C.Z.U.: 332.334.4:631.111(478)

THE ECONOMICS OF LAND FRAGMENTATION IN THE INDIVIDUAL FARM SECTOR OF MOLDOVA

D. CIMPOIEŞ
State Agrarian University of Moldova

Abstract. În această lucrare se descrie starea actuală a fragmentării funciare al gospodăriilor ţărăneşti din Republica Moldova şi efectele pe care le are aceasta asupra bunăstării familiilor rurale şi a productivităţii exploataţiilor agricole. Ipoteza de bază înaintată este dacă consolidarea terenurilor agricole va avea efecte benefice asupra productivităţii şi dacă această este binevenită pe termen lung.

În acest context, se va examina consolidarea în baza principiilor economiei de piaţă, utilizând informaţia obţinută din mai multe studii de teren recent efectuate. În particular, vom arăta că în sectorul individual exploataţiile agricole mai mari consumă mai puţin din producţia obţinută şi dispun de nivele de comercializare mai ridicate. Astfel, acestea obţin venituri din vânzări mai mari, generând un nivel de trai mai ridicat al familiilor din spaţiul rural. De asemenea, gradul fragmentării funciare este corelat cu eficienţa relativă a exploataţiilor agricole, demonstrându-se că unităţile consolidate sunt mai eficiente decât cele parcelate. Aşa dar, consolidarea funciară contribuie la o performanţă economică sporită a gospodăriilor ţărăneşti.

Key words: Households, Land consolidation, Land fragmentation, Land market, Peasant farms, Rural incomes.

INTRODUCTION

The creation of so-called "peasant farms" was one of the main objectives of land reform, and this objective has been fully achieved. However, the small size of the peasant farms, whose holdings are furthermore split into several disjointed parcels, raises considerable concerns about their long-term viability and has led to an intense public debate regarding the impacts of fragmentation.

This paper examines how the two dimensions of fragmentation – small farm sizes and large number of parcels per farm – affect farm productivity and family incomes. We also review the development of land markets in Moldova, as buy-and-sell transactions and land leasing provide obvious mechanisms for market-driven consolidation of fragmented holdings.

The paper is organized as follows: first, it presents the survey evidence regarding the positive impact of consolidation on farm efficiency and rural well-being. A separate section describes the formal land consolidation effort in Moldova and presents some preliminary results of the 2008 land consolidation pilot project. Some concluding remarks are given at the end.

MATERIAL AND METHOD

The analysis relies on several farm and household surveys conducted between 2003 and 2008. These surveys are shown at the beginning of the list of references. The latest in the series of surveys (referred to as the 2008 ASM survey in what follows) was conducted in July 2008 covering about 600 households and peasant farms from four villages spread across the country and about 80 corporate farms from 30 districts. Financing was provided by the Academy of Sciences of Moldova under the State project "Developing the economic mechanisms of land consolidation".

RESULTS AND DISCUSSIONS

Despite an early start, the process of land reform in Moldova was not visible until 1996. Thus, during the initial period land reform, Moldova saw only minimum changes and agriculture largely retained the Soviet heritage. Nevertheless, most of the rural residents received during this period paper certificates attesting the ownership of a certain land share, but in an unspecified location.

In 1996, the constitutional court removed some legislative constraints on land reform, providing an impetus for fundamental changes in the organization of the agricultural sector. A significant shift started to be felt a year later, when the National Land Program (NLP) was launched.

Each landowner who exercised his rights under the NLP received on average 1.3-1.4 hectares of agricultural land. Combined with the original household plot of 0.3-0.4 hectares, the NLP distribution produced small holdings of less than 2 hectares. The small farm sizes produced in the process of land reform are one dimension of land fragmentation in Moldova.

Size fragmentation was exacerbated by the equity-driven design of land privatization in Moldova. To ensure that all peasants had equal access to land of different types, each land share was divided into three separate parts: a share of arable land, a share of orchards, and a share of vineyards. In practice, many landowners received more than three parcels against their land shares. In a 2003 survey of peasant farms, 55% reported 3-6 parcels and 19% reported more than 6 parcels (A. Muravschi et al., 2005). The inherently small holdings were thus further fragmented into still smaller parcels in scattered locations. The splitting of small land holdings into multiple parcels is the second dimension of land fragmentation in Moldova.

