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# **A Possible Examination Method for Observing Agriculture**

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**Paper prepared for presentation at the 12<sup>th</sup> EAAE Congress  
'People, Food and Environments: Global Trends and European Strategies',  
Gent (Belgium), 26-29 August 2008**

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# A POSSIBLE EXAMINATION METHOD FOR OBSERVING AGRICULTURE

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*Abstract*– On the basis of our examinations we have come to the conclusion that longitudinal examinations are the simplest and most up-to-date methods as well as the most cost-efficient ones to follow the decision-making, preparatory data collecting, processing and analysing opportunities serving the sustainability of agriculture better and better together with tracing down the feedback about the decisions to see if the given measure has really resulted in reaching the objectives.

The method was proved to be able to supply both micro- and macro-level information in the desired breakdown, groupings and systems of connections.

The development successive (panel) examination that we applied can serve as the basis of making decisions affecting huge areas by means of total listings and breakdowns. Moreover, it can also control their effects and aftermaths.

We suggest the implementation of introducing this data collecting and information supplying method declared to be desirable also by the European Union. Implementation could be eased to a great extent by the fact that it is available for the organisations, as well.

*Key words*– longitudinal examination, method, application

## INTRODUCTION

Due to the favourable natural endowments and historical traditions, agriculture plays a decisive role in the social, political and, last but not least, economic life of our country. It is not a negligible fact either that during the EU integration this branch caused most of the problems as the analysis of the agricultural sector is a more complex task than that of any other sector at all levels. Here totally different procedures must be examined at the same time (e.g. biological, technological, demographic, climatic, market and income ...etc.). According to *Simai (2002)*, the complex analysis of the processes happening in the sector is a complex task even regarding the decentralisation of the production system". To achieve this, a lot of precise information is necessary about the endowments and situation of the homesteads to make well-established decisions as well as to measure the aftermath of certain decisions. The information outlined cannot be supplied perfectly and the future cannot be forecast by any of the systems. At the same time, the so-called longitudinal (development successive) examination as a method of procedure can be of approximate accuracy as it describes

changes in their process and correlations in dynamism, development in contrast with the traditional static examinations.

The method was tested by means of the changes in private farms for a period of 15 years.

*The main objective* of the examination was to find out if the longitudinal method was really useful and suitable to examine the development of the actors in agriculture, i.e. to make a model of its application to trace down the changes in the single private farms of Heves county.

## THE DATABASE OF THE EXAMINATIONS

The thorough listings of 1994 and 2000 carried out by the National Statistical Office (NSO) serve as the basis of macro-level comparison and the listings of 2005, between which the connection was established by the individual identification of homesteads in the representative sample.

The results of the examination were assessed for 15 years (1991-2006) in 31 private farms of Heves county- mainly based on own data collection and the data of the NSO by thoroughly processing such data as the personal particulars of the farmers, the formation of land size, vegetable production, plant production, fruit-and grape production together with animal husbandry.

The unique identification of the homesteads was also ensured here. The problem was how to manage the homesteads ceased to operate in the meantime but this was solved by indicating them in a separate line of the table (in 1991 there were 31, in 2006 only 17 homesteads).

By making use of the results, the shifts in the volume and structure can be presented based on the changes in the model homesteads, which can perfectly show the shifts and trends typical of the private homesteads.

## THE DEFINITION, ROLE AND SIGNIFICANCE OF LONGITUDINAL (DEVELOPMENT SUCCESSIVE) EXAMINATIONS

Determinism can only be expected in the case of the events already happened or when there is an extremely tight

correlation (dependence). However, the so-called longitudinal (development successive) examination as a method of procedure can be of approximate accuracy. As a terminus technicus, we will use this term as a development successive examination in our own research. What do we mean under this term?

*Development successive examination*: describes changes in their process and correlations in dynamism, development in contrast with the traditional static examinations.

The term *change* usually denotes a change in quantity but also in quality in a positive or negative direction. However, *development* means a change in quality due to the change in quantity. We think the longitudinal method we applied and from which we carried out panel examination can best be termed as *development successive examination* in the national terminology.

Of course, to support this, first of all the term of longitudinal examination must be clarified:

According to the collection of concepts of methodology „*longitudinal examination* is a research project including data recording at different times, in contrast with the examination of cross-sections. *Panel examination*: such a *longitudinal examination* during which data are collected from the same sample (panel) at different times. .”(Szabó, 2006)

According to *Babbie (2003)* unlike cross-section examinations, *longitudinal examinations* are planned to inspect the same phenomenon for a longer period of time.

In case of quantitative research like surveying a huge population (pattern) it is more difficult to carry out longitudinal examinations. However, it is often the best way to study changes in time. The Reader must get acquainted with three types of longitudinal examinations: *trend, cohorts and panel examinations*.

