P)	$\frac{L}{P}$	$\frac{Lr}{P}$	$\frac{A}{P}$	$\frac{I}{P}$	$\frac{C}{P}$	$\frac{Y}{P}$	$\frac{V}{P}$	

Note : - - - Direct Efficiency Indicators — Indirect Efficiency Indicators Most Important Indicators (Source: Zs Nemessályi. In.: Buzás et al. Mezőgazdasági üzemtan/Farm Business Management (2000)

Figure 5 Index system of economy efficiency

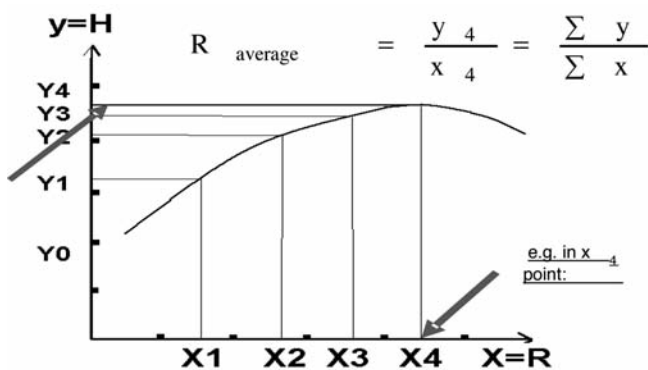


Figure 6 Graphic representation of average efficiency

If we examine the output change achieved through the input surplus as compared to the previous input level, we get the additional efficiency index. (Figure 7)

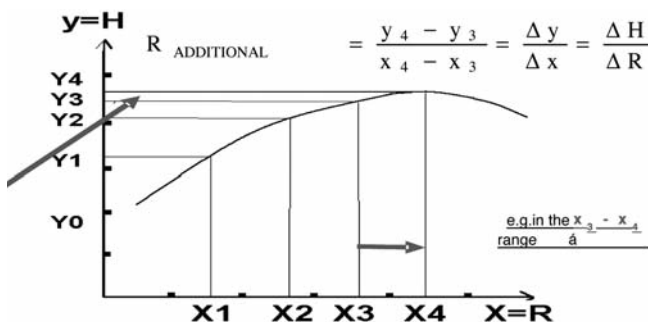


Figure 7 Graphic representation of additional efficiency

With respect to the output change caused by the last unit of input change, we can form the marginal efficiency indicator. All the above is shown by the comprehensive table in Figure 8.

Thus, efficiency is reflected by the quotient of output and input in any combination.

Different areas of science apply different nomenclatures. This, however, is natural, since their formation has followed

the organic development of individuality. At the same time, however, the differences in the applied notions can be rather disturbing in the judgement of the same economic facts.

Output categories according to the nomenclatures of business management studies can be:

- yield, yield value: volume of the products or services produced or provided, and yield value is the index number expressing the same in terms of money value
- revenue: yield value sold
- other income: non-yield based incomes, e.g.. interest rate on deposits, insurance indemnity, subsidies
- production value: total yield value and other incomes
- net income: difference between production value and production cost
- gross income: total net income and personnel costs
- variable gross margin: production value minus variable costs
- standard gross margin: production value minus direct variable costs
- contribution margin: production value minus direct costs

Input categories are:

- land,
- labour,
- production assets,
- or expressed in money: production cost.

Accountancy (in Hungary) applies denominations which are different from the above. Output categories are operating output, business output, regular corporate output, profit or loss after taxation. According to accountancy input is either costs or expenditures. The category 'input' as applied by enterprise studies means the use of funds in accountancy. Accountancy does not calculate with production value, and the list of differences in denominations could still be long continued, making endless misunderstandings possible.

- In order to eliminate the above problem, the following categorization is applied independently of scientific areas: within the two basic categories of efficiency (economic and natural) four groups of indicators are to be identified, which are:
 - o **Supply indicators:** given by input-input quotients,
 - o **Requirement indicators:** given by input-output quotients,
 - o **Productivity indicators:** given by output-input quotients,
 - o **Output-related indicators:** given by output-output quotients.

Below we present the individual corporate level efficiency indicators, on the basis of AKI Test Enterprise data.

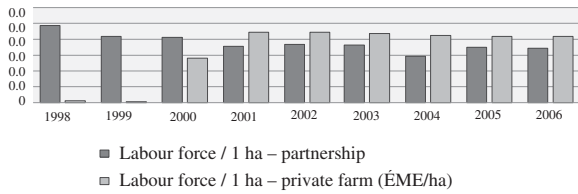
EFFICIENCY		
TYPES	Natural	Economic
Average	$\frac{\sum H}{\sum R}$	$\frac{\sum T\acute{E}}{\sum TK}$
Additional	$\frac{\Delta H}{\Delta R}$	$\frac{\Delta T\acute{E}}{\Delta TK}$
Marginal	—	$\frac{\Delta T\acute{E}}{\Delta TK} \approx 1$

Figure 8. Classification of efficiency by manner of input

– **Supply indicators:** input-input ratios;

Supply (I/I)

Labour force / hectare (LWF/ha)

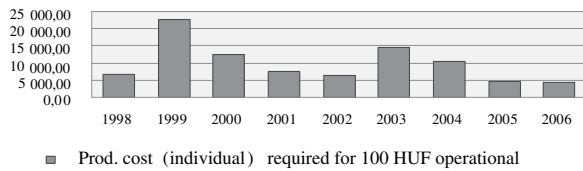


Source: AKI 2007

– **Requirement indicators:** input-output ratios;

Requirement (I/O)

Production cost (individual) required for HUF 100 operating output

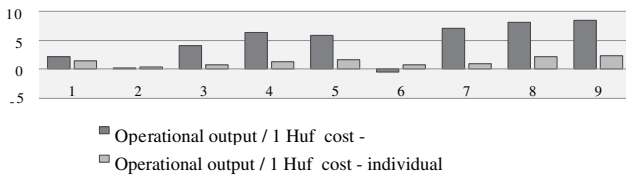


Source: AKI 2007

– **Productivity indicators:** output-input ratios;

Productivity (O/I)

Cost-related operational (business) output (%)

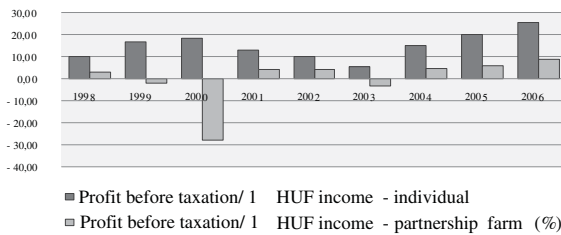


Source: AKI 2007

– **Output-related indicators:** output-output ratios.

Output-relatedness (O/O)

Income-related Profit before taxation



Source: AKI 2007

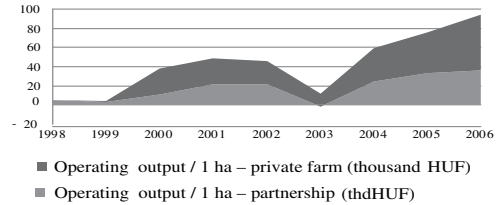
Within and beyond the category of productivity, the concept of profitability can also be discussed. Profitability is given by the quotient of income and any input or output category. An activity of which production value (yield in terms of accountancy) exceeds its production costs (expenditures, costs in terms of accountancy) can be regarded as income producing. Thus, income arises from a difference. Profitability, however, is a ratio, where income itself is in the numerator, and the denominator contains any

input or output category. For example, revenue-related income (Return on Sales (ROS)), or cost-related income.

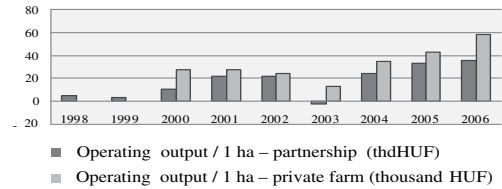
The series of figures below present the development of different efficiency indicators through the test enterprise data. The database contains the results of 9 years.

Graphic representation of test results (total economy)

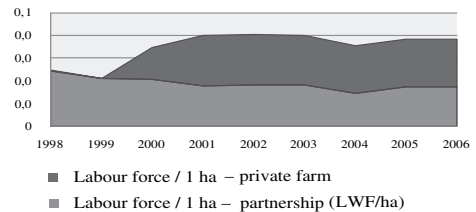
Operating output / 1 ha (thousand HUF)



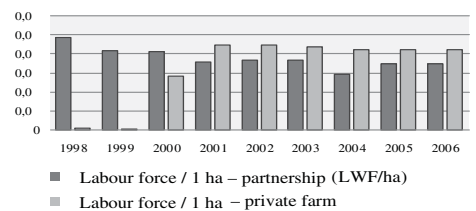
Operating output / 1 ha (thousand HUF)



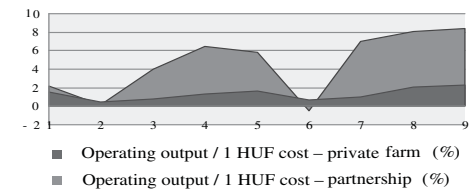
Labour force / 1 ha (LWF/ha)



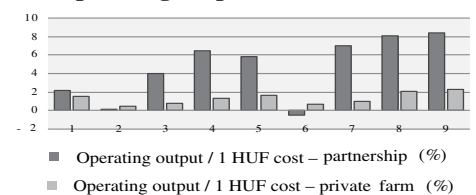
Labour force / 1 ha (LWF/ha)

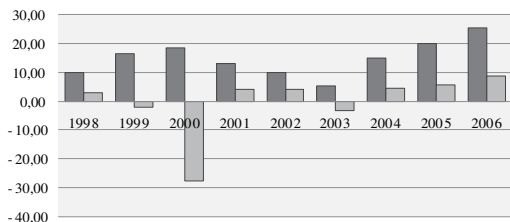


Operating output / 1 HUF cost (%)

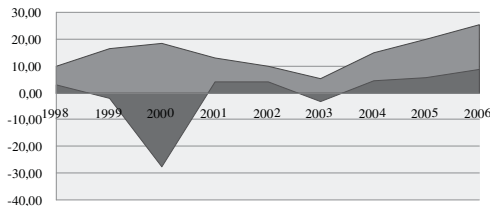


Operating output / 1 HUF cost (%)



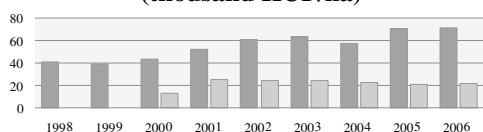


■ Profit before taxation / 1 HUF revenue – private farm (%)
 □ Profit before taxation / 1 HUF revenue – partnership



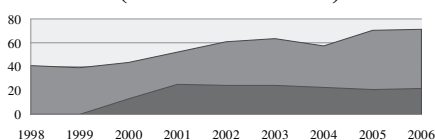
■ Profit before taxation / 1 HUF revenue – private farm (%)
 ■ Profit before taxation / 1 HUF revenue – partnership

Personnel input / 1 ha (thousand HUF/ha)



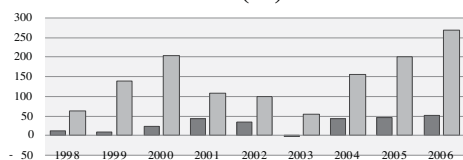
■ Personnel input / 1 ha – partnership (thousand HUF t/ha)
 ■ Personnel input / 1 ha – Privatefarm (thousand HUF t/ha)

Personnel input / 1 ha (thousand HUF/ha)



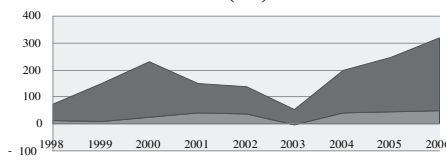
■ Personnel input / 1 ha – partnership (thousand HUF t/ha)
 ■ Personnel input / 1 ha – Privatefarm (thousand HUF t/ha)

Operating output / 1 HUF wage (%)



■ Operating output / 1 HUF wage – partnership (%)
 ■ Operating output / 1 HUF wage – private

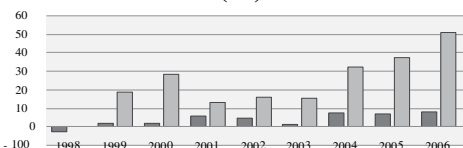
Operating output / 1 HUF wage (%)



■ Operating output / 1 HUF wage – private
 ■ Operating output / 1 HUF wage – partnership (%)

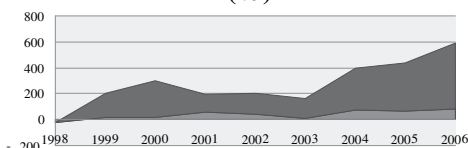
Graphic representation of test results (cash crop producing farm)

Operating output / 1 HUF wage (%)



■ Operating output / 1 HUF wage - partnership
 ■ Operating output / 1 HUF wage – private farm

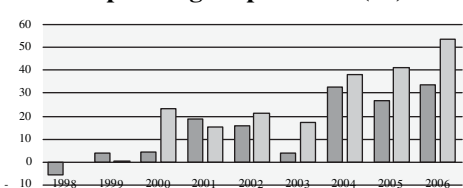
Operating output / 1 HUF wage (%)



■ Operating output / 1 HUF wage – private farm
 ■ Operating output / 1 HUF wage – partnership

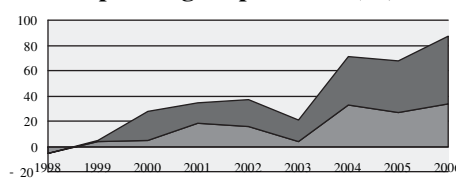
Graphic representation of test results (animal breeding farm)

Operating output / 1 ha (%)



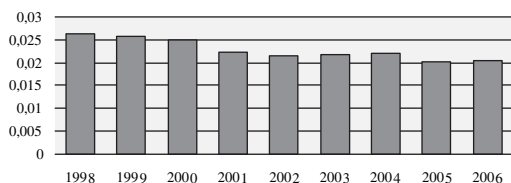
■ Operating output / 1ha – partnership (%)
 ■ Operating output/ 1 ha – private farm (%)

Operating output / 1 ha (%)



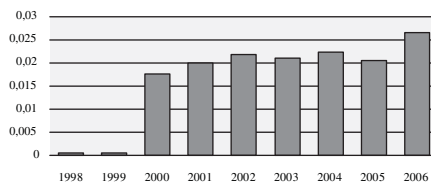
■ Operating output / 1 ha – private farm (%)
 ■ Operating output / 1ha - partnership (%)

**Labour force / 1 ha – partnership
(LWF/ha)**



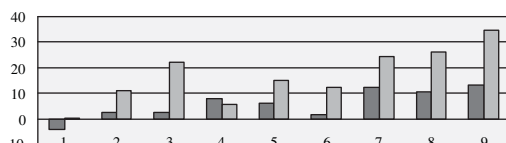
■ Labour force / 1 ha - partnership (LWF/ha)

**Labour force / 1 ha – private farm
(LWF/ha)**



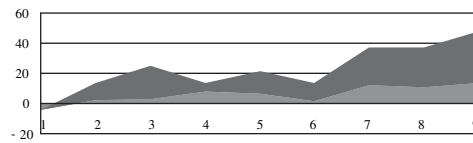
■ Labour force / 1 ha – private farm (LWF/ha)

Operating output / unit cost



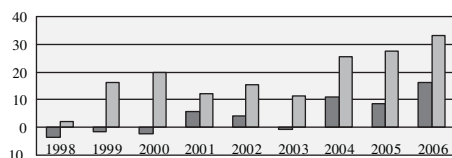
■ Operating output / unit cost – partnership
■ Operating output / unit cost – private farm

Operating output / unit cost



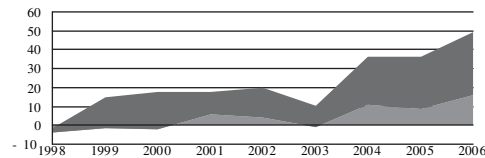
■ Operating output / unit cost – private farm (%)
■ Operating output / unit cost – partnership (%)

Output / 1 HUF revenue (%)



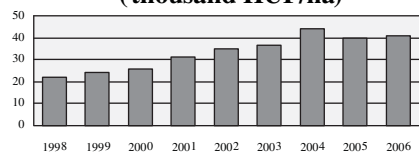
■ Output / 1 HUF revenue – partnership (%)
■ Output / 1 HUF revenue – Private

Output / 1 HUF revenue (%)



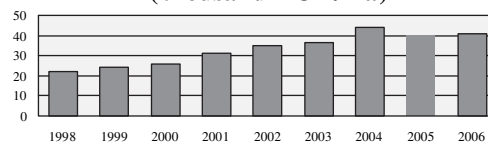
■ Output/ 1 HUF revenue – private farm (%)
■ Output / 1 HUF revenue – partnership (%)

**Personnel input / 1 ha – partnership
(thousand HUF/ha)**



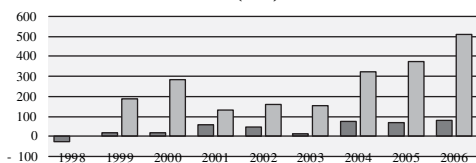
■ Personnel input / 1 ha - partnership (thousand HUF/ha)

**Personnel input / 1 ha – private farm
(thousand HUF / ha)**



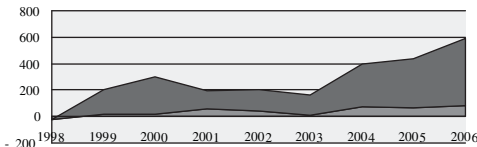
■ Personnel input / 1 ha – private farm (thousand HUF/ha)

**Operating output / 1 HUF wage
(%)**



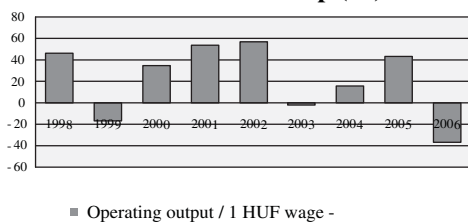
■ Operating output / 1 HUF wage – partnership (%)
■ Operating output / 1 HUF wage – private farm

**Operating output / 1 HUF wage
(%)**

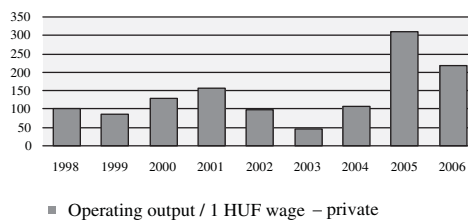


■ Operating output / 1 HUF wage – private farm
■ Operating output / 1 HUF wage – partnership (%)

**Operating output / 1 HUF wage
Partnership (%)**



**Operating output / 1 HUF wage
Private farm (%)**



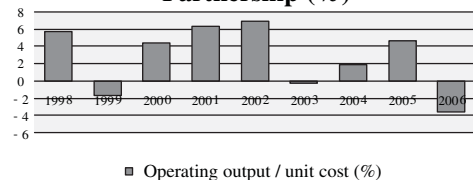
**Labour force / 1 ha – partnership
(LWF/ha)**



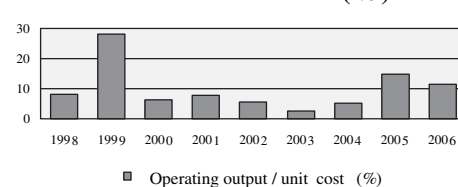
**Labour force / 1 ha – private farm
(LWF/ha)**



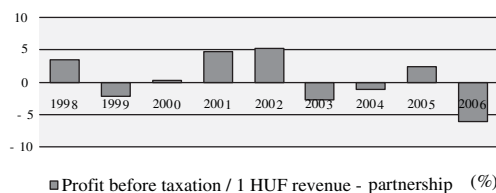
**Operating output / unit cost
Partnership (%)**



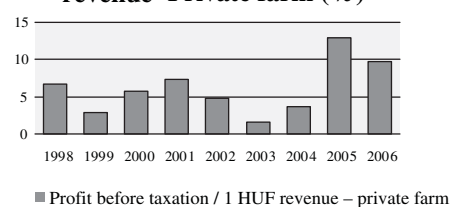
**Operating output / unit cost
Private farm (%)**



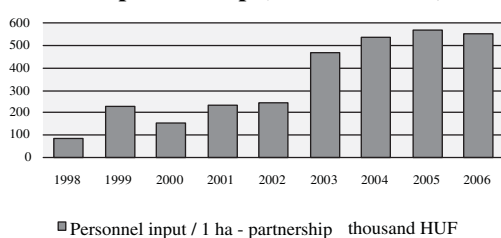
**Profit before taxation / 1 HUF
revenue**



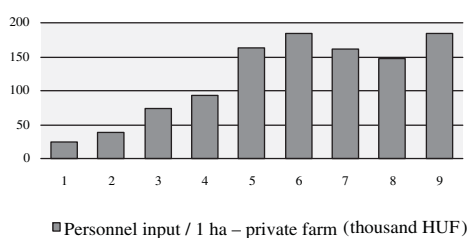
**Profit before taxation / 1 HUF
revenue Private farm (%)**



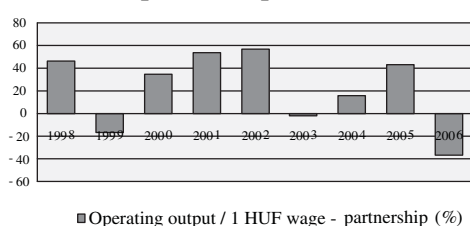
**Personnel input / 1 ha
partnership (thousand HUF)**



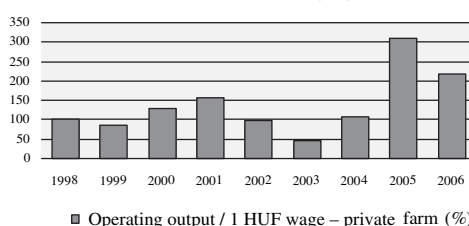
**Personnel input / 1 ha
Private farm (thousand HUF)**



**Operating output / 1 HUF wage
partnership (%)**



**Operating output / 1 HUF wage
Private farm (%)**



Summary

Finally, we provide an overview of the way the concept of efficiency is built up. Efficiency always expresses the relationship between an output and an input category. Different level efficiency indicators are used for estimating the efficiency of an activity (partial, complex, social, corporate, regional and macroeconomic). The smallest unit is the partial efficiency index, which only characterizes the efficiency of one specific sub-unit or resource of the corporation. Complex efficiency reflects the joint efficiency of these resources. Next, corporate efficiency expresses the efficiency of the given corporation or plant through supply, requirement, productivity and output-relatedness indicators. The efficiency of corporations in one specific region is shown by regional efficiency and its different indicators, such as the number of operating enterprises per 1000 inhabitants. The efficiency of all regions provides social efficiency, which expresses the efficiency of the national economy (Figure 9).

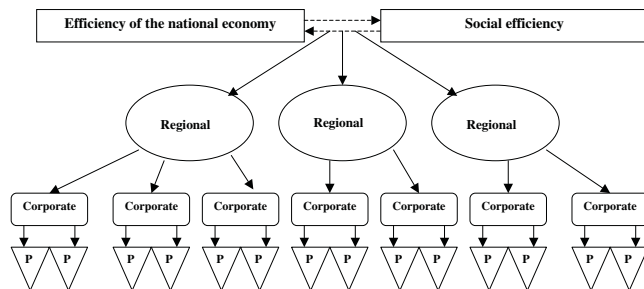


Figure 9 Relations between different levels of efficiency indicators

Comparison of Hungarian and English efficiency indicators

Studying international literature, one often realizes differences between the indicators applied in Hungary and abroad. The reason for these differences lies in the partial differences between the systems of accounting records. In order to make the interpretation of international literature easier, the tables below provide an overview of Anglo-Saxon indicators.

1. Liquidity

Name	Calculation	What does it measure?
Liquidity ratio (Current)	$\frac{\text{Tangible assets}}{\text{liabilities}}$	Can the enterprise fulfill its short-term undertakings?
(Quick ratio)	$\frac{\text{Tangible assets} - \text{inventories}}{\text{liabilities}}$	Can the enterprise fulfill its short-term undertakings without selling its inventories?

² P = partial efficiency

2. Leverage ratios

Denomination	Calculation	What does it measure?
(Debt to total assets)	$\frac{\text{Total debt}}{\text{Total assets}}$	% proportion of capital provided by creditors
(Debt to equity)	$\frac{\text{Debt}}{\text{Equity}}$	% proportion of debt and equity
(Long term debt to equity)	$\frac{\text{Long-term debt}}{\text{equity}}$	Ratio of long-term debt and equity in the long-term capital structure of the enterprise
(Times interest earned ratio)	$\frac{\text{Output before taxation and interest payment}}{\text{Total interest charges}}$	The level of revenue up to which the enterprise is able to fulfill its interest liabilities

3. Activity ratios

Name	Calculation	What does it measure?
(Inventory turnover)	$\frac{\text{Sales}}{\text{Finished products}}$	Does the enterprise hold an inventory larger than needed?
(Tangible assets turnover)	$\frac{\text{Sales}}{\text{Tangible assets}}$	Productivity of sales and utilization of plant and equipment
(Total assets turnover)	$\frac{\text{Sales}}{\text{Total asset value}}$	The efficiency of sales in relation to total asset value
(Account receivable turnover)	$\frac{\text{Return on sales}}{\text{Accounts receivable}}$	Repayment of accounts receivable in% value
(Average collection period)	$\frac{\text{Accounts receivable}}{\text{Return on sales for 1 day}}$	Average length of accounts receivable in days

4. Profitability ratios

Name	Calculation	What does it measure?
(Gross profit margin)	$\frac{\text{Revenue} - \text{procurement price of the goods sold}}{\text{revenue}}$	Gross profit available for covering operating costs and profit
(Operating profit margin)	$\frac{\text{operating (business) output}}{\text{revenue}}$	Profit on sales before taxation
(Net profit margin)	$\frac{\text{Net income}}{\text{revenue}}$	Profit on sales after taxation
(ROA) (Return on total assets (ROA))	$\frac{\text{Net income}}{\text{Total assets}}$	Return on assets after taxation (return of investments)
(Return on stockholders' equity)	$\frac{\text{Net income}}{\text{Stockholders' equity}}$	Profit of stockholders' investments after taxation
(Earnings per share (EPS))	$\frac{\text{Net income}}{\text{Number of ordinary shares}}$	Income available for stockholders
(Price earning ratio)	$\frac{\text{Market price of the share}}{\text{Gain on one share}}$	Attractive force of the enterprise on the stock market

5. Growth ratios

Name	Calculation	What does it measure?
(Sales)	Annual growth rate of sales in%	Sales growth of the enterprise
(Net income)	Annual% growth of profit	Growth of the income of the enterprise
(EPS) (Earnings per share)	Annual% growth of earnings per share	Growth of the income of the enterprise
(Dividends per share)	Annual% growth of dividends per share	Growth of dividends per share

The table below presents the scale of the individual indicators in the case of different sections and activities of the national economy. The figures only serve the purpose of information.

Name	Current	Quick rate	Debt to equity	Inventory turnover	Operating profit margin
Agriculture	1.31	0.39	1.33	2.52	2.58
Mining	1.19	0.77	0.48	0.00	0.00
Construction industry	1.44	0.98	1.31	4.74	1.74
Light Industry	1.50	0.62	1.48	6.05	1.64
Chemical industry	1.54	0.75	1.33	6.94	2.23
Wood processing, furniture industry	1.43	0.62	1.41	6.46	2.16
Machine manufacturing	1.54	0.74	1.34	5.89	2.38
Transport, telecommunications	1.03	0.70	1.64	0.00	1.84
Wholesale, durable consumer goods	1.42	0.69	1.60	7.36	1.11
Retail					
Hardware	1.68	0.43	1.30	4.20	1.11
Clothing	1.90	0.14	0.91	2.96	1.35
Car trade	1.23	0.19	2.61	4.75	0.84
Furniture	1.61	0.38	1.33	4.03	0.92
Catering	0.73	0.18	1.24	35.65	0.43
Services	1.29	0.68	0.75	3.04	0.77
Financial services	1.18	0.43	0.72	0.00	1.29

Source: www.creditguru.com (2007). (I.6)

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Less favoured area measure in the Netherlands: a welcome or negligible addition?

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Abstract: The Less Favoured Areas (LFAs) Directive (75/268) which was introduced in 1975, was the first common European instrument of regional agricultural structural policy. LFAs are areas where agriculture is hampered by permanent natural handicaps. The major objectives were to ensure the continuation of farming, thereby maintaining a minimum population level and preserving scenic landscapes and environmentally valuable habitats. In the Netherlands, the LFA measure is used as an additional payment, to compensate farmers for negative economic effects due to the conservation of these natural handicaps. It was not implemented as a stand alone policy, but is linked to measures aiming at active nature and landscape conservation management. In this paper, the effects will be examined of the regulations aiming at the conservation of natural handicaps on farm businesses within LFAs, when comparing them to farm businesses outside LFAs, where these regulations and handicaps do not exist. The main data source that was used is the Farm Accountancy Data Network. Reference groups of farms were compiled with the use of the simple and multiple imputation approach in Stars (Statistics for Regional Studies). Both analyses were tested with the use of a parametric and a nonparametric test. When comparing the results of both analyses, it can be concluded that there is no evidence that there is a statistical difference in family farm income corrected for and not corrected for LFA payment between the LFA farm businesses and the reference groups.

Based on these findings it can be concluded that the size of the compensatory allowances is small and there is no evidence that it has a significant effect on the family farm income of LFA farm businesses. The main purpose of the Dutch LFA policy is to compensate farm businesses for negative economic effects due to the conservation of natural handicaps. Although this may be true for some individual farms, based on the methods used in this paper, it appears not to be the case for the collectivity of LFA premium beneficiaries as a whole.

Key words: Less Favoured Areas, family farm income, regional development

1. Introduction

Nowadays, more than half of the agricultural area in the European Union is classified as a 'Less Favoured Area' (LFA). The LFA policy was introduced in 1975 as part of the Common Agricultural Structural Policy. The major objectives were to ensure the continuation of farming, thereby maintaining a minimum population level and preserving scenic landscapes and environmentally valuable habitats (IEEP, 2006; Tamminga et al., 1991).

In 2000, the LFA measure was integrated into the Common Agricultural Policy (CAP). In the Rural Development Program for the period 2007-2013 a major shift was perceived as the social need had lessened, and the measure no longer addressed depopulation. At the same time, the concern for the maintenance of certain types of agricultural land use and environmental protection increased. Member states have been offered increased flexibility in the implementation of the measure. They are now responsible for fixing the levels of compensation, defining the types of production to be covered by a scheme, and modifying the

geographical LFA boundaries. The shift of emphasis of the LFA policy to an environmental focus, provoked the question of whether this measure should be subject to review (Dax, 2005).

In 2003, the European Court of Auditors expressed its concerns in a Special Report. It drew attention to the existence of considerable disparities between member states for its effectiveness and efficiency. It is now foreseen that the European Commission will present a new proposal for the designation of the so-called 'intermediate LFAs' in 2009, which are planned to come into force in 2010 (IEEP, 2006).

In the European regulations four different categories of LFAs are distinguished. In the Netherlands only LFAs affected by specific handicaps are implemented into national policy. Less than 10% of the area is considered to be Less Favoured. In the Netherlands, the LFA measure is used as an additional payment, to compensate the farmers for negative economic effects due to the conservation of natural handicaps. It is not implemented as a stand alone measure, but is linked to measures aiming at active nature and landscape conservation management. The compensatory

allowances are €94 per hectare. This income support is financed by the member states and partly reimbursed by the EU. Farmers only receive an LFA payment if they apply a number of nature management packages on their land (Terluin *et al.*, 2007). Since January 2007, part of the Dutch LFA policy has been decoupled from these management contracts (LNV, 2007).

This paper examines the effect of the regulations aiming at the conservation of natural handicaps on the family farm income of farm businesses within LFAs, when comparing them to farm businesses outside LFAs, where these regulations and handicaps do not exist.

2. The LFA designation

The Dutch LFAs are scattered over the country. The Netherlands distinguishes five types of natural handicaps:

1. Deep peat meadows
2. Small-scale sand landscapes
3. River forelands
4. Brook valleys and inundation areas
5. Slopes

Figure 1 shows the designated LFAs in the Netherlands.

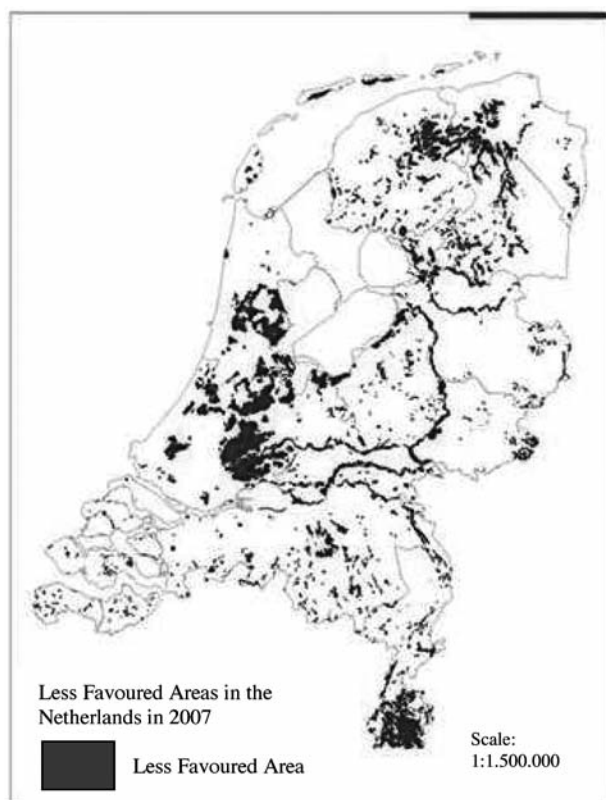


Figure 1: Less Favoured Areas in the Netherlands in 2007 (LNV, 2007)

In table 1 the designation of Less Favoured Area hectares over the different provinces is shown.

Table 1: Designation of Less Favoured Areas over the 12 Dutch provinces, according to regulation (EG) 1257/1999¹

Province	ha LFA	As% total LFA in the Netherlands
Zuid-Holland	46991	21
Noord-Holland	29739	13
Gelderland	28087	12
Utrecht	23740	11
Friesland	22614	10
Groningen	16182	7
Drenthe	15274	7
Noord-Brabant	14519	6
Overijssel	12748	6
Limburg (NL)	12374	5
Zeeland	2733	1
Flevoland	0	0
The Netherlands	225001	100

¹ Including areas designated under Regulation (EG) 950/97 or older regulations (75/268/EEG and 2328/91/EEG) (IEEP, 2006).

3. Family farm income of LFA farm businesses in the Netherlands

In general, Farm Accountancy Data Networks (FADNs) are appropriate tools to monitor income development at a micro level. The advantage of FADN is that it is a harmonized data source with micro-economic data on both the structure and the economic performance of farms (Vrolijk *et al.*, 2005). With the use of FADN, detailed information is available on individual farm businesses, which provide the opportunity to conduct analyses at the farm level and gives an insight into the distribution and differences in incomes between groups of farms. In this study, data for the year 2006 are used. An average over two or three years would be preferable, but due to major policy adjustments in 2004 and 2005 these data were not reliable for analysis. Data for 2007 are not yet available.

In this study, attention is focused on the comparison of the family farm income of farm businesses that are situated in LFAs with farm businesses that are situated outside LFAs. The definition of family farm income is the following:

'Income for the farm family arising from the farm business; this is a remuneration for the labour of all family members as well as the private capital and land' (Berkhout and Bruchem, 2007).

The Dutch FADN covered 1133 farms in 2006. Of these farms, 79 received a Less Favoured Area payment. These farms were selected from the database with the use of a list of LFA receivers in 2006 that was made available by the Dutch Ministry of Agriculture, Nature and Food Quality. This means that 1054 farms in the FADN did not receive an LFA payment. An overview of the farms situated in LFAs, arranged by farm type is shown in table 2. The specialized dairy farms are represented in the sample with 60 farms.

Together, these farms got LFA payments for 1233 hectares in 2006. This means a total amount of approximately €116,000. These 1233 hectares represent roughly 88% of the total amount of subsidized Less Favoured Area hectares in the Netherlands (1398 hectares is 100%).

Table 2: Division of farms situated in Less Favoured Areas by farm type in 2006

Farm types	No. farms	No. LFA hectares
Arable farms	3	28.77
Pasture animal farms:	69	1328.97
– Specialized dairy farms	60	1233.28
Other	8	39.83
Total	79	1397.57

(Source: FADN and own calculations)

Because specialized dairy farms represent 88% of the total FADN sample, only these dairy farms will be analyzed. From now on, only the specialized dairy farms will be compared to other specialized dairy farms in the Netherlands. The definition of a specialized dairy farmer is the following:

‘Grazing animals and pasture contribute more than two thirds of the share of the DSU¹ of the involved farms. The dairy- and cow in calf also contribute to more than two thirds of the share of DSU of the involved farms’ (Poppe, 2004).

4. Definition of the reference groups

4.1 Reference group compilation

In agriculture, data from the FADN are often used to estimate population characteristics. The use of FADN data in regional studies is often problematic due to the low number of observations. A tool for statistics for regional studies (Stars) was developed to make estimates of small areas using the FADN more reliable (Vrolijk *et al.*, 2005).

Reference groups will be compiled that are similar to the LFA farm businesses on certain characteristics, but are not situated in LFAs. In this study attention is focused only on specialized dairy farms. This group is called the population of interest. For each farm in the population, a farm in the FADN sample is selected that resembles the farm as closely as possible. There are several variables that are used to decide whether a farm resembles the sample farm. These variables are called the imputation variables. The choice for the imputation variables is based on Berentsen and Giesen (1994). In this study the following imputation variables are used:

1. Farm type (only specialized dairy farms)
2. NGE (farm size)

3. Number of dairy cows
4. Hectares of grass land
5. Hectares of fodder crops

The condition is that the imputation variables should be known for all farms in the sample and in the population. This is true for these variables. Now, based on these variables the mean difference is calculated. The sample farm with the smallest dissimilarity is regarded as the farm that resembles the population farm as closely as possible. For each farm in the population, the most similar farm is selected from the sample. This best fit is recorded together with measures expressing the dissimilarity. Based on this best fit, estimates can be made for a set of goal variables, which are known in the sample but unknown for all population farms. The goal variables are family farm income, total revenue, total costs and total farm profit. A separate analysis will be done for farm businesses in the deep peat meadows, because they are represented in large numbers in the population of interest.

4.2 Distance restriction

The FADN farms that are used for the reference group selection have to satisfy a few conditions. First of all, the farms should be specialized dairy farms, like the population. This means, 274 FADN farms are eligible for selection for the reference group. Second, the farms must not be situated in an LFA area. There are, however, farm businesses with part or all of their parcels of land inside an LFA, who do not apply for LFA payment. These farms have to be excluded from the reference group selection. Since the location of the parcels is not available for each farm individually, a minimum distance to the nearest LFA is chosen to minimize this chance. A minimum distance of 1000 meters from the nearest LFA was considered as a reasonable interval. Taking a larger distance would result in too little available farm businesses left for the reference group selection, taking a smaller distance results in a larger chance that the farmer has parcels in LFAs. The farms are located using a GIS-application. When applying the minimum distance to the FADN sample, 177 farms can be selected.

5. Simple imputation approach

5.1 Simple and multiple imputation

In making estimations for the population of interest a choice can be made between *simple* and *multiple* imputations. Vrolijk *et al.* (2005) describe that simple imputation has the disadvantage that the variance of the estimator is underestimated. The estimated (or imputed) value is treated as the real value, although there is a degree of uncertainty about this value. To overcome this problem multiple imputation can be used. In this option it is possible to define how many of the best fit farms will be used to make estimates about the population. In this study, both approaches will be applied. To make estimates of the

¹ Dutch Size Units (DSU): A unit describing the economic size of agricultural holdings. The DSU is based on the standard gross margins (SGM), which are calculated by deducting related specific costs from the gross returns per hectare or per animal. The SGM is expressed in euro (current prices) (Poppe, 2004).

population of interest (LFA specialized dairy farmers) sample farms are matched to population farms based on the imputation variable. In this section, the best fitted sample farm will be matched to the population farms to make estimates of the goal variables.