The distribution of land to the rural population led to dramatic changes in the structure of land use by farms of various organizational forms. Particularly notable is the shrinking share of former state and collective farms and a corresponding increase in land used by the individual sector. Thus, in 1990, less than 10% of the total agricultural land was operated by the individual sector. Since then, the picture has significantly changed: the two sectors of corporate and individual farms each controls about 50% of agricultural land. The traditional collective farms practically disappeared during the last decade, as many of them were privatized or liquidated and others registered in new legal forms.

While corporate farms average 500-800 hectares, the individual farms (household plots and peasant farms) are much smaller. Half the agricultural land in Moldova is in units smaller than 10 hectares (World Bank, 2005). This category comprises over 1 million household plots and small peasant farms with average holdings of 0.8 hectares. The small average size and the huge number of small farming units in a population of less than 4 million clearly demonstrate the extent of fragmentation produced by land reform in Moldova.

Table 1

Size distribution characteristics for farms of different types, in ha[1]

	Households (n=135)	**Peasant farms (n=477)**	**Corporate farms (n=76)**
Min-max range	0,10-0,75	0,76-18,40	3,2-4224
Mean size	0,37	2,61	851
Median size	0,30	2,16	529
Interquartile range	0,30-0,51	1,58-3,02	240-1071
Lower 10%	0,10	1,23	100
Upper 10%	0,68	3,98	2400
Number of parcels	3	6	

Source: The State Project 08.814.08.01A.

A recent survey conducted in 2008 (2008 ASM survey) accordingly covered the three main farm types that characterize the agriculture in Moldova today: household plots, peasant farms, and corporate farms. The household plot is usually situated close to the house, but not always. When the plot is situated outside the village, it is practically impossible to distinguish it from the land of a peasant farm. The privatized land outside the village is considered a peasant farm (regardless of whether it is officially registered or not)[2]. Many people have chosen to lease out their land allotments outside the village to corporate farms or peasant farms, and to continue cultivating only their household plot. These specific aspects have been taken into consideration in our sample design.

The three farm types surveyed a wide range of farm sizes (Table 1), and the survey data has been used to examine how farm sizes affect farm efficiency.[3] Households and peasant farms combined constitute the so-called individual sector, as opposed to corporate farms. There are distinctive differences between the individual and the corporate sectors (Table 1), while the two components of the individual sector – household plots and peasant farms – are much closer to one another by size. Still, there is no

[1] Farm size expressed by land in actual use.

[2] Official sources give conflicting information on the number of peasant farms and the area of agricultural land they control, their total number varying between 283 000 and 558 000, depending on the source of reference.

[3] Following Lund (1983), the land holdings are used as a measure of farm size.

overlap between the interquartile ranges of these types of farms (Figure 1), which means that all three types of farms are significantly different by size. Thus, corporate farms are much larger than peasant farms, while the latter are larger than household plots. Also, peasant farms being larger are more fragmented: 6 parcels compared to only 3 on average for households.

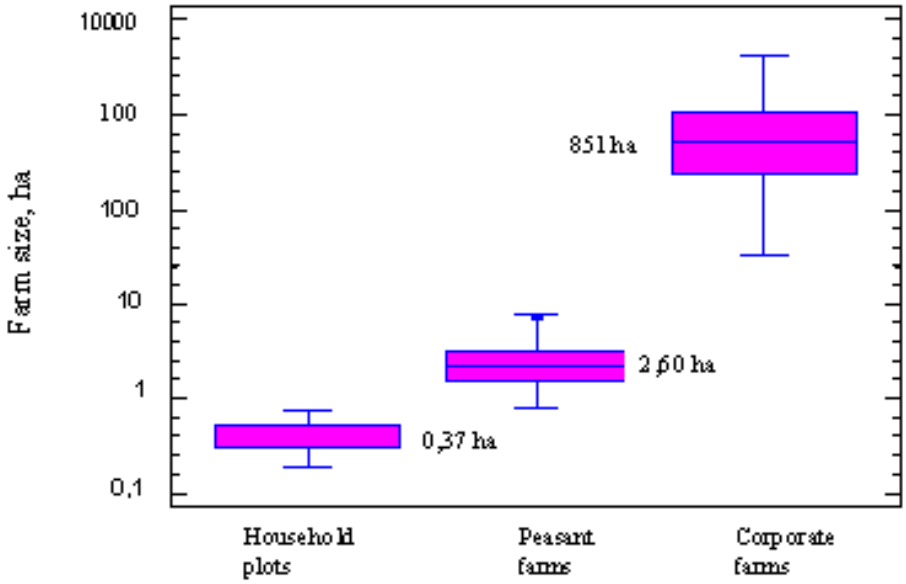

Fig. 1. Median size and interquartile range for farms of different types.
Source: The State Project 08.814.08.01A.