*Panel examinations* are like trend and cohorts examinations but here the same people are examined every time (*Domán-Tamusné, 2002*).

The advantage of longitudinal examinations over the cross-section ones is obvious: we can get detailed information about the processes in time. However, this has a high price both in terms of time and money mainly in case of the examinations of high volume. Observations must be made at the same time with the events and this may need a lot of cooperates.

- Panel examinations give the most thorough, precise data of the temporal changes but *we have to face a unique problem here: that is dropping out*. One part of those asked during the first wave of the survey may not take part in further records due to their own decisions or special circumstances. The danger is that dropping out of the examination

cannot be regarded incidental so results can be distorted.

According to *Collins, 2000* „for the ideal longitudinal examination

- the proper *theoretical model* of change,
- such *temporal design* that is able to examine the clear and detailed picture of the change and a suitable *statistical model* that tests the theoretical model is necessary”

## THE LONGITUDINAL EXAMINATION AS A METHOD

Based on our secondary research, we experienced that longitudinal examination as a method is primarily used in surveying education, medical research and all other kinds involving the population (out of 477 bibliographical items only 1 mentions its agricultural respect).

The agricultural application of this method was first mentioned in 1993 in Geneva at the working group session of the Meeting of European Statisticians from the Dutch and Swedish delegation. Both papers were dealing with this topic. The Swedish delegation handed in their paper under the title of „The long temporal linear examination of the structural changes of the Swedish agriculture” (*Gundel-Laczka, 1995*) One of the conditions of the analysis was the presence of homogeneous time series and another was the identification of homesteads with which the data of the homesteads could reliably be identified at different consecutive times (statistical identification code). The main point of the method is that the size categories of land will be created on the total data set of the index to be analysed (e.g. plot of land). These plot size categories of land will be written into the headings and lateral columns of the table in the same way during the examination. (*Mrs Ficzer-Vanó, 2004*)

After careful identification the homesteads will be put into the cells of the table according to the area of land possessed during the examined  $t$  period of time (side column) as well as during  $t+1$  period of time (heading). This way the homesteads which had the same area of land during the examined  $t$  and  $t+1$  period are in the diagonal of the table so they kept the same size. Above the diagonal of the table are the ones that increased their area and below the diagonal are those that decreased their area from period  $t$  to period  $t+1$ . In the two latter cases the size and the extent of the area change can be traced. Of course, the examination can go on consecutively year by year but even the changes of a longer period can easily be analysed (*Gundel-Laczka, 1995*).

**Table 1.**  
**The spread of components on the basis of the size categories of the criterion 1.**

time		classification of criterion				for time t			
		X <sub>1ah</sub> -X <sub>1fh</sub>	X <sub>2ah</sub> -X <sub>2fh</sub>	X <sub>3ah</sub> -X <sub>3fh</sub>	X <sub>nah</sub> -X <sub>nfh</sub>				
t+1 time		occurrence of components				Z <sub>t</sub>	Y <sub>t</sub>	(y/z)	
classification of criteria	Y <sub>1ah</sub> -Y <sub>1fh</sub>	Z <sub>x1y1</sub>	Z <sub>x2y1</sub>	Z <sub>x3y1</sub>	Z <sub>xny1</sub>	Σ z <sub>y1xi</sub>	Σ y <sub>1</sub>	y <sub>1</sub>	
	Y <sub>2ah</sub> -Y <sub>2fh</sub>	Z <sub>x1y2</sub>	Z <sub>x2y2</sub>	Z <sub>x3y2</sub>	Z <sub>xny2</sub>	Σ z <sub>y2xi</sub>	Σ y <sub>2</sub>	y <sub>2</sub>	
	Y <sub>3ah</sub> -Y <sub>3fh</sub>	Z <sub>x1y3</sub>	Z <sub>x2y3</sub>	Z <sub>x3y3</sub>	Z <sub>xny3</sub>	Σ z <sub>y3xi</sub>	Σ y <sub>3</sub>	y <sub>3</sub>	
	Y <sub>nah</sub> -Y <sub>nfh</sub>	Z <sub>x1yn</sub>	Z <sub>x2yn</sub>	Z <sub>x3yn</sub>	Z <sub>xny</sub>	Σ z <sub>y<sub>n</sub>xi</sub>	Σ y <sub>n</sub>	y <sub>n</sub>	
for t+1 time		Z <sub>t+1</sub>	Σ z <sub>x1yi</sub>	Σ z <sub>x2yi</sub>	Σ z <sub>x3yi</sub>	Σ z <sub>xnyi</sub>	Σ z <sub>x<sub>i</sub>yi</sub>	Σ y <sub>i</sub>	y <sub>i</sub>
		X <sub>t+1</sub>	Σ x <sub>1</sub>	Σ x <sub>2</sub>	Σ x <sub>3</sub>	Σ x <sub>n</sub>	Σ x <sub>i</sub>		
		(x/z)	x <sub>1</sub>	x <sub>2</sub>	x <sub>3</sub>	x <sub>n</sub>	x <sub>i</sub>		