5.2 Test procedure

In the simple imputation approach, each farm in the population is matched with the best fitting sample farm. The two samples are not independent. When designing the study, it was recognized that there are large differences in the family farm incomes between the farms, this would result in large variations among the 60 estimates of the reference group compared to the LFA farmers. By having both groups give an estimate of their incomes, the difference could be calculated between the estimates of the LFA and non-LFA farmers and hence the large variability between incomes could be reduced (*Ott and Longnecker, 2001*). In this situation, the two groups maintain important differences prior to their assignment to the group. The use of paired data in this paper reduces the variability in the standard error of the differences in the sample means in comparison to using independent samples. The actual analysis of paired data means computing the differences in the n pairs of measurements, $d_i = y_{1i} - y_{2i}$, and obtaining \bar{d} , s_d the mean and standard deviations in the d_i s. Also, the hypotheses of μ_1 and μ_2 must be formulated into hypotheses about the mean of the differences, $\mu_d = \mu_1 - \mu_2$. The conditions required to develop a t procedure for testing hypotheses and constructing confidence intervals for μ_d are:

1. The sampling distribution of the d_i s is a normal distribution
2. The d_i s are independent; that is, the pairs of observations are independent.

First, the paired t test will be applied to the total revenue, total costs and total farm profit. This gives an overview of the elements that make up the family farm income. Next, the paired t test is applied on the family farm income with and without LFA payment on both the LFA farm businesses and the reference group. The drawn conclusion will be based on $\alpha = 0.05$.

For these data, the parts of the 2-sided statistical tests are

$$H_0: \mu_d = \mu_1 - \mu_2 = 0$$

$$H_1: \mu_d = \mu_1 - \mu_2 \neq 0$$

Before computing t , first the \bar{d} and s_d will be calculated. The mean, standard deviation and the test results of the total revenue, total costs and total farm profit of the 60 LFA farms and their reference group are given in tables 3, 4 and 5.

Table 3: Total revenue (€, rounded) on the LFA farm businesses and the reference group¹, 2006

	LFA farms	Reference group	test statistic t	p-value (sig. 2-tailed)
Mean	261,100	258,500	0.284	0.777
Std Dev.	138,500	144,500		

¹ Total revenue for operational management, depending on the VAT

Table 4: Total costs (€, rounded) on the LFA farm businesses and the reference group¹, 2006

	LFA farms	Reference group	test statistic t	p-value (sig. 2-tailed)
Mean	171,500	170,800	0.076	0.940
Std Dev.	92,000	76,000		

¹ Including depreciations and excluding interests

Table 5: Total farm profit (€, rounded) at operational management¹, 2006

	LFA farms	Reference group	test statistic t	p-value (sig. 2-tailed)
Mean	63,300	58,500	0.614	0.541
Std Dev.	50,400	65,900		

¹ Depending on VAT

The t -test statistic is smaller than the tabulated t -value (2.000) for $df=59$. Based on the results, there is no evidence that there is a difference in total revenue, total costs and total farm profit between the LFA farm businesses and the reference group.

The same paired t test will be performed on the family farm income with and without an LFA subsidy of the LFA farms and the corresponding reference group. The drawn conclusion will be based on $\alpha = 0.05$. The mean, standard deviation and the test results of the 60 LFA farms and their reference group are given in tables 6 and 7.

Table 6: Family farm income (€, rounded) minus Less Favoured Area payment, 2006

	LFA farms	Reference group	test statistic t	p-value (sig. 2-tailed)
Mean	61,600	59,300	0.290	0.773
Std Dev.	50,100	67,200		

Table 7: Family farm income (€, rounded), 2006

	LFA farms	Reference group	test statistic t	p-value (sig. 2-tailed)
Mean	63,500	59,300	0.538	0.592
Std Dev.	50,200	67,200		

The t -test statistic is smaller than the tabulated t -value (2.000) for $df=59$. This shows that there is no evidence that the family farm income with and without the LFA payment is different from the family farm income of the reference group. Also the nonparametric Wilcoxon signed-rank test is performed to test the various hypotheses and showed the same results.

6. Multiple imputation approach

As described in section 4, there are two ways in which estimations can be made for the population LFA farm businesses and the reference groups. In this section, the

multiple imputation approach will be used. By using the multiple imputation approach, it can be defined how many best fitting farms should be used for the sample to make estimates about the population (Vrolijk *et al.*, 2005). In this case, for each LFA farm business, the five best fitting farms will be matched to the population. The same imputation variables will be used as in the simple imputation approach. Now, Stars searched for the five best fitting farms to make estimations about the population. Stars simulates that at random one of the five reference farms is chosen to match the LFA farm business. Theoretically, all 5^{60} combinations of LFA farms and the reference farms would have to be analyzed to get to know the distribution of the mean. This is quite impracticable; therefore the combinations will be simulated 1000 times at random. To determine whether the hypotheses are significant, the mean and the sampling distribution are necessary. The dissimilarity is calculated for the goal variables, all farms and all simulations between the reference farm and the LFA farm. For each goal variable, the mean difference is calculated, as well as the corresponding standard deviation. From this point onward the same procedure is used as in the simple imputation approach. Having all the elements of the paired *t*-test, the *t*-test statistic is calculated. The drawn conclusion will be based on $\alpha = 0.05$. For these data, the parts of the 2-sided statistical tests are

$$H_0 : \mu_d = \mu_1 - \mu_2 = 0$$

$$H_1 : \mu_d = \mu_1 - \mu_2 \neq 0$$

The *t*-test statistic, the confidence interval of the family farm income for the 60 LFA farms, and their reference group are given in table 8.

Table 8: Paired *t*-test for business indicators of LFA farmers and the reference group

Variables	Test statistic <i>t</i>	Confidence interval Lower and upper bound	Rejection yes/no
Family farm income Family farm income	-0.625	- 19,700 and + 10,300	No
Family farm income minus Less Favoured Area payment	-0.368	- 17,700 and + 12,200	No
Farm business indicators Total costs (total paid costs included depreciations and excl. interest)	0.538	- 11,400 and + 19,700	No
Total revenue (for operational management, depending on VAT)	0.027	- 18,700 and + 19,300	No
Total farm profits (shown at operational management, depending on VAT)	-0.990	- 22,000 and + 7,400	No

No H_0 hypotheses are rejected, the *t*-test statistics are smaller than the tabulated *t*-value (2.000), and the *p*-values are $> \alpha = 0.05$ (2-tailed). Also when using the nonparametric Wilcoxon signed-rank test the same results were shown.

Based on the results, it can be concluded that there is no evidence that there is a difference in total revenue, total costs and total farm profit between the LFA farm businesses and the reference group. There is also no evidence that there is a difference in family farm income, before and after subtraction of the LFA payment, of the LFA farm businesses and the reference group.

7. Deep peat meadows

Nineteen deep peat meadow farm businesses that are situated in the provinces of Zuid-Holland and Utrecht are present in the FADN sample. Because of the size of the group, and the share of the deep peat meadow LFA farmers in the Dutch LFA policy, this group was analyzed separately. Both the simple and multiple approaches were applied to the data. Both analyses were tested with the use of both a parametric and a nonparametric test. From the results of the analyses when applying the multiple imputation approach it can be concluded that there are no significant differences between the LFA farm businesses in the deep peat meadows and their reference group. Only when the simple imputation procedure is applied², there is a statistically significant difference in the family farm income before subtraction of LFA payment, between the deep peat meadow farm businesses and the reference group. Then the family farm income of LFA farm businesses in the deep peat meadows is significantly higher than the family farm income of the reference group. The results of the family farm income after subtraction of the LFA payment and the other farm business indicators showed no significant differences.

8. Conclusion

It is a challenge to support farming in regions with particularly unfavorable natural conditions for agricultural production. Farmers in Less Favoured Areas sometimes have a long tradition of farming, and farms are taken over generation after generation in the same place. Farmers create the landscape, use the landscape and adapt to the landscape.

This study tried to find out whether there are differences in family farm incomes of LFA farm businesses, due to the existence of natural handicaps in LFAs, when compared to farm businesses outside LFAs, where these handicaps do not exist. A reference group of farms was compiled with the use of the simple and multiple imputation approach in Stars. Because a large group of LFA farm businesses are located in the deep peat meadows, these farms were taken separately and a separate reference group was composed. Both analyses were tested with the use of a parametric and nonparametric

² The simple imputation approach is tested with both a parametric and a non-parametric test. The outcome of the parametric test was significant with a 95% confidence interval for the variable family farm income, before subtraction of the LFA subsidy, in the deep peat meadows.

test. When comparing the outcomes of both analyses, using both tests, the overall conclusion is that there is no evidence that there is a difference in family farm income (excluding LFA payments) between the LFA farm businesses and the reference groups. When looking at the family farm income including the LFA payment, still no evidence was found that there is a significant difference in family farm income between the two groups. Based on these findings it can be concluded that the relative size of the compensatory allowance is small and there is no evidence that it has a significant effect on the family farm income of LFA farm businesses. A significant different family farm income is found in the deep peat meadows, however but only when applying the simple imputation approach. When applying the multiple imputation approach to the reference group, no significant difference between the groups could be found anymore. It can be concluded, based on the method used in this paper, that there is no evidence that the family farm income of Dutch LFA farm businesses is affected by the regulations aiming at the conservation of natural handicaps, when compared to farm businesses outside LFAs. The main purpose of the Dutch LFA policy is to compensate farm businesses for negative economic effects due to the conservation of natural handicaps. Although this may be true for some individual farms, based on the methods used in this paper, it appears not to be the case for the collectivity of LFA premium beneficiaries as a whole.

9. Discussion

In 2004 and 2005 major adjustments were made to the Dutch Less Favoured Area policy. This meant the datasets for these years were not reliable for analysis. The year 2006 was chosen as it was the first year in which all data were available, and therefore can be used for the quantitative part of this study.

Only 79 LFA farm businesses on the list of LFA payment receivers were present in the FADN for the year 2006. This is a low number of farms, and it would be better to have a larger dataset.

Another problem rose when locating the non-LFA farm businesses for the reference group composition: There is a possibility that there are farmers that do have land in a LFA, but did not apply for this subsidy for several reasons. This means that the conditions of farming are exactly the same as for the LFA farmers. It is difficult to locate these farm businesses by using the available statistical data. By setting up a minimum distance of the reference farms from the LFAs, this problem has been reduced, although it could not be removed with absolute certainty.

The regional differences in prices of land could affect the family farm income of LFA farm businesses and farm businesses outside LFAs. Sufficient data necessary for research on this topic are not available, so no conclusions can be drawn.

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Co-innovation: what are the success factors?¹

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Abstract: The problem we address in this paper is that in projects focusing on public-private cooperation to stimulate innovation in the Netherlands, initiatives often lack continuation after the study-phase. We extracted possible influencing variables from business and (transaction) cost economic theorizing, stakeholder and capability theory. Moreover, we used measures for classifying projects with respect to financial interdependencies between participants. We supposed that project characteristics influence managerial behavior to continue or stop.

We studied 28 projects (20 supply chain projects and 8 biological product development projects). Our aim was to explore the barriers and success factors for these co-innovation projects: innovation as a cooperative effort between public sector/research institute and private organization(s).

We derived data from project descriptions and performed semi-structured interviews with project informants. Critical to success appears to be ex ante commitment of all parties. Goal congruence, both at a personal and a company level, and proportionality of sharing in project results are of decisive importance to establish such commitment. Estimations about financial project results should be made in an early stage; they should be used as a basis for negotiations on the (re)distribution of costs and benefits, especially if the value added is disproportionately distributed over the participants. Ideally, project teams of co-innovation projects should bring in complementary capabilities: technical, marketing, financial and organizational. Project governance should therefore be organized in such a way that the knowledge gaps are filled in before kick-off.

Key words: co-innovation, food industry, supply chains, investments

1. Introduction

Innovation is, as to J.A. Schumpeter and many others, the primary source for gaining and maintaining competitive advantage. This is especially true for the European food and drinks industry, which consists to a large extent of SMEs (companies with less than 250 employees). SMEs possibly experience barriers in continuous innovation because of lacking budgets, skills, competences and capabilities to systematically improve processes and products (Teece 1997; Avermaete et. al. 2004). SMEs account in Europe for about 50% of turnover, and include 99.1% of the total population of companies. The European Food and Drinks sector is the largest manufacturing sector in the EU, with a total turnover of € 836 billion in 2005, which is 13.6% of total manufacturing turnover, and 3.8 million workers in 282,600 companies (CIAA, 2006, p.5). SMEs have a distinctive and important role to play in the diffusion of innovations into the market, and in some ways even are in advance compared with large firms (e.g., lack of bureaucracy, fast internal communication, informality and nearness to the consumer; Freel, 2008). Although there is abundant evidence that small firms innovate more than large firms, there is also the

concern that innovation in the food and drinks industry lags behind. Organizational learning networks provide a relatively cheap device for capacity-building and acquiring complementary assets (McGovern 2006; Powell 1990). Learning networks can be built in cooperation with the government. If they are directed at innovation, the result will be a co-innovation structure. As pointed out by Williams (2003), innovation is associated with continuously undertaking projects. Managing projects has become a complicated task due to increasing technological complexity and time pressure. For this reason is it of extreme importance for companies to assess the success achieved (or the reasons of failure) of the projects they invested in. Learning is recognized as an essential process that stimulates the renewal of the firm's knowledge (Lane and Lubatkin, 1998). However, in order to "create knowledge", in the words of Nonaka and Takeuchi (1995) and to learn from projects (Williams, 2003), firms need to have a clear understanding of the mechanisms that lead to success or failure of innovation projects.

The problem we address in this paper is that co-innovation projects often lack continuation after the study-phase. The question is: what are the underlying factors that

¹ This paper was modified after being presented at the Continuous Innovation Conference, Valencia 2008.

lead to success or failure? The answer to this question is extremely important: it contributes to a learning process and will give ways to improve future supervision of co-innovation.

In this paper, success is defined (1) on a project level as the willingness to make (follow-up) investments and (2) on an individual level as (2) the satisfaction of the participants with the project results. The choice to use personal satisfaction and learning as key aspects that favors the willingness to undertake future cooperative efforts (*Gadstein* 1984, *Hoegl and Gemuenden* 2001). As already posed, innovation is a crucial factor for the survival of companies as well as of whole industrial sectors. Key factors that determine success can be located in the potential and perceived market opportunities, but also in the fit of initiatives to innovate with business structure and existent capabilities of firms (and therefore absence of exorbitant investment and transaction costs). The relevance of cooperative teams for successful innovation project results has been confirmed by several studies (*Hoegl and Gemuenden*, 2001). This article focuses on the (required) project attributes and managerial skills to make (co-) innovation a success. Expressed intentions to co-invest can be regarded as a sign of permanent commitment to common goals.

This paper is structured as follows, In § 2 the theoretical foundation is explained. § 3 contains the material and methods of this paper. In § 4 the results will be addressed. Finally, the conclusions and managerial implications are described in § 5.

2. Theoretical framework

Working in cooperation to innovate has become an imperative in an economy where firms' links are increasing in number and in relevance (*De Man*, 2004). To innovate, individual efforts alone are not sufficient and the use of partnerships has developed remarkably in the last years (*Hagedoorn* 2002). That cooperation as an essential ingredient for innovation performance has been widely recognized in the innovation management literature.

Working in teams has been recognized as one of the critical success factors that can foster the levels of innovation at the firm level (*Cooper and Kleinschmidt*, 1995). However, the literature has paid little attention to define different measures of project success and to explore what drives the innovation achievements (*Hoegl and Gemuenden*, 2001). In their study, *Hoegl and Gemuenden* (2001) have conceptualized the success of innovation projects in teamwork under multiple dimensions. Those dimensions include, a) effectiveness, which refers to the quality of the outcome, b) efficiency, achieving the project 's goals within the time and the budget constraints imposed c) work satisfaction, indicating the personal fulfillment and the willingness to undertake new projects in the future, and, d) learning, the acquisition of new knowledge. The above aspects have been proven to be related to the quality of teamwork.

The factors that have an influence on the success of projects are related to the second part of the present study. There is a great variety of aspects that can support or inhibit the results of co-innovation projects, spreading from the role of individual characters of team members to more general aspects like the organization of the team work (*Pinto et al.* 1993). Especially when cross-functional teams are involved in an innovation project, four factors have been identified as stimulating the team cooperation and the project's success. Those factors include the clear definition and commitment to a goal, the existence of rules and procedures for coordinating the team activities and tasks, the proximity of the personnel involved in the cooperation and the accessibility related to the rate and regularity of the communication within the team (*Pinto et al.* 1993). Remarkably, perceptions about the determinants and the consequences of cooperative teams are similar in different departments like R&D, marketing or manufacturing: In all cases managerial direction and support has been perceived as essential for the success of the cooperative project (*Song et al.* 1997).

In the present work the above literature is expanded to take into account the investments associated with the innovation project. To explain the project results in terms of satisfaction of participants and their inclination to invest, we make a distinction between the following groups of variables:

- perceived costs and benefits (§ 2.2);
- stakeholder norms and support (§ 2.3);
- controllability: the ability of the participants to carry out the project (§ 2.4).

We use the 'characteristics of the investment project', especially dependency and result distribution, as factors which influence the behavioral variables as presented in § 2.2–§ 2.4; these in turn are supposed to influence the level of satisfaction with project outcomes, and thus the willingness to continue.

2.1 Investment Project Specifics

Investments are the result of complex decision processes. This is contrary to the common notion that investing depends on calculating the present value of future, predictable, cash flows (*Sauner-Leroy* 2004). Asset-specificity and irreversibility of investments, environmental dynamism and uncertainty, make committing to joint investment activities a risky matter. As to *Sauner-Leroy* (2004), irreversibility causes "irredeemable and asymmetric cost of des-investment", and the cut-off of strategic alternatives. Being locked into a particular investment makes the project partners vulnerable to opportunism (*Williamson* 1975, 1985). We discern *investment dependency* and *value dependency*. With investment dependency the situation is depicted in which more than one party has to make investments to make the project a success. Value dependency is often the result of investment dependency: no participant can cash the added value on his own. Value dependency occurs at the output side, while investment dependency is located at the input-

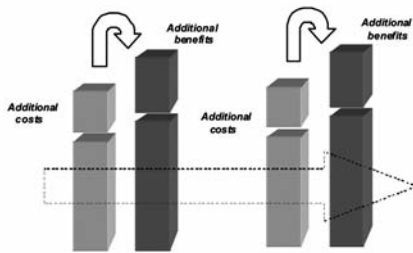


Figure 1a. Example of independence and proportional distribution of value added. Project: “Energy reduction in the pork chain”.

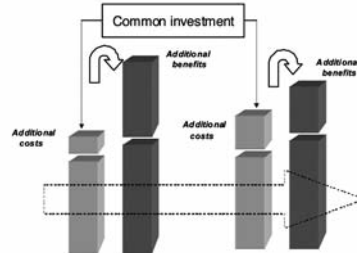


Figure 1b. Example of dependence and disproportional distribution of the value added. Project: “Easy slurry system”

Source: Bremmers & Broens 2008; details on: www.akk.nl

side of a project. Dependencies are binding forces for the participants, because they cannot easily opt out once a commitment has been made. However, they could also be exploited in an opportunistic way. This is especially true in case of, what we call, *value displacement* (Broens and Bremmers 2007). Value displacement occurs if (extra) efforts by one partner in a (co-)innovation project cause extra benefits for someone else, and vice versa. A perceived lack of fairness of the initial distribution of project advantages can be mended by negotiating on a redistribution scheme. To establish an acceptable scheme, trust between the partners is of viable importance. The categories we use to characterize projects are visualized in figures 1a and 1b.

A perceived des-equilibrium in outcome distribution is deepened by environmental and accounting uncertainty. With environmental uncertainty we refer to a lack of predictability of market success of an investment project. Accounting uncertainty refers to the lack objective (financial) measures and/or skills to calculate expected project outcomes. Moreover, the financial criteria which are used by partners can be different; probably they will use accrual accounting techniques (like activity based costing) instead of more transparent cash accounting techniques. The resulting asymmetric distribution of information can infringe on the willingness to invest. Tacit assets and benefits, the absence of benchmarks and/or negative projections for the first years of a project can deepen feelings of uncertainty and fear of opportunism. Trust can compensate for the lack of transparency. Trust depends on past (positive) experiences, the duration of the relationship, the relative – in proportion to total investments – size of the investment, and the availability of investment alternatives (which provide opportunities to opt-out).

The investment characteristics affect three clusters of variables which explain behavioral intentions: the attitude (perceived and expected costs and benefits), the normative environment of the decision maker and the level of perceived controllability (Ajzen 1991). In our view these primarily psychological variables can be interpreted from a managerial perspective as being related to (transaction) economic theory, stakeholder theory and dynamic capability approach (which, in turn, finds its roots in the resource based view; compare:

Amit & Schoemaker 1993; Barney 1991; Wernerfelt 1984). The (psychological) theory of planned behavior (Ajzen 1991) serves to bring these theories together in an integrated framework.

2.2 Explaining Investment Decisions: Costs and Benefits

The model we use explains the decision making processes in co-innovation processes from the following categories: *attitude* (perception of competitive advantage (positive,

Porter 1980; 1981) and cost and risk awareness (negative; Masten 1993), *subjective norms* and *controllability* (available budgets, size of the organization, existing competences, previous experience with innovation etc.). The attitude towards a project is the result of a personal ‘cost-benefit analysis’, of the expected results of certain actions (Tonglet et al., 2004). Such a cost-benefit analysis is made constantly in “go-nogo”-decisions by project participants. The positive side of co-innovation is the expected increase of the participant’s net cash flows; in symbols:

$$p^* \frac{\sum CF}{\delta N}$$

In which: CF = Cash Flows, N = the number of firms, p is the probability of success, and stands for a ‘disproportionality parameter’². The ‘fit’ of a project in the individual firms’ strategy is possibly an important factor influencing the expected net-cash-flows. Prospector firms (Miles et al. 1978) will focus on product innovation, while defender firms will be more reluctant to accept completely new (product) innovations.

The negative consequences of joint investments are measured as $\frac{I}{\alpha N} + \frac{\beta(N)}{\gamma} TC$

The first part of the equation indicates that joint investment cash-outflows are split up over more than one project partner (N). The factor denotes the share individual partners take in the total initial investment (I). The second part refers to the additional relational transaction costs (TC, costs of contracting, monitoring and control; see Rindfleisch and Heide 1997; Williamson 1998), which will reduce the net benefit of a partnership. Individual (Transaction) Costs will be lower ($1/\gamma$) with the ability to share such costs and will increase the wider the network stretches ($\beta_{(N)}$). Transaction cost reasoning addresses the problem of how costs of transacting influence the choice between exchange in a hierarchy (vertically integrated organization) and spot exchange (market), as well as hybrids (alliances, joint

2 Indicating a more or less than proportional share of total positive cash flows to individual partners out of the project, in case of value dependency and displacement

ventures etc.) are made, from a *cost* perspective. Hierarchies (integration, in our case: cooperation) in the co-innovation projects, cause bureaucratic costs. Key dimensions of governance like asset specificity (dependence), asymmetrically distributed information and uncertainty can create space for opportunistic behaviour, so that 'competition' (stand-alone investment) over cooperation (co-innovation) is preferred (compare: *David and Han* 2004; *Geyskens et al.* 2006; *Poppo & Zenger* 1998, 2002).

2.3 Stakeholder Norms

The network in which the project organization is embedded plays a definite role in the decision making process and project evaluation. Primary stakeholders are fellow-companies, research institutes/public agencies as well as strategic (top) management. They provide norms and support for actions (i.e., project involvement (*Dirsmith and Covalleski* 1983)). Norms to behave in a certain way are not only extracted from the business environment, but also from the home organization. Without support from top-management, a double round of project-approval would be necessary: one within the project team and another at the home-office. Should a strategic fit between project delegate and home office be lacking, the initiative will be abandoned at the latest when real investments have to be made.

2.4 Control

Control is the *ability* to behave as is intended. Past experiences with partners in similar projects will contribute to the perception of control (i.e., will reduce perceptions of risk and uncertainty). The availability of the necessary assets, competences and capabilities improves the chances for success of the project. As to the resource based view, companies distinguish themselves from competitors by the specific, hard-to-imitate, valuable assets they possess (*Barney* 1991). Such assets can be physical (machinery), intellectual (knowledge base), social (networks) and organizational (procedures, systems) of a kind. The dynamic capability approach is an extension of the resource based view (*Teece et al.* 1997; *Newbert* 2005). Capabilities are tacit assets (routines) which make firms able to strategically come up to environmental challenges. Investments which are complementary to existing routines will be adopted more easily than 'alien' investment options. The existing assets form a 'frozen memory' of stakeholder wishes from the past. However, available routines of action and interpretation, of skills and competences, could also obstruct a clear vision on radical innovation options (*Gersick and Hackman*, 1990). We suppose that available routines (built by experience) facilitate new innovations, especially in prospector firms which have acquired the capabilities to creatively deal with complex learning and unlearning processes (compare: *Lybaert*, 1998, in: *Freel* 2008).

2.5 Research Model

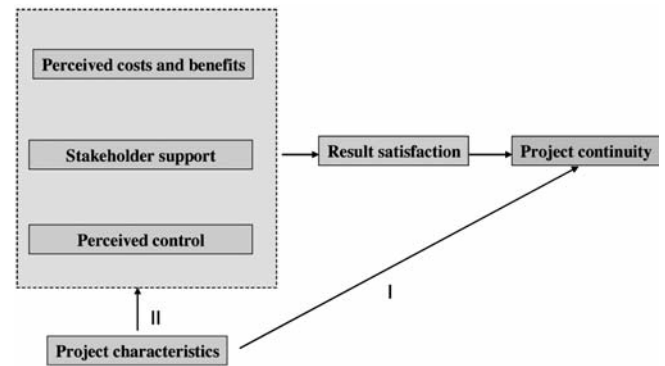


Figure 2. Research model

On the basis of the exposure of the theoretical foundations, the research model in figure 2 can be formulated. In the analysis of the first sample of 20 supply chain projects (I) (*Bremmers & Broens* 2008), a direct relationship between project characteristics and project continuity was observed. The results have been described and were used to build a decision making tool for project management³. A key conclusion in study (I) was that in projects with dependency and value displacement, ex ante measurement of probable project outcomes and the design of a fair redistribution system contributes to project continuity. If not, such projects often come to a halt after the initial research phase (the phase in which the research institute is participating). Focusing on co-innovation projects, a second sample (II) was used to explain the level of project satisfaction by means of costs and benefits, stakeholder influences and control, to deepen the findings and triangulate the results.

3. Material and methods

The second sample comprised of 8 co-innovation projects (subsidized by the Dutch Ministry LNV and carried out in the period 2005–2007). The projects are summarized in table 1.

Table 1. Co-innovation projects

	Title of project	Supply chain partners
A	Dairy innovation	4
B	Fruit Innovation	4
C	Juice innovation	3
D	Vegetable species	3
E	Flower Innovation	3
F	Soft drinks	4
G	Chicken	3
H	Vegetables	4

³ A CD-rom with the results and a management tool (in Dutch) are attainable at SenterNovem (The Netherlands); www.SenterNovem.nl

Table 2. Operationalization, means and standard deviations (STD)

Question	Code	Theoretical support	Mean	STD
Costs and benefits (attitude)		(Transaction) cost economics	7-point scale (1 = low, 7 = high)	
The participants were at the start convinced of the success of the project	Convinc	lack of expected success (uncertainty) causes low levels of project integration (vv)	4.88	1.356
The project is important for attaining the participant's business goals	Import	high levels of goal convergence increases the willingness to invest.	3.75	1.389
The participants perceived the advantages of the project to be distributed fairly	Fair	experienced fairness will reduce opportunistic behavior and the necessity to monitor and control.	4.13	1.246
Stakeholders (normative environment)		Stakeholder theory	Mean	STD
The private goals of the participants in the project converged	Fair	experienced fairness will reduce opportunistic to common projects (vv)	4.63	2.326
The opinion about the direction of the project converged	Opinion	homogeneity of stakeholder strategies leads to commitment in common projects (vv)	4.38	1.768
The top-management of the firms supported the project from the beginning	Commit	support from stakeholders/superiors leads to commitment in common projects	4.38	2.134
Capabilities (control)		Dynamic capabilities approach	Mean	STD
The participants have experience with the type of project activities that are expected	Experience	Similar activities in the past improve the capabilities that make the project a success	4.25	1.909
The composition of the project team was ideal for this project	Ideal	Complementary capabilities improve project control	4.25	2.252
The advantages and disadvantages for the participants were known at the start of the project	Division	Higher predictability by assessing probable benefits and costs (planning capabilities)	2.50	1.309

The information on the characteristics and outcomes of the projects was derived from official reports and from a semi-structured interview with a key informant that was unaware of our theoretical framework. A questionnaire was designed to structure the information. Most questions were designed as Likert 7-point scales. The following questions were asked with respect to the three behavioral categories (table 2). Levels of dependency and value displacement were measured.

4. Results

4.1 Structural Project Characteristics

All projects focus to some extent on product- and/or market development. In all projects the improvement of efficiency is not the primary motive for cooperation. To check this, we posed the statement: "The project has as a focus to supply products cheaper than competitors". The average score was only 1.63 (STD = 0.756). All are primarily interested in product innovation, but in doing so will have to reorganize their supply chain. This is least the case in the Fruit Innovation project, as the introduced berries were already available; the project focused on harvesting and setting up a domestic supply chain. All projects combine product- and/or market development with a high grade of knowledge acquisition. Special dominance of one

of the project participants was found in projects B, C, D, F and G, which could influence a fair distribution of project results. The Juice as well as the Fruit Innovation project had as a special characteristic that the project teams only consisted of top-management, which provided support ex ante. The Dairy Innovation case (A) was characterized with high value displacement. Value displacement was also characteristic for the Fruit Innovation project. However, investment dependency was so high in this project, that there is a locked-in situation which gives solid ground for negotiations on the redistribution of project results. The absence of cost focus, combined with the technological expertise – to a large extent – of the project team members explains the lack of ex ante estimations of possible costs and benefits.

4.2 Correlation Matrix

To get an idea about the influence of identified factors on project satisfaction, Spearman rank correlations were calculated (see table 3).

Table 3. Explaining participant satisfaction

	CONVINC	IMPORT	FAIR	CONJOINT	OPINION	IDEAL	ADVANTAGE	EXPERIENCE	VALUE DISPLACEMENT	DEPENDENCY
CONVINC	1.000									
IMPORT	-0.04	11.000								
FAIR	0.869**	0.171	1.000							
CONJOINT	0.847**	0.246	0.932**	1.000						
OPINION	0.934**	0.040	0.796*	0.850**	1.000					
IDEAL	0.922**	0.066	0.905**	0.932**	0.892**	1.000				
ADVANTAGE	0.673	0.366	0.816*	0.870**	0.750*	0.802*	1.000			
EXPERIENCE	0.574	0.372	0.455	0.606	0.784*	0.650	0.722*	1.000		
VALUE DISPLACEMENT	0.525	0.448	0.410	0.640	0.751*	0.592	0.642	0.932**	1.000	
DEPENDENCY	0.588	0.459	0.497	0.585	0.788	0.590	0.704	0.956	0.891**	1.000
SATISFIE	0.901**	0.172	0.904**	0.882**	0.891**	0.943**	0.892**	0.719*	0.589	0.713*

** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

The results in table 3 should be interpreted in relation with previous and desk research, given the danger of multicollinearity and common method bias. Table 3 shows, that value displacement and the project satisfaction level are not significantly associated (which is in line with our theoretical foundation). However, there seems to be no significant relationship between the satisfaction level and the importance of the project from a individual businesses' standpoint. Possibly, participants value project outcomes on other criteria than by looking solely at single business goal attainment.

4.2 Measuring Project Results and Barriers

We asked the participants to rank the main *barriers* (assigning 1 = very important and 7 = least important) of investing and continuing the project in the future. Lack of organizing capabilities scores highest, while absent transparency of results and lack of financial means on average take in the next ranks. Absence of knowledge of financial outcomes is a significant barrier, but the participants do not (know how to) fill in the knowledge gap: they just do not systematically apply financial criteria for project feasibility assessment (see table 4).

Table 4. Result measurement

<i>For the ex ante projection of results of the project is used:</i> (ranking from 1 = very important, to 7 = not important at all)	Average rank	STD
Knowledge from previous experience	3.625	1.768
Pay back period	5.875	0.354
Profitability of the project	4.500	0.756
Cash streams provoked by the project	7.000	0.000
Technical feasibility	1.500	0.535
Positive effects for customers	2.250	1.035
Positive effects for the business network	3.250	0.886

Table 4 shows that technical feasibility is ranked first as a result indicator. The expected benefits for customers scores second. Financial indicators (pay-back period, profitability and cash flow) are ranked lowest on average. This is surprising in the light of the barriers of success which were identified. Not only uncertainty about the project results, but also uncertainty about the division of costs & benefits over project participants will influence project continuation. We asked whether the participants were sure in advance how project costs and benefits would be divided. Not surprising anymore, the score appeared to be very low (mean = 2.500, STD = 1.309), with the lowest score for the Dairy Innovation project (A) and the highest in Juices (C) and Vegetable Species (D). It should be noted that past experience and trust between the participants in the Vegetable Species project were high, so that sound measures could be applied to split-up the potential profits.

4.6 Project Continuation and Success

We asked the participants to assess the success of the projects as well as the willingness to invest in the project on a 7-point scale (1 = very low, 7 = very high). The results are included in table 5.

Table 5. Project success and continuation

	Title of project	success	continuation
A	Dairy Innovation	3	3
B	Fruit Innovation	5	6
C	Juice innovation	6	7
D	Vegetable species	7	7
E	Flower Innovation	4	4
F	Soft Drinks	6	5
G	Chicken project	4	4
H	Vegetables	5	5

Obviously, the Dairy Innovation project (A) is rated lowest while the Vegetable Species project (D) is rated highest. What are then the similarities and fundamental differences in the characteristics of these two?

5. Conclusions and Managerial Implications

The following summarizing overview reveals remarkable differences between the Dairy Innovation project (A) and the Vegetable Species (D) project.

Table 6. Key differences between a successful and an unsuccessful

project	A	D
<i>Project specifics</i>		
Investment dependency	1.5	6.5
Value displacement	4	6
<i>Costs and benefits (attitude)</i>		
Convinc	3	6
Import	2	5
Fair	2	6
<i>Stakeholders (normative environment)</i>		
Conjoint	1	7
Opinion	2	6
Commit	3	7
<i>Capabilities</i>		
Experience	2	6
Ideal	2	7
Division	1	4

Investment dependency implicates that the partners will have to invest together, or not. The moment they invest, they are locked-in. In the Dairy Innovation project (A) with respect to the deployment of this production capacity there existed a situation we call value-independency. Moreover,

result-proportionality was low in the Dairy Innovation case (the results for each of the partners are disproportional to their efforts) and value displacement was high. Such a situation, combined with lacking joint experience from past projects, was probably a major cause for lower success than in project D. Built capabilities from past experiences enhanced a sense of solidarity in project D. Goal congruence, or the conditions to establish it, were also present in this project. Support from top-management and predetermined financial arrangements further strengthen the chances for success..

The projects show, in an explorative way, that fundamental conditions have to be met for co-innovation project success. We mention especially:

- goal congruence, both at a personal and a company level;
- investment and value dependency contributing to the willingness to cooperate, and, if value displacement occurs, redistribution schemes should be available;
- unanimity on the project goals and strategy reached in the early stages of the project.

The absence of financial information on the outcomes of a project can lead to early abandonment, especially if uncertainty persists. It is a matter of sound project coordination and governance to urge participants to quantify the possible project outcomes and to make agreements on the distribution of costs and benefits. Governance of co-innovation projects requires skills and knowledge on three levels:

- technical knowledge, to be able to understand the context and aims of the project;
- knowledge of group processes to create an alignment of goals;
- advisory skills to guide project teams in the projection of expected outcomes and choosing between real options;
- advisory skills to guide project teams in the process of negotiating on the redistribution of project outcomes if proportionality is lacking.

Ideally, project teams of co-innovation projects share different capabilities: technical, marketing, financial and organizational. In practice however, technical capabilities dominated in many cases, leading to project failure. It is a matter of good project governance to fill in knowledge gaps before kick-off, to avoid break-off and disappointment.

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Correction method on fairs' attraction radius

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Abstract: At auditing a fair the measure and evaluation of the exhibitors' distance is a important task and can be used for further promotion of the fair. In analyzing the attraction radius of different fairs one can discover some figures that may raise questions regarding a simple averaging of the attraction distances. According to the research of the author, the bias in the attraction radius can be caused by to factors: the size of the attraction region and the distance from the region's business center. Authors explored the bias factors and suggest a correction method to remedy it. A theoretical correction model was applied to evaluate three agribusiness fairs. It is established that the corrected attraction radius gives more realistic result than the simple averaging of exhibitors' distance.

1. Introduction, Aims

Calculation of attraction radius and evaluation the attractiveness of a fair can be considered as a routine method nowadays. The basic principle is: the more and longer-distance exhibitors participate in a fair, the bigger is the professional attractiveness of the exhibition. At the auditing of a fair, therefore, the measure and evaluation of the exhibitors' distance is a important task and can be used for the further promotion of the fair. Further advantage is that measuring exhibitors' distance can easily be carried out and interpreted. The average attraction radius especially important in case of exhibitions' comparison, classification and categorization.

In analyzing the attraction radius of different fairs one can discover some figures that may raise question mark regarding a simple averaging of the attraction distances. In case of some exhibition the measured attraction radius was lower or higher than expected in their professional category and the differences were caused by not an incorrect data recording or statistical method. This finding led the author to the conclusion that the traditional measurement of the attraction radius should be critically reviewed and based on that to elaborate a method to correct it. In this article the author makes an experiment to explain the professional results that "different from the expected" and based on that to elaborate a new method that makes the fairs' attraction radius better comparable, especially in international relationship.

2. Review of Literature

Several authors deal with evaluation of attraction radius of fairs / exhibitions / events, one part of the publications does not make distinctions between exhibitors and visitors, but at the other part of relevant publications this distinction exists. The following authors' publications deal with general issues of the attraction radius: *Ali-Knight et al. (2008)*, *Anonymous (2004)*, *Biró (1994)*, *Csizmadia (2004)*, *Fenich (2008)*, *Gauder (2006)*, *Kozma (1999)*, *Masterman – Wood (2008)*, *Robinson – Long (2008)*, *Rutherford Silvers – Jeff Goldblatt (2008)*, *Shone (2008)*.

In connection with exhibitors' attraction radius the following authors' publications contain relevant information: *Arany et al. (2002)*, *Bakos (2004)*, *Faragó (2005)*, *Gyarmati (2005)*, *Járási (2004)*, *McDonel et al. (2008)*, *Rogers – Davidson (2008)*, *Shone et al. (2008)*, *Tomecskó (2003)*, *Varga (2008)*, *Vatel team (2006)*.

From the literature listed above the publication of *Varga (2008)* has special reference to this paper. Varga evaluates the attraction radiuses of two Hungarian and one Polish fair regarding the exhibitors. One of the Hungarian fairs is the Farmerexpo which is organized in Debrecen once in a year, generally in late August – early September. This fair has an agribusiness character and attracts large number of Hungarian and foreign exhibitors, the participation is between 300 and 400 yearly.

The other Hungarian fair is the OMÉK, organized in Budapest. Its character is also agribusiness (and food) and this fair can be considered as the number one agricultural – agribusiness exhibition in Hungary according to the generally accepted professional opinion. Number of exhibitors in case of the OMÉK is over 500 in average.