Evidence of higher efficiency and productivity of larger, consolidated holdings would be a strong argument in favor of mass re-parcelling of fragmented family farms in Moldova. Previous studies (Z. Lerman, D. Cimpoies, 2006; Z. Lerman, W. Sutton, 2008) have revealed an interconnection between efficiency and farm size, demonstrating that small family farms are more efficient than large corporate farms. The 2008 ASM survey investigated mainly the effect that fragmentation of holdings into multiple parcels has on farm performance.

The advisability of reducing the number of parcels in a farm of a given size through land consolidation emerges from the negative correlation between the number of parcels and technical efficiency across farms as calculated by the stochastic frontier algorithms (SFA). Our survey reveals a clear negative relationship between the productivity and number of parcels held by the operator. Figure 2 shows that the productivity (technical efficiency) decrease as fragmentation (i.e., the number of parcels in a farm) increases. The negative relationship between productivity and fragmentation in Figure 2 is statistically significant by all standard measures. This new result reinforces earlier findings, which showed that two partial productivity measures – farm income per hectare and farm income per worker – decreased with fragmentation as measured by the number of parcels per farm (Z. Lerman, D. Cimpoies, 2006).

One of the major arguments in favor of land consolidation is based on the hypothesis that farmers with consolidated holdings have higher incomes and their family well-being is considerably higher than for farms with fragmented holdings.

Linear regression analysis shows that farm revenue from product sales increases with farm size (land used) and decreases with the number of parcels operated by the farmer (Table 2). The important result here is that number of parcels has a negative effect on farm income when we control for other variables (the negative regression coefficient is significant at $p < 0.05$). Hence, consolidation, in the sense of reducing the number of parcels, makes economic sense for peasant farms and households in Moldova. Other statistically significant factors affecting farm income are farm costs and the number of employed workers: larger revenues are generated by larger farms, which, in addition to more land, involve higher total costs and more workers.[4]

[4] A similar study in Ukraine (Lerman, Sedik, 2007) noted a decrease of income with the age of the family head. In Moldova, on the other hand, the age of the head of family had a positive effect on farm revenues.

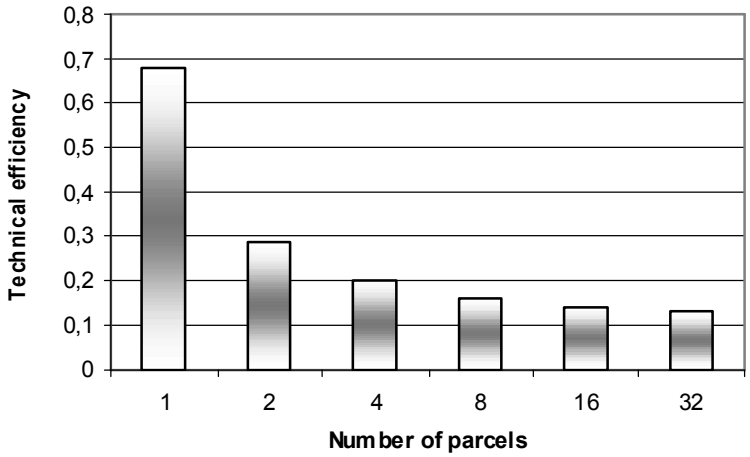

Fig 2. Technical efficiency versus fragmentation of peasant farms.
Source: The State Project 08.814.08.01A.

Table 2

Linear regression analysis of farm revenue versus farm size and number of parcels[5]

Independent variables	Estimated coefficients	t value
Land used, ha	**1.977**	10.81
Costs, lei	0.432	6.39
Number of parcels	**-0.654**	-6.93
Employees, workers	1.376	5.20
Age of head of family	0.121	3.52
Intercept	-5.405	-2.72
R-square	0.788	
Number of observations	193	

Source: The State Project 08.814.08.01A.

