AN ANALYSIS OF THE PROFITABILITY OF LAND CONSOLIDATION PROJECTS: APATIN CASE STUDY

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Summary: Land consolidation is an effective tool for land management, aiming to ensure more efficient and cost-effective agricultural production, that further directly affects the development and prosperity of local communities in which land consolidation projects are implemented. For this reason, many countries around the globe recognize land consolidation as a basic tool which leads to economic and social development of an area. The object of this paper's research are land consolidation projects, observed from the aspect of the profitability evaluation for planned and realized projects. Accordingly, the paper represents the performed evaluation of land consolidation profitability on the example of Municipality of Apatin, with the goal of establishing whether the future benefits would surpass the expenses of launching and realization of land consolidation projects. The study should show whether the achieved effects justify the investment and in which period the refund of invested resources can be expected.

Keywords: land consolidation, land consolidation projects, profitability

1. INTRODUCTION

For over a century, land consolidation is a very important instrument of rural development all across Europe. [12], [1], [2], [13].
According to [14], [5], [6], [9], [10], [3], [15], land consolidation represents an important approach towards sustainable development. It started with a primary goal of increasing the area of arable land, and later developed in a valuable instrument for overall management and development of both rural and urban areas. In time, land consolidation was adjusted towards progressively more complex goals in land development [8].
During the recent years, land consolidation has had numerous applications. Not just when it is necessary to group fragmented properties and increase the efficiency of agricultural production, but also for the necessities of performing individual areas

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management with the goal of developing protection from floods and/or land erosion, as well as when it is necessary to realize capital projects and/or manage construction land.

If we start with the assumption that the goal of economic development is to preserve and promote available land resources, and if we perceive the definition of land consolidation, it remains clear that land consolidation is exactly what it takes to accomplish that particular goal.

Furthermore, land consolidation doesn't have just one goal – to enlarge fragmented agricultural lots, but it also includes management of all the related fields like space management, agriculture, economy, social and cultural area development. That being said, it is clear that the importance and significance of realized land consolidation projects can be perceived from different perspectives.

In this paper, the importance and significance of land consolidation projects are analyzed from the financial aspect, with the consideration that the economic effect is one of the most dominant reasons for performing land consolidation.

The profitability of land consolidation is a complex category since it includes social, natural, legal, economic and financial parameters. Furthermore, the effects of social, natural, and legal parameters can't be objectively and effectively measured by applying economic methods, but they are mainly positive, as demonstrated by the experiences of developed countries.

Social parameters refer to the development of rural areas, thus to the increase of life quality in rural areas, which directly promotes a decrease of migration towards urban areas.

Natural effects of land consolidation refer to environmental protection and include a decrease or elimination of erosion processes. Measuring of these effects by economic methods is possible if we include the presumptions about the size of potential damage originated if land consolidation management is left out, although it is the most effective and the most economic medium for acquiring these goals [7], [11].

Legal effects are portrayed in an increase of the legal land management level, because through the realization of land consolidation projects, property – legal relations are also solved. This fact represents a very important and unavoidable factor for effective land management.

Besides the mentioned factors, reconstruction of the diameter is also performed through the process of land consolidation. That is, the problem of outdated state diameter is solved, a geodetic basis is set up, and an up-to-date real estate record is lead, which are all necessary conditions for effective land management.

Based on the portrayed facts, it is clear that land consolidation produces positive effects on the overall society, as well as on the development of regions and the states. However, due to the impossibility of their precise economic measuring and prior experiences which suggest that these effects can't be decreased, but only increased during land consolidation, they will not be subjected to the further analysis of the economic validity of land consolidation.

The object of this paper's research are land consolidation projects, observed from the aspect of profitability estimation for the realized projects. The basic and primary goal of the research is to establish whether the future benefits surpass the expenses of launching and realization of land consolidation projects, by using an example of Municipality of Apatin. The study should be able to show whether the achieved effects justify the investment, and in which period can the refund of invested resources be expected.