Analysis of the exhibitors' attraction radius of the two Hungarian fairs above has brought a surprising result, namely the OMÉK's radius was 140 km, while the Farmerexpo's radius was longer: 177 km, although the number of exhibitors was less in case of the Farmerexpo. This result raises a question about the figures and supervision of nature and measure of the attraction radius.

Varga (2008) examined a Polish agribusiness fair, as well. This fair is organized in Poznan, the average number of exhibitors is around 600. This fair can be compared to Debrecen's Farmerexpo since it is organized not in the business center of the country (Warsaw), and the fair has also a countrywide effect. The measured attraction radius was an average of 364 km, that is more than a double to that of Farmerexpo, although the number of exhibitors was just about 50 per cent bigger. In this case also arises the question, namely: what caused this considerable difference between the average attraction radiuses of the respecting fairs of similar character.

From the contradictory facts described above the author intends to make an experiment to explain this phenomenon's

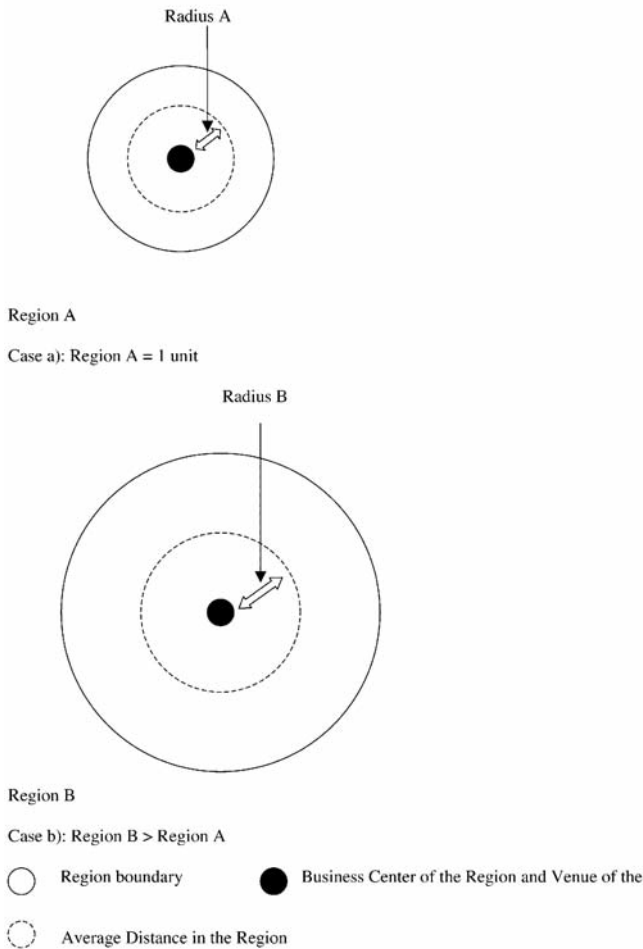


Figure 1. Effect of the Region's Size on Attraction Radius

contradictory nature and to suggest a solution to modify the attraction radius in order for a better comparison.

3. Effect of Size of the Region on the Attraction Radius

The contradiction between the Farmerexpo and Poznan fair described in Point 2, is visualized in Figure 1.

As it can be seen in Figure 1, two regions were visualized: Region A was symbolized by a smaller circle, while Region B by a bigger one. The “region“ in this sense means a wider / theoretical maximum attraction distance. In Varga’s publication (2008) all of the fairs he examined the region means always the given country, that is Hungary in case of Farmerexpo and OMÉK, and Poland in case of the Poznan fair. If we accept this precondition, than we can make a comparison between the total area of the two countries. Area of Hungary is 93 thousand square km, while the area of Poland is 312 thousands square km. The area ratio of the two countries is 1:3.35, its square root – that refers to the attraction radius – is 1:1.83. It explains the fact that an “average ride” in case of Hungary is about 300 km, but the same figure in Poland is about 600 km. Deriving from this fact, that a so-called “countrywide participation” means

about a double distance in Poland in comparison with that of Hungary.

In Figure 1 the comparison of radius A and radius B shows well this difference, that derives practically from the size differences of the general attraction regions. In comparison of fairs inside a given country it does not cause any problem, but it is worthwhile to take it into account in case of international comparison. To treat this problem described above the author suggests a correction according to the size of the general attraction distance of the given region or country. This correction is shown in Formula 1.

Formula 1

$$BAC = (MAAR / 100) * [(100 - ((MAAR^2 * \pi) / (BAR^2 * \pi)) * 100)] / 100$$

, where

BAC: Business Area Correction, km

MAAR: Measured Average Attraction Radius, km

BAR: Business Area Radius, km

With the help of Formula 1 such a BAC correction distance can be calculated that takes into account the absolute size of the wider attraction region (for example country) and a reduction is applied on the measured attraction radius.

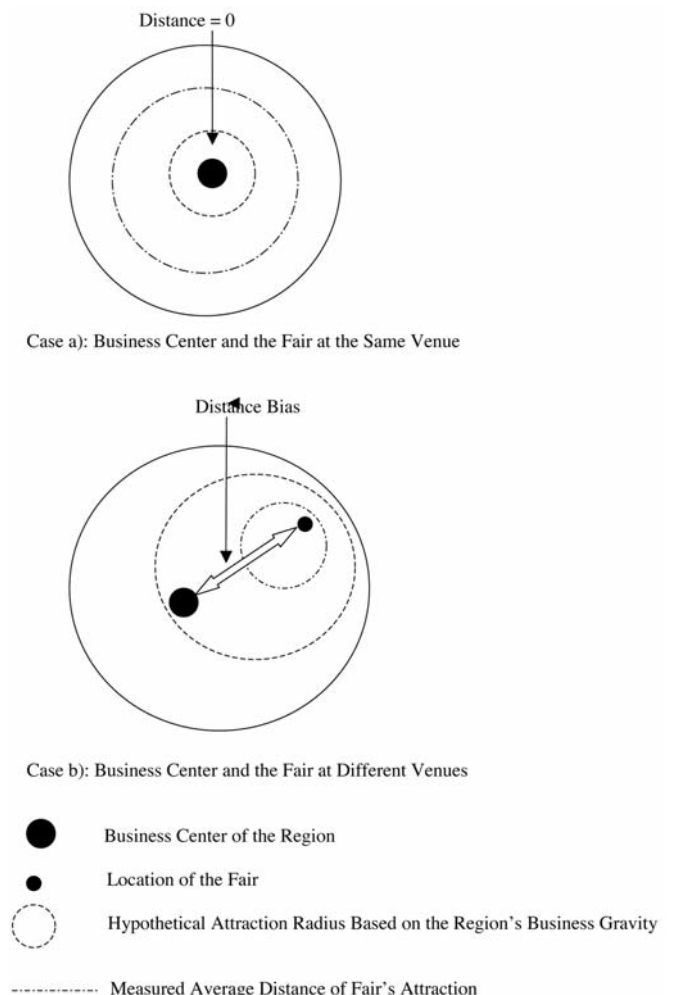


Figure 2. Effect of Business Center Location on the Average Distance

Although using the BAC correction distance is especially advantageous in case of comparison among different countries, but it can be used at evaluation of local or sub-regional fairs / exhibitions, as well. These events are generally closely connected to a settlement or geographical areas and they not have countrywide effect in nature. In this case the generally accepted maximum effective professional attraction radius can be compared with the size of the given country and in this case the attraction radius can be unified inside a given country, as well.

4. Effect of Distance from the Business Center and Its Correction

In Point 2 the attractive radius contradiction between the Farmerexpo and the OMÉK is described. Figure 2 illustrates this situation.

As it can be seen in Figure 2, in case of situation a) the business center of the region (country) and the location of the fair can be found at the same venue or its direct environment. In this case the participating firms can exhibit at their own business headquarters that diminish the average distance considerably.

In case of situation b) of Figure 2, there is a considerable distance between the business center of the region (country) and the venue of the fair. A big proportion of the firms, therefore, have to "relocate" a part of their company to the distant venue of the fair, that is why the attractive radius was increased just by this fact. The suggested correction in connection with the phenomenon described above is shown in Formula 2.

Formula 2

$$BCDC = BCDE * (0.05 + 0.001 * BCER) * MAAR / 100$$

, where

- BCDC: Business Center Distance Correction, km
- BCDE: Business Center Distance from Exhibition, km
- BCER: Business Center Exhibition Ratio, %
- MAAR: Measured Average Attraction Radius, km

As it can be seen in Formula 2, the correction depends basically from two factors: the distance between the business center and the venue of the fair as well as from the proportion of firms who exhibit from the business center at the distant fair. The constants in Formula 2 were determined on the basis of practical considerations, namely: correction based on the distance was taken into account with a smaller proportion since participation at a distant fair refers to the bigger attractiveness of that fair.

5. Determination of Corrected Attraction Radius

The correction factors described above (in Points 3 and 4) have to be taken into account together during the determination of the final correction distance. The suggested method is the square root average, as it can be seen in Formula 3.

Formula 3

$$CD = BCDC^{\frac{1}{2}} * BAC^{\frac{1}{2}}$$

, where

- CD: Correction Distance, km
- BCDC: Business Center Distance Correction, km
- BAC: Business Area Correction, km

With the calculated CD correction distance the measured attraction radius of the fair has to be modified as it can be seen in Formulae 4 and 5.

Formula 4

$$CAR = MAAR - CD$$

, where

- CAR: Corrected Attraction Radius, km
- MAAR: Measured Average Attraction Radius, km
- CD: Correction Distance, km

and

Formula 5

$$AR = CAR^2 * \pi$$

, where

- AR: Attraction Region, km²
- CAR: Corrected Attraction Radius, km

As it can be seen above, the correction distance is subtracted from the measured average attraction radius. It means that the modification effect is higher according to the absolute size of the region (country) and the distance between the region's business center and the venue of the fair. If we compare countrywide fairs in the same country, than the correction based on the region's size does not play any role in the calculation, the correction distance will depend on exclusively from the business center distance and the participation rate in the fair from the distant business center.

However, if one wants to make an international comparison of fairs, the correction based on the sizes of the respective countries have to be incorporated into the calculations in all the cases.

In order to carry out the calculations of the Formulae 1–5, a software named: CAR was created by the author and the calculations described above can easily be executed by this software. Furthermore, the correction calculations are shown (Table 1) based on the Varga (2008) article – referred above – in order to demonstrate the use of the correction method.

As it can be seen in Table 1, the OMÉK fair was considered as a basis for the model calculations. The corrected attraction radius was changed a little, just because of the algorithm of the calculation: 137 km against the measured 140 km, that is practically the same distance. In case of the Farmerexpo, however, the corrected result has changed radically: 104 km against the measured 177 km, that is 76 per cent of that of the OMÉK. The reason can be explained exclusively by the fact that 43 per cent of the exhibitors arrived from the distant business center (Budapest, 230 km), and this was not the case at the OMÉK, where the fair's location and the business headquarters are more closely to each-other.

Table 1: Corrected Attraction Radius of Fairs Examined by Varga (2008)

Factor of the calculation	Unit	Fair (average values)		
		OMÉK	FARMER EXPO	POZNAN
Country		Hungary	Hungary	Poland
Area of the country	1000 km ²	93	93	312
Country's attraction radius	km	300	300	600
Venue of the fair		Budapest	Debrecen	Poznan
Business center of the country		Budapest	Budapest	Warsaw
Distance of the business center from the fair	km	1 (technical number)	230	326
Measured participation of firms from the business center	%	1 (technical number)	43	37
Measured average attraction radius	km	140	177	364
Measured average attraction radius index (OMÉK = 100%)	%	100	126	260
Corrected attraction radius calculated by the CAR model	km	137	104	244
Corrected attraction radius index (OMÉK = 100%)	%	100	76	178

In case of the Poznan fair the corrected distance is reduced to 244 km, in comparison with the measured 364 km. By this correction the original 260 per cent attraction radius in comparison with the OMÉK (=100%) was reduced to 178 per cent. In this case not just the distance from the main business center (Warsaw, 326 km) played a role, but the geographical size of Poland against Hungary, as well.

In interpreting the results not just the changes in the distance can be considered important, but rather the ratio between the corrected distances for the sake of comparison. In this way, therefore, the different results can better be compared after filtering out the disturbing technical factors. The main purpose of comparison has to be emphasized in every case because those fairs that do not seem so attractive after the distance correction by the CAR model may found this corrected result to be resentful. That is why it is necessary to show the measured average attraction radius parallel with the corrected attraction radius as well as their ratios, too, in order to obtain a clearer picture about the fairs to be compared.

With the help of the CAR model one can make sample calculations to see how the corrected attraction radius is changing on the change of the participation rate of firms from the distant business center. In Table 2 model calculation results can be found using the average variables of the Farmerexpo as a basis.

As it can seen in Table 2, ten per cent increased participation rate of exhibitors from the distant business center the per cent results in about 3-5 per cent attraction radius reduction in relationship of Debrecen – Budapest. Naturally, it is a positive fact for the Farmerexpo that quite a

Table 2: Calculation of the Corrected Attraction Radius of Farmerexpo

Proportion of exhibitors from the distant business center (Budapest, 230 km)%	Corrected attraction radius km	Index (measured value = 100%)
10	119	114
20	114	110
30	109	105
40	105	101
43 (measured value!)	104	100
50	102	98
60	98	94
70	94	90
80	91	87
90	88	85

big ratio of exhibitors arrived from the distant business center. The corrected attraction radius just creates an opportunity to measure the attraction radius of fairs organized in different location by a unified method, and by using the CAR model it the comparison will be more realistic. The attraction radius – however – just one element of the effectiveness of the fairs and should not be overestimated anyway.

6. Conclusion

Introduction of the corrected attraction radius alongside with the measured attraction radius creates an opportunity of comparison on unified basis since measured attraction radius is distorted by the absolute size of the region (country) and the effect of venue different from the business center. Using of corrected attraction radius may be justified especially in comparison of fairs of different countries. By the model this correction can easily be calculated that is why its use is suggested for evaluation and auditing of different fairs.

The model theoretically can be suitable for modification of attraction distance of different events, but for events different from fairs a different variant of the CAR model should be used.

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Forecasting with X-12-ARIMA: International tourist arrivals to India and Thailand

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Abstract: Forecasting is an essential analytical tool in tourism policy and planning. This paper focuses on forecasting methods based on X-12-ARIMA seasonal adjustment and this method was developed by the Census Bureau in the United States. It has been continually improved since the 1960s, and it is used by many statistics agencies and central banks. The secondary data were used to produce forecasts of international tourist arrivals to India for 2007-2010 and also these data were used to produce forecasts of international tourist arrivals to Thailand for 2006-2010. From these period the results confirm that the best forecasting method based on the X-12-ARIMA seasonal adjustment is X-12-ARIMA(0,1,2)(0,1,1), X-12-ARIMA(0,1,1)(0,1,1) and X-12-ARIMA(2,1,0)(0,1,1) for India and the best forecasting method based on this method is X-12-ARIMA(0,1,1)(0,1,1) and X-12-ARIMA(2,1,0)(0,1,1) for Thailand. Furthermore this method predict that international tourism arrivals to India for 2007–2010 will growth at a positive rate as same as in this during period the number of international tourists arrival to India will be 5,079,651 million, 5,652,180 million, 6,224,480 million and 6,796,890 million, respectively. Also this method predict that international tourism arrivals to Thailand for 2006-2010 will growth at a positive rate as same as in this during period the number of international tourists arrival to Thailand will be 12,211,033 million, 12,699,532 million, 13,187,591 million, 13,674,669 million and 14,161,998 million, respectively. If these results can be generalized for future year, then it suggests that both the India government sector and the Thailand government sector also the private tourism industry sector of these country should prepare to receive increasing numbers of international tourist arrivals both to India and Thailand in this period.

Key words: India; Thailand, international tourism; X-12-ARIMA; the best forecasting methods;

1. Introduction

International tourist arrivals and international tourist receipts have traditionally been used as benchmark aggregate series to assess the overall importance of tourism worldwide and in specific countries. High international tourist arrival levels may be used in advertising campaigns and also in political discussions to legitimize and emphasize the success of a country in the international community. Similarly, sizeable international tourist receipts can be a good indicator of the role of tourism in an economy in term of both Gross Domestic Product and foreign exchange generation. Policy makers may subsequently be convinced to assist tourism development and further increase profitability from tourism activities. It is not surprising, therefore, that the majority of World Tourism Organization (WTO) statistics focus on these two time series reported as levels, annual changes and market shares (*Papatheodorou and Song 2005*). Furthermore The United Nations Conference on Trade and Development singled out tourism as the only sector in international trade in services for which developing countries had experienced positive surpluses in their trade account (UNCTAD, 1998). Tourism receipts in developing countries, valued at US\$ 6 billion in 1980, reached an unprecedented US.\$ 62.2 billion

in 1996. The prognosis is that this surge will continue, a manifestation of the growing importance of tourism (*Narayan, 2005*). The above information emphasizes that international tourism can generate money for the economy of developing countries, such as India. In 2002, India 2.38 million international tourists and in the same year India received income from international tourism of 2,923 million US.\$. And in 2004, the number of international tourists was 3.46 million and the income was 4,769 million US.\$. This data shows that when the number of international tourists to India increases, then the income from international tourists to India also increases. Therefore, if the econometrics approach is able to forecast the number of international tourist arrivals to India, it will also be able to forecast the level of income from international tourists. Thus it is an essential analytical tool in tourism policy and planning.

In 2003, Thailand 10,082,109 million international tourists and in the same year Thailand received income from international tourism of 309,269 million baht. And in 2004, the number of international tourists was 11,737,413 million and the income was 384,359 million baht. This data shows that when the number of international tourists to Thailand increases, then the income from international tourists to Thailand also increases. Therefore, if the econometrics

approach is able to forecast the number of international tourist arrivals to Thailand, it will also be able to forecast the level of income from international tourists. Thus it is an essential analytical tool in tourism policy and planning.

In a lot of articles to study about time series methods to forecast international tourism (in terms of tourist arrivals) for a particular country (Richa, 2005). An incomplete list of recent studies includes those by Martin and Witt (1987), Chan (1993), Witt et al. (1994), Turner et al. (1995, 1997), Kulendran and King (1997), Chu (1998), Kim (1999) and Lim and McAleer (2000a, 2000b), N. Rangaswamy, Prasert and Chukiat (2006). Authors differ on the best method for tourism forecasting. For example, whereas Martin and Witt (1989) used simple autoregressive (AR) models, Lim and McAleer found that the Autoregressive Integrated Moving Average (ARIMA) forecast tourism arrivals more accurately, and N. Rangaswamy, Prasert and Chukiat found that the best methods to forecast international tourists arrivals to Thailand was both VAR model and SAIMA (p,d,q) (P,D,Q) model. It is impossible to reach a unanimous decision for any particular model, since forecasts are affected by a variety of factors, particularly the country/countries under consideration, the type of data and time span covered by the study.

Form above of reason this paper focus on the famous econometrics approach based on X-12-ARIMA for forecasting the number of international tourist arrival to India for the period 2007-2010 based on data from the period 2002-2006. And also this paper focus on this approach based on X-12-ARIMA for forecasting the number of international tourist arrival to Thailand for the period 2006-2010 based on data from the period 1997-2005.

2. Research Aim and Objective

This research aims to predict the number of international tourist arrivals to India and Thailand in the period 2006-2010 and to seek the best forecasting model for forecasting international tourist arrivals to India and Thailand in this period.

3. Scope of this research

The scope of this research is the period 1997–2010 and mostly the data was secondary data. The countries used for forecasting international tourist arrivals to India were all the countries of importance to the international tourism industry of both India and Thailand such as UK, USA, Canada, France, Sri Lanka, Germany, Japan, Malaysia, Australia, Italy, Singapore, Nepal, Netherlands, Korea, Spain and other country (source : India 's Tourism Organization and Thailand 's Tourism Organization). And the variables used in this research were the number of international tourist arrivals to India and Thailand from 1997–2005 to forecast for 2006–2010.

4. The research framework of tourism forecasting and forecasting methodology

Tourism forecasting methods can be divided into qualitative and quantitative methods and causal quantitative techniques. Regardless of the type of forecasting method used, the usefulness of any tourism demand forecasting model is really determined by the accuracy of the tourism forecasts that it can generate, as measured by comparison with actual tourism flows (Mahmoud, 1984). Frechtling (1996, 2001) highlighted five patterns in a tourism time series: (a) seasonality, (b) stationarity, (c) linear trend, (d) non-linear trend and (e) stepped series. The time series non-causal approach or forecasting a single variable approach is limited by the lack of explanatory variables and it also was best used for short-term to medium-term forecasting. Additionally, in this approach, it is assumed that the factors related to seasonality, trend and cycle are slow to change and can be extrapolated in the short term (Kon and Turner, 2005 and N. Rangaswamy, Prasert and Chukiat, 2006).

In this paper, focus on forecasting a single variable approach as well as this variable as international tourists arrival to India during period 2002–2006 and to Thailand 1997–2005. The X-12-ARIMA(p,d,q)(P,D,Q) method was used to forecast international tourist arrival to India during period 2007–2010 also this method was used to forecast international tourist arrival to Thailand during period 2006–2010. This method developed by the Census Bureau in the United States as well as it has been continually improved since the 1960s, and it is used by many statistics agencies and central banks (Shu and Andrew (2005)).

4.1 The X-12-ARIMA forecasting method

The X-12-ARIMA program is the primary method used for seasonal adjustment of government and economic time series in the United States, Canada, and the European Union (Miller and Williams (2003)). The package seasonal adjustment is X-12-ARIMA developed by the Census Bureau in the United States. It has been continually improved since the 1960s, and it is used by many statistics agencies and central banks (Shu and Andrew (2005)). As well as it is based on ratio-to-moving-average (classical) decomposition (Macauley, F.R., 1930; also described in Makridakis, et al., 1998) and includes a great number of improvements that have been developed through empirical testing over the years, with the X-12-ARIMA variant having being released in 1996. The X-12-ARIMA procedure makes adjustment for monthly or quarterly series. It consists of three steps that build upon one another (see more information at appendix C).

1. A regress-ARIMA model is built for the time series as well as this technique combines the tools of regression analysis with the ARIMA approach to pre-adjust various effects such as outliers, trading day and holiday effects.
2. Carries out the actual seasonal adjustment which decomposes the pre-adjusted series, *i.e.* the output

from the reg-ARIMA step, into three elements – trend, seasonal, and irregular components.

3. And the final step of the program tests the quality of seasonal adjustment.

4.2. The general model of X-12-ARIMA (Source: U.S. Census Bureau X-12-ARIMA Reference Manual version 0.2.7)

ARIMA models as discussed by Box and Jenkins(1976), are frequently used for seasonal time series. A general multiplicative seasonal ARIMA model for a time series Z_t can be written

$$\emptyset(B)\Phi(B^s)(1-B)^d(1-B^s)^D Z_t = \theta(B)\rho(B^s)a_t \text{ ----- (1J)}$$

where

- B = the backshift operator ($B z_t = Z_{t-1}$)
- S = the seasonal period
- $\emptyset(B)$ = $(1 - \emptyset_1 B - \dots - \emptyset_p B^p)$ is the non-seasonal AR operator
- $\Phi(B^s)$ = $(1 - \Phi_1 B^s - \dots - \Phi_p B^s)$ is the seasonal AR operator
- $\theta(B)$ = $(1 - \theta_1 B - \dots - \theta_q B^q)$ is the non-seasonal moving average(MA) operator
- $\rho(B)$ = $(1 - \rho_1 B^s - \dots - \rho_Q B^{Qs})$ is the seasonal moving average(MA) operator
- $(1-B)^d(1-B^s)^D$ = non-seasonal differencing of order d and seasonal differencing of order D

A useful extension of ARIMA models results from the use of a time-varying mean function modeled via linear regression effects. More explicitly, suppose write a linear regression equation for a time series Y_t as

The time series of regression error, is assumed to follow the ARIMA model (1J). Modelling Z_t as ARIMA address the fundamental problem with applying standard regression methodology to time series data, which is that standard regression assumes that the regression error (Z_t in(2J)) are uncorrelated over time. In fact, for time series data, the errors in (2J) will usually be auto correlated, and , moreover with often require differencing. Assuming Z_t is uncorrelated in such cases will typically lead to grossly invalid results the expression (1J) and (2J) taken together define the general regARIMA model allowed by the X-12-ARIMA program. Combining (1J) and (2J), the model can be written in a single equation as

$$Y_t = \sum \beta_i x_{i,t} + Z_t \text{ ----- (2J)}$$

where

- Y_t = the (dependent) time series
- $x_{i,t}$ = regression variables observed concurrently with Y_t
- β_i = regression parameters
- $Z_t = Y_t - \sum \beta_i x_{i,t}$

The regARIMA model (3J) can be thought of either as generalizing the pure ARIMA model (1J) to allow a regression mean function $\sum \beta_i x_{i,t}$, or as generalizing the regression model (2J) to allow the errors Z_t to follow the ARIMA model (1J). In any case, notice that the regARIMA model implies that first the regression effect are subtracted from Y_t to get the zero mean series Z_t , then the error series Z_t is differenced to get a stationary series, say w_t , and w_t is then assumed to follow the stationary ARIMA model, $\emptyset(B)\Phi(B^s)w_t = \theta(B)\rho(B^s)a_t$. Another way to write the regARIMA model (3J) is (see model 4J)

$$(1-B)^d(1-B^s)^D Y_t = \sum \beta_i(1-B)^d(1-B^s)^D x_{i,t} + w_t \text{ ----- (4J)}$$

where w_t follows the stationery ARIMA model just given. Equation (4J) emphasize that that the regression variables $x_{i,t}$ in the regARIMA model, as well as the series Y_t are differenced by the ARIMA model differencing operator $(1-B)^d(1-B^s)^D$. Notice that the regARIMA model as written in (3J) assumes that the regression variable $x_{i,t}$ affect the dependent series Y_t only at concurrent time points, i.e., model (3J) does not explicitly provide for lagged regression effects such as $\beta_i x_{i,t-1}$. lagged effects can be included by the X-12-ARIMA program.

5. The results of the research

The X-12-ARIMA seasonal adjustment method were employed in this paper for forecasting international tourists arrival to India for 2007-2010. A single variable as the number of international tourist arrivals to India was used to forecasting. The table 1 to table 4 present the best models of X-12-ARIMA to forecasting international tourists arrival to India in this period is selected based on the average absolute percentage error in within-sample forecast (three year). And the table 5 presentation forecasts of quaternary average percentage change in international tourist arrivals to India based on the best models of X-12-ARIMA(p,d,q)(P,D,Q) during the period 2007–2010.

5.1. Forecasting accuracy is based on the Average Absolute Percentage Error in within-sample forecasts: (three year) of each X-12-ARIMA model for forecasting international tourist arrivals to India for 2007–2010

Table 1 shows forecasting performance accuracy comparisons of the 5 models based on X-12-ARIMA seasonal adjustment method for forecasting international tourist arrivals to India for 2007. The value of Average Absolute Percentage Error(AAPE(%)) in within-sample forecasts: (three year) of each X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to India for this period.

Table 1: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2007

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	10.95
2	X-12-ARIMA(0,1,2)(0,1,1)	7.21
3	X-12-ARIMA(2,1,0)(0,1,1)	9.99
4	X-12-ARIMA(0,2,2)(0,1,1)	26.21
5	X-12-ARIMA(2,1,2)(0,1,1)	11.41

Form: computed

Form table 1, the best model to forecasting international tourist arrivals to India during the specified period is X-12-ARIMA(0,1,2)(0,1,1). Because the AAPE(%) of this model

is lower than the other models such as X-12-ARIMA(0,1,1)(0,1,1), X-12-ARIMA(2,1,0)(0,1,1), X-12-ARIMA(0,2,2)(0,1,1) and X-12-ARIMA(2,1,2)(0,1,1). Table 2 shows forecasting performance accuracy comparisons of the 5 models based on X-12-ARIMA seasonal adjustment method for forecasting international tourist arrivals to India for 2008. The value of Average Absolute Percentage Error in within-sample forecasts: (three year) of each X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to India for this period.

Table 2: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2008

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	6.07
2	X-12-ARIMA(0,1,2)(0,1,1)	4.05
3	X-12-ARIMA(2,1,0)(0,1,1)	6.46
4	X-12-ARIMA(0,2,2)(0,1,1)	11.24
5	X-12-ARIMA(2,1,2)(0,1,1)	7.00

Form: computed

Form table 2, the best model to forecasting international tourist arrivals to India during the specified period is X-12-ARIMA (0,1,2) (0,1,1). Because the AAPE(%) of this model is lower than the other models such as X-12-ARIMA (0,1,1) (0,1,1), X-12-ARIMA (2,1,0) (0,1,1), X-12-ARIMA (0,2,2) (0,1,1) and X-12-ARIMA (2,1,2) (0,1,1). Table 3 shows forecasting performance accuracy comparisons of the 5 models based on X-12-ARIMA seasonal adjustment method for forecasting international tourist arrivals to India for 2009. The value of Average Absolute Percentage Error in within-sample forecasts: (three year) of each X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to India for this period.

Table 3: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2009

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	2.13
2	X-12-ARIMA(0,1,2)(0,1,1)	1.46
3	X-12-ARIMA(2,1,0)(0,1,1)	2.20
4	X-12-ARIMA(0,2,2)(0,1,1)	9.03
5	X-12-ARIMA(2,1,2)(0,1,1)	3.84

Form: computed

Form table 3, the best model to forecasting international tourist arrivals to India during the specified period is X-12-ARIMA(0,1,1)(0,1,1). Because the AAPE(%) of this model is lower than the other models such as X-12-ARIMA(2,2,0)(0,1,1), X-12-ARIMA(0,2,2)(0,1,1) and X-12-ARIMA(2,1,2)(0,1,1). But X-12-ARIMA(0,1,2)(0,1,1) was not selected to the best model for forecasting because this model has been found that evidence of non-seasonal over differencing (see more information at U.S. Census Bureau.

X-12-ARIMA Reference Manual, Version 0.2.10. and appendix B). Table 4 shows forecasting performance accuracy comparisons of the 5 models based on X-12-ARIMA seasonal adjustment method for forecasting international tourist arrivals to India for 2010. The value of Average Absolute Percentage Error in within-sample forecasts: (three year) of each X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to India for this period.

Table 4: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2010

Number	Models of forecasting (Three Year)	AAPE(%)
1	X-12-ARIMA(0,1,1)(0,1,1)	0.33
2	X-12-ARIMA(0,1,2)(0,1,1)	0.70
3	X-12-ARIMA(2,1,0)(0,1,1)	0.81
4	X-12-ARIMA(0,2,2)(0,1,1)	24.48
5	X-12-ARIMA(2,1,2)(0,1,1)	1.11

Form: computed

Form table 4, the best model to forecasting international tourist arrivals to India during the specified period is X-12-ARIMA(2,1,0)(0,1,1). Because the AAPE(%) of this model is lower than the other models both X-12-ARIMA(0,2,2)(0,1,1) and X-12-ARIMA(2,1,2)(0,1,1). But X-12-ARIMA (0,1,1) (0,1,1) and X-12-RIMA(0,1,2)(0,1,1) were not selected to the best model for forecasting because these models have been found that evidence of non-seasonal over differencing (see more information at U.S. Census Bureau. X-12-ARIMA Reference Manual, Version 0.2.10. and appendix B).

5.2 The empirical results of forecasting international tourist arrivals to India for 2007–2010 by quaternary growth rate

Table 5 presents the results of forecasting by the best of X-12-ARIMA(p,d,q)(P,D,Q) models for 2007-2010. Mostly first quaternary average percentage change, second quaternary average percentage change and third quaternary average percentage change in international tourist arrivals to India are negative. And mostly fourth quaternary average percentage change in international tourist arrivals to India are positive. Furthermore the quaternary average percentage change per year are positive as well as the quaternary average percentage change per year equally between 1.30% and 2.00% during this period.

Table 5: Forecasts of quaternary average percentage change in international tourist arrivals to India based on the best of X-12-ARIMA(p,d,q)(P,D,Q) models during the period 2007–2010.

Year	Q1 (%)	Q2 (%)	Q3 (%)	Q4 (%)	Average per Year
2007	-5.07	-9.03	-0.07	22.01	1.96
2008	-4.59	-8.16	-0.01	19.58	1.68
2009	-4.21	-7.45	-0.12	17.66	1.47
2010	-3.89	-6.85	-0.13	16.09	1.30

From: computed

From this table the X-12-ARIMA method forecasting that the high season of international tourism industry in India should be fourth quaternary of each year during the period 2007-2010. This empirical results similarity with previously empirical results from India’s tourism organization. And the future based on this method show that international tourism industry in India (the period 2007–2010) will be a good business for India’s government and privet business sectors.

5.3 Forecasting accuracy is based on the Average Absolute Percentage Error in within-sample forecasts: (five year) of each X-12-ARIMA model for forecasting international tourist arrivals to Thailand for 2006–2010

Table 6 shows forecasting performance accuracy of the 1 models based on X-12-ARIMA seasonal adjustment method for forecasting international tourist arrivals to Thailand for 2006. The value of Average Absolute Percentage Error (AAPE (%)) in within-sample forecasts: (three year) of each X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to Thailand for this period.

Table 6: The Accuracy forecasting models based on X-12-ARIMA seasonal adjustment method for 2006.

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	14.93

Form: computed

Form table 6, the best model to forecasting international tourist arrivals to Thailand during the specified period is X-12-ARIMA(0,1,1)(0,1,1). The value of Average Absolute Percentage Error in within-sample forecasts: (three year) of X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to Thailand for this period.

Table 7: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2007.

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	5.07

Form: computed

Form table 7, the best model to forecasting international tourist arrivals to Thailand during the specified period is X-12-ARIMA (0,1,1)(0,1,1). The value of Average Absolute Percentage Error in within-sample forecasts: (three year) of

Table 8: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2008

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	2.14

Form: computed

X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to Thailand for this period.

Form table 8, the best model to forecasting international tourist arrivals to Thailand during the specified period is X-12-ARIMA (0,1,1)(0,1,1). The value of Average Absolute Percentage Error in within-sample forecasts: (three year) of X-12-ARIMA model was used for selection the best of X-12-ARIMA models for forecasting international tourist arrivals to Thailand for this period.

Table 9: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2009

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	0.07
2	X-12-ARIMA(0,1,2)(0,1,1)	0.14
3	X-12-ARIMA(2,1,0)(0,1,1)	0.11

Form: computed

Form table 9, the best model to forecasting international tourist arrivals to Thailand during the specified period is X-12-ARIMA(2,1,0)(0,1,1). Because the AAPE(%) of this model is lower than the model X-12-ARIMA(0,1,2)(0,1,1). But X-12-ARIMA(0,1,1)(0,1,1) was not selected to the best model for forecasting because this model has been found that Ljung-Box Q chi-square probability < 5.00% (see more information at U.S. Census Bureau. *X-12-ARIMA Reference Manual, Version 0.2.10.*).

Table 10: Accuracy comparison in sample for different forecasting models based on X-12-ARIMA seasonal adjustment method for 2010

Number	Models of forecasting	AAPE(%) (Three Year)
1	X-12-ARIMA(0,1,1)(0,1,1)	0.03
2	X-12-ARIMA(0,1,2)(0,1,1)	0.08
3	X-12-ARIMA(2,1,0)(0,1,1)	0.01

Form: computed

Form table 10, the best model to forecasting international tourist arrivals to Thailand during the specified period is X-12-ARIMA(2,1,0)(0,1,1). Because the AAPE(%) of this model is lower than the other models such as X-12-ARIMA(0,1,1)(0,1,1) and X-12-ARIMA(0,1,2)(0,1,1) (see more information at U.S. Census Bureau. *X-12-ARIMA Reference Manual, Version 0.2.10.*).

6. The conclusions of research and policy recommendations

This paper provides forecasting analysis of international tourist arrivals to India for 2007-2010 based on the X-12-ARIMA seasonal adjustment method. The best X-12-ARIMA models are the X-12-ARIMA(0,1,2)(0,1,1), the X-12-ARIMA (0,1,1) (0,1,1) and the X-12-ARIMA (2,1,0) (0,1,1). Because of these models have a value of average

absolute percentage error (AAPE(%)) are very low than other X-12-ARIMA models (see more detail at U.S. Census Bureau. X-12-ARIMA Reference Manual, Version 0.2.10. and appendix B). And the X-12-ARIMA (0,1,2)(0,1,1) model predicts that both in 2007 the number of international tourists arrival to India will be 5,079,651 million and in 2008 the number of international tourists to India will be 6,224,480 million. Furthermore the X-12-ARIMA (0,1,1) (0,1,1) model predicts that in 2009 the number of international tourists arrival to India will be 6,224,480 million and X-12-ARIMA(2,1,0)(0,1,1) predicts that in 2010 the number of international tourist to India will be 6,796,890 million (see more information at appendix A, table 11 and figure 1).

Therefore the conclusion of this research is that for the next four years, the number of international tourists to India will continue to increase. This result was similar with the results of previous empirical studies of forecasting the international tourist receipts for the world, Asia and Thailand (Papatheodorou and Song, 2005), (Jo Chau Vu and Lindsay W. Turner, 2006) and (N. Rangaswamy, Prasert and Chukiat, 2006) which indicate that the number of international tourists in these area will have positive growth rates for 2007–2010.

If these results can be generalized for future years, then it suggests that both the Indian government sector and the private tourism industry sector need to prepare for increased numbers of international tourists to India for 2007–2010 and should ensure that there are adequate numbers of hotels, transportation, tourist destinations, tourist police units and airports, and that there is an adequate budget allocated for developing facilities and human resources and for addressing the environmental impact of increased tourism.

This paper also provides forecasting analysis of international tourist arrivals to Thailand for 2006–2010 based on the X-12-ARIMA seasonal adjustment method. The best X-12-ARIMA models are both the X-12-ARIMA (0,1,1) (0,1,1) and the X-12-ARIMA (2,1,0) (0,1,1). Because of these models have a value of average absolute percentage error (AAPE(%)) are very low than other X-12-ARIMA models (see more detail at U.S. Census Bureau. X-12-ARIMA Reference Manual, Version 0.2.10.). And the X-12-ARIMA (0,1,1) (0,1,1) model predicts that in 2006 the number of international tourists arrival to Thailand will be 12,211,033 million, in 2007 the number of international tourists to Thailand will be 12,699,532 million and in 2008 the number of international tourists to Thailand will be 13,187,591 million. Furthermore the X-12-ARIMA (2,1,0) (0,1,1) model predicts that in 2009 the number of international tourists arrival to Thailand will be 13,674,669 million and also this model predicts that in 2010 the number of international tourist to Thailand will be 14,161,998 million (see more information at appendix D, table 12 and figure 2).

Therefore the conclusion of this research is that for the next five years, the number of international tourists to Thailand will continue to increase. This result was similar with the results of previous empirical studies of forecasting the international tourist receipts for the world, Asia and Thailand (Papatheodorou and Song, 2005), (Jo Chau Vu and Lindsay W.

Turner, 2006) and (N. Rangaswamy, Prasert and Chukiat, 2006) which indicate that the number of international tourists in these area will have positive growth rates for 2007–2010.

If these results can be generalized for future years, then it suggests that both the Thailand government sector and the private tourism industry sector need to prepare for increased numbers of international tourists to Thailand for 2006–2010 and should ensure that there are adequate numbers of hotels, transportation, tourist destinations, tourist police units and airports, and that there is an adequate budget allocated for developing facilities and human resources and for addressing the environmental impact of increased tourism.