From: own compilation

where: - **t** and **t+1** are successive dates and criterion **x** is identical with **y**;

- **X<sub>1ah</sub>-X<sub>1fh</sub>** the upper-lower first class marginal value of the criterion of the component at date **t+1** which is the same time **t** in the longitudinal examination with **Y<sub>1ah</sub>-Y<sub>1fh</sub>**;
- **z** is the number of the occurrence of components (units) in the size categories of **x** and **y**;
- **Y<sub>t</sub>** and **X<sub>t+1</sub>** is the total amount of criteria reflected to the given time;

**Table 2.**  
**The spread of components on the basis of the size categories of the criterion 2.**

t+1 time		The change of components from time <b>t</b> to time <b>t+1</b> according to the criterion			Σ Z <sub>t</sub>
t time		less (a)	similar (b)	more (c)	
Y <sub>1ah</sub> -Y <sub>1fh</sub>	occurrence of components	-	Z <sub>x1y1</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Z <sub>x2,3,n y1</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>y1xi</sub> /Σ z <sub>xiyi</sub>
Y <sub>2ah</sub> -Y <sub>2fh</sub>		Z <sub>x1 y2</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Z <sub>x2y2</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Z <sub>x3,n y2</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>y2xi</sub> /Σ z <sub>xiyi</sub>
Y <sub>3ah</sub> -Y <sub>3fh</sub>		Z <sub>x1,2 y3</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Z <sub>x3y3</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Z <sub>xny3</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>y3xi</sub> /Σ z <sub>xiyi</sub>
Y <sub>nah</sub> -Y <sub>nfh</sub>		Z <sub>x1,2,3 yn</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Z <sub>xny<sub>n</sub></sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	-	Σ z <sub>y<sub>n</sub>xi</sub> /Σ z <sub>xiyi</sub>
Z <sub>t+1</sub>		Σ z <sub>a</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>b</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>c</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	1

From: own compilation

The frequencies inserted in the contingency table can clearly indicate non-random spread without the application of more serious mathematical-statistical methods.

The spread of occurrences of Table 1 in percentage reflected to principal ΣZ<sub>x<sub>i</sub>yi</sub> in the diagonal of the error range (downwards from left to right) shows the proportion of the units (components) whose examined feature or size did not change between the two dates. The extent of criterion decreased in the case of the components below the diagonal from the previous (t) time to t+1 time while the extent of those above the diagonal increased. By contracting the columns the assessment of the result can be simplified according to Table 2 by highlighting the extent of decrease, increase and invariability (similarity) per category and in total.

**Table 3.**  
**The directions of the change of criterion**

time	the proportion of the change of components from date to date according to the criterion			the proportion of missing components between t <sub>n-1</sub> -t <sub>n</sub>	Total
	less	similar	more		
t+1	Σ z <sub>a</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>b</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>c</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	ΔZ/Σ Z <sub>x<sub>i</sub>yi</sub>	1
t+2	Σ z <sub>a</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>b</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>c</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	ΔZ/Σ Z <sub>x<sub>i</sub>yi</sub>	1
t+3	Σ z <sub>a</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>b</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>c</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	ΔZ/Σ Z <sub>x<sub>i</sub>yi</sub>	1
t+4	Σ z <sub>a</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>b</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>c</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	ΔZ/Σ Z <sub>x<sub>i</sub>yi</sub>	1
t+n	Σ z <sub>a</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>b</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	Σ z <sub>c</sub> /Σ Z <sub>x<sub>i</sub>yi</sub>	ΔZ/Σ Z <sub>x<sub>i</sub>yi</sub>	1

From: own compilation

With the arrangement of the data summarising the changes of the features of the farms between the two dates in the chronological order of the series of survey into a table (Table 3), the changes from time to time can be reviewed much easier and the partial results can be made more understandable with graphical designs. (The decrease of components resulting from the method of examination can be presented in a separate column in the summarising tables).

## CONCLUSIONS, FINDINGS

As a result of the longitudinal examination we concluded that the number of farms had decreased and only those viable and capable of increasing their area survived and operate even today. Farm stability greatly depends on if it is based on inheritance or the foundations of a previous farm. Most of the active farmers are employed full time. Nearly

70% of the farmers have no agricultural qualification. Regarding the type of farming, those of mixed structure are the most viable ones, which are based on own and leased land.