Consolidation affects not only farm productivity, but also the standard of living of rural families. One of the major arguments for re-parceling is the hypothesis that land consolidation increases farm income by raising the degree of commercialization, i.e., the share of sold output.

Family farms in Moldova are generally viewed as subsistence operations. Indeed, fully 80% of farms in the survey are smaller than 3 ha, reporting sales of less than 10% of their output.

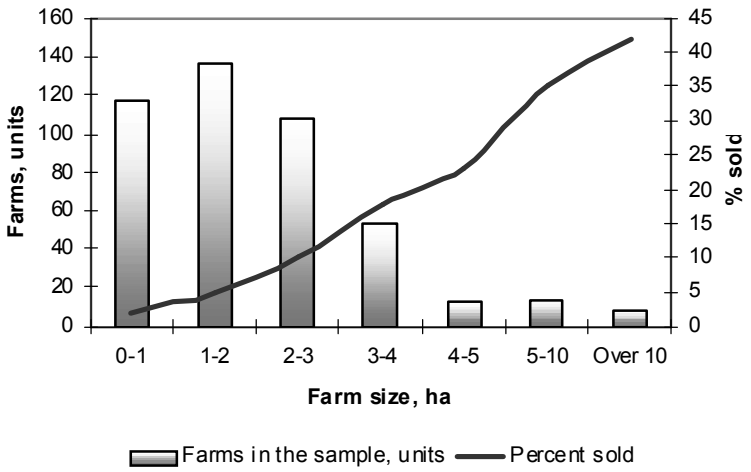

Fig. 3. Farm size vs. commercialization
Source: The State Project 08.814.08.01A.

[5] Dependent variable: farm revenues from sales.

The share of sold output clearly increases with farm size. Thus, the commercialization rate of farms smaller than 1 ha is almost zero and these very small farms can be regarded as pure subsistence operations. On the other hand, farms larger than 5 ha can be regarded as practicing commercial farming: they sell more than 30 percent of their output. This is consistent with the results observed in other transition countries (Lerman, Sedik, 2007). The level of commercialization increases with farm size: while small farms use all they produce for family consumption, the output of larger farms exceeds the family needs, creating a marketable surplus.

Moreover, our survey revealed that the second dimension of land fragmentation, namely the number of parcels held by an operator, also affects the level of commercialization.

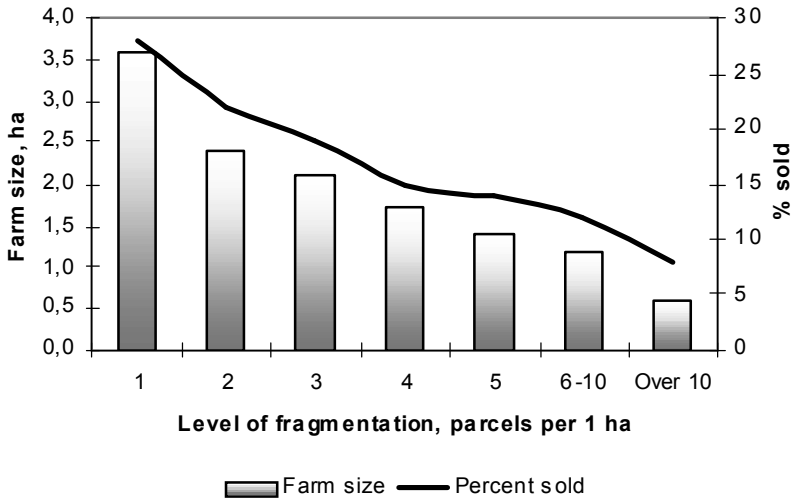

Fig. 4. Fragmentation vs. commercialization

Source: The State Project 08.814.08.01A.

As the number of parcels per ha, i.e. the level of fragmentation increases, the commercialization rate decreases. Family farmers operating one consolidated plot sell about 30 percent of their output, whereas those with highly fragmented holdings sell less than 5 percent of the output. Thus, farmers with consolidated holdings have a higher marketable surplus, which is conducive to creating a higher farm income and thus increasing their families standard of living. Also, consolidated farms are much larger than fragmented farms. Consolidated farms have 3,6 ha on average, compared to 1 ha and less for highly fragmented farms (6 parcels and more). These results suggest that relatively large consolidated holdings stimulate commercial farming, while small fragmented plots lead to subsistence operation, with farm output used entirely for family consumption.