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Appendix A

Extension experimental results of forecasting international tourist arrivals to India for 2007-2010 based on X-12-ARIMA forecasting method

Table 11. Forecast the number of international tourist arrivals to India for 2006–2010 based on the X-12-ARIMA(0,1,2)(0,1,1), X-12-ARIMA(0,1,1)(0,1,1) and X-12-ARIMA(2,1,0)(0,1,1)

Year/Month	2007	2008	2009	2010
Jan	505,575.00	552,962.00	600,570.00	648,269.00
Feb	476,527.00	524,294.00	571,992.00	619,692.00
Mar	455,593.00	503,356.00	551,054.00	598,756.00
Apr	372,654.00	420,243.00	467,944.00	515,644.00
May	311,258.00	359,061.00	406,759.00	454,460.00
Jun	334,873.00	382,714.00	430,412.00	478,113.00
Jul	379,481.00	427,242.00	474,946.00	522,648.00
Aug	357,028.00	404,795.00	452,494.00	500,195.00
Sep	329,832.00	377,699.00	425,396.00	473,097.00
Oct	442,002.00	489,717.00	537,416.00	585,117.00
Nov	520,081.00	567,781.00	615,480.00	663,181.00
Dec	594,747.00	642,316.00	690,017.00	737,718.00
Total	5,079,651.00	5,652,180.00	6,224,480.00	6,796,890.00

Form computed.

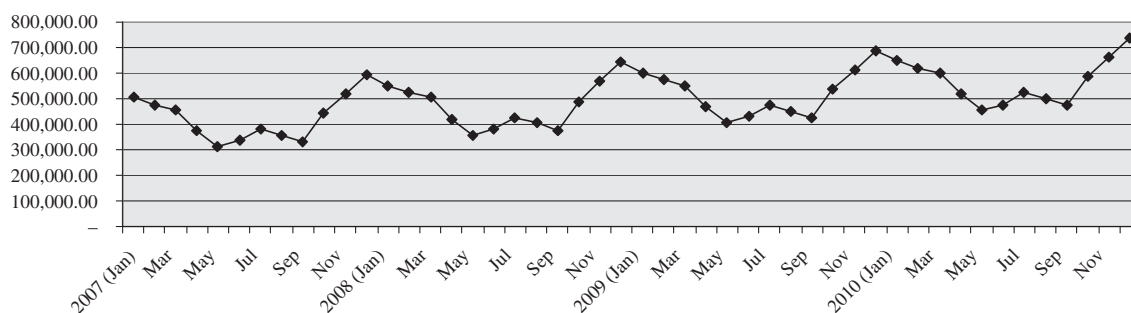


Figure 1. Graphical presentation of forecasting international tourist arrivals to India for 2007–2010 based on X-12-ARIMA(0,1,2)(0,1,1), X-12-ARIMA(0,1,1)(0,1,1) and X-12-ARIMA(2,1,0)(0,1,1)

Form computed.

Appendix B.

The totally empirical results of this research based on X-12-ARIMA monthly seasonal adjustment Method, Release Version 0.2.9

U. S. Department of Commerce, U. S. Census Bureau
 X-12-ARIMA monthly seasonal adjustment Method,
 Release Version 0.2.9
 (forecasting for 2007)

Model 1: (0 1 1) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 5.35 Last-1 year: 16.85 Last-2 year: 10.67

Last three years: 10.95

Chi Square Probability: 6.06%

Nonseasonal MA parameter estimates: 0.270

Seasonal MA parameter estimates: 0.062

Model 2: (0 1 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 3.13 Last-1 year: 8.42 Last-2 year: 10.18

Last three years: 7.24

Chi Square Probability: 44.09%

Nonseasonal MA parameter estimates: 0.272 0.469

Seasonal MA parameter estimates: 0.033

Model 3: (2 1 0) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 4.73 Last-1 year: 14.87 Last-2 year: 10.37

Last three years: 9.99

Chi Square Probability: 44.36%

Nonseasonal AR parameter estimates: -0.165 -0.318

Seasonal MA parameter estimates: 0.028

Model 4: (0 2 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 7.12 Last-1 year: 11.04 Last-2 year: 60.49

Last three years: 26.21

Chi Square Probability: 1.44%

Nonseasonal MA parameter estimates: 1.207 -0.207

Seasonal MA parameter estimates: 0.061

MODEL 4 REJECTED:

Average forecast error > 15.00%

Ljung-Box Q chi-square probability < 5.00%

Evidence of nonseasonal overdifferencing.

Model 5: (2 1 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 3.43 Last-1 year: 7.07 Last-2 year: 23.72

Last three years: 11.41

Chi Square Probability: 29.04%

Nonseasonal AR parameter estimates: -0.209 0.408

Nonseasonal MA parameter estimates: 0.058 0.941

Seasonal MA parameter estimates: 0.075

MODEL 5 REJECTED:

Evidence of nonseasonal overdifferencing.

The model chosen is (0 1 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 3.13 Last-1 year: 8.42 Last-2 year: 10.18

Last three years: 7.24

ARIMA Model: (0 1 2) (0 1 1)

Nonseasonal differences: 1

Seasonal differences: 1

Parameter	Estimate	Standard Errors
Nonseasonal MA		
Lag 1	0.2721	0.13440
Lag 2	0.4686	0.13348
Seasonal MA		
Lag 12	0.0325	0.13360
Variance	0.31002E+09	

Likelihood Statistics

Effective number of observations (nefobs)	47
Number of parameters estimated (np)	4
Log likelihood (L)	-526.5756
AIC	1061.1511
AICC (F-corrected-AIC)	1062.1035
Hannan Quinn	1063.9360
BIC	1068.5517

FORECASTING

Origin 2006.Dec

Number 12

Forecasts and Standard Errors

Date	Forecast	Standard Error
2007.Jan	505575.59	17607.376
2007.Feb	476527.28	21778.487
2007.Mar	455593.82	22251.983
2007.Apr	372654.64	22715.613
2007.May	311258.26	23169.966
2007.Jun	334877.00	23615.580
2007.Jul	379481.39	24052.940
2007.Aug	357028.77	24482.488
2007.Sep	329832.10	24904.628
2007.Oct	442002.26	25319.731
2007.Nov	520081.28	25728.138
2007.Dec	594747.31	26130.162

Confidence intervals with coverage probability (0.95000)

Date	Lower	Forecast	Upper
2007.Jan	471065.76	505575.59	540085.41
2007.Feb	433842.23	476527.28	519212.33
2007.Mar	411980.73	455593.82	499206.90
2007.Apr	328132.86	372654.64	417176.43
2007.May	265845.96	311258.26	356670.56
2007.Jun	288591.32	334877.00	381162.69
2007.Jul	332338.49	379481.39	426624.29
2007.Aug	309043.98	357028.77	405013.57
2007.Sep	281019.92	329832.10	378644.27
2007.Oct	392376.50	442002.26	491628.02
2007.Nov	469655.05	520081.28	570507.50
2007.Dec	543533.14	594747.31	645961.49

U. S. Department of Commerce, U. S. Census Bureau
 X-12-ARIMA monthly seasonal adjustment Method,
 Release Version 0.2.9
 (forecasting for 2008)

Model 1: (0 1 1) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 1.67 Last-1 year: 2.91 Last-2 year: 13.61

Last three years: 6.07

Chi Square Probability: 5.25%

Nonseasonal MA parameter estimates: 0.520

Seasonal MA parameter estimates: -0.197

Model 2: (0 1 2)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.49 Last-1 year: 3.07 Last-2 year: 8.59

Last three years: 4.05

Chi Square Probability: 21.99%

Nonseasonal MA parameter estimates: 0.349 0.493

Seasonal MA parameter estimates: -0.068

Model 3: (2 1 0)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 2.40 Last-1 year: 3.04 Last-2 year: 13.94

Last three years: 6.46

Chi Square Probability: 6.97%

Nonseasonal AR parameter estimates: -0.277 -0.418

Seasonal MA parameter estimates: -0.144

Model 4: (0 2 2)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 3.87 Last-1 year: 5.10 Last-2 year: 24.76

Last three years: 11.24

Chi Square Probability: 5.75%

Nonseasonal MA parameter estimates: 1.449 -0.449

Seasonal MA parameter estimates: -0.182

MODEL 4 REJECTED:

Evidence of nonseasonal overdifferencing.

Model 5: (2 1 2)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 2.85 Last-1 year: 3.20 Last-2 year: 14.94

Last three years: 7.00

Chi Square Probability: 6.53%

Nonseasonal AR parameter estimates: -0.307 -0.530

Nonseasonal MA parameter estimates: -0.047 -0.137

Seasonal MA parameter estimates: -0.146

The model chosen is (0 1 2)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.49 Last-1 year: 3.07 Last-2 year: 8.59

Last three years: 4.05

ARIMA Model: (0 1 2)(0 1 1)

Nonseasonal differences: 1

Seasonal differences: 1

Parameter	Estimate	Standard Errors
Nonseasonal MA		
Lag 1	0.3488	0.12816
Lag 2	0.4929	0.12352
Seasonal MA		
Lag 12	-0.0683	0.12396
Variance	0.19600E+09	

Likelihood Statistics

Effective number of observations (nefobs)	47
Number of parameters estimated (np)	4
Log likelihood (L)	-515.9986
AIC	1039.9973
AICC (F-corrected-AIC)	1040.9497
Hannan Quinn	1042.7822
BIC	1047.3979

FORECASTING

Origin 2007.Dec

Number 12

Forecasts and Standard Errors

Date	Forecast	Standard Error
2008.Jan	552962.42	14000.107
2008.Feb	524294.89	16707.016
2008.Mar	503356.98	16853.472
2008.Apr	420243.65	16998.667
2008.May	359061.36	17142.632
2008.Jun	382714.41	17285.398
2008.Jul	427242.66	17426.994
2008.Aug	404795.34	17567.449
2008.Sep	377699.56	17706.790
2008.Oct	489717.98	17845.043
2008.Nov	567781.19	17982.233
2008.Dec	642316.83	18118.384

Confidence intervals with coverage probability (0.95000)

Date	Lower	Forecast	Upper
2008.Jan	525522.71	552962.42	580402.12
2008.Feb	491549.74	524294.89	557040.04
2008.Mar	470324.78	503356.98	536389.18
2008.Apr	386926.88	420243.65	453560.43
2008.May	325462.42	359061.36	392660.30
2008.Jun	348835.66	382714.41	416593.17
2008.Jul	393086.38	427242.66	461398.94

2008.Aug 370363.77 404795.34 439226.91
 2008.Sep 342994.89 377699.56 412404.23
 2008.Oct 454742.34 489717.98 524693.62
 2008.Nov 532536.66 567781.19 603025.72
 2008.Dec 606805.45 642316.83 677828.21

U. S. Department of Commerce, U. S. Census Bureau
 X-12-ARIMA monthly seasonal adjustment Method,
 Release Version 0.2.9
 (forecasting for 2009)

Model 1: (0 1 1)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.19 Last-1 year: 2.26 Last-2 year: 3.94

Last three years: 2.13

Chi Square Probability: 13.89%

Nonseasonal MA parameter estimates: 0.404

Seasonal MA parameter estimates: -0.075

Model 2: (0 1 2)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.39 Last-1 year: 1.21 Last-2 year: 2.78

Last three years: 1.46

Chi Square Probability: 18.13%

Nonseasonal MA parameter estimates: 0.583 0.376

Seasonal MA parameter estimates: -0.136

MODEL 2 REJECTED:

Evidence of nonseasonal overdifferencing.

Model 3: (2 1 0)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.27 Last-1 year: 2.53 Last-2 year: 3.79

Last three years: 2.20

Chi Square Probability: 18.34%

Nonseasonal AR parameter estimates: -0.354 -0.259

Seasonal MA parameter estimates: -0.098

Model 4: (0 2 2)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 2.61 Last-1 year: 9.56 Last-2 year: 14.92

Last three years: 9.03

Chi Square Probability: 24.21%

Nonseasonal MA parameter estimates: 1.355 -0.356

Seasonal MA parameter estimates: -0.066

MODEL 4 REJECTED:

Evidence of nonseasonal overdifferencing.

Model 5: (2 1 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 1.14 Last-1 year: 2.95 Last-2 year: 7.44

Last three years: 3.84

Chi Square Probability: 9.92%

Nonseasonal AR parameter estimates: -0.125 0.279

Nonseasonal MA parameter estimates: 0.400 0.600

Seasonal MA parameter estimates: -0.054

MODEL 5 REJECTED:

Evidence of nonseasonal overdifferencing.

The model chosen is (0 1 1) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.19 Last-1 year: 2.26 Last-2 year: 3.94

Last three years: 2.13

ARIMA Model: (0 1 1) (0 1 1)

Nonseasonal differences: 1

Seasonal differences: 1

Parameter	Estimate	Standard Errors

Nonseasonal MA		
Lag 1	0.4041	0.13425
Seasonal MA		
Lag 12	-0.0747	0.11898
Variance	0.12095E+09	

Likelihood Statistics

Effective number of observations (nefobs)	47
Number of parameters estimated (np)	3
Log likelihood (L)	-504.1679
AIC	1014.3358
AICC (F-corrected-AIC)	1014.8939
Hannan Quinn	1016.4244
BIC	1019.8862

FORECASTING

Origin 2008.Dec

Number 12

Forecasts and Standard Errors

Date	Forecast	Standard Error
2009.Jan	600570.38	10997.542
2009.Feb	571992.85	12801.973
2009.Mar	551054.82	14381.762
2009.Apr	467944.12	15804.419
2009.May	406759.56	17109.186
2009.Jun	430412.13	18321.267
2009.Jul	474941.12	19457.991
2009.Aug	452494.08	20531.877
2009.Sep	425396.83	21552.321
2009.Oct	537416.58	22526.587
2009.Nov	615480.75	23460.429
2009.Dec	690017.19	24358.495

Confidence intervals with coverage probability (0.95000)

Date	Lower	Forecast	Upper
2009.Jan	579015.59	600570.38	622125.16
2009.Feb	546901.45	571992.85	597084.26
2009.Mar	522867.08	551054.82	579242.56
2009.Apr	436968.03	467944.12	498920.21
2009.May	373226.17	406759.56	440292.94
2009.Jun	394503.11	430412.13	466321.15
2009.Jul	436804.16	474941.12	513078.08
2009.Aug	412252.34	452494.08	492735.82
2009.Sep	383155.05	425396.83	467638.60
2009.Oct	493265.28	537416.58	581567.88
2009.Nov	569499.15	615480.75	661462.34
2009.Dec	642275.42	690017.19	737758.96

U. S. Department of Commerce, U. S. Census Bureau
X-12-ARIMA monthly seasonal adjustment Method,
Release Version 0.2.9
(forecasting for 2010)

Model 1: (0 1 1)(0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.09 Last-1 year: 0.06 Last-2 year: 0.84

Last three years: 0.33

Chi Square Probability: 85.72%

Nonseasonal MA parameter estimates: 0.965

Seasonal MA parameter estimates: -0.132

MODEL 1 REJECTED:

Evidence of nonseasonal overdifferencing.

Model 2: (0 1 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.31 Last-1 year: 0.88 Last-2 year: 0.92

Last three years: 0.70

Chi Square Probability: 99.37%

Nonseasonal MA parameter estimates: 0.599 0.401

Seasonal MA parameter estimates: -0.160

MODEL 2 REJECTED:

Evidence of nonseasonal overdifferencing.

Model 3: (2 1 0) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.01 Last-1 year: 0.11 Last-2 year: 2.32

Last three years: 0.81

Chi Square Probability: 50.71%

Nonseasonal AR parameter estimates: -0.419 -0.439

Seasonal MA parameter estimates: -0.037

Model 4: (0 2 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 5.94 Last-1 year: 13.30 Last-2 year: 24.20

Last three years: 14.48

Chi Square Probability: 87.84%

Nonseasonal MA parameter estimates: 1.582 -0.582

Seasonal MA parameter estimates: -0.195

MODEL 4 REJECTED:

Evidence of nonseasonal overdifferencing.

Model 5: (2 1 2) (0 1 1)

Average absolute percentage error in within-sample forecasts:

Last year: 0.51 Last-1 year: 0.93 Last-2 year: 1.90

Last three years: 1.11

Chi Square Probability: 99.05%

Nonseasonal AR parameter estimates: -0.144 0.029

Nonseasonal MA parameter estimates: 0.476 0.524

Seasonal MA parameter estimates: -0.090

MODEL 5 REJECTED:

Evidence of nonseasonal overdifferencing.

The model chosen is (2 1 0) (0 1 1)
 Average absolute percentage error in within-sample forecasts:
 Last year: 0.01 Last-1 year: 0.11 Last-2 year: 2.32
 Last three years: 0.81

ARIMA Model: (2 1 0) (0 1 1)
 Nonseasonal differences: 1
 Seasonal differences: 1

Parameter	Estimate	Standard Errors

Nonseasonal AR		
Lag 1	-0.4190	0.13491
Lag 2	-0.4387	0.12953
Seasonal MA		
Lag 12	-0.0365	0.10768
Variance	0.53534E+08	

Likelihood Statistics

Effective number of observations (nefobs)	47
Number of parameters estimated (np)	4
Log likelihood (L)	-485.1577
AIC	978.3155
AICC (F-corrected-AIC)	979.2679
Hannan Quinn	981.1004
BIC	985.7161

FORECASTING

Origin 2009.Dec
 Number 12

Forecasts and Standard Errors

Date	Forecast	Standard Error

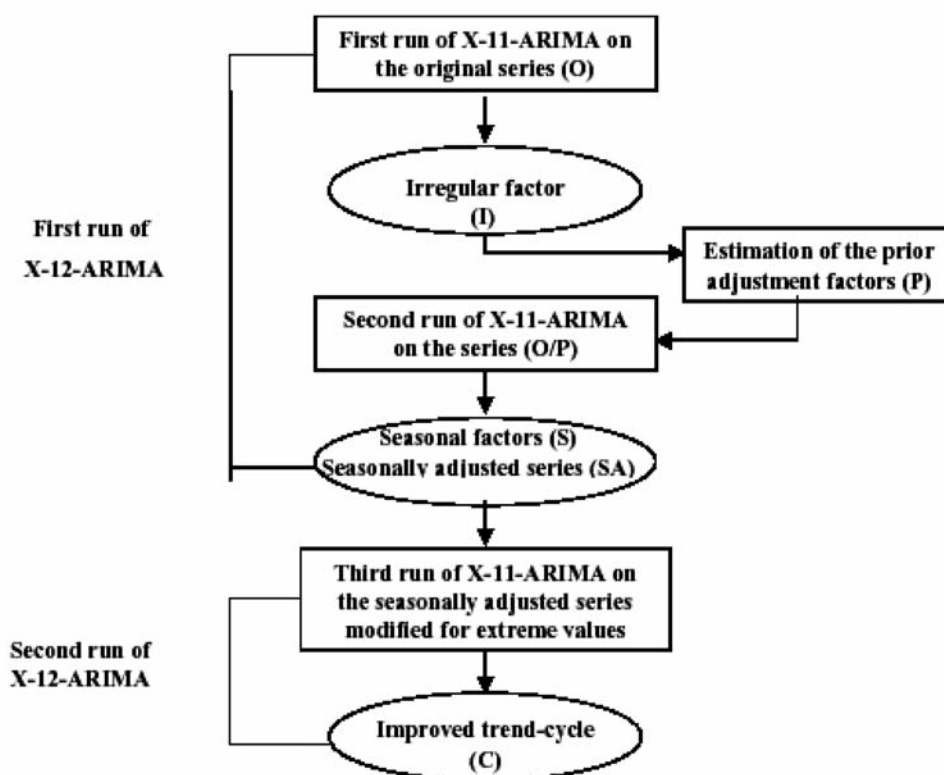
2010.Jan	648269.68	7316.689
2010.Feb	619692.61	8462.123
2010.Mar	598756.11	8775.874
2010.Apr	515646.30	9851.984
2010.May	454460.38	10798.313
2010.Jun	478113.64	11351.488
2010.Jul	522648.08	12006.262
2010.Aug	500195.70	12700.832
2010.Sep	473097.56	13276.013
2010.Oct	585117.84	13831.327
2010.Nov	663181.81	14396.828
2010.Dec	737718.97	14926.396

Confidence intervals with coverage probability (0.95000)

Date	Lower	Forecast	Upper
2010.Jan	633929.23	648269.68	662610.12
2010.Feb	603107.15	619692.61	636278.07
2010.Mar	581555.71	598756.11	615956.50
2010.Apr	496336.76	515646.30	534955.83
2010.May	433296.08	454460.38	475624.68
2010.Jun	455865.14	478113.64	500362.15
2010.Jul	499116.24	522648.08	546179.93
2010.Aug	475302.53	500195.70	525088.88
2010.Sep	447077.05	473097.56	499118.06
2010.Oct	558008.93	585117.84	612226.74
2010.Nov	634964.55	663181.81	691399.07
2010.Dec	708463.77	737718.97	766974.17

Appendix C.

Stages in the estimation of the components of a time series using the X-11-ARIMA and X-12-ARIMA methods



Source : From Israel's Central Bureau of statistics

Appendix D

Extension experimental results of forecasting international tourist arrivals to Thailand for 2006-2010 based on X-12-ARIMA forecasting method

Table 12. Forecast the number of international tourist arrivals to India for 2006- 2010 based on the X-12-ARIMA(0,1,1)(0,1,1) and X-12 ARIMA(2,1,0)(0,1,1)

Year/Month	2006	2007	2008	2009	2010
Jan	1,043,095.00	1,084,464.77	1,125,396.40	1,165,972.74	1,206,634.43
Feb	991,404.00	1,032,742.73	1,073,676.63	1,114,210.56	1,154,870.13
Mar	984,573.70	1,025,540.71	1,066,323.64	1,106,893.81	1,147,523.39
Apr	861,304.20	902,144.53	942,877.10	983,458.43	1,024,080.81
May	834,200.10	874,728.26	915,331.49	955,929.38	996,527.96
Jun	918,156.00	958,554.97	999,101.72	1,039,709.47	1,080,297.16
Jul	1,065,703.00	1,106,124.09	1,146,676.84	1,187,284.24	1,227,872.88
Aug	1,096,558.00	1,137,013.97	1,177,579.65	1,218,184.73	1,258,775.63
Sep	963,674.90	1,004,276.62	1,044,903.55	1,085,499.00	1,126,101.12
Oct	1,047,093.00	1,087,477.69	1,128,014.30	1,168,624.08	1,209,209.62
Nov	1,157,672.00	1,198,198.59	1,238,792.75	1,279,393.44	1,319,989.46
Dec	1,247,600.00	1,288,265.65	1,328,917.58	1,369,509.16	1,410,115.76
Total	12,211,033.90	12,699,532.58	13,187,591.65	13,674,669.04	14,161,998.35

Form computed.

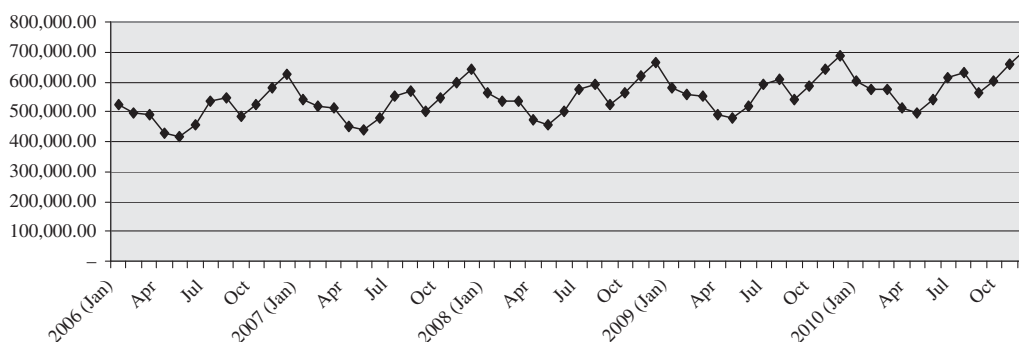


Figure 2. Graphical presentation of forecasting international tourist arrivals to Thailand for 2006-2010 based on X-12-ARIMA(0,1,1)(0,1,1) and X-12-ARIMA(2,1,0)(0,1,1)

Form computed .

The Position Losing of Animal Husbandry in Agriculture

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Abstract: The author in the presentation deals with the fact that what caused the decline of animal husbandry in contrast with plant production; how this unfavourable ratio of 60:40 could evolve when comparing plant production and animal husbandry

What the reason is for the decreasing animal stock; and how the effect of changes in the elements of the economic efficiency such as yields, prices, subsidies, production value, inputs, costs, profits can be evaluated in case of more important animal husbandry enterprises highlighting several significant animal products.

Key words: Hungary, animal husbandry, economic efficiency, prices, subsidies, profit

Introduction

The ratio of agriculture in the nation economy changed for several times during the past 30 years. In contrast with the „golden age” of the 1970’ies, the wage of agriculture decreased to 3 to 4%, but according to optimistic calculations and defining the agribusiness in an expanded way, this ratio is about 13 to 14% comprising the relating branches (Kapronczai, 2007).

On the basis of the latest statistical data, the gross output of the agriculture is about 50 thousands billion HUF, from which the share of agriculture is 2 thousands billion. The added-value (GDP) is 20 thousands billion HUF at the nation economic level, from which that of agriculture is 850 billion HUF. These figures are only understandable if it is known that for example the yearly subsidization of the agriculture (from national and EU-sources) is about 400 billion HUF, constituting half of the GDP produced by the agriculture and one fifth of the whole production value.

In the presentation I deal with the fact that what caused the decline of animal husbandry in contrast with plant production; how this unfavourable ratio of 60:40 could evolve when comparing plant production and animal husbandry (Figure 1.).

Reasons of Position Losing of Animal Husbandry

If we take a look at the world’s agriculture, there are countries which are stronger in animal husbandry and others where plant production is dominant. Table 1. lists several examples.

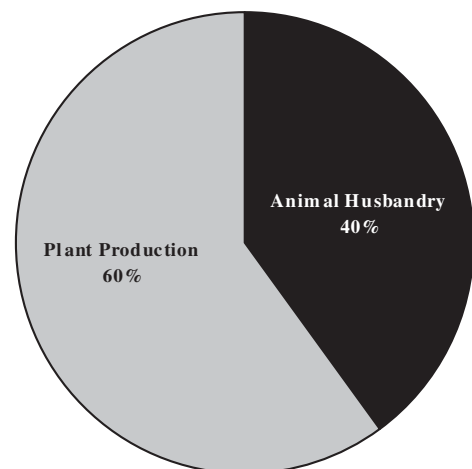


Figure 1.: The Share of Plant Production and Animal Husbandry from the Production

Hungary’s natural conditions, its tradition in agricultural and animal husbandry and food consuming habits do not explain the decline of animal husbandry. However, the figures reflect that the country, having a strong animal

Table 1.: The Share of Animal Husbandry from Production Value

Animal Husbandry		Plant Production	
Share of Animal Husbandry			
Ireland	75%	France	42%
Denmark	66%	Hungary	40%
USA (Iowa)	55%	Spain	33%
Germany	51%	Greece	25%

Source: processing Kapronczai I.’s data by own supplementation

husbandry earlier, declines increasingly after the change of regime and EU accession.

The low share of animal husbandry from the production value comes from the decrease of the animal stock, as well as from the specialization of enterprises in plant production. *Table 2.* shows the decline of animal stock, while *Figure 2.* reflects the changes of ratio of the farms' structure.

Table 2.: The Decline of Animal Stock
(Animal stock on December 31, 1000 animal)

Denomination	1986-1990	1991-1995	2003	2004	2005	2006
Cattle altogether	1650	1083	739	723	708	702
From which: cow	658	468	350	345	334	322
Hog altogether	8178	5149	4913	4059	3853	3987
From which: sow	658	424	327	296	277	290
Sheep altogether	2165	1347	1296	1397	1405	1298
Poultry altogether	55093	33582	37502	32814	31902	30303

Source: Hungarian Central Statistical Office (HSCO)

The drastic decrease of animal stock endangers even the nation economic balances. The structural change may cause irreversible processes.

The structure of large-scale farms, co-operations and state farms before the change of regime was characterized by the „mixed” adjective. By the year 2000, specialization became significant in farms. According to the farm structure report of the HCSO, by 2005 the specialization grew further by the relevant change between the ratios of main branches (HSCO, 2006).

Figure 2. reflects clearly that the number of private farms and joint ventures dealing with plant production increase, the ratio of farms specialized in animal husbandry decrease, and altogether the number of farms of mixed structure is less and less.

If this trend continues, animal husbandry will cease in Hungary

The structural distortion of farms do not favour for the utilization of advantages in enterprise connections.

One hundred years ago, Hensch (1906) also introduced farms which ignored animal keeping, if „farm animal keeping did not provide reasonable profit”. His opinion on this kind of farming was that „greater significance must not have been paid to this system as, firstly, conditions become better for animal husbandry in general, and secondly, ignoring animal husbandry makes the production one-sided, increases risks, decreases the certainty of profit, and gives a rigid feature to the whole farming”. Iván Gönczi (*Gönczi-Kádár-Vadász*, 1967) also shared the suggestion that „Producing more kinds of plants and animals!” This structure considered to be traditional satisfies saving the land condition, decreases the seasonality of labour work and mechanical work, the utilization of by-products within the farm, the realization of expertise and ensures the quicker and more even return of current assets. All these are supplemented as follows „our

farms should create opportunities for carrying out processing, preparing, serving activities relating to agriculture, such as processing and smoking meat products, skimming cow milk and ewe milk, producing cottage-cheese and cheese, etc.”

Even the American school does not deny the advantages of enterprise connections. It is doubtless that most of the farms in the long-range geographical belts of the United States are specialized in horizontal and vertical ways, „losing the traditional advantages of the diversification” (*Nemessályi*, 1992).

The number and combination of the branches depend on the fact that what connection exists between the branches. On the basis of these connections, there are competitive, associate and supplementary branches. Two branches are considered as competitive if the product growth of one of them results in the decrease of the other. They compete for the resources. The associate branches

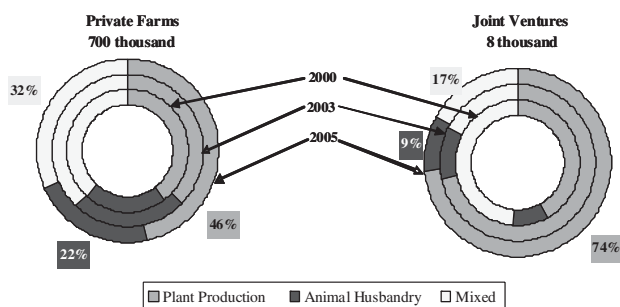


Figure 2.: Distribution of Farms on the Basis of Structure

Source: HCSO, 2006

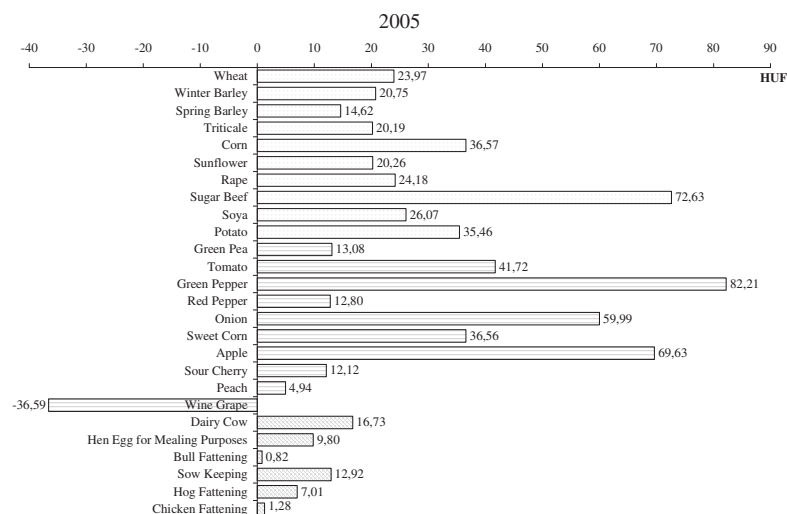


Figure 3.: Enterprise Profit on Production Cost of 100 HUF in case of Products in Plant Production and Animal Husbandry (Average of farms determining the market) 2005

Source: Béládi-Kertész, 2006

make the better utilization of the resources possible. In case of supplementary connection, one of the branches helps in developing the other. The construction, connections and enlargement of branches result in the chain-type connections and production chains in the cited Gönczi-scheme such as „manure chain”, „feed chain”, „litter chain”, „processing chain” and in the end the vertical and horizontal connections.

The decrease number of animal stock, the shift of farm structures to plant production, the low share of animal husbandry from the production value are just effects. The reason should be looked for in the unfavourable profit condition of animal husbandry.

The decline of the interest in animal husbandry may be explained by several reasons in Hungary, but the weakening profit conditions of animal husbandry enterprises are outstanding from them. This tendency accelerated after the EU accession as the subsidy system favoured for plant production in a better way than for animal husbandry.

Béládi-Kertész (2006)'s figure comparing enterprises justifies this fact squarely. The profitability of producing products in plant production exceeds significantly the profitability of products in animal husbandry (Figure 3.).

Supporting the enterprises is a clue issue

It is worth knowing that the profit of enterprises in plant production largely comes from subsidies.

More than 70% of the arable land of 4.5 million hectares is covered by cereals, corn and sunflower. Without the arable area payment these enterprises would show a deficit. This is indicated in Table 3.

Table 3.: Results of Producing the Most Important Plant Products (Average of farms determining the market) 2005

Enterprise	Profit	Subsidy	Profitability
	Ft/t		%
Wheat	-3.159	9.031,4	23,97
Corn	1.963	5.110,6	36,57
Sunflower	-7.628	18.943,8	20,26

Source: constructed table from the database of Béládi-Kertész

Comparing the figures in Figure 3. and Table 3., it is clear that wheat and sunflower production would show a deficit without any subsidy, and 70% of the profitability in corn comes from subsidies.

Contrary to this, enterprises in animal husbandry are under-subsidized. The production of porker, egg and broiler is hardly or not subsidized at all, that of milk production is minimal; more significant subsidy goes to the beef sector and sheep branch, which would otherwise show a deficit.

Figure 4. reflects the profit and the ratio of deficit of the more important enterprises in animal husbandry during the past 10 years. There were years showing deficit in every branch, but beef and broiler have the negative record. The profit of milk production exceeds that of porker, but both of the branches touched the bottom during the past five years.

The EU wishes to introduce the single payment scheme (SPS-system) instead of the presently used subsidy system in the next five years. This system may be excellent for Western-European farmers, but will become sources of further strains for the newly-joined member states, so for Hungary as well.

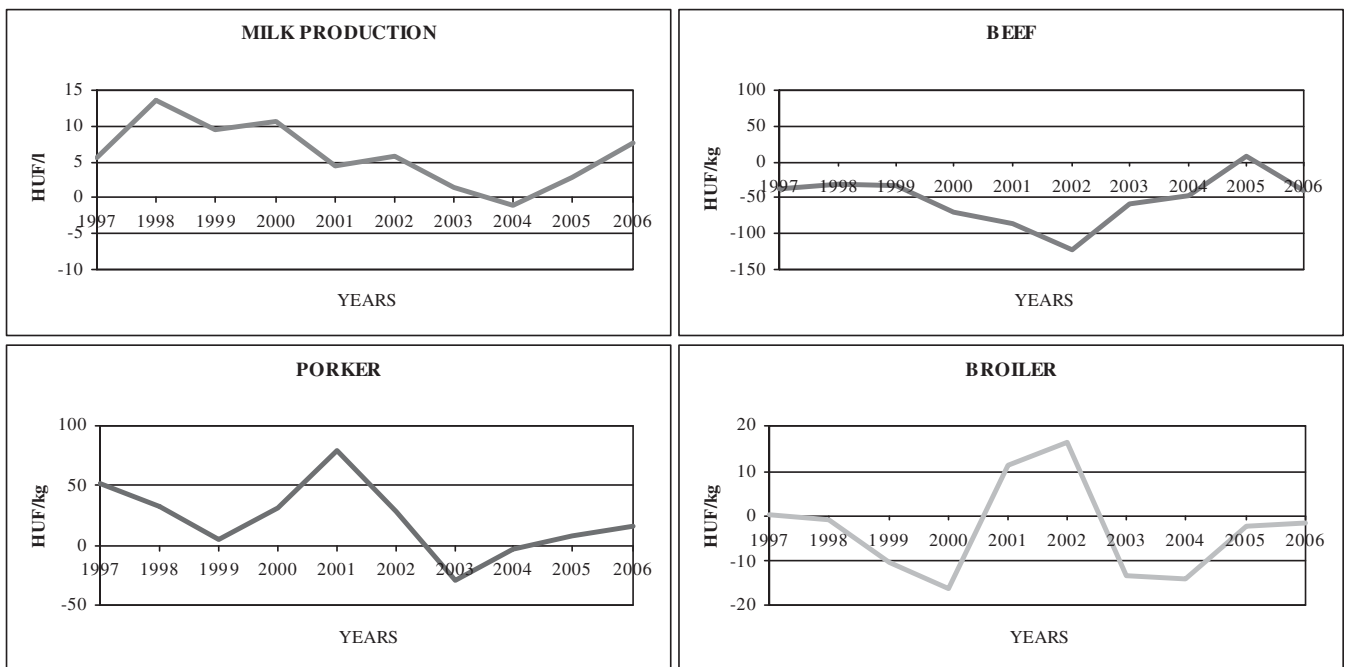


Figure 4.: Profit in Animal Husbandry

Source: constructed figures from the database of Béládi-Kertész (Research Institute of Agricultural Economics)

The lower subsidy rate has drifted the Hungarian farmers into competitive disadvantage. Although the total sum of subsidy from EU sources and national supplementation increased to more than 400 billion HUF, the rigid EU regulation did not make its most reasonable utilization of national interests possible. The biggest loser of the regulation is the animal husbandry. If the agricultural government do not get the opportunity for spreading the whole sources of the subsidy in a reasonable way, focusing on the Hungarian conditions, the future of the Hungarian agriculture including the future of the animal husbandry, even the system of subsidizing agriculture will become battles among parties without limitation.

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Analysis of consumer habits and attitudes on the Hungarian beef and rabbit market

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Abstract: As a consortium partner the authors took part in a research project aiming at the development of high added value, healthy and environment friendly animal products. From among the products developed by the consortium (rabbit meat, omega3-fatty acid enriched beef, goose liver from non forcible feeding, selenium-, vitamin-E and natural color enriched eggs) the present study describes the results concerning beef and rabbit meat. The given products are chosen because they are produced in and exported from Hungary in considerable quantities and their competitiveness can be further improved. In order to able to map the consumer preferences a 300 count nationwide, representative, questionnaire based survey was designed and performed. Actual products were tested by focus groups and professional interviews. Beside the specific features of the products a common character is that the marketing strategy focuses on the distinctive nutritional benefits and other quality parameters that seem to be of crucial importance for the targeted consumer segment. Their unique character and health protecting effects make their branding and using community labeling easy. Their positioning points toward the prestige products therefore consumers tend to accept higher prices. In marketing communication the image building advertisement can be a common goal.

Key words: beef, rabbit, consumer preferences and attitudes, nutritional benefits, consumption frequency

1. Introduction

Nowadays the production of special agricultural goods can be a real alternative for mass production. In our research project the focus was given on the development of high added value, healthy and environment friendly animal products and specifically our team performed the market analysis of the developed products. Our goal was to map the consumer requests, the demand as well as the main objectives of the corporate market. The results show a descriptive picture on the acceptance, attitudes and preferences concerning the given product categories. Beside revealing the requests of the target market the special research methodology offered the chance to optimize the features of the developed products. Consumer information can be paired to the marketing strategy concepts of the companies and based on that the strategy can be modified even before the introduction of the product to the market.

The primary research of rabbit and beef products focused on the analysis of consumer behaviour, the description of consumer attitudes and preferences. On the basis of the information concerning the supply and demand a general marketing strategy was elaborated for the given products.

2. Investigation methods and materials

During the survey 300 people were asked about their shopping habits and attitudes. The questioning happened in August 2007. Data were collected from different settlement

types, including the capital, county towns, other towns and villages. The population segment above 18 years of age had equal chances to get into the panel. Due to the relatively small size of the panel the age and sex compositions of the settlements (based on 2001 statistical data) were distorted, so they were corrected by using a weight factor, therefore the survey can be regarded as a representative one both in terms of age and sex. The random walking method was combined with the so called birthday key method so the random character of the sampling was ensured. The actual data recording happened through face-to-face interviews. The questionnaire contained mostly closed questions, in certain points an interval scale was applied. and scarcely free contextual answers could also be given.