When reviewing regional spread, we found that liquidation was in close contact with the endowments of the production area. 60% of the farms of the sample reached their size of 1992 due to privatisation and compensation.

Those engaged in only animal keeping were terminated due to the market changes.

The proportion of animal husbandry and crop plant production increased in the production structure but the decrease of the proportion of the so-far significant vegetable and grape production is a cause of concern. 20% of the claims for compensation were in one's own right and in 75% land was the basis of compensation that was primarily used for purchasing land.

Concerning credit, we experienced that initially farmers had been asking for a loan on things where reduction was available such as purchase or building of real estates. Till 1994-2003 the purchase of machinery was gradually preferred. In 2004 the sum spent on machinery was significantly reduced (66% of the previous year) due to the EU regulations on machinery support.

This process was stopped by 2005 when the conditions of farming were transformed so that the farms could not implement simple reproduction, either due to the high repayment charges of the loan. Furthermore, the reduction in the above-mentioned support also played a decisive role. The high degree of indebtedness can incur the decrease of employment in agriculture and the concentration of areas of land.

Based on our examinations, we concluded that longitudinal examinations are the best to implement the decision-making, preparing, data collecting, processing and analysing possibilities as well as monitoring the aftermath of the decision whether it has reached the desired objective while serving the sustainable development of agriculture can be realised in the simplest, most up-to-date way with the smallest financial sacrifices.

The method is able to furnish information on both micro- and macro- level in the desired breakdown, groupings and relations.

We have reviewed the data collection practice of this kind in the countries with developed agriculture and on the basis of this, we can recommend its adaptation to domestic conditions. Of course, it would be a great burden if it were implemented only by one data providing organisation so we think it is important to include professional organisations that are in daily contact with the farmers.

The change successive method (panel examination) that we applied is suitable both for founding decisions on great

areas and monitoring the aftermath of their effects- due to integration and distribution.

## NEW AND NOVEL SCIENTIFIC RESULTS

1. Relying on domestic and foreign paper-and Internet-based specialist literature, we have defined change or development successive (longitudinal) examination in own interpretation. Change (development) successive examination: describes quantitative and/or qualitative changes in their process and relations in dynamics and development despite the traditional static examinations.
2. We have concluded that our applied method was much simpler than the other procedures used before so the frequencies inserted in the contingency table can clearly indicate non-random spread without the application of more serious mathematical-statistical methods.
3. As a result of longitudinal examinations, we concluded that:
  - the number of farms has decreased, only those above 5 ha are operating even now.
  - farm stability greatly depends on if it is based on inheritance or the foundations of a previous farm.
  - most of the active farmers are employed full time. The proportion of those with special qualification is critically low.
  - regarding the type of farming, those of mixed structure are the most viable ones which are based on own and leased land.
  - when reviewing regional spread, we found that liquidation was in close contact with the endowments of the production area.
  - 60% of the farms of the sample reached their size of 1992 due to privatisation and compensation.
  - those engaged in only animal keeping were terminated due to the market changes.
  - the proportion of animal husbandry and crop plant production increased in the production structure but the decrease of the proportion of the so-far significant vegetable and grape production is a cause of concern.
  - concerning credit, we experienced that initially farmers had been asking for a loan on things where reduction was available such as purchase or building of real estates. Till 1994-2003 the purchase of machinery was gradually preferred. In 2004 the sum spent on machinery was significantly

reduced (66% of the previous year) due to the EU regulations on machinery support.

This process was stopped by 2005 when the conditions of farming were transformed so that the farms could not implement simple reproduction, either due to the high repayment charges of the loan. Furthermore, the reduction in the above-mentioned support also played a decisive role.

— based on the things above, we can state that a not well-considered support regulation (support policy) can affect certain components of agriculture in a negative way, can extract capital from the branches and groups of producers concerned thus preventing those otherwise in a difficult situation from recovering from the drift towards the crisis.

— the high degree of indebtedness can incur the decrease of employment in agriculture and the concentration of areas of land.

4. Based on our examinations, we concluded that longitudinal examinations are the best to implement the decision-making, preparing, data collecting, processing and analysing possibilities as well as monitoring the aftermath of the decision whether it has reached the desired objective while serving the sustainable development of agriculture can be realised in the simplest, most up-to-date way with the smallest financial sacrifices.

The method is able to furnish information on both micro-and macro- level in the desired breakdown, groupings and relations.

5. We have reviewed the data collection practice of this kind in the countries with developed agriculture and on the basis of this, we can recommend its adaptation to domestic conditions. Of course, it would be a great burden if it were implemented only by one data providing organisation so we think it is important to include professional organisations that are in daily contact with the farmers.

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