The various approaches to land consolidation are based on common principles. First, land consolidation schemes should not deprive people of their right to land and should not create landless people. The process should be participatory, democratic, and based on market principles. Second, policy makers should remember that not fragmentation is a problem. Land consolidation programs should address only those cases were land fragmentation is a real problem and not attempt to impose a solution were it is not needed. Finally, we have to accept that it will not be possible to eliminate land fragmentation entirely.

The State Planning Institute for Land Management has been the traditional vehicle for land consolidation in Moldova. Nine consolidation projects, mainly in the south of the country, were carried out in recent years, but the lack of funding limited the Institute's consolidation activities. The projects typically focused on a mechanism whereby an investor buys or leases land from smallholders.

Valuable experience with the implementation and design of land consolidation had been accumulated since May 2003 in the framework of the USAID-funded Land Privatization Support Project (LPSP), which ended in 2005. In most LPSP projects the instrument of consolidation is selling land to an investor, not leasing. An LPSP consolidation project was typically initiated by a buyer (a winery or an agricultural enterprise), who over a period of time had tried to purchase contiguous land plots for large-scale agricultural production. It was the responsibility of the buyer to negotiate the agreements with

the small individual owners. The project served as an intermediary between landowners and buyers and supported the mayor's office in the village in the use of a simplified land transaction method developed under the LPSP in compliance with the procedures of the 2002 Amendment to the Land Code. When small owners with land plots in the interest area preferred not to sell their land, they were normally offered voluntary exchange of their land for other plots in order to make the original land available for the project initiator. The focus of the LPSP consolidation projects was the main buyer or investor, and the result was development of large-scale farms, often owned by wineries or agricultural enterprises from outside of the village.

Given the accumulated experience, the Government of Moldova has decided to implement a National Program of Land Consolidation (NPLC) with financial support from the World Bank, based on concepts proposed by a team from the Danish Ministry of Agriculture (Haldrup, Hartvigsen, 2005). In contrast to previous land consolidation activities, the new program focused primarily on small and medium-sized family farms (3-30 ha) and not on large corporate structures. The operational emphasis was on landowner preferences and on identifying land exchanges in which people were willing and able to engage. The success of the procedure depended entirely on the willingness and readiness of landowners to exchange their land plots. Unfortunately, in a 2003 survey over 80% of respondents indicated that they would not agree to exchange their existing land plot for a new one in the process of land consolidation (Muravschi, Bucatca, 2005).

The entire process was based on voluntary participation and the participants retained the freedom of choice throughout: they could decide to leave the project at any stage before the final transaction agreement was signed. The consolidation solution was not known at the outset and it only emerged at the very end as a result of multilateral negotiations. There was no need to secure guidance or approval by the authorities, and the voluntary participatory nature of the process reduced the likelihood of costly and time-consuming appeals.

The NPLC was launched in August 2007 in six pilot villages, thus enabling the procedures to be ironed out before national rollout. The length of the project was 18 months and it ended in February 2009. During the 18-month period, the project tested the demand for voluntary land consolidation from small landholders and verified the available sporadic evidence that indicated popular support for small-scale consolidation.

Table 3

Land consolidation pilot project: preliminary results

	Villages					
	Buşăuca	**Sadova**	**Boldureşti**	**Calmaţui**	**Opaci**	**Baimaclia**
Number of land parcels	3088	5922	6006	1757	5626	4204
Number of landowners	708	1319	1786	634	1762	1048
Estimated number of participating landowners in % of all landowners	60	19	62	47	23	33
Average parcel size, ha	0,50	0,21	0,29	0,40	0,60	0,73
Average number of parcels per landowner	4,72	4,49	3,36	3,69	3,19	5,08
Percent of parcels offered for sale, %	25,6	13,6	28,1	12,9	14,7	19,7
Percent of parcels offered for exchange, %	1,6	7,3	3,1	11,0	1,2	1,8
Percent of owners willing to lease out land, %	9	0	46	90	26	25
Public agricultural land available as a reserve for land consolidation, ha	15	45	46	1,4	19	7

Sources: M. Hartvigsen, 2008 [a, b].