Data processing was performed by SPSS for Windows 16.0. Frequency distributions, cross tables (for determining the relation of a variable to the background variables and to other involved variables) were used. Beside mean calculations significance analysis (Chi2-probe) was performed and T-probe was also used.

3. RESULTS AND DISCUSSION

The important results of the primary research are presented in terms of the product categories below.

3.1. Beef and beef products

Human nutrition biologists pointed previously out that the consumption of red meats and within them of beef should

be reduced (Várhegyi and Várhegyiné, 2008). Today we already know that it has very valuable components which have health conditioning and positive physiological effects. Beef's essential fatty acid (linoleic acid, linolen acid) content is necessary for the evolution and normal function of the nervous system and retina that is why it is advised to pregnant and nursing mothers. Beef has a favourable polysaturated and unsaturated fatty acid proportion which plays an important role in health protection mostly because of its anti thrombosis effect (French et al., 2000). Beef has a high protein and amino acid content and taurin for babies in an easy eligible form. That is the reason for that firstly beef is added to baby food. Beef is rich in minerals like potassium, phosphorus and magnesium, but mainly it is indispensable in human nourishing of its iron and zinc content. In beef iron can be found in hemo- or myoglobin that is why it assimilates and benefits better than the iron in plants. This specific feature of beef plays an important role in the prevention and healing of anaemia. The dietetic estimation of beef is even favourably influenced by that the anticarcinogen conjugated linoleic acid's (CLA) main source is the product of ruminant origin (Csapó et al., 2001; Schmid, 2005) and of its omega-3 and omega-6 proportion corresponds to the recommendations (Szakály S., 2004) of health support diet ($\leq 5:1$)

Seemingly the benefits of the beef consumption caused that in 2007 as much as 52.5 million tons (in live weight) of beef were consumed around the world which is 0.5% higher than that of the previous year value (Agroinform, 2008). In the European Union – mostly in the Western countries – the relatively high per capita consumption of 20 kg/head seems to persist (Agrár Európa, 2005). In Hungary between 1970 and 1980 the per capita beef and veal consumption was 10 kg followed by a drop back to 4.3 kg/head by 2000. The 2006 year data showed only 3.1 kg/head (KSH, 2007).

The questionnaire survey showed that 8 consumers out of ten (82%) used to eat beef or beef products with certain frequencies. Men eat beef more often. People who do not eat beef usually state that they do not like the taste or beef is out of their nourishment habits and most of them do not tend to eat it in the future. Those who would consume it in the future indicated a lower price as a motivation. As for beef the consumption frequency of dishes made of cuts (roast, shank, sirloin etc.) and the beef products (salami, stuffed products). Results are shown in Table 1.

Table 1. Consumption frequency of beef and its products among consumers (N=245)

Frequency	Carcase meat		Beef product	
	Head	%	Head	%
Every day	0	0.0	1	0.4
2-3 times a week	20	8.2	29	11.8
2-3 times a month	108	44.1	92	37.6
Every other month	61	24.9%	31	12.7
Rarely than every other month	56	22.9%	48	19.6
Never	0	0.0%	41	16.7
Do not know/Do not answer	0	0.0%	3	1.2

Cut dishes occur on the table of most answerers 2 or 3 times a week. The average consumer buys them more rarely, not even on one occasion per month. Beef products are consumed far more rarely by people.

The answerers were asked to determine how much they agree with the statements on a 5 range scale (1 – do not agree, 5 – agree). The evaluation is showed in Table 2.

Table 2. Consumer judgement of beef¹ (N=300)

Statement	More important statistical data		
	N	Average	Standard deviation
Beef is healthier than pork.	278	4.23	0.98
Beef is expensive compared to other meats.	272	4.11	0.89
I look for quality when I buy beef.	284	4.04	1.16
I would buy more if beef was cheaper.	297	3.51	1.51
Beef includes conjugated linoleic acid (CLA).	119	3.47	1.06
Frequent consumption of beef helps to prevent cancer.	177	2.97	1.34

¹1= Don't agree at all ... 5= Totally agree)

The panel agreed mostly with the statement saying that beef is healthier than the pork (4.23). However, they do not seem to know at all that beef products are rich in conjugated linoleic acids which can be traced back to the fact that they do not know anything about fatty acids. It comes out that they do not know (2.97) the most important anticarcinogenic effect of multiple unsaturated fatty acids. The price of beef is considered to be high, especially when compared to other meat types. It turns out, however, that price reduction alone would not be able to raise the consumption level.

The analyses of the attitudes against the beef showed that most consumers do not have any idea about the conjugated linoleic acid (CLA) content (and therefore cancer preventing effects) of the beef. As a summary it can be stated that most Hungarian consumers do not buy red meats because of their taste and price.

3.2. Rabbit meat

Rabbit meat has low fat and cholesterol level, high protein content and it is especially rich in some vitamins and minerals. The cholesterol level and fat content of rabbit is lower than that of poultry, turkey, beef or pork. Another benefit of rabbit meat is that its unsaturated fat content reaches 63% among all fats, and the ratio of n-6 and n-3 fatty acids is 7,4–7,5, which is advantageous from nutritional-biological point of view (Lugasi, 2007).

In spite of its nutritional benefits the consumption per inhabitant in Hungary hardly reaches 0,1 kg per year (Szendrő, 1998, Tanai, 2007). Almost the total quantity of the rabbits bred in the country is exported to Italy, Switzerland, France, Belgium) (Lugasi, 2007). Surveys – apart from one or two – to find the reasons for the low consumption have not yet been made in Hungary, but at the same time two

influencing factors are evident: only a tiny part of the produced meat reaches the Hungarian retailers (Bodnár et al., 2003) and partly due to this rabbit meat consumption has no traditions in Hungarian dining culture.

The countrywide survey showed that 31% of the people involved in the panel used to consume rabbit meat and such products with certain frequencies. Among people living in the less populated settlements the rabbit meat consumption is more frequent than in other areas (the peak values are 40% in villages, and 16% in the capital).

What are the motives of 207 (69%) people in the panel who do not eat rabbit meat at all? About one third of the consumers (41.5%) do not like its taste and 29% said that rabbit meat was out of the range of their dietary habits. If the two categories were aggregated, the result would show that the rejection of rabbit meat comes from bad preconceptions, attitudes, misbeliefs and habits. Some 91.3% of them would not see a chance for consuming rabbit meat in the future.

It is an additional problem that even in the case of rabbit eaters the consumption frequency is quite low as it is shown in Table 3.

Table 3. Consumption frequency of rabbit meat among consumers (N=93)

Frequency	Division of answers	
	Head	%
Every day	–	–
2-3 times a week	2	2.2
2-3 times a month	14	15.1
Every other month	21	22.6
More rarely than every other month	56	60.1

The results point out that most people consume rabbit meat once (22.6%) or less than once (60.1%) in every two months. Therefore it is not surprising that rate of more frequent consumption is very low (17.3%), daily usage is not observable.

Most people buy rabbit meat at the local market directly from the producer (29%) or in special shops (21.5%) and the rate of own production is remarkable (28%).

Table 4. Consumer judgement of rabbit meat¹ (N=300)

Statement	More important statistical data		
	N	Mean	Std. deviation
Rabbit meat has low fat content.	229	4,22	0,88
Rabbit meat has lower fat content than poultry.	213	4,13	0,97
Rabbit meat has low cholesterol content.	203	4,01	0,98
Rabbit meat is expensive compared to other meats.	200	3,94	1,05
Rabbit meat has low calorie content.	209	3,90	0,98
Rabbit meat has a favourable n-6/n-3 fatty acid rate.	138	3,62	1,00
I would buy more if rabbit meat was cheaper.	263	2,55	1,55
I would buy more if rabbit meat was available everywhere.	269	2,55	1,61

¹ 1=Don't agree at all ... 5=Totally agree

The attitudes concerning rabbit meat are shown in Table 4.

The results are favourable on the one hand and quite reminding on the other. The panel agreed mostly with the fact that rabbit meat has low fat content and that is true when compared to other meat types, mainly with pork and beef. The result is important because – through effective marketing communication – it can be fitted into the frames of healthy nutrition. Many people think that rabbit meat has lower fat content than that of the poultry and many consumers associate low fat levels with low cholesterol and energy contents, so the position of the product is very favourable. The positive product image is indicated by low deviation values. Lack of knowledge and poor community marketing efforts are indicated, however, by the fact that in case of omega-6/omega-3 fatty acid content the rate of uncertain answers is extremely high (54%).

A part of the panel representatives agreed upon the fact that the price of rabbit meat is high compared to other meat types. It can be a serious marketing challenge for the companies entering the Hungarian market that the customers are obviously unmotivated in buying rabbit meat. About half of them would not buy more of it even at lower prices. It means that no discount campaigns could help, and it would not help either if the product was available more widely.

As a summary it can be concluded that biggest part of the Hungarian consumers failed to know the characteristics of rabbit meat, many of them had not even eaten it yet, therefore their judgments did not based on own experiences.

4. Conclusions and proposals

Market analysis of the investigated products showed that rabbit meat and beef belong to the products of special niche markets and through their health conditioning features their marketing can be placed on common strategic bases. It turned out that to define the target market the concentrated, unisegmental marketing is applicable. Practically it means segment targeting (both in Hungary and abroad) with higher income levels.

The positions of the products are described by the followings: highest quality level (in strict sense of the word), unique character, well identifiable product features. The taste and organoleptic value of the products are excellent accompanied by health conditioning functions. The direction of marketing activities is defined by the latter points, namely beside the health conditioning function the special character should be emphasized.

Marketing tools under the product strategy can be: identifiable branding strategy, aesthetic and attractive packaging, unique product features, target group specific quality characters. The central element of the strategy (for both product categories) on the Hungarian and foreign markets is the high quality (and health conditioning) branded product accompanied by aesthetic packaging and high organoleptic value. Both product categories have all the necessary and advantageous features to become successful on the markets.

Taking this position in the foreground, the direction of pricing in case of rabbit and beef products can point only toward the prestige categories both on domestic and on foreign markets. The pricing should be demand driven, namely the basis of the price is the level still accepted by the customers. The other elements of the marketing mix (community marketing, branding, high quality level) serve to make the potential markets accept the higher price level. It is obvious that due to the high prices the products in concern will be the foodstuffs of certain market niches.

It is no doubt, that the high price and quality level products should be sold in retail units where the customers of the higher income segment appear frequently. Since the beef and rabbit products are rather niche foodstuffs beside the hyper- and supermarkets the exclusive retail units (delicate shops, special butcheries, restaurants, luxury hotel chains etc.) should also be targeted. Enlisting in exclusive retail chain can be expected mostly on foreign markets.

The key factor of the market distribution of the two product categories is the rational design of the integrated communication. In Hungary already appeared a smaller group of consumers being clear with the values and nutritional benefits delivered by certain foods. Community marketing has a central role in promoting the products. Wider occurrence of the products in concern requires new concepts in community marketing focusing on own labeling, forming of regional labeling groups and protection of origin. An effective marketing communication has to be present in the tourism as well. Remarkable profits can be gained through hosting, catering (dishes, garnishes, recipes) even supported by (after effective programming) the different community marketing organizations.

Acknowledgement

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Human resources management in small and medium enterprises

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Abstract: Development of small and medium enterprises (SME) represents primary goal of every modern economy. It is complex challenge which includes great number of directly concerned parties in every sector of the state and economy. SME stimulate private ownership and entrepreneurship. Their characteristic is that they are flexible and can easily adjust to changes in supply and demand on the market. At the same time they open possibilities for increase of employment, promote diversification of economical activities, support sustainable growth and give significant contribution to export, trade and increase the competitiveness of the entire economy. Importance of SME for economy is undisputable. All research show that globally, more than 90% of all business activities are realized by SME. SMEs employ two thirds of total labor of European Union. Approaching to European Union presumes harmonization of the systematic environment and improvement of the climate of entrepreneurship, private initiative, development of SME. This determination has strongpoint in current world processes that prefer the development of SME, utilizing their profit efficiency and established advantages relating to the adaptability of small business to dynamic changes in economy. Problem of Human resources management is very sensitive issue in SMEs. Namely, in big companies there are entire teams of agencies or consultants are hired for selection and education of new employees, whereas in SMEs this work is done by owner or manager. Therefore, in this paper several facts were pointed out which need to be considered in selection of new employees, since every mistake in this activity can cause far-reaching consequences on functioning of SME.

Key words: small and medium enterprises, human resources management.

1. Situation with SME in Republic of Serbia

Serbia is facing challenges of global economic trends and integration processes, on European and World market. Its priority undoubtedly is accession to European Union, with development of competitive economy based on knowledge and innovation. Numerous effects of entrepreneurship on economical and social development are expected, and therefore it becomes strong element of developmental strategy of every country, regardless of whether they are developed or countries in transition, such as Serbia. Process of fast technological changes which characterizes modern economy is mainly result of new entrepreneurship ideas. Entrepreneurship, therefore, becomes opportunity for Serbia, since entrepreneurs can contribute to higher degree of utilization of available resources and faster economical growth necessary in order to reach developed countries. Most of the countries expect from entrepreneurship solution for one of the greatest current issues – high unemployment rate. Serbia is one of the countries with the highest unemployment rate and therefore development of entrepreneurship is its great opportunity. Of total number of active enterprises in Serbia, almost 99% are SMEs, but their contribution to employment rate and economical results is considerably smaller compared to developed countries and European Union.

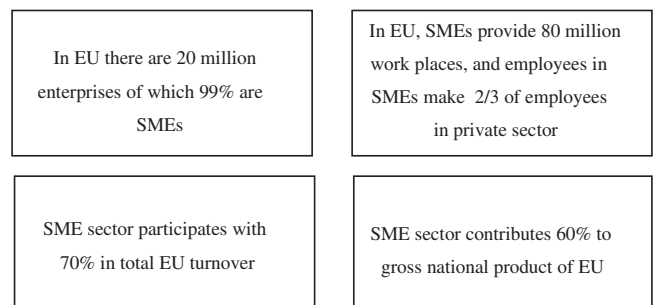


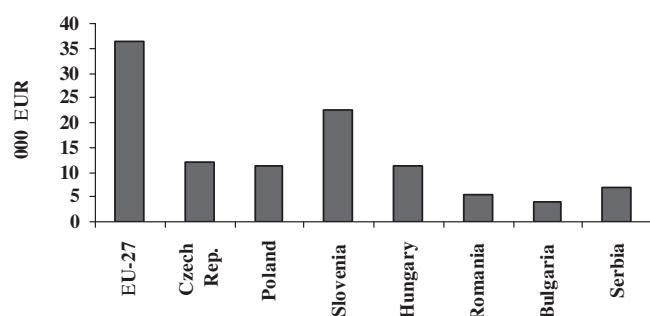
Figure 1: SME sector in European Union

Comparative analysis indicates low level of development of SME sector in Serbia in relation to EU-27 and surrounding countries – EU members.

Table 1: Comparative analysis

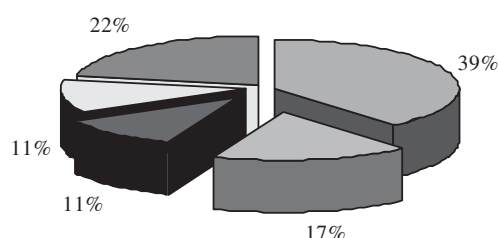
Parameter	EU-27	Czech Rep.	Poland	Slovenia	Hungary	Romania	Bulgaria	Serbia
Number of enterprises in 000	19 602	878	1 405	88	556	410	240	277
Number of employees in 000	85 000	3 461	5 289	371	1 783	2 463	1 318	811
GAV in bil. EUR	3 060	30	59	8	20	13	5	6
Number of employees per enterprise	4.3	2.8	3.8	4.2	3.2	6	5.5	2.9
GAV per employee in 000 EUR	36.4	12.1	11.2	22.4	11.3	5.4	4.0	6.9

Source: EUROSTAT – Statistics in focus, 31/2008.



Graph 1: GAV per employee in year 2006.

Serbia is characterized by explicit sector concentration of SMEs since almost 80% of SMEs operates in four sectors (wholesale and retail; processing industry; transportation/traffic; storing and communications; activities relating to real estate businesses).



Graph 2: Concentration of SMEs in regard to sectors in Serbia in 2006.

2. Defining of SME in Republic of Serbia

Term/concept of SME has not been clearly defined. Most often, when defining small business, economists go from legally determined provisions relating to small business in specific countries. There are many such definitions and therefore there is no unique attitude/position in defining of the concept of small business. Beside considerable number of factors taken into consideration in different countries in defining of SME, the following three are common in most of the countries:

- Total annual income/revenue
- Number of employees
- Shareholders sum (invested capital by shareholders in establishing of the enterprise)

According to current/valid legal provisions¹ of Republic of Serbia, enterprises are classified into small, medium and big depending on the following three factors:

- Average number of employees
- Total income/revenue
- Value of assets on the day when financial report was made in the last business year.

¹ Law on accounting and audit, „Official gazette of SRY“, No. 71/08 from 27.12. 2002.

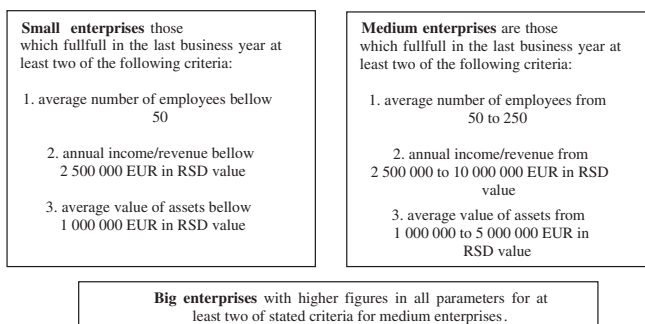


Figure 2: Defining of SME in Republic of Serbia

3. Human resources management in SME

Every owner of SME aspires to have successfully organized enterprise which is competitive on the market and realized high profits with employees which have high level of motivation in regard to the successful operating of the enterprise. Differences in competitiveness between SMEs today are significantly different compared to period twenty years ago. The importance of factors such as technology, finances, production process and similar is diminished, whereas more important sources of additional and newly created value of SMEs are their employees with their intellectual capital/assets, skills, creativity and information. Differences between competitive SMEs in regard to appearance, quality and functionality of products are decreasing. What differs SMEs more and more are their employees, i.e. their relation to clients, the way they solve problematic situations, speed of their reaction/response, motivation, ability to learn, etc.

At the beginning of 21st century, with dizzying development of information and communication technologies, human element became the single element which the competition could not copy. Since employees have very important role in SME which is aspiring to be distinct from competition, **human resources management** has more important role in planning and realization of SME's success compared to the past period. Strategy of human resources management has gained importance since the employees now are the most important factor of development. Intellectual capital, knowledge and competence of employees cause success or failure of SME in dynamic environment. Human resources management is potentially business function which has become a key element of the strategy of every SME in their efforts to establish and maintain their competitive edge on the market. In recent years, human resources management gained special significance, in theory and practice of SME management. Many SMEs are included in skills of human resources management and they pay more attention to development of their human potentials than ever before. Because of sudden changes and concrete conditions, human resources management is perceived as strategic factor influencing not only the success of SME but also of nations.

Human resources management relates to practice and policy necessary to execute all management tasks relating to

personnel issues, especially employment/hiring, education, evaluation and rewarding of SME employees and provision of safe, ethically acceptable and just/fair environment for them. Beside others, these practices and policies are the following:

- Work analysis (determination of the nature of work of each employee),
- Planning of work places and recruiting of candidates for the job,
- Selection of candidates for the job,
- Direction and education of new employees,
- Evaluation of the efficiency/output,
- Management of the employees' salaries,
- Providing incentives and benefits for employees,
- Communication with employees,
- Education and improvement of employees,
- Creation of the spirit of dedication in employees.

Figure 3 presents the connection of the strategy of main HR processes. It is specific connection which affects in long term employment of personnel, since this is process realized in 5 phases. So it is not important only to find personnel/employees and hire them. This approach could have permanent negative consequences for SME. Therefore, there is gradual approach, such as presented on the figure, which reflects in detailed preparation for hiring of new employees, as well as their gradual qualifying/training and introduction to their new job.

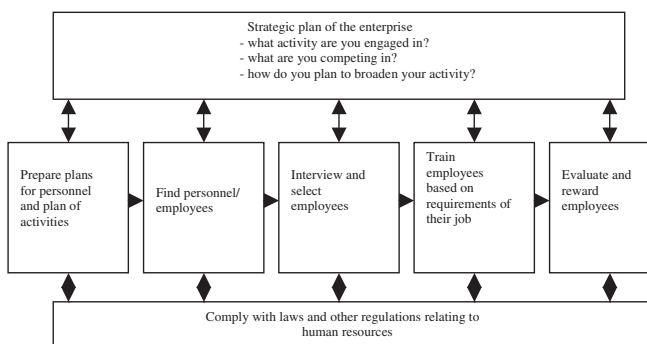


Figure 3: Strategy and main HR processes

Why are stated concepts and techniques important for managers? Answer is relatively simple, if manager does not follow with certain procedures, some of the following mistakes can easily occur:

- Hiring of wrong persons,
- Increased fluctuation of employees,
- Employees who are not „doing the best they can”,
- Enterprise can face the problem due to non-compliance with laws regulating protection of employees at the work place,
- Inadequate training of employees can endanger realization off tasks set by the management.

Planning of human resources demands constant adjustments since goals and objectives of SME can change, and development is insecure. Planning of human resources is very complex and depends on many independent factors: competition, domestic and foreign, consumer demand, new technologies, government interventions, etc. It has to contain feed back in case the plan for any reason is not feasible, SME

has to change the strategy in order to enable realization within existing human resources.

Main goal of human resources management is improvement of work efficiency/output of employees in strategic, ethical and socially responsible way. It is necessary to harmonize individual, organizational and social goals and at the same time enable realization of the strategy of enterprise and cancel negative effects from the environment. Monitoring and evaluation of the success of function of human resources management must be continuous and directed to control of realization of set goals. Result of successful human resources management is increase of profit, productivity, market share, increase of the satisfaction of clients and employees and improvement of the SME's reputation and influence. All of the stated parameters should be compared to previous situation, competition or common standards in certain activity/business in order to determine the efficiency/output of the human resources function. Monitoring of the fluctuation rate of employees, absence from work, salaries per employee, share of salaries in business costs, cost of hiring of new employee and cost of human resources management also contributes to determination of the influence of activities of human resources management on parameters of the successful SME operation.

For successful business operation and realization of set goals, organization of the function of human resources management in SME is also very important. Several different organizational forms are possible, depending on the needs and size of enterprises. It can be organized at the level of manager, department, service, sector or even center.

In SMEs, all managers are, in a way, human resource managers considering the fact that they are also included in recruiting, interviewing, selection and training of personnel. Also, SMEs should have manager responsible for human resources whose task is to advise other managers (for instance production or sale managers) during recruiting, hiring, salary determination, motivation and other activities.

Introduction and increase of availability of data base in form of software solutions for administrative affairs, on-line catalogues for development and education/training contribute greatly to the improvement of function of human resources management. Separation and entrusting activities of human resources management to independent partner institutions is also one of the alternatives for SME. Engagement of independent enterprises for certain activities of human resources management such as: recruiting and testing of candidates, training, development, calculation of salaries, etc., represents possible way for solving of tasks relating to human resource management in SMEs.

4. Principles and techniques of personnel selection

In the process of selection of relevant personnel/employees for establishing of SME, there are three key phases:

1. identification of personnel,
2. evaluation of personnel,
3. selecting personnel.

Entire procedure of personnel identification takes place through following three phases:

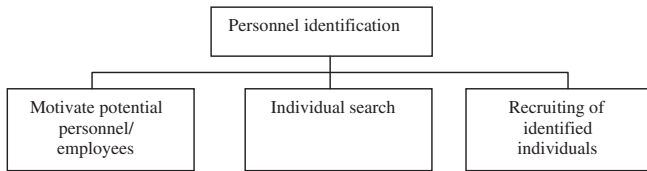


Figure 4: Procedure of personnel identification

In the evaluation phase, identification, evaluation and checking of desired knowledge, traits, skills and characteristics which are considered relevant for realization of tasks on certain position in the enterprise, are carried out.

All characteristics and traits of the individual which are subject to evaluation are divided into:

- psychological traits and characteristics,
- socio-demographic traits and characteristics,
- professional experience and quantification.

Selection phase has very important task, in the procedure of personnel selection, to bring the initial mass of all who are interested to number which is adequate for further analysis of compliance with requirements. Therefore, this phase is realized in three steps:

- preliminary selection,
- primary selection,
- secondary selection.

5. Conclusion

Development of SME sector, market economy, privatization and increased presence of foreign capital on the market of Republic of Serbia demand changes in the relation

towards employees, i.e. human resources management. Inadequate and insufficiently utilized work and creational potential of employees in Republic of Serbia requires improvement of human resources management in practice. More strict/severe competition on the market is characteristic of modern business, and employees with higher degree of education/training often represent competitive advantage of SMEs. Quality labor force increases the competitiveness of SME in the following way: it reacts faster on market demands and technological innovations, it improves the quality of product and services, etc. Competitive advantage of SME should be based on quality of its employees which includes human resources management in realization of the strategy of SME. Human resources management as carrier of the knowledge and skills in management of human resources has to be strategic partner that will contribute to the preparation and realization of strategic plans of the SME. This function has especially significant role in SMEs which are often forced to adjust their business policy to the market demands.

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The Study of Group and Team Management in Agribusiness Companies

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Summary: For almost three decades now that the operation of groups and teams became highlighted by scientific examinations and widespread acknowledged leverage for improving corporate efficiency and effectiveness. Much is known about general conditions of operation, still little is known about managerial attitudes, behaviour in operating them. Considering the agribusiness sector, we have hundreds of years of traditions; although operational rules, internal properties, managerial aspects are poorly acknowledged. The Department of Management of University of Debrecen has been conducting research in this field for many years now. Its research program enabled me to work out a questionnaire for surveying agribusiness organizations so that I could identify major and typical characteristics of performance groups. In this article I intend to more precisely describe internal rules, relations and characteristics of this phenomenon.

Key words: agribusiness, management, group and team performance, leadership

Introduction

Human performance may be characterized by specialization and task division during work. Mostly, the aim of the collective work is the improvement of efficiency and effectiveness, the better realization of corporate tasks. On the other hand, at working together, the mere presence of the other dominates human behaviour (*Dienesné-Berde*, 2003). The influence of groups largely affects the behaviour and performance of the members, so within a company it should be directed in a positive way, since it largely affects the success or the failure of the organization. Hungarian managers usually work much more than the law prescribes; professional literatures suggest that it is a direct result of improper task delegation. In Hungary, and the same applies to Slovenia and the Czech Republic, managers consider technical knowledge more important than social skills. It also means that the most trained, technical type professional will become the manager instead of a more social sensitive one. This attitude stands in contrast with Western trends. *Juhász* (2004) described further major problems with the Hungarian-Eastern style management. Regarding the countries examined he found that social skills and competences become more important for a manager with the increase of corporate scale, which also seems to get more importance with corporate concentration. Groups and teams are often considered as official, authority leverages, which purely serve corporate objectives. However, the presence of informal/social groups cannot be depreciated; since such groups equally influence effectiveness and social work atmosphere, sometimes not at all advantageously. On international level, teams and groups are distinct terms, in the Hungarian application they are often used as one. Hungarian professional literatures use the words team and group as

synonyms without any differences, *Klein* also (1998) thinks these two words fully harmonize, mean the same.

In the agribusiness sector group and team performance have long term traditions. Considering antecedents, in the end of the XIX century physical agricultural workers usually went to the southern parts to Hungary in well-organized groups, forming a typical phenomenon of the sector, regulated on central level. Examining the agribusiness sector I believe that seasonality (and its direct sequent, the changing, dynamic work structure), professional tasks and managerial challenges (EU accession, labour organization) justify the reason for the research, mainly managers need to learn more about the human aspects of it.

Precedents and applied methods

Scientific examinations were carried out in the framework of a doctoral programme; prime objective was to find properties and rules in the operation of agribusiness groups. A special questionnaire was edited covering all the relevant fields, later was revised many times, and survey was taken by attendants.

Since different approaches are present in the professional literature (point of economics, point of psychology, point of history, point of management, etc.), I have selected the managerial point of view and an operational approach. It also means that group operation was detailed in processes and managerial activity was broken into special activities paired with the distinctive process. This approach is represented in the questionnaire itself, meaning that major parts of the questionnaire is based on this model. Figure 1 describes further details with associated managerial duties and tasks.

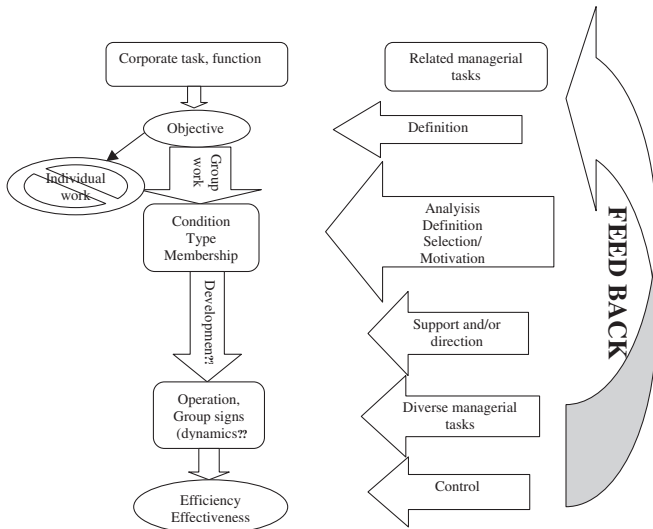


Figure 1. The managerial process of group operation
Source: Private editing, 2008.

Prime suppositions were that groups are basic leverages for the managerial activity, meaning that managers probably use and prefer common work activity. Permanent and temporary working activity may determine types of groups. I have also supposed that current agribusiness conditions primarily justify efficiency and effectiveness (that is corporate aspect) orientation, human relations are not really considered. By ignoring personal relations, managerial work division is complex, which may result in overload. Considering internal relations, human aspects are apparent. It was not really clear what defines the system of internal relations, moreover whether managers need to deal with major or every single operational task. Continuous attention and related experience seemed more obvious. Analysis of performance seemed to be a problematic field due to many outputs. Organizational performance may prevail above all the other factors. Leverages for evaluation were descriptive statistics, main component and cluster analysis. Number of items for the evaluation was 477, different level agribusiness managers.

Results and discussion

Results of descriptive statistics revealed that group work is a general leverage of meeting organizational objectives. It was considered useful by most interviewees, this corresponds with international aspects (Dumaine, 1994), on the other hand 99% of managers had experience in working together (Figure 2). Based on the analyses, I could define that technical, professional point of views, work tasks play an important role in the creation of groups, and these are corporate aspects. Drastic methods of group creation, such as enforcement and power, were qualified with lower values. Research results suggest that interviewees consider the more efficient realization of corporate goals and successful operation the most important benefits of the groups, so corporate objectives also prevail.

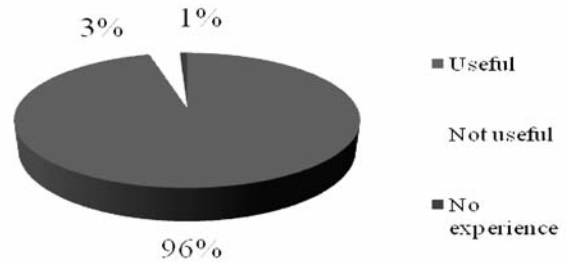


Figure 2. Opinions about group performance
Source: Private examinations, 2008.

Of the drawbacks opposition and strict norms were emphasized, these may relate to personal factors. Status and role examinations were treated together, since first defines vertical, the other horizontal position. Status is mainly determined by technical competence and performance, that is corporate aspect. I have applied a widely accepted structure at the definition of the possible role of the interviewee. Belbin (1998) firstly defined novel roles in the composition of a performance team. One member may identify himself with one of the eight roles by a simple test, the reason for application is to define main characteristics and eliminate repetition, aggregation when setting up a team. I have applied it in a novel way. Of the interviewees, most of them identified themselves as a monitor-evaluator (Figure 3.). It may also be declared, that there was not large differences between the identification of the roles, which may relate to the democracy of the roles.

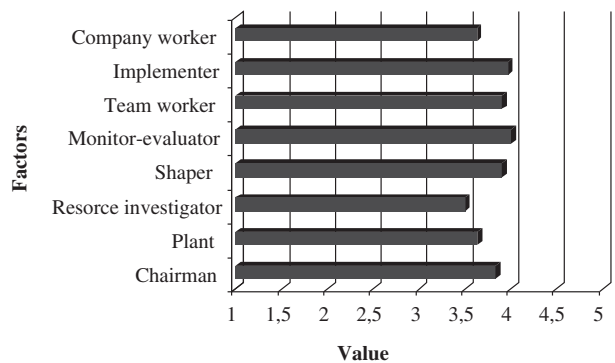


Figure 3. Definition of membership
Source: Private examinations, 2008.

Norm examinations suggest that of the group norms, formal organizational functions were emphasized, these were quick and fast work performance.

Results of success and failure examinations suggest that factors posses a greater role in the success compared to the failure. The success of a group is a result of many factors. Reachable goals, managerial expectations and imaginations, strong norms equally interact. The termination of an operation is influenced by many factors; most important were the managerial intentions, environmental conditions, changes and mainly strong norms.

After descriptive statistics, I have applied the method of main component analysis on the sample. Of the 104 questions, and 43 variables (33 main and 10 single ones) were created. Variables were examined by sex, age, graduation, position (individual parameters), operation form, number of employees and specialization (organizational parameters). I have used parametric variance analysis to find differences in the samples, and non-parametric tests were carried out for the missing values.

Considering the sex of respondents, I have found that women assign a larger importance for the formal functional being of the group operation, analysis of the missing values revealed that authority factors (leadership, enforcement, and power) seem to be more important for and typical of men.

Examinations of the affect of age parameter revealed that significant differences mainly appeared in the case of relatively younger and older respondents. Furthermore, mainly financial and prestige, correlation and effectiveness reasons seemed to be more determinant and important for them.

Examining the effect of graduation I have revealed that technical aspects of formation were mainly important for the ones with higher graduation, its importance decreases with lower graduations. Importance of internal group factors (norms, cohesion, and appeal) also rises with graduation, which means these respondents have a higher and more thorough view of group operation.

No significant differences were found considering organizational form examinations, it also means that behaviour of the sample slightly changes by shift in organizational forms.

Examining the effect of employee number categories I have indicated the differences in formation methods, membership benefits, polarization reasons and membership related questions.

I intended to explain differences by typical properties in the framework of cluster analysis, and some tendencies could be revealed. Groups formed differed by many aspects, many properties, so by focus on these differences further characteristics may be illustrated, and former definitions may be justified. Cluster analysis required the division of the sample into four groups, which were the following:

1. Middle age managers of co-operatives and other organizations
2. Elder top managers of corporations
3. Young lower and middle level managers of corporations and public companies
4. Elder lower and middle level managers of corporations and public companies

Cluster analysis revealed many connections. Formation is mainly affected by technical factors at corporations and public companies, while information factor seems to be more

Table 1. Differences in the evaluation of components by cluster analysis

Clusters/ Factors	Group formation		Membership benefits	Polari- zation	Membership		Group failure
	Technical aspect	Information aspect	Financial, prestige benefits	Different value orinetation	Appeal	Limita- tion factor	Group norm/effect factor
1.cluster	-	+	-	~	+	~	+
2. cluster	+	-	~	~	~	-	-
3. cluster	+	-	+	-	-	~	~
4. cluster	~	~	~	+	~	+	+

Legend (- less important, ~ average important, + more important)

Source: *Private examinations, 2008.*

determining for co-operatives and other organizations. Financials and prestige as membership vales are mostly dominant for bottom and middle level younger managers. The importance of different values as a reason for polarization differs between the younger and older respondents; its importance may rise with age for public and limited company bottom and intermediate level managers. Appeal is mainly dominant for middle age managers of co-operatives. Group pressure is mainly emphasized by elder bottom and middle level managers of limited companies, while top managers ignore that. Of the roles, chairman seems specific for elder top managers of small scale limited companies; its importance seems to be changing by the increase of position and age.

Consequences

I have edited a private model for the management of group operation, it has a process approach, and stages are paired with managerial tasks. Mainly organizational aspects are considered at formation, informational relations are less emphasized. Managerial opinions revealed that organizational and individual aspects equally appear in internal relations. Operation may be evaluated by criteria of success, and it is primarily judged by efficiency.

In general, managerial opinions mainly covered organizational aspects; the participation of individual relations seems to be slight. It also means the ignorance of personal conditions, enhances the current, mainly economic aspects and may relate to the autocratic attitude of managers.

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Some possibilities for risk analysis in the decision support of crop production

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Abstract: This article has been made according to my dissertation in which I present some opportunity of risk analysis and risk management in the decision support of crop production.

Plant production is one of the most hazardous agricultural enterprises. Among risk sources seasonal fluctuation of average yields plays an important role in the assessment of enterprises. Therefore, I analyzed the production risk of the produced crops in Hungary compared to the European Union's, after that I took into consideration the production site's circumstances as well.

Decision-makers must possess such means, by which they can measure, oversee and manage the effects and consequences of risk. In crop production linear programming models can be used to determine the optimal crop structure, by which income-sensitivity can be taken into account, but it does not reflect the behavior to risk. This deficiency can be avoided by using risk programming models. By the complementary usage of linear programming and risk programming models the optimizing and adaptive planning can be executed.

It often causes a problem for the producers to decide when and how much to sell to realize a maximum turnover. The decision is mostly influenced by the selling prices, but also important factors are the financial status of the business, the amount of credit and its conditions, the stock-piling opportunities and costs, and the short-term investment opportunities as well. For the resolution of the problem I set up a dynamic, simultaneous financial model by which the system-conceptual analysis of the above mentioned factors and a sound decision-making can be executed.

Key words: risk, crop production, decision support

Introduction

Crop production usually consists of more enterprises among which there are differences in their products' market perception, production technology, resource-demand, time-scattering, in their time and need for field, agronomical interactions, the level of expenditures and profitability.

The future status of external and internal factors, that affect the result of economic decisions, is not known by the farmer (Bácskai et al., 1976; Hardaker et al., 1997; Drimba, 1998a), and based on the contradiction that the decision concerning the business' future must be made at the time when reliable information are available about the previous period (Buzás, 2000).

Risk presents in all areas of the economy and nobody can avoid it. In plant production beside economic risk the risk of weather's changeableness bears an increased significance. In extreme cases, catastrophe can evolve, however fluctuations from climatic conditions can induce positive and negative changes in the growth and development of crops and in their yields (Harnos, 1996). These thoughts can suggest – and external observers often think so – that beside such level of uncertainty in the agriculture good weather, fertile ground, various assists and luck are needed for the good result. However, players in economic or business spheres must possess such means by which they can measure, oversee and manage the effects and consequences of risk (Madai – Nábrádi, 2005). One condition of this is that for the decision-

makers the information needed for decision should be available up-to-date, in appropriate quality and quantity and after their evaluation, process it allows setting up and analyzing various decision alternatives, variants. By this, the support of the most appropriate decision-making that matches to the style of decision-maker can be possible. This is the task of decision support.

In the presence of needed information we can measure risk by using statistical means. Knowing the feature and level of risk, we can reject a possible alternative or if we decide so, by applying proper risk management tools we can even realize it. The thought about the risk's economic importance was born almost 90 years ago. Since then, almost in all areas of economic spheres also in agriculture significant results and applications have been evolved. The development of informatics and the internet gave a much bigger stamina to research; the practical utilization's availability is simpler and cheaper.