2. AN ANALYSIS OF THE PROFITABILITY OF LAND CONSOLIDATION PROJECTS

The analysis of the profitability of land consolidation projects in this paper includes the territory of the Municipality of Apatin, that is, cadastral municipalities of Apatin, Kupusina, Prigrevica, Sonta,and Svilojevo. To determinate the relation between the resources invested in land consolidation and the resources refunded after the performed land consolidation, this chapter offers a review of the gathered data, significant for the experiment. A mathematical model applied in the paper is also described.

2.1. Evaluation of the existing status in Municipality of Apatin

The Municipality of Apatin lies on the very west of Autonomous Province of Vojvodina, that is in Western Bačka, on $45^040'$ N and $18^059'$ E. It occupies the bank of Danube and territorially belongs to West Bačka district. AP of Vojvodina includes five inhabited territories - municipalities: Apatin city and four villages – Prigrevica, Svilojevo, Sonta, and Kupusina. Based on the size of its territory, with a total surface of 333 km^2, Vojvodina is ranked as a medium size provincial municipality.

The Municipality of Apatin is well-known for its fertile agricultural land, favorable climate conditions, forests, and agriculture - a significant part of its industry.

The data about mentioned cadastral municipalities, gathered in this research, are provided by the competent Real Estate Services. These services offered the necessary information, specified so that they include the surface of land consolidation area in the analyzed cadastral municipalities. A depiction of the number of lots and average surfaces of the lots per cadastral municipalities (Table 1) is also given, as well as the number of lots by real estate folios per property form (Table 2).

The data presented in tables 1 and 2clearly indicate there is a need for performing land consolidation in the analyzed cadastral municipalities.

CM	Land consolidation area surface [ac]	No. of lots	Average lot surface [ac]
Apatin	7130	12749	0,94
Kupusina	4851	14074	0,29
Prigrevica	3656	7941	0,54
Sonta	10479	19655	0,70
Svilojevo	3539	5975	0,57

Table 1. Review of the number of lots and average surface of the lost in analyzed municipalities

CM	Private property			Other property forms			Total		
	Folio No.	No. of lots	Average	Folio No.	No. of lots	Average	Folio No.	No. of lots	Average
Apatin	1910	4103	2,1	4984	8646	1,7	6894	12749	1,8

Kupusina	2556	11090	4,3	115	2984	25,9	2671	14074	5,3
Prigrevica	2155	6027	2,8	380	1914	5,0	2535	7941	3,1
Sonta	3524	14485	4,1	196	5170	26,4	3720	19655	5,3
Svilojevo	1222	4059	3,3	120	1916	16,0	1342	5975	4,5

Table 2.Review of the number of lots per real estate folios per property form

Based on gathered data and by applying the methodology developed on the Faculty of Technical Sciences in Novi Sad (Marinkovic i dr, 2017), a calculation of the price is performed, that is, of the expenses of land consolidation projects realization in the considered cadastral municipalities (Table 3).

CM	Land consolidation area surface [ac]	Price [dinars]	Average price[dinars/ac]
Apatin	7130	98269500	13 783
Kupusina	4851	66676500	13 745
Prigrevica	3656	50288000	13 755
Sonta	10479	127906000	12 206
Svilojevo	3539	43634000	12 329

Table 3.Review of total expenses of the land consolidation projects realization

2.2. Financial analysis of land consolidation effects

Financial analysis of the land consolidation is based on the monetary expression of the increased incomes value after performed land consolidation and their comparison with the size of the investment.While performing a financial evaluation of the land consolidation effects, it is necessary to use only the parameters which can be predicted with enough certainty and are proved in the so far praxis.

According to the professional literature, it is possible to achieve the following measurable economical effects in agricultural production, after land consolidation:
- o Increase of agricultural areas for 10% and
- o Increase of the income due to a better orientation of the lots, for 2.5%.

Agricultural production increase is the result of existing large areas, newly-built hydro-technical objects (for irrigation and drainage), and it may vary depending on the plant culture and climate variations over the years (precipitation level, etc.). These effects may be expressed by an increase of the income between 15% и 25%.