The land consolidation pilot project has generally produced positive results, but its final achievements are much more modest than originally expected. Big questions arise with the procedure of parcels exchange, which is one of the main instruments of re-parcelling. As we see from Table 3, an insignificant number of parcels have been offered for exchange. Also, the small area of the public reserve land in local mayoralties makes the task of land consolidation extremely difficult.

One of the possible barriers to project success is a low demand for land or absence of active buyers in many rural locations. Absentee ownership or non-participation may also require development of new imaginative tools. How to proceed with land consolidation if there are parcels belonging to absentee owners in the middle of the field or if a small number of landowners refuse to participate and instead try to sell their land to outsiders at speculative prices?

Two possible solutions to these difficulties – both requiring new legislation – are being currently debated in Moldova. According to one proposal, landowners who do not farm their land for a certain length of time (e.g., three years) will be obliged to sell their holdings to the local authorities at the average market price. The authorities will then re-sell the land to active farmers at the same average price, thus taking part in the consolidation process in the role of a local land bank. According to another proposal, if a small minority of landowners (e.g., 10%) block the local consolidation program by their refusal to participate (i.e., voluntarily sell or exchange their land parcels), they will be obliged by law to exchange their plots for equivalent land from the village reserve (if other options to use reserve land directly for consolidation have failed).

The project ended its activities in January 2009. In response to a request from the Government of Moldova, larger scale re-parcelling activities are currently implemented by the World Bank in 40 new villages.

Although formal re-parceling programs can be very effective, they should supplement market-driven consolidation and stimulate land market development through buying and leasing of land by private entrepreneurs, not replace it.

CONCLUSIONS AND RECOMMENDATIONS

Land consolidation through land market development has a positive effect on farm efficiency. A clear negative relationship was observed between the productivity and number of parcels held by the farmer. An additional argument in favor of land consolidation is that farm revenue from product sales increases with farm size and decreases with the number of parcels operated.

Consolidation affects not only farm productivity, but also the standard of living of rural families, by raising the degree of commercialization and thus contributing to higher family income. Larger individual farms attain a higher level of commercial sales, because they consume a substantially smaller proportion of their output than the very small farms. Also, as the number of parcels per ha increases, the commercialization rate decreases.

The common approach to land consolidation in Moldova is individual or market-driven, which relies on land market transactions – mainly leasing at the present stage. Market-driven consolidation of agricultural land does not require new legislation, as the existing land laws are sufficient for this purpose. Consolidation based on formal government-sponsored projects will require certain amendments to the Land Code.

Consolidation of small fragmented parcels into contiguous holdings is preferred by both farmers and landowners. However, land consolidation should be carried out on a voluntary basis in accordance with market principles. Land consolidation projects should supplement market-driven consolidation, not replace it.

BIBLIOGRAPHY

1. Hartvigsen, M. Implementation of land re-parceling pilots in six villages (Moldova land re-parceling pilot project). Mid-term report. May, 2008. MAIA. Chisinau. Moldova.

2. Hartvigsen, M. Implementation of land re-parceling pilots in six villages (Moldova land re-parceling pilot project). Process report II. September, 2008. MAIA. Chisinau. Moldova.

3. Lerman, Z., Cimpoieş, D. (2006). Land consolidation as a factor for rural development in Moldova, *Europe-Asia Studies* 58, No. 3, 2006, p. 439-455.

4. Lerman, Z., Sedik, D. The role of land markets in improving rural incomes. Discussion Paper No. 15.07, 2007, the Center of Agricultural Economic Research, the Hebrew University of Jerusalem.

5. Lerman, Z., Sutton, W. Productivity and efficiency of small and large farms in transition: Evidence from Moldova, *Post-Soviet Affairs*, 24: No. 2, 2008, p. 97-120.

6. Lund, P. The use of alternative measures of farm size in analysis of size and efficiency relationship. *Journal of Agricultural Economics,* Vol. 2, 1983, p. 187-189.

7. Muravschi, A., Bucatca, A. et al. Politica agrară în viziunea fermierilor. Programul de Asistenţă pentru Fermierii Privaţi (PAFP). Moldova. Chişinău, 2005.

8. Proiectului de Stat 08.814.08.01A „Elaborarea mecanismelor economice de consolidare a terenurilor agricole", Academia de Ştiinţe a Moldovei, 2009.

Data prezentării articolului – ***22.11.2010***