1. Objectives of the research

In this paper my **general objective** was to ensure efficient means for the crop production's decision support by applying present risk management methods, models and their development or by the adaptation of models which are used on other economic fields successfully taken into consideration their features of crop production.

Database, activities and outputs to be used during the research are summarized in *Figure 1*.

My concrete objective can be separated into three main groups:

Presentation of the production risk for some field crops in the level of the European Union and the Észak-Alföld Region

Among risk sources in the crop sector production risk has an extended role (*Balogh, 2008*). In the course of production risk's analysis I point out that without reference to the decision-makers behavior to risk, risk is presented in production. Both experts and researchers need quantified knowledge about the risk of various enterprises, because crop production that is developed, competitive and where the characteristics of production site are considered requires these research findings as well.

The countries of the European Union have diverse climatic, natural and economic characteristics (*Bocz, 1996*). These can be seen on the level and risk of agricultural production. By the greenhouse effect the production risk is rising and we can count with higher yield fluctuations. The European Committee gives high priority to the risks of agriculture. For the more efficient utilization of our negotiation power we must know – amongst other things – the main crops' calculated production risk in Hungary and in the other EU members, which demonstration and analysis is one of my objectives.

Considering Hungary's arable crop production, the Észak-Alföld Region has a significant role in it, because it occupies 21,5% of 4,5 million hectares, by which it is on the second place after the Dél-Alföld. If we see the fields' characteristics the state is more unfavorable. Within the region the difference among the quality of fields is significant. In the county of Szabolcs-Szatmár-Bereg the values of golden crown are the lowest, in the county of Hajdú-Bihar and Jász-Nagykun-Szolnok there are very good production sites. My aim is to present the main enterprises' production risk by field characteristics in the Észak-Alföld Region.

Considering risk during the creation of crop structure

In the crop sector conventional planning is the most common even nowadays, which means adequate planning, however determines increasing lag in the economic competition. In this agriculture with new challenges – environmental and nature conservation aspects, biomass energy, sustainable development, etc. – only those can take part in the competition who adapt to the environment. However, its condition is the execution of adaptive and optimizing planning together. One of my objectives is to present the importance of usage of linear programming and risk programming models by case studies and its advantages in the decision support of crop production. According to my plans during the application of risk programming models I am going to analyze the behavior to risk with and without assist.

Reducing marketing risk by using optimal wheat marketing strategies

The crop sector's special characteristic is that end-products appear at a biologically determined period, but their utilization is year-round. Selling prices are always the lowest at the harvesting period, after that they show a more or less identifiable seasonal fluctuation. This situation is further complicated by the fact that among the different crop years, we can notice great divergences in prices (*Bács, 2003; Bács – Fenyves, 2005*). Given the above, both on the side of producers and the biggest wheat-user enterprises – mill industry, animal husbandry – economic risk increases notably.

In my research I wanted to find the answer for the question that when and how much wheat have to be sold by the producer to choose financially the most favorable decision variant in the given financial-economic state. The problem is going to be solved by a **dynamic, simultaneous linear programming model** in which I am going to take into consideration the cash-flow balances by months, borrowing, alternative capital investment opportunities and stock-piling costs as well.

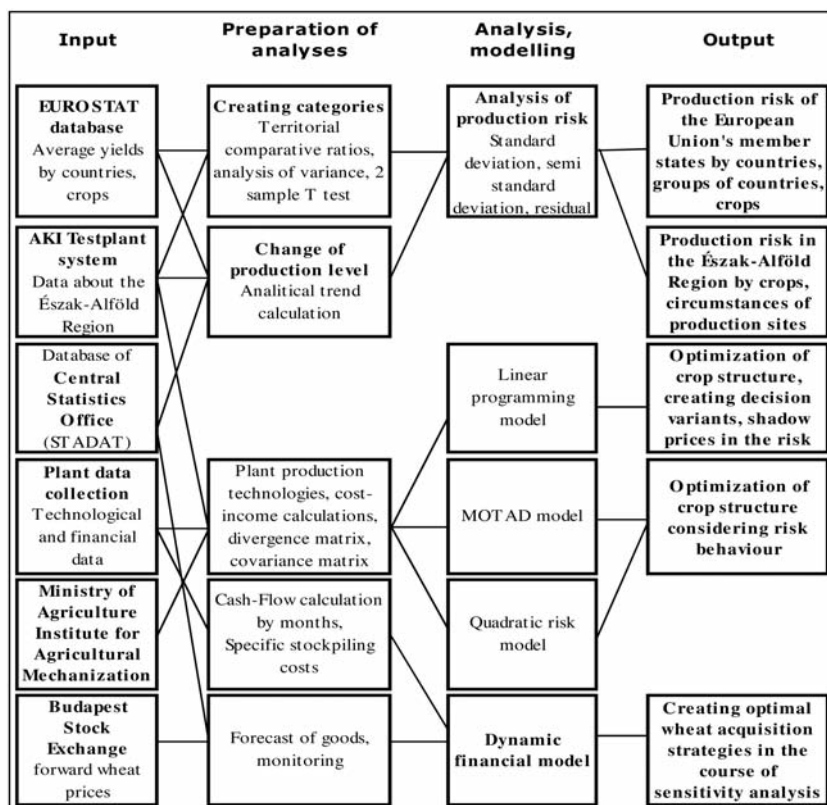


Figure 1. Objectives, inputs and activities of the research
Source: own assemblage

2. Materials and methods

To reach the objectives which were mentioned in the introduction part widespread data collection was needed. For the calculation of the European Union countries' production risk I used EUROSTAT data among 1990–2006. For the production risk analysis that was made in the Észak-Alföld Region the Agricultural Economics Research Institute made available the data of its Testplant system among 2001–2005.

The enterprise technologies' basic data that are needed for the linear and risk programming models are from own data collection, I have been collecting information concerning crop enterprises from 15 agricultural undertakings since 2003. In the course of calculation of machine operational beside own data collection I used the comprehensive database of Ministry of Agriculture Institute for Agricultural Mechanization (Gockler, 2007a, b).

For the wheat's price analysis I used the historical database of Budapest Stock Exchange among 1999–2006 and monthly buying-in data of Central Statistics Office among 2001–2007.

I typified the production risk by dispersions – standard deviation, relative deviation, semi deviation – and in the case of trend effect I calculated residual deviation, residual semi deviation.

I checked the golden crown classifiability of field characteristics by statistical hypothesis testing, 2 sampled T test and variance analysis.

I did the optimization of crop structure by using linear programming, I applied the MOTAD model and the quadratic portfolio optimizing model among the risk programming models that take into consideration the decision-makers' risk behavior.

In determining the optimal wheat selling strategy I compared the different statistical forecasting models' applicability and its accuracy by using follower mark in the course of wheat prices' forecast. For the creation of strategies Drimba-Ertsey's (1999) financial planning model was the base and I made a new, dynamic simultaneous model which was needed to solve the problem.

For the statistical calculations I applied the SPSS 13.0 and XLSTAT 5.5 programs. The database operations that were needed for the creation of technologies were done by Microsoft Access 2003, the set-up, solving and formal post-work were made by Microsoft Excel 2003.

3. Results and discussion

In the first part of my paper I analyzed some field crop enterprise's production cost on the level of European Union and the Észak-Alföld Region. In the next part I examined that what kind of possibilities we have to consider risk in the course of crop structure's planning and that how the different risk behavioral decision-makers react with and without assist. At last, I took up that when and how much to sell from the already produced goods to realize the highest income.

3.1. Analysis of production risk for some field crops in the level of the European Union and the Észak-Alföld Region

The members of the European Union that can be separated into groups according to the production risk possess various climatic and economic characteristics. For the more developed west-European countries – where the climate is characteristically constant oceanic and wet continental – high yields and lower is typical. *New member states* lag behind not only in the level of production from the above-mentioned group, but *both in absolute and relative sense they produce with higher risk (Table 1.)*. This can be explained with the more extreme climatic conditions and with the catching-up social, economic environment. While in the developed countries average yields have been rising in the latest 16 years, in the new member states, which joined in 2004, stagnation or decreasing tendency can be demonstrated.

Table 1. Relative deviations of average yields in the analyzed countries

Country	Barley	Potato	Wheat	Sugar beet	Corn	Turnsole	Rape
United Kingdom	4,5%	5,5%	4,1%	7,3%			9,5%
France	6,9%	6,2%	6,2%	5,6%	8,3%	5,6%	10,1%
Germany	7,8%	10,0%	6,3%	5,2%	7,7%		11,2%
Denmark	10,2%	6,2%	4,9%	6,8%			12,5%
Austria	8,5%	8,7%	8,2%	7,4%	8,7%	9,3%	17,1%
Czech Republic	15,0%	10,9%	10,6%	5,0%	19,2%	9,3%	17,2%
Slovakia	18,7%	16,8%	12,6%	10,6%	21,2%	15,0%	21,5%
Hungary	18,3%	15,1%	18,7%	16,1%	25,3%	17,5%	21,7%
Italy	5,2%	5,6%	10,0%	11,3%	9,0%	7,7%	
Greece	15,1%	11,9%	12,6%	5,9%	5,0%	13,0%	
Romania	17,9%	11,0%	21,0%	18,6%	23,8%	15,0%	
Spain	25,7%	34,2%	20,1%	6,2%	7,1%	21,9%	
Portugal	32,4%	8,8%	31,6%		12,0%	24,6%	
Netherlands	6,7%	5,1%	5,6%	9,4%	15,4%		
Poland	11,8%	13,5%	9,5%	8,8%	13,3%		
Minimum	4,5%	5,1%	4,1%	5,0%	5,0%	5,6%	9,5%
Maximum	32,4%	34,2%	31,6%	18,6%	25,3%	24,6%	21,7%

Source: Own calculation by using Eurostat data

From the point of risk Mediterranean countries constitute a separate group where in case of less intensively produced crops – for example cereals – production risk is extremely high, however in case of intensive, irrigated cultures higher yield can be reached with less risk. *Within the European Union Hungary is one of the most hazardous countries.* The values of *standard deviation* and *semi deviation* for wheat and sugar beet production are the highest. Rape is the only crop, which takes place in the middle.

Considering the agro potential Észak-Alföld Region is one of the weakest and the most heterogeneous area in Hungary. I examined the average golden crown value per one hectare, as a potential field characteristic impounding factor, for arable crops' average yields by using statistical hypothesis testing. In the Észak-Alföld Region the average golden crown value is 19,62, the standard deviation is 6,31. I took this into consideration, I separated 3–3 categories below and above the average by steps of half of the deviation, after that I examined by variance analysis if in the different categories' average yields significant difference could be observed. The results of the analysis are shown in Table 1. In the case of corn, wheat and turnsole we can see that among the average yields at fields with below-the-average golden

crown value and with higher golden crown value the deviance is significant, but for above-the-average fields it is not so. Therefore it can be concluded that in case of some crops it was reasonable to separate the types of fields by this *grouping of golden crowns*, however there is no meaning to *grouping with more varied shades* from the point of the analysis.

Table 2. Significant divergences among average yields by categories of golden crown

Categories (golden crown/ha)	<13,31	13,31 - 16,46	16,47 - 19,62	19,63 - 22,78	22,79 - 25,93	25,93<
<13,31	-	KÁN	BKN	BKÁN	BKN	BKÁN
13,31 - 16,46	KÁN	-	BKÁN	BKNC	BKN	BKC
16,47 - 19,62	BKN	BKÁN	-	-	-	Á
19,63 - 22,78	BKÁN	BKNC	-	-	-	-
22,79 - 25,93	BKN	BKN	-	-	-	-
25,93<	BKÁN	BKC	Á	-	-	-

Source: own calculation

According to the values of relative residual deviation it can be demonstrated that *in the Észak-Alföld Region the riskiest is the production of winter colza and winter barley and corn production's risk is also high on fields which quality is lower than the average. Irrespectively of field characteristic turnsole can be grown with low risk (Figure 2.).*

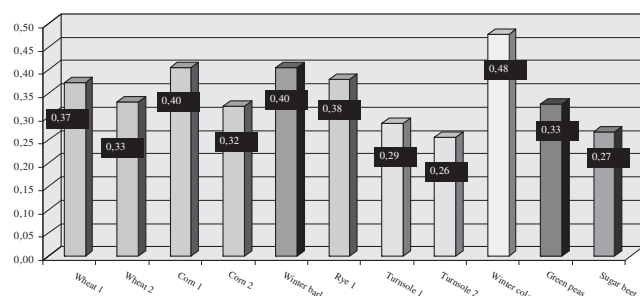


Figure 2. Production risk in the Észak-Alföld Region

Source: own calculation

In the case of wheat, corn and turnsole I had the chance to compare below average and above average fields' production risk. It can be demonstrated for corn and turnsole that in worse years in those undertakings that possess above average fields the production risk is lower, while in better years the values of relative deviation are almost the same. In case of wheat the state is in reverse: the better production site's level-off effect to yield fluctuations is predominated in favorable years (Figure 3.).

3.2. Optimizing crop structure by considering risk

Linear programming model makes for income maximalization and because of its deterministic character it is less suitable for considering risk. In the course of sensitivity analyses the proper interpretation of shadow prices can help us in the risk analysis as well. In my paper I am going to do the crop structure analysis of an undertaking of 2000 hectares. In pursuance of the analysis of activities' shadow prices, we get a precise view of the enterprises' sensitivity to income changes (Ragsdale, 2007). By the

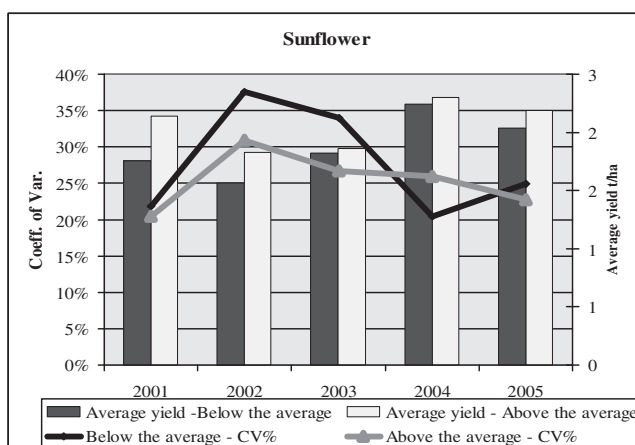
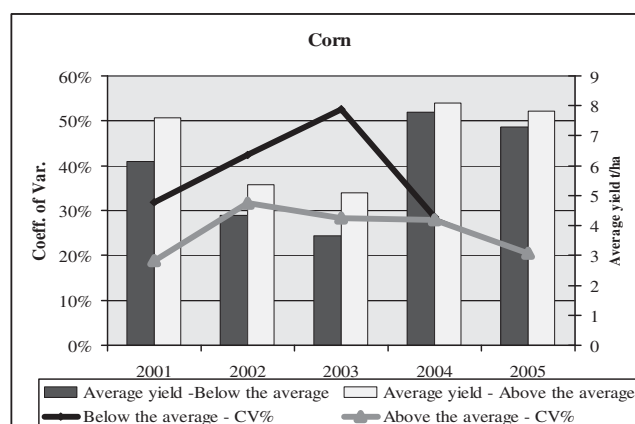
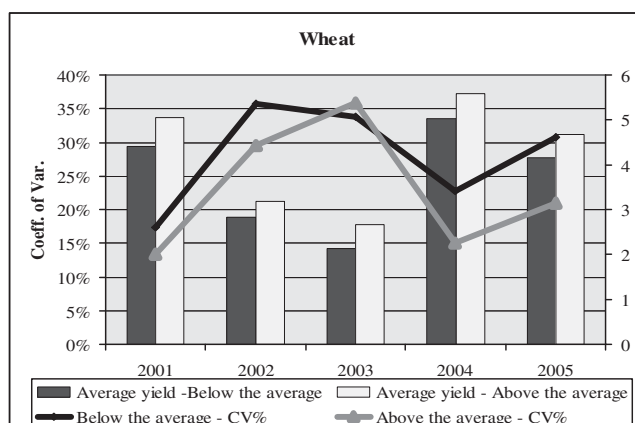


Figure 3. Wheat's, corn's and turnsole's average yields and production risk within 2001–2005

Source: own calculation

allowable increase and decrease an income interval can be determined within which, if its value is changed, the optimal crop structure remains unchanged. In practice it means that our production structure only have to be reasonably changed, i.e. rerun the model with new parameters, if the alteration exceeds the mower and upper limits. In other cases the **production structure shall not be changed, because we still realize the highest income with the available resources.** From the point of risk, the lower limit is more important for us, because it can acquire the undertaking of drastic income decrease (Figure 4.).

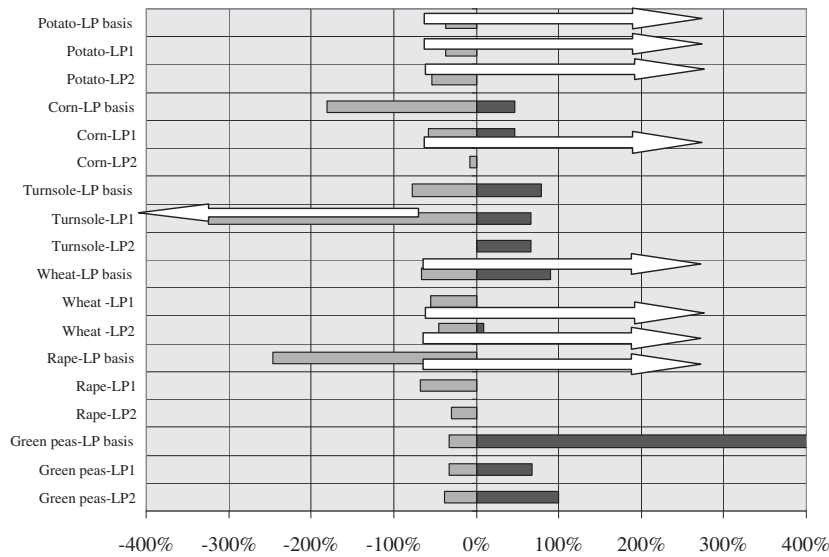


Figure 4. Sensitivity of the competed enterprises to profit contribution in various model variants *
 * the arrows mean that in case of unrestricted growth or decrease of profit contribution the production structure does not change
 Source: own calculation

We cannot ignore the fact that the highest risk is born by plan variants created by linear programming. Decision-makers do not always choose the plans with the highest income; their decision is affected by their behaviors to risk (Anderson et al., 1977, Anderson – Dillon, 1992). The choice is created by using risk programming models.

In these models risk is typified by income fluctuation. In the MOTAD model we quantify by negative deviations from the average value and in the quadratic model by variance. In both cases – using the expected income as parameter – model serials and efficient curves are created and the most conforming plan to the individual’s utility can be chosen by the relative change average.

In the case study I analyzed how efficient limit plans with and without assist set. It can be concluded that there are significant deviances in the production structure and risk if we use the MOTAD model, while in case of portfolio model we cannot see such a pronounced difference (Hazell, 1971, Hazell – Norton, 1986). The result of the MOTAD model

Table 3. Risk after reducing profit contribution

Variants	Profit contribution	ΔFH/ FH	With assist			Without assist		
			Risk value	ΔM/M	ΔM/M: ΔFH/FH	Risk value	ΔM/M	ΔM/M: ΔFH/ FH
Variant 1.	297530	0,0%	166162	0,0%		181061	0,0%	
Variant 2.	295000	0,9%	158847	4,4%	5,178	172208	4,9%	5,751
Variant 3.	290000	2,5%	154131	7,2%	2,861	162202	10,4%	4,116
Variant 4.	285000	4,2%	149991	9,7%	2,311	154086	14,9%	3,538
Variant 5.	280000	5,9%	145907	12,2%	2,069	146871	18,9%	3,205
Variant 6.	275000	7,6%	141821	14,6%	1,935	143288	20,9%	2,755
Variant 7.	270000	9,3%	137731	17,1%	1,849	141246	22,0%	2,377
Variant 8.	265000	10,9%	133646	19,6%	1,790	139920	22,7%	2,078
Variant 9.	260000	12,6%	131598	20,8%	1,649	138594	23,5%	1,859

Δ FH/FH: Decrease of profit contribution compared to Variant 1.

Δ M/M: Decrease of risk compared to Variant 1.

Δ M/M: Δ FH/FH: Risk reduction by income-sacrifice units

Source: own calculation

without assist show that in higher income zones risk values are higher than with assist, after that a level-off can be observed in the case of 5th and 6th variant, than deviances are rising again (Table 2.).

The result can be examined by E-M efficient curves from other point of view (Figure 5.). On the stage where the curve’s slope is smaller, one percent of income-sacrifice means more risk reduction. Rational decision-makers will choose from those plans that are on the stage with smaller slope accordingly to their risk behavior.

On the critical limit there is the plan where the slope of the E-M efficient curve increases suddenly. After this, the risk reduction for an income sacrifice unit is going to be so low that even risk refusal undertakers will not choose this. Figure 5. well illustrates that without assist we reach sooner the plan, where the curve’s slope is rising suddenly compared to the values with assist. This suggests that those

decision-makers who are against risk may often choose plans with low expected value in the presence of assist, which worsens the competitiveness in a long-term.

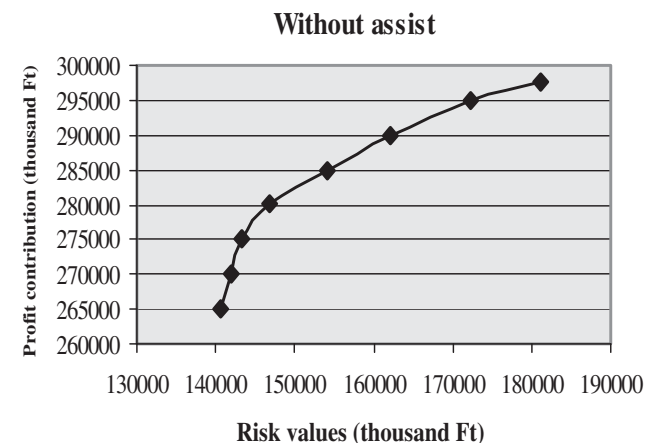
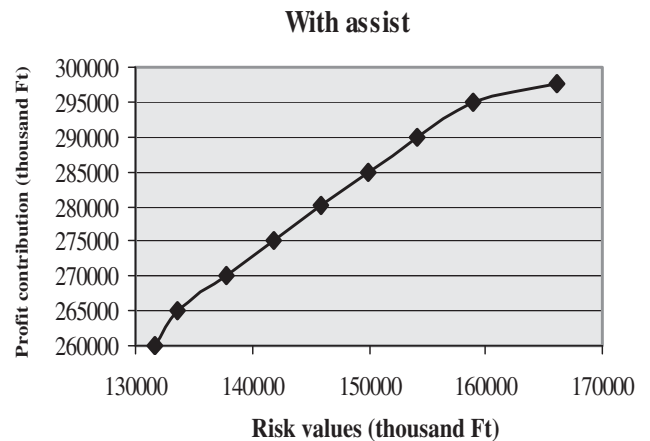


Figure 5. E-M efficient curves in the presence of assist and without assist
 Source: own calculation

One condition of adaptive planning is the application of developed planning methods. Linear programming and risk programming models make possible more efficient decision-making. The implementation depends on the consistent operation of education, research and consultancy, in which the information technology instruments play an important role. In the expert systems thereby caused, risk management tools can play an important role.

3.3. Reducing marketing risk by using optimal wheat marketing strategies

The crop sector's special characteristic is that end-products appear at a biologically determined period, but their utilization is year-round. Selling prices are always the lowest at the harvesting period, after that they show a more or less identifiable seasonal fluctuation. This situation is further complicated by the fact that among the different crop years, we can notice great divergences in prices. Given the above, both on the side of producers and on the side of the biggest wheat-user enterprises, economic risk increases notably (Nagy – Gál, 2007).

For reducing costs forwards and futures and good-exchange options can be used, but in the countries of the European Union these techniques are not widespread (Pálincás – Székely, 2008). Either by futures, or contracts, or by free market 'sit-outs', or by other methods is happening

the sale, *not only the available selling price*, however this is beyond doubt the most important factor, *affects the marketing strategy to be chosen*. In the decision the financial state of the business, the available credit and its conditions, gains from alternative investment and stock-piling costs as well. My objective was to set up such a model by which we can examine these factors relatedly, at one time.

The creation of strategies is happened in three closely related steps. The first step is the forecast of prices, the second one is the setting up of the model, giving its parameters, solving and at last different decision variants are created by sensitivity analysis and after the comparative analysis is done, the decision can be made.

The first step, the reliable price forecast is a very important part of the exercise. There are a lot of available statistical methods and the most reliable must be chosen. For the comparison of methods and their continuous monitoring I used an easily applicable follower mark which was working at the forecast of needs (Koltai, 2006). The gist of the follower mark's use is that the error of the estimation shall be within a set-up interval, which can be narrower or wider according to the feature of the problem. If the value takes place out of the interval, the forecasting method must be re-examined, because it can happen that for the next period another method gives more reliable results. The advantage of the follower mark, beside its simplicity, is that in contrast to

Description	Alternative investments	1st period						...	1st period						R	Capacity vector	
		Credit	Wheat marketing	Income of investments	Closing stock	Average stock	Transfer		Credit	Wheat marketing	Income of investments	Closing stock	Average stock	Transfer			
Money balance 1st period		-1					1	...								=	CF 1st period
∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴		
Money balance 1st period							-1	...	-1					1		=	CF 1st period
Credit constraint		1						...	1							<=	H _{max}
Constraint for alternative investment	1							...								<=	A _{max}
Wheat commodity balance			1					...		1						=	V
jnth investment inth period	-1/h			1				...								=	0
∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴		
Commodity balances jnth investment inth period	-1/h							...			1					=	0
Closing stock 1st period			-1		-1			...								=	-V
∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴		
Closing stock 1st period					1			...		-1		-1				=	0
Average stock 1st period			1/2		1	-1		...								=	0
∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴	∴		
Average stock 1st period										1/2		1	-1			=	0
Objective function					0		0	...				0		0			MAX!

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Figure 6. The financial model's schematic structure
Source: own figure

other techniques it requires constant freshening. I compared three techniques for the forecast of wheat prices: seasonal decomposition, moving average and Winter's smoothing method, among which the third one proved to be the most reliable.

After the price forecast I set up such a *dynamic simultaneous financial model* (Figure 6.) to solve the problem that beyond the application of classical risk management methods manages stock-piling, equity-binding costs and it allows gaining maximal corporate income.

At the calculation of periodical money balances the paid out amount for the alternative investments is on the side of expenditures in the model, the planned Cash-Flow is on the side of liabilities; the borrowed money, the earnings of the wheat and the incomings from alternative investments mean turnovers. I store the closing balance by periods in a so-called transfer variable, which means of course that it is the opening balance for the next period. Credit constraint and the maximum amount that can be put into alternative investments can be fixed in the model. In the wheat's commodity balance I set the quantity of wheat to be marketed and we can set here if we allow stocks to be continued to the next period or not, by correctly using the relations. Constraints for alternative investments are model-technical. Besides, I modeled dynamically the change of wheat stock and I determined the average stock for all periods to calculate stock-piling costs.

After having solved the model, considering shadow prices I created more variants (Table 3.). A1 variant reflects the parameters given by the managers of the undertakings which mean that I did not calculate with credit or short-term investments.

In Table 4 I summarized the results. It shows that, among the modeled variants by sensitivity analysis, A4 ensures with 7 percent higher income for the undertaking and in this case the whole quantity is sold in the buying-in period.

Another advantage of the system-conceptual analysis is that price flexibility analysis becomes possible to execute. Lower and upper price limits in Table 5 mean that the result is going to alter if the objective function is risen above or reduced below. Blanks in the table mean that if the prices are moved up or down the result is unchanged in case of infinitely great alterations. In the case of A1, A2 and A3 variants' marginal prices are the same which means the three model's price flexibility is the same. In the course of A4 variant the upper marginal price is higher from September compared to other variants that refers to the advantage of short-term investments.

In conclusion, the **dynamic, simultaneous linear programming model** that was made for the risk

Table 3. The set variants in the course of sensitivity analysis

Variant	Credit (thousand Ft)	Credit's interest rate	Constraint for investment (thousand Ft)
A1	0	12,0%	0
A2	20000	12,0%	0
A2_1	20000	7,50%	0
A3	20000	12,0%	50000
A3_1	20000	7,50%	50000

Source: own calculation

Table 4. The sensitivity analysis' summary data

Variant	Wheat marketing tons		Credit thousand Ft	Short-time investment thousand Ft	Objective function thousand Ft	Change of objective function (A1=100%)
	July	October				
A1	1 801,1	2 417,4	-	-	102783	100,0%
A2	1 801,1	2 417,4	-	-	102783	100,0%
A2_1	975,2	3 243,3	20 000	-	102912	100,1%
A3	3 865,6	352,9	-	50 000	106521	103,6%
A3_1	3 039,8	1 187,7	20 000	-	106650	103,8%
A4	4 218,5	-	20 000	100 000	109958	107,0%

Source: own calculation

Table 5. The prices' extremes in the course of basic variants

Period	Objective function	A1		A2		A3		A4	
		Lower price bound	Upper price bound	Lower price bound	Upper price bound	Lower price bound	Upper price bound	Lower price bound	Upper price bound
July 2006	23,50	23,40	25,32	23,40	25,32	23,40	25,32	23,40	
August 2006	24,46		24,56		24,56		24,56	24,38	24,56
September 2006	26,63		27,32		27,32		27,32		27,40
October 2006	28,58	28,00	28,76	28,00	28,76	28,00	28,76		28,66
01 November 2006	29,61		30,20		30,20		30,20		30,28
01 December 2006	31,58		32,17		32,17		32,17		32,25
January 2007	32,47		32,91		32,91		32,91		32,95
February 2007	34,01	33,13	37,20	33,13	37,20	33,13	37,20	33,05	37,28
March 2007	34,87		37,06		37,06		37,06		37,06
April 2007	35,58		40,47		40,47		40,47		40,47
May 2007	35,80		44,24		44,24		44,24		44,24

Source: own calculation

management of wheat marketing can be applied successfully to choose the optimal sale strategy. I used the follower mark for easing the model's implementation, controlling the accuracy of forecasts and for using the proper forecasting technique. The model can be used successfully for any arable crop to choose the optimal marketing strategy.

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Development of commodity exchange in Croatia

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Introduction

Purpose of this thesis work is to show relevance and necessity for existing of commodity exchange and its influence to the economy of Croatia. Because eastern part of Croatia, region called Slavonia is mostly agricultural oriented, it is of essential relevance to establish and make operate of first commodity exchange in Croatia.

Widely in the past, while Croatia was part of Austrian – Hungarian kingdom, first commodity exchange in Europe that was established in 1853. in Budapest, practically was domestic commodity exchange for Croatian business subjects, and they were able to use benefits it brought. Me personally, and a lot of other business people and business society in Croatia believe that time to reestablish commodity exchange has come.

In this thesis, I will give a deeper look in to commodity exchange, describe actual situation in Croatia, show possibilities that commodity exchange brings, how it works and what has to be done to implement commodity exchange and benefits it will bring to Croatian economy.

As it is known, existing and doing business on commodity exchange, together with combine use of different financial derivatives (futures, options, hedging, etc...) and warehouse receipt brings benefits to all participants on market – producers, traders, buyers, financial institutions (like banks) and speculators. It largely reduces price risk, increases liquidity of market and opens a lot of space to increase and secure profit.

First commodity exchange in the world was established in 1848 in Chicago, and it was called Chicago Board of Trade (CBOT®)1. It is still leading futures and futures –options exchange. As globalization and mergers are becoming leading trends, and CBOT has merged2 together with Chicago Mercantile Exchange (CME) in this year, creating strongest commodity exchange in the world.

Commodities exchanges

A commodities exchange is an exchange where various commodities and derivatives products are traded. Most commodity markets across the world trade in agricultural products and other raw materials (like wheat, barley, sugar, maize, cotton, cocoa, coffee, milk products, pork bellies, oil, metals, etc.) and contracts based on them. Specificity is that no physical commodity is traded, but contracts are, and these

contracts are strictly standardized. These contracts can include spot prices, forwards, futures and options on futures. Other sophisticated products may include interest rates, environmental instruments, swaps, or ocean freight contracts. In most cases, commodity exchanges are formed as public companies, which main purpose isn't to make profit from operating, but to give possibility to establishers to operate on them, and they make profit from provisions for executing orders on exchange. In some way, establishers have monopole in trading on exchange because only establishers / brokers are aloud to trade on exchange.

Since first commodity exchange – Chicago Board of Trade – was established in 1848. Their business and ways of doing it, their technical level and legal regulation, developed constantly. Two institutions have special role in existing and business transactions on commodity exchanges – Clearing house and trading commission. Functions of both of them are guarantee to participants that realization of trading will be done according to Law and competent regulations. Clearing house does it by taking offset position in all transactions stepping between sellers and buyers. Trading commission has function of permanent control of business activities, and if irregularity is noted, they have to intervene immediately.

Main participants of commodity exchange

Clearing house: An agency or separate corporation of a futures exchange responsible for settling trading accounts, clearing trades, collecting and maintaining margin monies, regulating delivery and reporting trading data. Clearing houses act as third parties to all futures and options contracts – as a buyer to every clearing member seller and a seller to every clearing member buyer. By doing this, they sit as buyer for the seller, taking long position, and for the buyer they become seller, taking short position.

Each futures exchange has its own clearing house. All members of an exchange are required to clear their trades through the clearing house at the end of each trading session and to deposit with the clearing house a sum of money (based on clearinghouse margin requirements) sufficient to cover the member's debit balance. For example, if a member broker reports to the clearing house at the end of the day total purchase of 100,000 bushels of May wheat and total sales of 50,000 bushels of May wheat, he would be net long 50,000 bushels of May wheat. Assuming that this is the broker's only position in futures and that the clearing house margin is six

cents per bushel, this would mean the broker would be required to have \$3,000 on deposit with the clearing house. Because all members are required to clear their trades through the clearing house and must maintain sufficient funds to cover their debit balances, the clearing house is responsible to all members for the fulfilment of the contracts.

Trading commission: Trading commissions are independent agencies, with the mandate to regulate commodity futures and option markets. Today, Trading commission assures the economic utility of the futures markets by encouraging their competitiveness and efficiency, protecting market participants against fraud, manipulation, and abusive trading practices, and by ensuring the financial integrity of the clearing process. Through effective oversight, Trading commission enables the futures markets to serve the important function of providing a means for price discovery and offsetting price risk. Trading commission mission is to protect market users and the public from fraud, manipulation, and abusive practices related to the sale of commodity and financial futures and options, and to foster open, competitive, and financially sound futures and option markets.

Supervisory authority: Special organisations formed by State or Commodity exchange with purpose to supervise and control process of trading on exchanges. They authorise new positions (form of contracts) on exchanges, and regulate that someone wouldn't use inside information's and other illegal actions. Most known is U. S. Securities and Exchange Commission – SEC.

Brokearage company: A company with special authorization for trading on stock exchange. They charge a fee or commission for executing buy and sell orders submitted by an investor. An agency broker is a broker that acts as a middle man to the stock exchange, and places trades on behalf of clients. Also, they make analysis and advise their clients what to do. Each exchange has it's own regulation for operating of brokerage companies, but biggest of them operate on many different exchanges through world. Main of them are Merrill Lynch, Salomon Brothers, Dow-Jones, Pierce, Goldman Sachs & Co, Morgan Stanley (USA), Nomura securities, Nikko securities, Daiwa securities (Japan), Deutsche Bank (Germany).

Conclusion

Commodity exchanges exists through the world since 1848., when first commodity exchange was established in Chicago as Chicago Board of Trade (CBOT) which merged together with Chicago Mercantile Exchange in this year, forming far strongest commodity exchange in the world – the CME Group. First commodity exchange in Europe was established in Hungary, only five years after CBOT – Budapest Commodity Exchange BCE, with main focus on grain.

From the begging, till 1994. trading was executed with brokers physically present on the floor (trading pits) of exchanges (so called “open auction”). In 1994., CBOT successfully launched its first electronic trading system.

Volume of trading is enormous – more then 1.5 billion contracts will be traded in next year on CME alone.

As it is shown in this Thesis work, without any doubt commodity exchange is a must for Croatia and Croatian business sector, especially agriculture. Main advantages are that whole sector – for Croatia especially agriculture sector which is very important and still underdeveloped – can get lots of benefits from using commodity exchanges in many ways. These main benefits from using commodity exchange are:

- useable risk management (and transfer of them to those who are willing to except them, mostly those are speculants, who are trying to make a profit out of them),
- fixing prices and protection from unwished changes (it is possible to stipulate future price),
- increased liquidity,
- standardization of commodities,
- equilibrium of supply and demand.

To achieve above mentioned benefits, it is needed to use different tools that will make it possible:

- using futures contracts,
- using options contracts,
- hedging,
- using combination of Warehouse receipt, Public warehouses and banks to get Lombard financing wit hedge on commodity exchange.

Many faults exist without commodity exchange in function:

- risk management is on much lower level,
- profit margins for producers are lower,
- financing of production is problematic to producers,
- it is hard for traders and buyers to fix prices in the future,
- lot of uncertainty exists.

One of the main things that have to be done is Institution of Warehouse receipt issued from Public warehouses (which need to have authorization. Having status of security is one of the basic questions for development of production, and precondition for exploiting commodity exchange fully. Of course, it is not so easy to regulate everything that needs to be regulated to have things running in the proper way.

In this moment in Croatia, Commodity Exchange Osijek is established (in 2006.), but it still doesn't operate. Organizationally, it is formed only on “paper”, without preconditions to start operating. Many issues have to be done before commodity exchange can start operating:

- Law on commodity exchange
- Commodity exchange needs to be regulated,
- Law of warehouse receipt,
- Public warehouses,
- Lombard financing.

Law on commodity exchange: Members of parliament have to adopted Law on commodity exchange that will regulate legal frame for establishment and operating of commodity exchange.

Regulation of commodity exchange: This means that procedures have to be set. It is important to set forms of contracts, because all contracts traded on commodity

exchange are standardised (quality, weight...). Procedure for giving (on the other side getting) and execution of orders for selling / buying have to be set. Supervisory authority and its competences have to be established.

Law of warehouse receipt: This Law has to be accepted by the members of Parliament, but proposal isn't finished yet. It has to give Warehouse receipt power of security, and regulate issuing of it, elements it has to contain... In bottom line, warehouse receipt issued by Public warehouse has to be accepted from banks as security to make a pledge on commodity to use Lombard financing.

Public warehouses: Issue of Public warehouses has to be dealt with. Institution of Public warehouses doesn't exist in Croatia, so complete regulation has to be set.

Supervising of them, procedure for establishment, field warehousing...

Lombard financing. Lombard credits and financing of production by using them is one of the main benefits that Commodity exchange together with Warehouse receipt can bring to market.

Survey of job Satisfaction and Organizational Climate at the University Computing Centre (Srce), Zagreb

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Introduction

Organizational environment determines behavior of the organization's members. Therefore, in order to efficiently manage human resources in an organization, it is crucial to know and understand this environment. Being used to describe organizational environment, organizational climate and culture are one of the most important psychosocial constructs influencing successful organization functioning and development. During recent thirty years these constructs are attracting the interest for both – organizational behavior researchers as well as practitioners working in the field of the organizational effectiveness improvement and optimal human resources use. All of them are trying to find answers to questions related to the climate and culture nature, their ways of measurement and modification, and their causes and consequences.

Importance of studying climate and culture of different social units is based on classical *Lewin* (1936) model in which behavior arises as the consequence of the interaction between an individual and his/her surroundings. Generally, it is considered that an individual reacts on the specific situation based on his personal perception of such a situation. Working situation or organizational environment creates specific surroundings which restrict and influence behavior of the organizational members. Psychological significance that social surroundings create for an individual plays important role in the research of the organizational climate and culture. Despite the basic similarity between organizational climate and organizational culture, scientific research between these two constructs differs significantly and is almost completely independent. Only recently, there is an accent on complementarities and dependencies that exist between them. There is a basic differentiation on the content level between them – while “climate” addresses perception of the organizational environment characteristics, “culture” is focused on the value system that dominates over the organization. The difference is also evident from the comparison of their widely accepted definitions.

The most common definition of the organizational climate is as perception of various aspects of the working environment (events, actions, relations and rules) which are psychologically meaningful and significant to the organization members. Organizational culture, at the other hand, is usually defined as a value and belief system shared between

organization members. Having its roots in industrial and organizational psychology, and when compared to organizational culture, organizational climate has a significantly longer history. The first reference explicitly noting the “organizational climate” construct dates back to 1939, when Lewin, Lippitt and White have published their work on experimental construction of social climate among boy groups. Since then, organizational climate had gone through many inspections and changes in conceptualization. Organizational culture is for the first time mentioned in the paper published by Petigrew in 1979.

Organizational Culture

Organizational (or sometimes called „corporate“) culture is a pattern of values, norms, beliefs, attitudes and assumptions that may not have been articulated, but shape the ways in which people behave and things get done. Values refer to what is believed to be important about how people and the organizations behave; norms are the unwritten rules of behavior. Organizational culture deals with abstractions such as values and norms which pervade the whole or a part of an organization. They may not be defined, discussed or even noticed, but they do have a significant influence on people's behavior within an organization they belong.

Organizational culture offers a shared system of meanings which is the basis for communications and mutual understanding. If these functions are not fulfilled in a satisfactory way, culture may significantly reduce the efficiency of an organization.”

In general, “culture” is defined as a set of important assumptions (often unstated) shared by members of a community. These assumptions consist of beliefs about the world and how it works, and the ideals that are worth striving for.

Organizational culture concept is of recent origin, and similarly as the organizational climate, it is used to describe behavior of the organization. Through the literature describing organizational culture authors use various approaches in their efforts to provide its definition. Some of them are focused on the cultures' dimensions while others are investigating its roles and functions. Even between the research groups using same methodologies and approaches

there is still no agreement in providing a common definition. After almost twenty years, researchers of different scientific disciplines are still trying to give an answer to the seemingly simple question – “What is organizational culture?”

Organizational Climate

Although the term is sometimes mixed up with the term ‘organizational culture’, the climate has a different meaning – it describes aspects of the environment that are consciously perceived by organizational members (unlike culture, which covers mostly unconscious parts). Most usual way to describe organizational climate is how people perceive (see and feel about it) the culture existing in their organization – it is relatively persistent set of perceptions held by organization members concerning the characteristics and quality of organizational culture. Culture represents actual situations; climate is the perception of it. In other words, climate is more about how someone experiences his/her social environment; culture is about creating a social environment by group of people.

Highlights of results

Perceived strong points of the organization:

- Relatively important and attractive jobs with potential for professional development
- Organizational culture that enhances further professional education, in accordance with employees’ preferences
- Importance of gained competences for employees’ further professional development
- Regular salary
- Working time
- Work/private life balance
- Supervisors, especially their professional competences!
- Personal relationships with direct supervisors – understanding, respect, being available
- High level of trust into direct supervisors
- Friendly atmosphere, lots of informal relationships, many employees are friends
- Stable and secure employment within the company – no danger of losing jobs or firing
- Majority of employees do trust the management (but there is possibility for improvement, since vast majority should do!)
- New technology – being afoot, investment and implementation
- High-quality of service, orientation towards customers

Perceived weak points of the organization – space for improvement:

- Employees’ already existing professional competences are not fully used
- Gained skills and knowledge is not shared enough within the organization

- Not much hope for promotion within the system for majority of the staff
- Lower salaries than in corporate sector
- Distribution of salary amounts within the organization is not perceived as just
- No clear and just criteria for bonuses
- Lack of freedom to make decisions, not enough authority delegated
- Some employees can’t complete their tasks during working hours
- Criticizing by direct supervisors, without much praise (?)
- Not enough feedback by direct supervisors
- Lack of good communication and co-operation between departments, even within departments
- No culture of constructive conflict-resolution
- Work-load not evenly distributed within a sector; some employees work more and some less than the others
- Not enough vital and relevant information for employees; too much shared informally
- Low-quality performance is tolerated within the organization, high-quality performance not being stimulated
- Two-way communication between management and employees: perceived lack of management’s interest in employees’ opinion – the organization does not encourage, actively search for and stimulate employees’ initiatives for improvement of its productiveness and quality; it even does not accept and implement them properly when they arrive
- No clear vision about the organization’s goals and strategy, management’s expectation from the employees or quality required
- No clear criteria for quality-performed jobs
- Productivity is not at its best, nor is the employees’ commitment to perform their jobs well and contribute to organizational goals achievements

Conclusion

Employees perceive lots of strong sides of the organization, as well as those that need some improvement. It is important for the Srce management to be more aware of both. Recognizing and emphasizing strong sides and advantages of work in Srce could increase an employee value proposition. To identify disadvantages (both from the eyes of the employees and the management) and take over responsibility to change them is a crucial step for constant organizational improvement that management aims for.

We feel it is of equal importance that for the first time the employees’ opinions be required and systematically collected and interpreted. This, alongside with meaningful measures from the management, could be an important step for them to change their perception from not being asked for the opinion, to becoming real partners in mutual efforts to successful and satisfied organization.

Analysis of the process of Introducing Euro in New Member States: Defining Lessons for Croatia case Study: Slovenia

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Summary: On 1 May 2004, EU made a historical enlargement by expanding from 15 to 25 members, and with another enlargement in 2007, EU is now a union of 27 member states. Following the new member states accession to the EU the next challenge for them is joining European Monetary Union and introducing the euro as a national legal currency.

This thesis concentrated on the analysis on how the new member states handle the process of joining the Euro-zone with the main objective to examine whether there are any possible lessons that Croatia can apply to its EMU integration path.

The thesis is mainly focused on analysing the Slovenian EMU integration process, as this member state has been identified by the Croatian Authorities and Croatian National Bank as the one whose experience Croatia should try to follow.

The central questions that are discussed are whether Croatia is economically and politically capable to follow the Slovenian example, and, on the other side, whether the Slovenian example is the best one to follow i.e. should Croatia introduce euro by using the quick EMU entry strategy as Slovenia did.

In order to answer those questions thesis focused on analysing and explaining different strategies for euro adoption chosen by the new member states with special emphasis on the strategy of quick EMU entry approach chosen by Slovenia. The thesis also concentrated on analysing the Slovenian political and economical path from Yugoslavia to the EU and especially on its economic performance and key economic indicators prior to introducing euro.

Finally, with the aim to compare the economic performance between Slovenia and Croatia and define similarities/differences in their transition and EU accession process, the thesis gave a detailed overview of the Croatian current economical and political situation.

After brief analysis of all pros and cons of an early euro adoption, the thesis concluded that following the experiences of small sized countries with opened economies and strong trade orientation towards the countries of the Euro-zone, such Slovenia is, would be a comprehensive and logical strategy for Croatia. Early euro adoption would provide more benefits than costs for Croatian economy and society in general.

The thesis also concluded that Croatia should face no major problems when it comes to fulfilling most of the Maastricht criterion on time, in order to be able to adopt the euro in the shortest possible period as Slovenia did.

However, the thesis also highlighted that in order to do so Croatia has to put a serious emphasis on improving certain aspects of its current macroeconomic situation, in particular the one concerning the percentage of state sector deficit in the GDP and the size of public debt.

Conclusion

Following the accession to the European Union, the next most important step on new member state path to full European integration is to become a member of the European Monetary Union. This involves abandoning the national currency and adopting the euro as domestic legal tender.

This thesis concentrated on analysis of how the new member states handle the process of joining the Euro zone with the main objective to examine whether there are any possible lessons that Croatia can apply on its EMU integration path. Although Croatia is not a member state but a candidate country, indicators show that it is possible that it will join the EU already in 2010/2011. This will be followed by the integration in the EMU as well, and in order to successfully do so, the preparations should start well in advance.

The thesis concentrated in particular on the analysis of Slovenian EMU integration path, following the argument of Croatian Authorities and Croatian National Bank that Croatia

should follow the Slovenian example and chose the “quick EMU entry strategy” i.e. adopt the euro as soon as possible after the accession.

The thesis focused on answering two following questions. First, whether Croatia is economically strong and stable enough to be able to follow the Slovenian example and secondly, is Slovenian EMU integration path the right and optimal one for Croatia.

In order to answer on those questions thesis focused on analysing and explaining different strategies for euro adoption chosen by the new member states with special emphasis on the strategy chosen by Slovenia. The thesis also concentrated on analysing the Slovenian political and economical path from Yugoslavia to the EU and especially on its economic performance and key economic indicators prior to introducing euro.

Finally, with the aim to compare the economic performance between Slovenia and Croatia and define similarities/differences in their transition and EU accession

process the thesis gave a brief overview of the Croatian current economical and political situation.

By analysing the current state of play when it comes to fulfilling of the Maastricht convergence criterion, the thesis concluded that Croatia should face no major problems when it comes to fulfilling the Maastricht criterion on time, in order to be able to enter the ERM II immediately after the accession and hence adopt the euro in the shortest possible time as Slovenia did. However, the thesis also points out that, in order to do so, Croatia has to put a serious emphasis on its macroeconomic policy in order to lower the budget deficit and the size of public debt.

As for the second question, after analysing all pros and cons of an early euro adoption, the thesis concluded that following the experiences of small sized countries with opened economies and strong trade orientation towards the countries of the Euro-zone, like Slovenia is, would be a comprehensive and logical strategy for Croatia. Early euro adoption would provide more benefits than costs for Croatian economy and society in general.

Finally, it should be highlighted that hard work will not be over once Croatia fulfils Maastricht criteria and introduces euro. Hard efforts to ensure competitiveness of the Croatian economy in the EU will then only begin.

Agribusiness higher education development – ahead: the project results at a glance

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Summary: This booklet that has caught your attention contains basic information about the AHEAD project sponsored by the EU's TEMPUS grant. This project was carried out between University of Zagreb (and other Croatian partners) and four EU-based universities. The project was very ambitious and it is my pleasure to state that the great majority of the objectives were carried out with high quality during the 3 years project time span. The main results of the AHEAD project can be found in this booklet, and I would like to mention just a few of them:

- A new MBA training started in Zagreb with international recognition
- 61 subjects of 3 BSc/MSc trainings were reviewed and modified,
- a study was created in order to determine the short – and long – term expert demand of the Croatian national economy,
- computers, equipment and modern textbooks were purchased from European grant and
- finally a personal note: it was spectacular to see the rapid development of University of Zagreb and generally the whole Croatia during the last 3 years. If our project contributed just a little bit to it, the effort certainly was worthwhile.

Introduction

Agribusiness as well as food safety and quality are among the most important issues in higher education and science all over the Europe and the world today. With the Croatian succession to the EU these issues are getting only more and more importance. Since the Bologna declaration has been adopted in Croatia, new possibilities occurred for enhancement of agricultural education and introduction of new training programmes. The new two stage system of bachelor and master trainings has given the opportunity to University of Zagreb Faculties of Agriculture and Food Science to redesign their trainings. To better use the opportunity and to support the reform, the first Tempus project was introduced at the Faculty in 2003. The first project emphasised more on general agricultural knowledge, but specific studies, like agribusiness studies and food studies did not get special attention.

In view of the fact that business management as well as food quality and safety topics are increasing in importance rapidly, another Tempus project was applied and approved in 2005. The Agribusiness Higher Education Development Tempus CD JEP project ends in 2008, but it's results will have a long term impact on the project partners and their future cooperation.

Consortium members

1. Grant holder: University of Debrecen
2. Coordinator: University of Zagreb
 - Faculty of Agriculture
 - Faculty of Food Technology and Biotechnology

EU partners

3. Wageningen University
4. University of Stuttgart
5. Scottish Agricultural College

Croatian partners

6. Ministry of Agriculture, Fishery and Rural Development
7. Institute for Adriatic Crops and Karst Reclamation – Split
8. Institute of Agriculture and Tourism – Poreč
9. Croatian Agricultural Extension Institute
10. Agrokor d.d.
11. Croatian Chamber of Economy
12. Croatian Employers Association
13. Croatian Society of Agricultural Economists

Tempus AHEAD Project Activities

Work on the project has been conducted in frame of ten activities that can be divided in two groups: (1) basic and (2) general activities. The basic activities are targeted directly to achievement of the projects' goal, which is development of education in agribusiness and food quality and safety. The general activities cover work on the project management, dissemination of information, sustainability, etc. The list of all the activities is as follows:

- Basic activities
1. New Agribusiness and Rural Development Bachelor Programme
 2. New Food Safety and Quality Management Programme

3. Agribusiness and Rural Development Pilot Master Programme
4. MBA training
5. Food Safety and Quality Management Retraining
6. Training Needs Analysis
 1. General activities
 7. Dissemination
 8. Sustainability
 9. Quality Control and Monitoring
 10. Management of the Project

Additional activities

1. Procurement of equipment
2. Budget overview

New Study Programmes – Development and Supervision

It was a challenge as well as pleasure for University of Zagreb teachers to work on development of study programmes in cooperation with distinguished partners from Debrecen, Wageningen, Hohenheim and Aberdeen. In the focus of development and supervision activities there were three study programmes:

- Agricultural Economics (BSc.), Food Safety and Quality (BSc.) and Agribusiness and Rural Development (MSc.). Suggestions for improvement of particular modules were discussed and agreed among partners with mutual understanding and enthusiasm.
- The improvement of the modules encompassed module content, way of teaching, recommended literature, examination methods etc. We strongly believe that the project partners have managed to improve the quality of modules and the study programmes of the University of Zagreb Faculty of Agriculture and University of Zagreb Faculty of Food Technology and Biotechnology.

Development and supervision activity did enable partners to meet or even visit each other, giving them a chance for establishment of long-term cooperation. This kind of cooperation among institutions is completely in compliance with the spirit of unified European higher education network. It is for sure that the contacts established during the project implementation will result in fruitful and successful cooperation and maybe in framework of some new projects as well.

It has to be stressed that these activities have involved numerous partners from all the collaborating institutions in 5 countries. Therefore, it was not an easy job to manage and coordinate the activities. However, such a big number of partners ensured higher objectivity and professionalism of the work. Thanks to the results of these activities it is expected that University of Zagreb Faculty of Agriculture and University of Zagreb Faculty of Food Technology and Biotechnology will make a strong basis for further adjustment and reforms of Croatian higher education system.

In that way, the faculties will also serve as a fertile ground for development of future experts for up to date agribusiness sector.

Executive MBA Training in Agribusiness and Commerce

With respect to the plan of activities in project application, but also as answer to the results of Training Needs Analysis (activity no. 6.), one of the important goals of the project was the development and establishment of MBA course. The plan was to make attractive, internationally recognized study in English language, with lecturers from different universities, for the professionals of different profiles who intended studying in order to improve themselves for management positions in the field of agribusiness.

The programme is developed according to principles of International MBA Network in Agribusiness and Commerce AGRIMBA, and subjects are, by most part, developed and managed by lecturers from project's partner institutions (Debrecen, Wageningen, Hohenheim and Aberdeen). The first, so called "pilot generation" of students, included considerable number of young teaching staff from University of Zagreb, which is, by entering this study, preparing to become lecturers of specific modules for next generations. At first, the study was conceived as graduate but according to the changes in legislation a need occurred to redesign it into the so-called post graduate "specialist" study programme. At the end, the study consisted of 16 subjects, 14 of them were lectured by international lecturers in English language.

More than 200 applications were registered for the MBA training, 32 of them were selected according to the results based on preliminary exams and interviews with the AGRIMBA representatives. 19 out of 32 attendants were from the University of Zagreb, and 13 from the private and public sector. Major part of the students participated already had higher degree in agriculture or economics, and what's interesting, there were also attendants with degrees from other fields of professions, like linguistic or medicine. The costs of lecturers, literature and exam materials for University of Zagreb attendants were financed by means of Tempus AHEAD project, ensuring this study especially attractive.

Regarding the changes in the degree status from graduate to "specialist post-graduate", the application of Executive MBA training is in the procedure of accreditation at the University of Zagreb, at the moment of writing this booklet. The study permission is expected after the summer 2008.

Students' impressions

Branka Šakić Bobić: "Lectures at MBA training were useful and interesting. I would like to point out that practical examples, up-to-date literature and professor's experiences made this course very attractive and modern."

Zvonimir Šatalić: “The MBA training provided me new knowledge and new perspective on agribusiness. It was hard to incorporate MBA activities into daily schedule, but manageable and it was interesting to work with people from different areas of professional interest. I’ve benefited attending the lectures of professors coming from different cultures and using different approaches and methods.”

Lari Hadelan: “The MBA training offered us new educational approach with much more practical knowledge than in other programmes. Lecturers gave us excellent study cases which demanded high quality solutions. Team work has shown us how to cope with the difficulty of expressing your individual solution as well as objectively evaluate others contribution.”

Igor Gomezelj: “As a regional manager and agronomist I find extremely important to provide a quality education to colleagues from agribusiness sector. This training is a unique course in the field of agribusiness in Croatia. Case studies, business plans and other situations that we acquired are very real and applicable on “day to day” basis. Acquaintances I made during the course expanded my experiences in other business sectors and until today we kept contact as friends or colleagues.”

Food Safety and Quality Management Retraining

Retraining of University of Zagreb staff, from both of the faculties involved, has provided them with up to date knowledge in specific topics related to food safety and quality. Retraining was carried out in Zagreb, during two semesters period and was provided by prominent members of the University of Debrecen, Wageningen University and Scottish Agricultural College. The retraining was conducted in two very critical areas by three topics in each area.

The topics in first area included were:

- modern food bio-analytical methods,
- present and future of GMOs and
- advanced toxicology.

The topics in second area included were:

- in the fields of EU food regulation,
- quality assurance and
- traceability.

In addition to knowledge transfer, for each of the fields included in the retraining contemporary literature has been bought under the activity (total – 20 editions).

Training Needs Analysis

Croatian system of higher education experienced comprehensive changes to adjust to the economy in transition in last decades. In the agribusiness sector demand for highly educated experts is rising, while the higher education institutions are losing students. However, there is no available quantified information about real needs for

educated persons of different agribusiness professions. In addition, it is not known exactly what specific skills and knowledge are needed by present-day professionals in agribusiness and related public administration system. To fill the gap, in frame of the AHEAD project comprehensive training needs analysis have been carried out.

The results of the survey carried out among 434 agribusiness professionals can be summarised as follows:

1. Most of the professionals are employed in private firms and then public institutions. Mainly, they work as managers or consultants and their educational background are agriculture or economics in most of the cases.
2. Asked what knowledge or skill a professional has to have, the most usually they mentioned knowledge of organisation and management, and foreign language and computer skills. High on the list are some other knowledge as well: legislation, communication, marketing, human resource management and production technology.
3. When they have had to rank hypothetical study programs in field of economics and agribusiness, the most popular titles were: “Agrifood Technology”, “Trade and Marketing”, “Management”, “Environmental and Natural Resource Management”, and “Food Quality and Safety”.
4. Estimate of needed graduates per year differs significantly among the study programs. It is the highest for the “Food Quality and Safety” program among the agribusiness programs, and for the “International Economy” program among the economic programs. All together, the research shows that Croatia will probably need 800 to 900 graduates from all the programs annually. This is 250 more than number of graduates Croatia has in biotechnological sciences today.
5. In connection with final part of the research, it is obvious that Croatian agribusiness sector is looking for highly educated professionals. Therefore, there is an opportunity for higher education to widen the market and to answer the need.

In order to utilise the opportunity the higher education for agribusiness should have in mind key recommendations taken out from the results:

1. High education business is a business with specific market that has to be monitored, planed and nourished if it is to be preserved.
2. In addition to knowledge and skills traditionally associated to agriculture, up to date higher education for agribusiness have to pay more attention to organisation, management, and foreign language and computer skills.
3. Collection of study programs or curricula at higher institutions has to be modern and flexible to keep the institution attractive to students.
4. Education institutions can not provide successful and attractive programs if they do not consult the industry.

Forecasted demand and existing number of graduates in biotechnical field

Dissemination

The purpose of the dissemination strategy of the project was to distribute information about the project and its results to those who are not directly involved in implementation of the project itself. The principal venue of the dissemination activities was Croatia.

In the first phase of implementation an internet based information and communication platform has been established as one of the most important ways of dissemination. Over the three years period, more than 19.000 visitors were recorded at this Internet portal. The portal is operational at the address: <http://agrinf.agr.unideb.hu/ahead/index.php>.

In addition to it, more active forms of dissemination were executed in Croatian language, the most important of which are: Web information in Croatian language at http://www.agr.hr/cro/ustrojstvo/umo/eu_programi/tempus.htm

- 4 press conferences in Zagreb, Poreč and Split
- Public announcement of the MBA programme
- Participation in workshops, roundtables and conferences in Croatia and Hungary
- Distribution of information through the consortium members
- Participation in AGRIMBA Management Board meetings
- Printing and distribution of Training Needs Analysis Reports (in Croatian and English)
- Printing and distribution of The Project Results at a Glance booklet

The combination of the so-called “traditional” and “modern” (Internet-based) information technologies and the two languages approach has resulted in the effective information dissemination for target audience.

Sustainability

The long-term sustainability of the project results can be guaranteed by the fact that all the study programmes and trainings covered by the project fulfil an existing educational gap in Croatia. New study programmes are accepted by the faculties involved and they fully correspond with the university development efforts. The project and the programmes will contribute to internationalisation of teaching at both of the faculties, while the first results show that interest is high among the students for the programmes under development and supervision. Financial sustainability is ensured by official acceptance of the programmes from both: the faculties and the university. According to interest showed, the executive MBA training will have sustainability with no transfer payments from the budget. Sustainability of the project results is in a great deal due to constant support of the project from the university and all the Croatian partners.

Quality Control

Monitoring activities were carried out firstly through an Internet-based management information system. Constant tracking of the project was guaranteed throughout all three years. External evaluation of the project performance was done by different bodies:

- The MBA training was supervised by AGRIMBA representatives.
- The study programmes were revised and accredited by the project consortium members, the faculties, the University of Zagreb and Croatian authorities.
- The professional content of the subjects developed were supervised by members of the EU partners.
- The practical usefulness of the subjects was evaluated by the Croatian consortium members.

All together brought the project to its goal of development of contemporary teaching programmes at the University of Zagreb in the field of agribusiness.

Project Management

The project management has taken place at 5 levels in total. University of Debrecen has been responsible for general and financial management. Management activities in Croatia have been carried out by University of Zagreb on behalf of the other Croatian Consortium Members. In case of the other EU universities the contact persons have taken the responsibility for the local project management activities.

The project Council, as the main decision making body of the project, has had its meetings at the beginning of the project, and after every year of the project implementation. The operational tasks between two Council meetings were carried out by the Executive Committee comprising of the most responsible persons of the project: the grant holder, the coordinator, the financial manager and the project secretary. The Executive Committee did quite a job to make certain that the project is running smoothly. A numerous meetings and mutual visits were organised to ensure that all the project activities and all the project partners fulfil their assignments.



Trends in agriculture and food production

János Lazányi

Debrecen University Centre for Agricultural Sciences

Summary: Agricultural reform resulted a shift from collective farming to small-scale production in China. This reform also has resulted a strong increase in gross agricultural output, which coincides with a slower increase in labour productivity. At the beginning of the reforms, agriculture accounted for 70 percent of total employment in China and still employs more than 50%. As a result of these reforms, China has undergone impressive economic growth also in the agriculture; the country has become one of the world's top exporters and is attracting record amounts of foreign investment. The government has also stepped up investments in rural areas to meet the market demand for agricultural products. Results are very competitive compared to Central and Eastern European countries, where agriculture accounted for only 15 percent of total employment, but agricultural reform resulted a strong decline in gross agricultural output, which coincides with a similarly strong decline in employment. When approaching the issue of sustainable agriculture, we have to take into consideration, which China and India feed the largest populations in the world and both countries have had its own agricultural successes in the past 50 years. China has used land far more efficiently than many developed countries. With nine percent of the world's arable land, China is responsible for the greatest share of agricultural production worldwide. Volume of produced pork, eggs, wheat, cotton, tobacco, and rice has increased and China exports an increasing amount of product each year. China has opened his borders, but do not expose food consumers to price shocks and producers to risks and disincentives. In this paper, the land-tenure system and the trends of agricultural developments are analysed in China and selected countries of EU.

Introduction

The economic development of China and India presents threats and opportunities at the same time, says the State of the World 2006 report (*State of the World*, 2006). The strategy these countries make in the next few years will lead the world either towards a future growing ecological and political instability—or a development path based on efficient technologies and better stewardship of resources. From 1978 to 2007, GDP in China grew at an annual average of 9.7% to become one of the largest economies in the World. Foreign trade grew at an average of 17.4% annual, the third largest in the world (*World Bank*, 1999). China has attracted 83.5 billion US\$ of foreign direct investment and made overseas investment of 18.7 billion dollars, both are the biggest amount for developing countries. Per capita consumption grew by 4.4 times for urban and 4 times for rural residents (*World Trade Organization*, 2001, *Winters*, 2002).

The population living in poverty has dropped from 250 million to 20 million. China has benefited a lot from the trade and investment opportunities. Economic transformations generates one of the most sustained economic growth in the world since 1960 and has reduced the number of those living in poverty and also resulted a sizeable middle class and considerable environmental problems (*Zhi*, 2006). The GDP data published in 2006 indicate that the size of the economy, measured in financial terms, reached over US\$ 2,500 billion, and GDP measured at Purchasing Power Parity (PPP) is four times higher than the above figure. Average incomes per capita at PPP are US\$ 7,200, which is 25% of the average per capita income in the EU. There are large parts of the country, where income levels have reached, that of some developed East Asian and European countries. Many of China's

industries have become completely integrated into the world supply chain and China could become the largest exporter in the world by 2015 (*Lan*, 2003, 2005).

Agricultural development policy and land use

Land-tenure system in China combines private use rights with public ownership to provide economic incentives for farm households. Nominally, agricultural land is collectively owned by groups of 30–40 households (*Sicular*, 1988, 1995). In some cases, the village is the collective owner and there are around 10 groups in each village. Regardless of who owns the land, the village leadership may still influence and sometimes dictate land-use and land-allocation (*Yao*, 2000, *Ho*, 2001, *Ho and Lin*, 2003). Villages divide land parcels into four tenure categories, each with different rights and responsibilities attached. The most common allocation is “responsibility land,” which is allocated to households in return for the household's commitment to deliver a quota of grain. The bundle of rights extended to farmers varies among villages, sometimes among groups in the same village, and also according to the tenure category of each parcel. The most important right allocated to farm households is the right to residual income, which allows farmers to freely sell their output and retain their earnings.

From the 1960s through the early 1980s, China taxed its agricultural sector by procuring commodities at below-market prices to subsidize urban consumption and industrial development (*Lippett*, 2000). In 1978, the government began to shift away from collective farming giving individual households greater control and decision-making powers over land and other resources. Economic growth in agriculture has been focused on the productivity of rural population.

Agricultural development policy can be divided into six periods. During the 1990s, central government taxation of farmers receded, although local taxes and fees have become more expressed for farmers. The first period, from the 1950s through the early 1980s is characterised by collective farming.

The second period from 1979 to 1984, coincides with the introduction of the household responsibility system (HRS) and adjustments in the state purchase price for agricultural products. These price adjustments resulted an overall improvement in development of trade for grain and oilseeds. Local free markets were gradually given permission to re-open as an outlet for farm surpluses. After the fulfilment of the state procurement quotas, most products could be exchanged in deregulated local markets at higher than the quota price. Before economic reform, state commercial enterprises and marketing co-operatives had the exclusive entitlement to purchase grain and oil crops. By 1984, the share of state marketing dropped down to 91 percent for the 12 most important crops and livestock products and the overall agricultural output increased significantly.

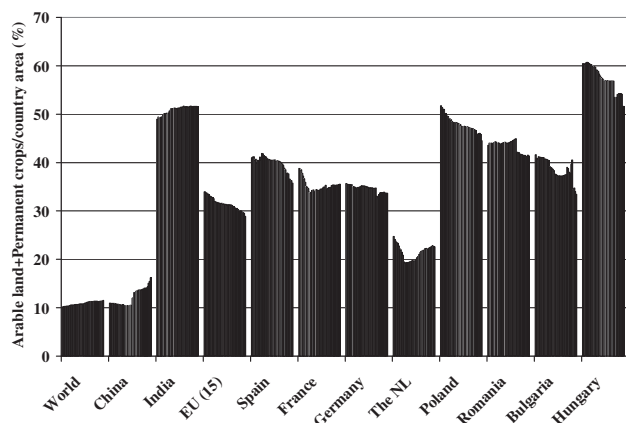


Figure 1: Proportion of arable and permanent crop area in selected countries (%) Source of data: www.fao.org/statistics/

In the beginning of the third reform period (1985–1989), a program was introduced to enhance the functioning of rural markets. Over this relative long period the adjustments of agricultural policies occurred in favour of market liberalization, quantities and prices were determined by market mechanisms. The debate was particularly intense in the second half of the 1980s, when the rate of growth of agricultural production fell and it was further acerbated in the beginning of the 1990s, when increases in agricultural prices affected inflation. In 1985 the marketing of many products, including animal products, fruit and vegetables, was deregulated, and a voluntary procurement contract for rice, wheat and maize was introduced. The introduction of the rural market program led to stagnating agricultural production and decreasing grain production (Lardy, 1998). This observation might be partially explained by the fact that labour mobility was allowed and an important labour outflow from agriculture took place. Following a decrease in grain production, the procurements quickly lost its voluntary

character so that contracts were mandatory again in 1986, but the procurement quota for grain was partly reduced. In addition, a new subsidy system for fertilizer and fuel was introduced for the cultivation of grain and oil crops to encourage higher production (Lardy, 1998).

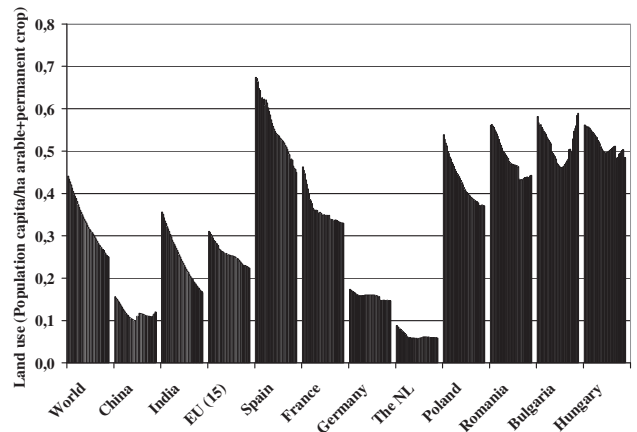


Figure 2: Trends in per capita arable land and permanent crop area in selected countries (ha) Source of data: www.fao.org/statistics/

Following criticisms of the impact of the rural market program, the government introduced a set of adjustment policies in 1990 and the government implemented reform in the cereal sector to phase out the old centrally planned supply system in favour of more market oriented solutions. Cereal and oilseed price subsidies to urban dwellers were eliminated; purchase and selling grain prices were equated. Interregional grain transfers were replaced by a contract system between provincial governments (Nguyen and Wu 1993). The government reformed the input supply system by removing subsidies and allowing private firms to supply inputs to producers. The system of supplies of fertilizers and fuel for deliveries of grain and oil crops to the state agencies was converted to monetary payments. However, market reform in agriculture remained incomplete, which is reflected by the different degrees of price and quantity controls in different sub-sectors (grain, cotton and oil crops versus livestock and vegetables), by the segmentation of regional agricultural markets, and by the isolation of domestic markets from international markets.

Political changes in 1994 initiated the fifth period (1994–1998). Most reforms aimed at a rebirth of self-sufficiency policies, not only at the national level but also at the regional level (OECD, 1997, Nyberg and Scott, 1999, Lu, 1999). It was not allowed for the relatively developed regions to purchase grain from other regions. Private grain traders were not allowed to buy grain from farmers before the latter had fulfilled their respective state purchase contract. The Governor's responsibility system was introduced in 1995 to maintain the overall balance of grain supply and demand. Policy instruments included stabilization of planting area, output, and stocks, as well as the installation of local reserves to directly regulate grain markets and stabilize prices. Some local governments have also reintroduced command purchase and others have set barriers to regional grain trade.

The rural market reforms for cereals, oil crops and cotton were also largely reversed, but the state procurement prices for grain and cotton increased substantially (Tian and Zhang, 2003). Between 1993 and 1996 prices for cereals and cotton doubled and the gap between the regulated quota procurement prices and market prices (for grain) narrowed substantially (Peng, 1998). In 1997, market prices even fell below the quota prices. In order to protect the interest of grain producers and to meet food security goals, the central government launched a price support policy and set a support price level for all cereals and subsidies were provided to the state grain marketing enterprises (Hsu and Gale 2001).

In May 1998, a new grain reform was announced in order to reduce the financial effects of the grain support program. The central government deepened the reform in the grain marketing area. The new policy is summarized as “four separations and one improvement”. The four separations set for grain marketing include separating government policy from commercial business functions; central grain reserves from local commercial reserves; central and local responsibilities on grain marketing and new debts from old debts. The one improvement means that quota procurement prices are determined by the prevailing market price. At the beginning of this agricultural development period, the original idea was to introduce a transition period before the total liberalization of the grain sector. However, the huge government debt caused the direction of the grain marketing reform to make a surprising change Wu, 1997, Wu et al. 2001, Xu, 2002, Brümmer et al 2006). The central government announced a means of simultaneously recovering the huge government debts, and raising market prices over state procurement prices (Holbig, 2004, Huang et al. 2004). This involves tightening up the country’s grain marketing system and returning it to government monopolistic control.

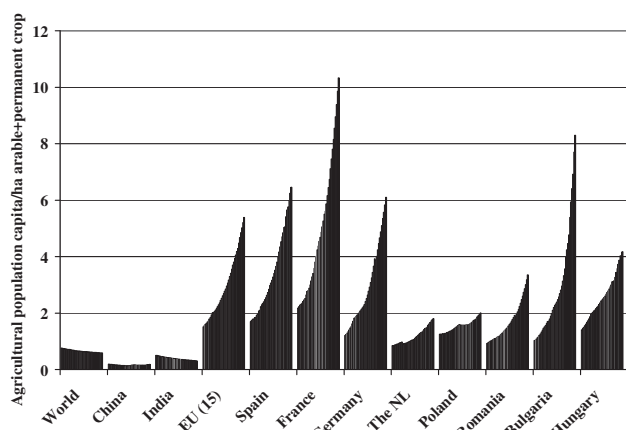


Figure 3: Arable land and permanent crop area used by agricultural population in selected countries (ha) (Source of data: www.fao.org/statistics)

The permanent crop and arable land areas is about 10% of the total territory of the country in China, while India cultivate about 50% of its territory (Figure 1). This is higher proportion than the means of 15 EU countries before the enlargement in years 2003 (Figure 1). China has 10 persons to feed per hectare of arable land, which is more than twice

the world average of 4.4 persons per hectare. China is largely self-sufficient in food production. Yields of major crops in China are above world averages (Table 1). China’s share of world agricultural production exceeds its share of world population for most major commodities. China produces over 40 percent of the world’s pork and vegetables. China’s low shares of milk, sugar, beef, soybean, and fruit production reflect its relatively low consumption levels for these commodities. Importing soybeans, allows China to free up one part of its land for higher yielding crops. High production and consumption of vegetables in China also makes efficient use of scarce land resources. China maintains its high level of food production by double- and triple-cropping and applying large quantities of fertilizer and labour to its limited land base. In contrast with China, Hungary is richly endowed with farmland. China has over 300 labourers for every 100 hectares of farmland. The size of arable land and permanent crop in EU (15) was less than 2 hectares in 1961, but sharply increasing and it was close to 6 hectares in 2007 (Figure 3). The size of arable land and permanent crop is less than 2 hectares in the Netherlands and more than 10 hectares in France. This is much higher than the World average. China’s farms are small and mostly cultivated by households. China has 10 persons per hectare of arable land and permanent crop area, which is less than half the world average. The average household cultivates about 1 hectare, which is located different places. Farmland is still owned collectively by villages and village leaders allocate land-use rights among households based on family size and labour availability.

Table 1: Participation of China in production of some selected crops in years 2004–2007

Source of data: www.fao.org/statistics/

term	Harvested area (million ha)				Yield (t/ha)	
	China (%)	World	China	World	China	China (%)
Rice, paddy	18,82	155,985	29,358	4,12	6,28	152,5
Maize	18,03	150,788	27,175	4,86	5,36	110,3
Wheat	10,59	217,366	23,014	2,81	4,52	160,7
Soybeans	9,78	94,087	9,198	2,31	1,72	74,4
Vegetables fresh	48,23	17,479	8,403	14,13	17,26	122,1
Rapeseed	24,63	28,565	7,023	1,73	1,69	97,7
Seed cotton	15,46	34,319	5,304	2,07	3,78	182,2
Potatoes	25,92	19,011	4,929	16,76	14,42	86,1
Sweet potatoes	52,24	8,999	4,701	13,94	21,64	155,3
Groundnuts, with shell	20,37	23,078	4,698	1,55	3,00	193,1
Watermelons	56,23	3,459	1,948	26,66	31,93	119,8
Apples	39,91	4,837	1,931	13,11	13,39	102,1
Cabbages and brassicas	56,10	3,097	1,737	22,10	20,14	91,2
Cucumbers and gherkins	63,47	2,526	1,604	17,37	17,04	98,1
Plums and sloes	66,77	2,367	1,580	4,04	2,95	73,0
Tomatoes	30,24	4,589	1,388	27,57	23,50	85,3

term	Harvested area (million ha)				Yield (t/ha)	
	China (%)	World	China	World	China	China (%)
Tobacco, unmanufactured	35,15	3,928	1,381	1,67	1,89	113,5
Tangerines, mandarins	64,11	2,042	1,310	12,48	9,86	79,0
Sugar cane	6,13	20,815	1,272	68,19	77,60	113,8
Beans, dry	4,62	26,451	1,221	0,71	1,51	211,9
Asparagus	89,97	1,338	1,204	5,11	5,06	99,0
Pears	70,06	1,673	1,173	11,78	10,28	87,3
Tea	40,40	2,757	1,114	1,34	0,95	71,0
Broad beans, horse beans, dry	40,50	2,630	1,065	1,77	2,08	117,4
Eggplants (aubergines)	54,85	1,912	1,052	16,79	16,80	100,1
Sunflower seed	4,42	23,166	1,023	1,28	1,82	142,2
Peas, dry	14,87	6,678	0,993	1,58	1,28	80,8
Onions, dry	27,94	3,403	0,951	18,59	20,77	111,7
Millet	2,55	35,895	0,917	0,88	2,07	235,5
Barley	1,55	56,301	0,872	2,45	4,15	169,4
Buckwheat	32,06	2,700	0,863	0,81	0,79	97,9
Peaches and nectarines	46,55	1,493	0,695	11,73	11,27	96,1
Spinach	79,08	0,871	0,689	15,61	16,76	107,3
Garlic	56,28	1,183	0,666	12,88	17,40	135,0
Persimmons	89,78	0,735	0,660	4,42	3,40	76,9
Chillies and peppers, green	36,55	1,732	0,633	14,93	20,84	139,6
Sesame seed	8,08	7,659	0,619	0,44	1,00	225,6
Sorghum	1,33	43,469	0,576	1,40	4,49	321,7
Other melons (cantaloupes)	43,08	1,238	0,533	20,87	24,90	119,4
Lettuce and chicory	49,85	1,043	0,520	21,92	22,17	101,2
Linseed	18,83	2,612	0,485	0,91	0,99	108,4
Carrots and turnips	40,10	1,196	0,480	22,25	18,21	81,9
Natural rubber	5,47	8,601	0,470	1,13	1,13	100,0
Grapes	6,25	7,454	0,466	8,96	13,09	146,2
Mangoes, guavas	9,88	4,478	0,442	7,12	8,41	118,1
Cauliflowers and broccoli	38,39	0,999	0,383	17,89	20,88	116,8
Oranges	9,62	3,866	0,372	16,42	7,53	45,8
Pumpkins, squash	20,92	1,520	0,318	13,41	19,00	141,7
Bananas	6,83	4,324	0,295	17,78	23,82	134,0
Triticale	7,57	3,652	0,277	3,32	1,86	56,0
Cassava	1,43	18,514	0,265	11,85	15,97	134,8
Peas, green	22,79	1,087	0,248	7,36	9,58	130,2
Castor oil seed	18,26	1,303	0,237	0,99	0,93	93,9
Oats	2,02	11,593	0,234	2,07	2,85	137,5
Rye	3,46	6,479	0,223	2,24	2,55	113,5
Beans, green	23,16	0,921	0,213	7,00	11,39	162,6
Walnuts, with shell	27,99	0,672	0,188	2,54	2,66	104,7
Sugar beet	3,28	5,367	0,176	46,75	53,35	114,1
Flax fibre and tow	35,06	0,472	0,165	2,08	4,33	208,1
Chestnuts	39,97	0,338	0,135	3,68	6,91	187,6
Tung Nuts	72,16	0,187	0,135	2,44	2,73	112,0
Ramie	96,80	0,114	0,110	2,48	2,52	101,7

Table 2: Participation of China in the consumption of plant nutrients 2004–2007

Source of data: www.fao.org/statistics/

Consumption in nutrients million tonnes	China	World	%
Nitrogen (N total nutrients)	30,264	95,716	31,6
Phosphate (P2O5 total nutrients)	11,226	38,713	29,0
Potash (K2O total nutrients)	5,367	28,085	19,1

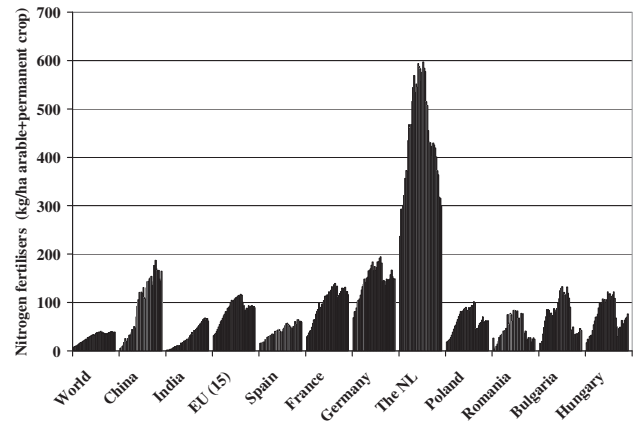


Figure 4: Trends in nitrogen fertilizers use between (1961–2004) in selected countries

Source of data: www.fao.org/statistics/

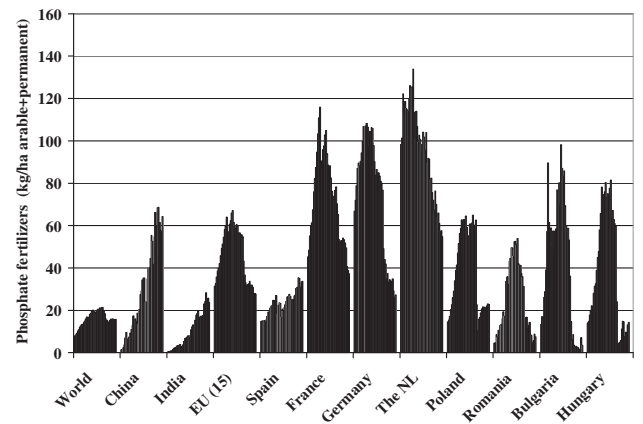


Figure 5: Trends in phosphate fertilizers use between (1961–2004) in selected countries

Source of data: www.fao.org/statistics/

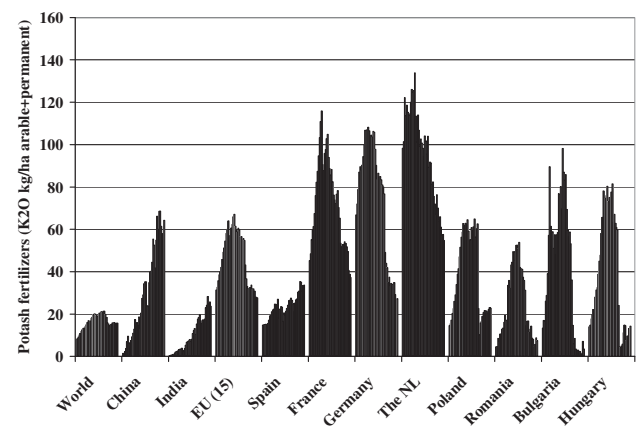


Figure 6: Trends in potash fertilizers use between (1961–2004) in selected countries

Source of data: www.fao.org/statistics/

Nitrogen, phosphorous and potassium fertilizer use per hectare is more than 3–4 times higher than the world averages. Nitrogen input is 150–180 kg/ha, which is higher than the means of EU (15). China uses similar amount of phosphorous and potassium as the EU countries. The rate of application of tendency of nitrogen, phosphorous and potassium fertilizer increasing in China and the input level of fertilisers are decreasing in EU, especially in the new EU member states (Figure 4–6). The high levels of fertilizer and pesticide use in China mean that further expansion of agricultural output through greater input use may not be sustainable (Guo, 2002). China has started to return environmentally fragile land to more sustainable forest or grass land, which further reducing the availability of land for arable crops. China has a relatively high share of irrigated land. Water supplies are dwindling in northern China, and pollution from industrial effluents and agricultural runoff is worsening. To accommodate growing consumer demand for food, the agricultural sector will probably need to make more efficient use of limited land and water resources by changing the mix of crops planted, adopting higher yielding varieties, improving land management and/or consolidating land holdings to achieve size economies.

Changing structure of livestock production

Dramatic increase in animal protein consumption would not have been possible without a rapid expansion of domestic livestock industry in China. Since 1985, pork output has increased markedly, reaching over 51.838 million tonnes in 2003–2006. Beef sector has grown from an inconsequential output level in the 1980s to the third largest in the world. Likewise, China has moved into second place behind the United States in total output of poultry meat. China produces more than 90% of the meat of mules, asses, goose and guinea fowl (Table 3.). China is a dominant producer of duck meat.

Since market reforms in the 1980s, an increasing number of traditional households in China have taken advantage of expanded marketing opportunities to raise additional animals for sale in local markets. Many households shifted their focus from crop production to livestock and increased the swine from 1 or 2 head per household to 10, 50, or 100 head. Encouraged by growing applications of imported technologies and management practices, large-scale commercial operations have also increased since the

1980s. Since 1985, the share of China's pork produced by traditional households has declined from 95 percent to less than 80 percent. Traditionally, livestock production was a sideline activity for many households; more farms are now specializing in livestock production. Households that specialize in livestock production and large commercial operations have risen in share and they produce 15% of overall livestock production. This transition in livestock production has important impacts on feed use. Traditional household operations make full use of readily available, low-cost feedstuffs. They often feed their swine with large quantities of water plants, vegetables, tubers, crop residue, table scraps, wheat and rice bran. These low-quality feeds are supplemented with some grain, protein meals, and concentrates, but traditional swine diets are often deficient in protein and energy, causing low productivity. Specialized producers often employ more advanced management and breeding practices and feed their livestock with grain and protein meal and archive roughly 36 percent more yield than

Table 3: Participation of China in the production of some selected animal products in years 2004–2007 Source of data: www.fao.org/statistics/

Items	Animal (million head)			Yield (kg/ head)		
	China	World	(%)	China	World	%
Meat of Mules	0,630	0,634	99,4	100,00	100,40	99,6
Meat of Asses	2,156	2,318	93,0	80,00	78,90	101,4
Goose and guinea fowl meat	555,567	601,318	92,4	4,00	3,97	100,9
Duck meat	1 931,374	2 535,651	76,2	1,30	1,45	89,5
Pig meat	662,548	1 323,583	50,1	78,24	79,02	99,0
Hen eggs, in shell	2 197,371	5 669,611	38,8	11,02	10,55	104,5
Goat meat	146,705	382,571	38,3	13,26	12,34	107,5
Rabbit meat	377,529	1 057,389	35,7	1,42	1,46	97,3
Goatskins	139,646	399,397	35,0	2,60	2,47	105,4
Horse meat	1,609	4,911	32,8	120,94	154,88	78,1
Sheep meat	154,226	536,840	28,7	15,10	15,64	96,5
Sheepskins	144,310	533,874	27,0	2,80	3,20	87,5
Sheep milk, whole, fresh	40,120	193,686	20,7	27,02	47,08	57,4
Cattle meat	49,613	296,740	16,7	135,84	203,34	66,8
Cattle Hides	47,684	306,153	15,6	34,00	25,20	134,9
Chicken meat	7 480,023	48 694,760	15,4	1,38	1,45	94,9
Buffalo meat	3,420	22,775	15,0	98,88	137,86	71,7
Buffalo Hide	3,299	29,778	11,1	30,00	27,47	109,2
Buffalo milk, whole, fresh	5,347	53,229	10,0	525,48	1 492,20	35,2
Camel meat	0,067	1,525	4,4	221,80	207,24	107,0
Cow milk, whole, fresh	9,652	241,441	4,0	2 751,58	2 236,18	123,0
Camel milk, whole, fresh	0,072	4,305	1,7	202,08	347,80	58,1
Bird meat	0,805	57,644	1,4	0,15	1,04	14,3
Goat milk, whole, fresh	1,321	165,580	0,8	197,64	86,56	228,3
Turkey meat	0,400	642,398	0,1	10,93	8,82	124,0
Natural honey (hives)	7,406	40,565	18,3	20,95	50,54	41,5

traditional households. As a result, specialized producers reduce the time it takes for swine to reach slaughtered weight by 20–80 days. The shift from traditional households to specialized operations has increased the demand for quality grain and oilseed-based feeds, reinforcing the growth in the number and capacity of Chinese feed mills.

Growth rate of agricultural production

All the indices at the country, regional and world levels are calculated by the Laspeyres formula according to the FAOSTAT. The indices are calculated from production data presented on a calendar year basis. Production quantities of each commodity are weighted by 1999–2001 average international commodity prices and summed for each year. To obtain the index, the aggregate for a given year is divided by the average aggregate for the base period 1961–1965. Since the FAO indices are based on the concept of agriculture as a single enterprise, amounts of seed and feed are subtracted from the production data to avoid double counting them. Deductions for seed (in the case of eggs, for hatching) for livestock and poultry feed is applied to both domestic and imported commodities. They cover only primary agricultural products destined to animal feed (maize, potatoes, milk, etc.). Processed and semi-processed feed items such as bran, oilcakes, meals and molasses have been completely excluded from the calculations at all stages. In this way, the FAO indices may differ from those produced by the countries themselves because of differences in concepts of production, coverage, weights, time reference of data and methods of calculation.

The largest increase in agricultural production was detected for China and India (Figure 7). Agricultural production index in Spain was similar to the World average and steadily increasing, while agricultural production has decreased in many Eastern European countries since 1980s. Similar trends were reported by *Majewski, (2008)* and *Bronisz, Heijman, (2008)* for *Poland and Kovács Katona, (2007)* for Hungary.

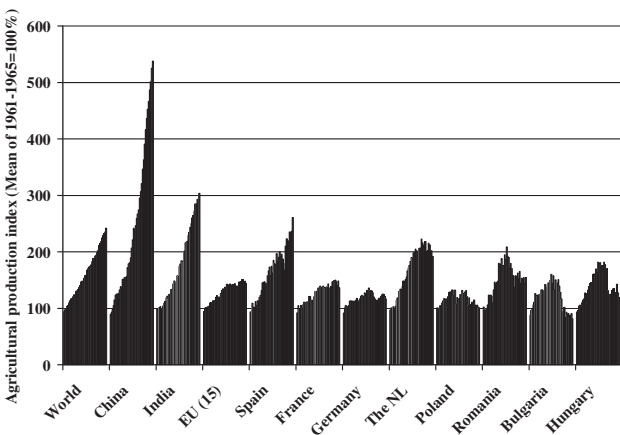


Figure 7: Agricultural production index in some selected countries
Source of data: www.fao.org/statistics/

Crop production data refer to the actual harvested production from the field or orchard and gardens, excluding harvesting and threshing losses. Production therefore includes the quantities of the commodity sold in the market and the quantities consumed or used by the producers. When the production data refers to a production period falling into two successive calendar years and it is not possible to allocate the relative production to each of them, it is usual to refer production data to that year into which the bulk of the production falls. The largest increase in crop production was detected for China and India (Figure). Agricultural production index in Spain and in the Netherland was similar to the World average and steadily increasing, while crop production has decreased in many Eastern European countries since in the second part on the examined period of 1961–2006.

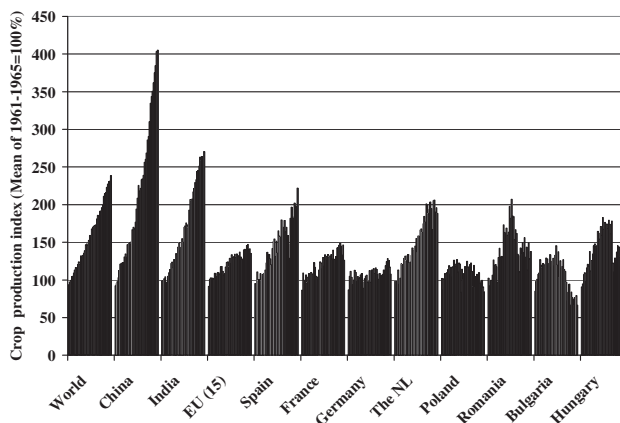


Figure 8: Crop production index in some selected countries
Source of data: www.fao.org/statistics/

Overall per capita meat consumption in China, however, is still lower than in many EU member states. Most of China’s livestock are still raised by traditional rural households that devote the bulk of their labour to crop production. Households generally keep livestock to provide food, draft power, and manure for the family. The largest increase in livestock production was detected for China (Figure 8). Livestock production index in Spain was similar

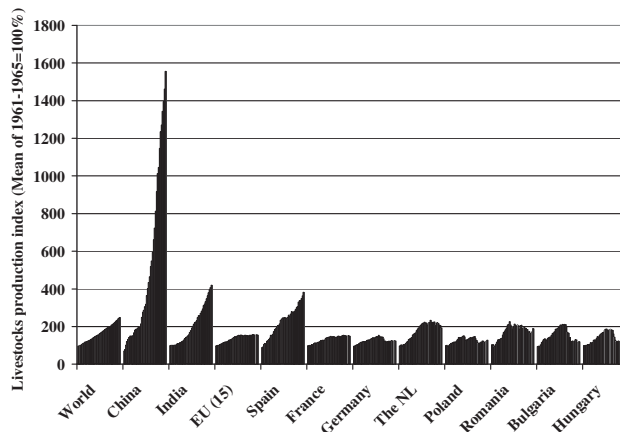


Figure 9: Livestock production index in some selected countries
Source of data: www.fao.org/statistics/

to India and steadily increasing in the examined period. Livestock production has decreased in many Eastern European countries since 1980s.

Food production index refers to the total amount of the commodity available as human food during the 1961–2006 period (Figure 10). Data include the commodity in question, as well as any commodity derived from them as a result of further processing. Food from maize, for example, comprises the amount of maize, maize meal and any other products derived available for human consumption. Food from milk relates to the amounts of milk consumed as well as the fresh milk equivalent of dairy products.

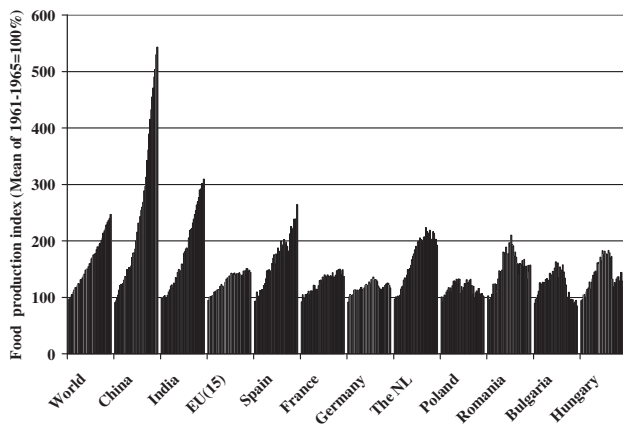


Figure 10: Food production index in some selected countries
Source of data: www.fao.org/statistics/

Indices for meat production are computed based on data for production from indigenous animals, which takes account of the meat equivalent of exported live animals but excludes the meat equivalent of imported live animals. For index purposes, annual changes in livestock and poultry numbers or in their average live weight are not taken into account. The largest increase in food production was detected for China and India (Figure 10). Food production index in Spain was similar to World average and steadily increasing, while food production index has decreased in many Eastern European countries since 1980s. The economic value of grassland products are well

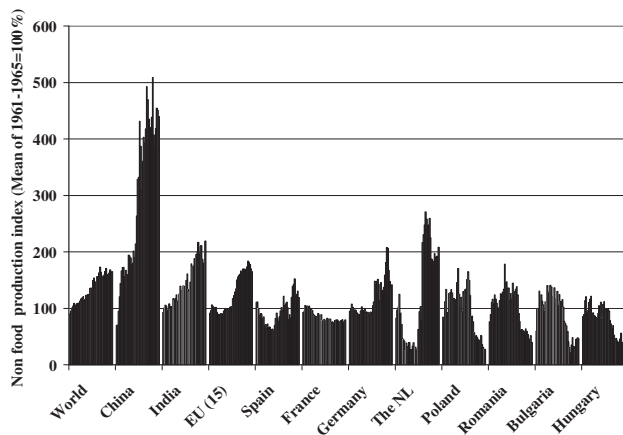


Figure 11: Production index for non food commodities in some selected countries
Source of data: www.fao.org/statistics/

known, but *Nábrádi*, (2007) highlighted the fact that certain utilization potentials is far from being complete.

The largest increase in non food production index was detected for China and the Netherlands (Figure 11). Production index for non food commodities in Spain was similar to the mean of EU countries, while production index for non food commodities has decreased in many East European countries since 1980s.

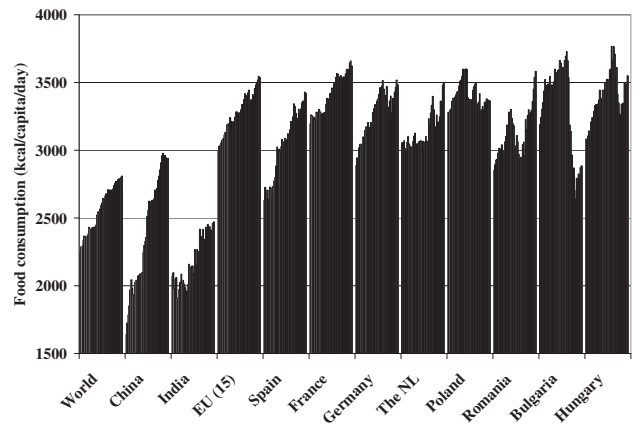


Figure 12: Food consumption in some selected countries
Source of data: www.fao.org/statistics/

Although per capita incomes and food expenditures in China are still low, food security is not a problem for most of the regions in China. Data in figure refers to the total amount of food available for human consumption expressed in kilocalories. Caloric content is derived by applying the appropriate food composition factors to the quantities of the commodities. In XX century, famine and food insecurity were common in China, but food consumption and food availability have soared since beginning of examined period (1961–2007). China is still a poor country, but it has a rising urban middle class with world-class consumption standards. Farm families, which still make up the 50% of the population, grow much of the food they consume. Food insecurity is not a problem for most of provinces, and per capita food supply, is above the world average in beginning

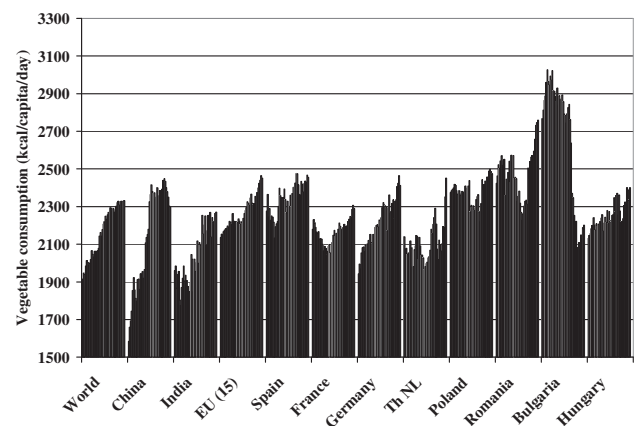


Figure 13: Vegetable consumption in some selected countries
Source of data: www.fao.org/statistics/

of XXI century. Per capita food supply is about 3000 kcal/capita/day, which is 500 kcal/capita/day less than in the member state of EU, except for Bulgaria, where the food supply was reduced sharply (Figure 12).

Cereals (mostly rice and wheat) and vegetables make up about 70% of per capita food consumption in China, which is higher share than in the EU. Per capita consumption of cereals and vegetables in China exceeds the world averages, but consumption of fruits, sugar, sweeteners, fats and oils is lower. Per capita vegetable consumption is about 2400 kcal/capita/day, which is similar to data of EU member states (Figure 13).

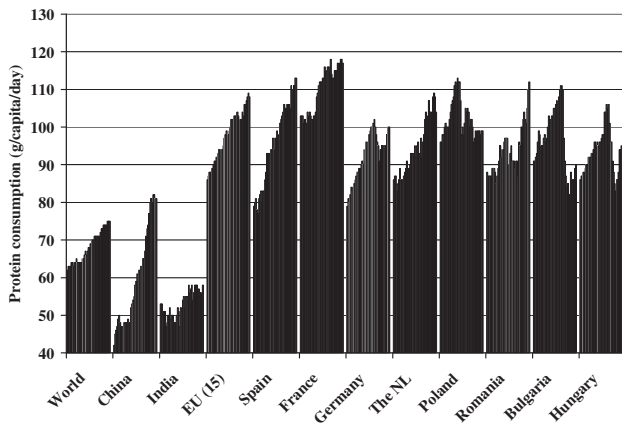


Figure 14: Protein consumption in some selected countries
Source of data: www.fao.org/statistics/

Per capita protein consumption is increasing sharply in China (Figure 14). Data in figure refers to the total amount of protein available for human consumption resulting from the multiplication of the quantity of food available. Protein content is derived by applying the appropriate food composition factors to the quantities of the commodities and is expressed in grams. Per capita protein consumption is about 80 g/capita/day, which are 10–30 g/capita/day less than the number in EU countries. These differences in food consumption between China and EU reflect a combination of lower per capita incomes and preferences in China. As consumers grow wealthier, consumption of all foods will grow, but consumption of meat, fruits, fish, fats and oils will grow the fastest (Figure 15).

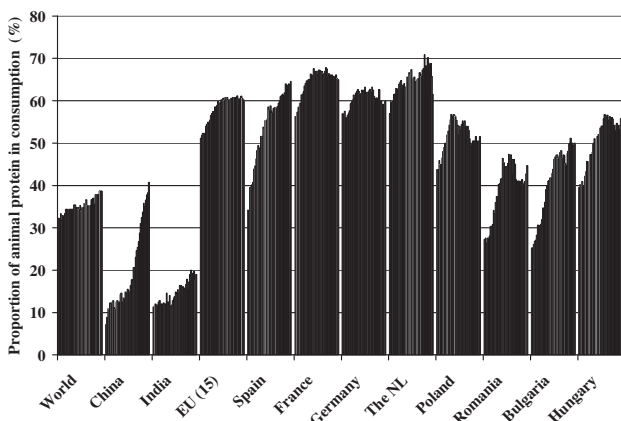


Figure 15: Proportion of animal protein in human diet in some selected countries
Source of data: www.fao.org/statistics/

China is one of the largest customers for agricultural products. The level of agricultural imports is still modest. Country tends to import bulk commodities and items used as intermediate inputs in labour-intensive manufacturing. At the same time, China is a major exporter of high-value, labour-intensive food products, such as manufactured foods, animal products, fish, vegetables, and fruits. The agricultural exports go largely to Asian markets. Until the 1980s, there was relatively little value-added in China's food sector, as consumers prepared most meals at home using rice, noodles, raw vegetables, and meat produced at home, purchased from state-run foodstuff stores, or purchased directly from farmers. Since then, foods processing and retailing industries has grown fast, as consumers demanded more quality and convenience. Modern supermarkets are the most widespread retail outlet for food, but they are being challenged by emerging hypermarkets, most of which are owned by foreign chains. Hypermarkets are introducing China to modern supply chain management techniques designed to improve efficiency in wholesaling and distribution. These developments might open new channels for high-value food imports. The demand for quality, uniform farm products in high volumes may transform agricultural production processing and retailing in China.

Trade and sustainable development

In the late 1990s, the market prices of some commodities rose above world prices in China as government supported prices (*Brown, 1995*). In the years leading up to WTO accession, China has liberalized trade considerably, but still maintained many barriers to agricultural trade (*Carter and Rozelle, 2001, 2002, Huang and Rozelle, 2002*). In accordance with its membership in the WTO, China lowers tariffs, weaken state trading monopolies, increase the openness of import license and quota allocation, and require publication of trade regulations, thus weakening most of the policy instruments the government has used to restrain agricultural imports. In the first few years after WTO accession, China allowed limited quantities of grains, cotton, vegetable oils, wool, and sugar to enter the country at low tariffs of 1–9 percent. At the same time, WTO entry opened more markets for China's labour-intensive exports, potentially moving China's trade patterns in a direction that will make more efficient use of human and natural resources. After the country's WTO accession, government fined other means of protecting and subsidizing farmers to maintain a degree of food self-sufficiency and social stability. Government subsidies are minimal in China, but spending on both price-distorting subsidies and infrastructure, education, and other subsidies, which are not tied to prices, have risen considerably. Increased competition after the WTO accession pushed China's food marketing system to squeeze out inefficiencies and reduce farm-retail margins. The country's goal of food self-sufficiency has led policymakers to restrain imports of land-intensive grains, the production of

which has a high opportunity cost. China's agricultural trade has grown relatively slowly, in comparison with booming merchandise trade (Duncan, 2001, Gilbert and Wahl 2002). The rapid development of transportation and marketing infrastructure has also played a role in integrating the national economy. Transportation and logistics costs account for an estimated one-fifth or more of retail prices, which is much higher than in developed countries. Marketing costs will need to be reduced to allow farmers in China to compete for markets on coastal and overseas area of China (Hsu et al. 2002, Fan and Chan-Kang, 2005). Inadequate port facilities and lack of warehousing and cold storage facilities can also impede both domestic and international trade. China is a major exporter of maize, chicken meat and preserved food, fruit and vegetables (Table 4). Tea, garlic frozen and dehydrated vegetables are also important export items for China. The country is responsible for more than 40% of world total export in respect of canned mushrooms, apple juice, carded and/or combed hair.

Table 4: Share (%) and volume (million USD) of most important export commodities in China between 2004–2006 Source of data: www.fao.org/statistics/

Export item	China	World	(%)
Crude Materials	1 673,758	23 314,415	7,18
Maize	1 088,732	10 999,423	9,90
Food Prepared	1 017,894	21 724,704	4,69
Fruit	546,203	5 900,076	9,26
Meat of Chicken Canned	520,930	3 054,138	17,06
Vegetables Preserved	520,774	3 592,950	14,49
Tea	421,613	3 159,917	13,34
Garlic	420,556	726,888	57,86
Vegetable Frozen	402,201	2 776,751	14,48
Vegetables Dehydrated	353,055	954,140	37,00
Beans, dry	323,759	1 309,839	24,72
Waters, Ice	315,484	2 097,429	15,04
Pork	306,307	5 480,347	5,59
Canned Mushrooms	303,122	748,375	40,50
Apple juice, single strength	302,792	735,891	41,15
Hair Carded/ Combed	301,551	647,086	46,60
Rice Milled	289,719	6 630,823	4,37
Groundnuts Shelled	250,811	752,169	33,34
Tobacco, unmanufactured	243,237	6 348,600	3,83
Chicken meat	236,391	8 455,154	2,80
Cigarettes	235,277	13 148,042	1,79
Apples	234,996	3 503,633	6,71
Paste of Tomatoes	229,868	1 560,912	14,73
Silk Raw	228,235	261,488	87,28
Prep of Pig Meat	225,078	1 679,649	13,40
Prepared Groundnuts	224,952	566,608	39,70
Cake of Soybeans	182,559	10 189,954	1,79
Dried Mushrooms	177,315	323,981	54,73
Confectionery	176,534	5 374,992	3,28
Vegetable Preservatives	167,827	367,051	45,72
Vegetable Fresh Or Dried	157,638	268,509	58,71

Export item	China	World	(%)
Pastry	152,892	10 426,397	1,47
Ginger	146,083	217,581	67,14
Prepared Nuts (Excluding Groundnuts)	132,729	1 097,994	12,09
Beverage Non-Alcohol	131,459	6 832,705	1,92
Wheat	120,985	17 041,994	0,71
Soybeans	119,563	14 429,944	0,83
Mushrooms and truffles	119,458	976,127	12,24
Chillies and peppers, dry	118,511	504,002	23,51
Vegetables fresh	114,197	1 471,283	7,76
Beverage, Alcohol	111,760	15 460,927	0,72
Vegetables, Prep, Pres, Frozen	101,036	385,102	26,24
Fruit, Nut, Peeled and Sugar	97,465	277,866	35,08
Food Wastes	95,246	3 825,085	2,49
Natural honey	93,273	808,570	11,54
Oil Essential	88,475	1 614,788	5,48
Pears	88,085	1 262,436	6,98
Onions, dry	84,910	1 187,175	7,15
Cotton lint	83,865	8 421,130	1,00
Tangerines, mandarins	76,769	2 039,082	3,76
Nuts	74,291	519,260	14,31
Flour of Wheat	73,932	2 139,045	3,46
Beer of Barley	70,957	7 090,399	1,00
Breakfast Cereals	68,536	2 555,379	2,68
Sesame seed	64,892	678,130	9,57
Taro (cocoyam)	64,109	77,725	82,48
Preparations of Beef Meat	61,090	1 309,147	4,67
Carrots and turnips	60,639	503,119	12,05
Sugar Refined	58,303	6 724,918	0,87
Sunflower seed	56,486	1 074,143	5,26
Chestnuts	55,189	207,389	26,61
Wool Degreased	54,094	922,449	5,86
Hen eggs, in shell	50,872	1 222,686	4,16
Sausages of Pig Meat	50,770	1 854,173	2,74
Feed	49,491	734,625	6,74
Groundnuts, with shell	49,171	147,674	33,30
Soya Sauce	46,773	204,468	22,88
Fruit Dried	42,235	448,281	9,42
Fruit Juice	36,487	1 862,984	1,96
Chocolate	34,202	10 577,121	0,32
Cider Etc	31,464	365,001	8,62
Rice Husked	30,803	453,810	6,79
Walnuts Shelled	30,450	403,448	7,55
Prepared Meat	30,095	135,590	22,20
Oil Boiled	30,014	440,868	6,81
Pig meat	29,773	8 699,900	0,34
Pineapples Canned	29,655	687,899	4,31
Pet Food	29,517	4 907,698	0,60
Beet Pulp	29,165	225,900	12,91
Duck meat	28,624	265,675	10,77
Cauliflowers and broccoli	28,133	624,715	4,50
Potatoes	27,810	1 891,680	1,47
Maize oil	26,321	641,780	4,10

Export item	China	World	(%)
Meat-Cattle Boneless	26,310	13 577,872	0,19
Tobacco	26,251	2 256,212	1,16
Cinnamon (canella)	26,136	124,871	20,93
Cocoon	25,884	47,698	54,27
Sheep meat	25,198	3 188,456	0,79
Cocoa Butter	25,174	2 061,836	1,22
Leeks, other alliaceous vegetable	24,982	177,959	14,04
Vegetable Prod for Feed	24,335	169,168	14,38
Vegetables in Vinegar	23,910	906,777	2,64
Buckwheat	23,776	38,523	61,72
Milk Whole Dried	23,752	4 422,318	0,54
Glucose and Dextrose	23,505	924,858	2,54
Cake of Rapeseed	23,212	626,138	3,71
Food Prep, Flour, Malt Extract	23,190	2 676,191	0,87
Coffee Extracts	22,899	2 521,501	0,91
Oil of Tung Nuts	22,669	32,016	70,81
Soybean oil	22,022	5 044,862	0,44
Cow milk, whole, fresh	20,183	2 162,413	0,93
Sesame oil	20,104	89,414	22,48
Bananas	19,970	4 906,680	0,41
Cabbages and other brassicas	19,902	537,255	3,70
Groundnut oil	19,404	230,463	8,42
Straw Husks	19,167	95,233	20,13
Spices	19,103	567,168	3,37
Fruit Fresh	18,821	564,976	3,33
Oilseeds	18,790	170,691	11,01
Mixes and Doughs	18,576	1 420,672	1,31
Coffee, green	17,551	6 884,884	0,25
Flour of Oilseeds	17,404	419,695	4,15
Peanut Butter	16,709	91,258	18,31
Gluten Feed & Meal	16,523	819,395	2,02
Sugar	16,344	411,058	3,98
Fat Prepared	16,299	760,006	2,14
Bran of Maize	16,235	60,023	27,05
Extracts Tea, Mate, Prep	16,133	382,785	4,21
Hides Cattle	14,540	18,527	78,48
Raisins	14,191	739,082	1,92
Goose and guinea fowl meat	13,712	142,035	9,65
Rice, paddy	13,379	376,044	3,56
Tomatoes	12,713	4 293,687	0,30
Macaroni	12,541	1 956,311	0,64
Ice Cream and Edible Ice	12,392	1 760,126	0,70
Triticale	12,236	51,032	23,98
Rabbit meat	12,115	147,435	8,22
Beeswax	12,017	41,304	29,09
Meat	11,379	151,895	7,49
Cereal Preparations,	11,339	429,220	2,64
Cake of Cottonseed	11,307	62,978	17,95
Chillies and peppers, green	11,291	2 428,128	0,46
Tapioca of Cassava	11,184	30,165	37,07
Oranges	11,057	2 479,136	0,45
Sorghum	10,861	663,857	1,64
Peas, green	10,494	123,065	8,53

China has been a major importer of corn and cotton. China is a net importer of bulk commodities, primarily soybeans, cotton lint and palm oil. In some years, During the 1990s, China emerged as a major market for imports of oilseeds, vegetable oils, and oil meal. China uses most other agriculturally related imports as intermediate inputs for manufacturing. China uses imports of fabrics, hides, and skins in its export-oriented garment, footwear, and leather product industries. Net imports of fertilizers help boost China's domestic crop production, reducing the need for food imports. Meat and other agricultural imports have grown at a steadier rate.

Table 4: Share (%) and volume (million USD) of most important import commodities in China between 2004–2006 Source of data: www.fao.org/statistics/

Import item (million USD)	China	World	(%)
Soybeans	6 315,951	17 015,679	37,12
Cotton lint	2 238,191	8 544,179	26,20
Palm oil	1 535,137	10 007,041	15,34
Rubber Nat Dry	1 295,229	6 292,221	20,58
Cattle hides Wet salted	1 021,268	3 005,250	33,98
Soybean oil	992,921	5 240,037	18,95
Wool, greasy	932,084	1 901,282	49,02
Wheat	877,680	19 303,825	4,55
Crude Materials	756,036	24 464,482	3,09
Maize	703,111	13 007,403	5,41
Food Prep	624,780	22 929,641	2,72
Cigarettes	544,246	14 813,945	3,67
Beverage, Distilled alcohol	364,433	14 609,140	2,49
Chicken meat	351,018	8 087,774	4,34
Barley	347,722	3 181,765	10,93
Sugar Raw Centrifugal	305,236	6 052,539	5,04
Tobacco, unmanufactured	296,850	7 722,938	3,84
Cassava dried	277,254	516,338	53,70
Meat-Cattle Boneless (Beef & Veal)	230,142	13 227,710	1,74
Food Prep, Flour, Malt Extract	204,838	2 544,559	8,05
Milk Whole Dried	200,690	3 810,424	5,27
Rice Milled	169,342	5 876,357	2,88
Cassava Starch	167,812	312,620	53,68
Tallow	161,546	903,034	17,89
Flax fibre and tow	154,279	410,456	37,59
Skins With Wool Sheep	149,941	631,082	23,76
Natural rubber	141,195	1 012,066	13,95
Offal of Pigs, Edible	136,657	855,967	15,97
Infant Food	135,597	1 880,482	7,21
Milk Skimmed Dry	127,016	3 495,073	3,63
Rapeseed oil	126,079	1 684,645	7,48
Fatty Acids	124,982	1 872,066	6,68
Wool Degreased	124,361	948,078	13,12
Beer of Barley	119,196	6 909,857	1,73
Whey Dry	116,658	1 021,914	11,42
Skin Furs	113,927	1 434,432	7,94
Apples	109,747	3 814,235	2,88
Food Wastes	107,191	3 854,641	2,78

Import item (million USD)	China	World	(%)
Rapeseed	102,979	2 292,450	4,49
Chocolate	101,865	10 279,013	0,99
Wine	94,067	18 119,460	0,52
Fruit Fresh	92,460	817,001	11,32
Bananas	90,478	7 269,793	1,24
Sheep meat	89,534	3 256,741	2,75
Pork	89,115	9 240,348	0,96
Palm kernel oil	88,861	1 038,067	8,56
Pastry	84,061	10 477,989	0,80
Fruit, tropical fresh	82,973	236,924	35,02
Sesame seed	82,066	700,596	11,71
Grapes	80,671	3 863,291	2,09
Sugar Refined	72,650	6 159,022	1,18
Coconut (copra) oil	70,458	1 196,921	5,89
Oil Essential	68,101	1 750,829	3,89
Frozen Potatoes	67,101	2 747,256	2,44
Fruit Prepared	64,385	6 225,966	1,03
Sugar Confectionery	54,371	5 407,715	1,01
Feed, Other	53,708	852,047	6,30
Orange juice, single strength	53,119	2 449,943	2,17
Pet Food	49,422	5 159,812	0,96
Wet Salted pigs Skins	45,683	69,866	65,39
Cherries	42,443	588,458	7,21
Peaches and nectarines	41,842	1 245,887	3,36
Butter Cow Milk	41,353	3 566,082	1,16
Fat prepared	41,150	832,140	4,95
Turkey meat	40,513	1 383,045	2,93
Oranges	40,190	2 881,236	1,39

Summary

Home and international trade promotes growth in China and that growth reduces poverty. Reducing trade barriers promotes more efficient resource use. Greater efficiency of agricultural production in China means that societies can produce more of the commodities people want, within their limited resources, raising overall social welfare. The poor farmers are able to improve their levels of nutrition, health and education, creating a virtuous circle of rising productivity and poverty reduction. Agricultural development policy has balanced the effects of trade liberalization and improved food security. Trade liberalization was useful for large and more export-oriented firms and it has led to scale incentives and size concentration. Trade liberalization itself do not hold guarantee that everyone will benefit from transition, but agricultural development policy assisted the poor and vulnerable members of society. Trade liberalization in China has not marginalized small farmers and does not created unemployment, but reduced poverty. Agricultural import from developed countries has not undermined the economic and social welfare of poor rural areas, but assisted the

development of producing and processing firms in rural area. China has opened his borders, but do not expose poor food consumers to price shocks and small food producers to risks and disincentives.

Food-consumption levels have grown and will continue to grow as the population grows richer. Income growth and urbanization are likely to boost food demand considerably and change the consumer preferences. Demand for meat, fish, vegetable oils, and dairy products will also grow fast. The country's transition from rural semi-subsistence to urban lifestyles will have profound impacts on consumption patterns, shifting demand from self-grown rice, wheat, and vegetables to fish, meat, processed foods, and restaurant meals. Consumers will also pay more attention to food quality, and they may demand foods with specific attributes.

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