For the real refund scenario, only the parameters involved in an increase of agricultural land area as well as of the income due to the lots orientation, can be used for the assets invested in the land consolidation. As for the optimistic scenario, it also includes an increase of the income as a result of infrastructure potential use (irrigation, drainage, decrease of the loss due to a decrease of erosion processes, etc.)

The real scenario of the financial effects of the land consolidation per year is expressed with the formula:

$$C = \Delta P \cdot (1 + \Delta p) \cdot \pi \cdot \overline{c} + P \cdot \Delta p \cdot \pi \cdot \overline{c} \tag{1}$$

where:
C – total land consolidation financial effect per year;
ΔP – total increase of agricultural areas in the land consolidation process in %;
Δp – increase of the incomes due to the better lots orientation in %;
π – average incomes per area unit and
$\overline{c}$ – average price of the agricultural products

The time period in which the funds are returned are expressed in the formula:

$$t = \frac{C_k}{C} \qquad (2)$$

where:
t – time period of return of invested funds;
C_k – cost of realization of the project of land consolidation;
C – total annual financial effect of the land consolidation.

If the effects of an increase in the infrastructure potential of 20% are also calculated, then:

$$t_{ip} = \frac{C_k}{1.2 * C} \qquad (3)$$

where:
t_{ip} – the time period for the return of invested funds with the calculated effects of increasing the infrastructure potential of 20%.

3. RESULTS

By applying the formula (1) with the assumptions that cereals are produced, the income is average and that the prices on the product market in Novi Sad on January the 1st 2018 are valid, we obtain the total annual financial effect of land consolidation, as well as a financial expression of land consolidation effects for the considered cadastral municipalities (Table 4).

CM	Total annual land consolidation financial effect C [RSD]
Apatin	38.453.184
Kupusina	21.244.968
Prigrevica	21.466.920
Sonta	57.277.488
Svilojevo	15.557.448

Table 4. Review of total annual effects of land consolidation

Based on the prices of land consolidation proceedings for the considered cadastral municipalities (Table 3), the overall annual financial effects of land consolidation (Table

4), and with the help of expressions (2) and (3), a calculation oft he time period in which the invested resources are refunded is performed (Table 5).

CM	t [year]	t_{ip} [year]
Apatin	2.3	2.1
Kupusina	3.1	2.6
Prigrevica	2.3	2.0
Sonta	2.2	1.9
Svilojevo	2.8	2.3
Average	2.5	2.2

Table5. Review of the period in which the invested resources in land consolidation are refunded

According to the methodology described in the paper [7], and based on the following parameters – the evaluated number of years during which the invested resources will be refunded, the price of land consolidation (Table 3) and the total annual effects of land consolidation (Table 4), an increase in the profitability of agricultural production is calculated for the considered cadastral municipalities, due to land consolidation (Table 5).

A mathematical model of the economic analysis of land consolidation effects is described in detail in the paper above so that it will be left out here.

CM	Accepted number of years n	R_{pp}
Apatin	3	1.17
Kupusina	4	1.27
Prigrevica	3	1.28
Sonta	3	1.34
Svilojevo	3	1.07
Average	3-4	1.23

Table 5. Profitability increase of the agricultural production due to land consolidation

4. DISCUSSION AND FINAL CONSIDERATIONS

The analysis of the obtained results suggests that the refund period of the invested resources in the land consolidation process on the territory of Municipality of Apatin is between two and three years. The period up to two years is expected to bring the refund of invested resources in cadastral municipalities of Apatin, Prigrevica, and Sonta, while a three-year-period is expected in cadastral municipalities of Kupusina and Svilojevo.

By also taking into consideration the effects which would emerge due to an increase of infrastructural potential of 20% (drainage, irrigation, losses decrease due to a decrease in the influence of erosion, etc.), that is if we consider an optimistic scenario, the average refund period of the invested resources on the territory of the analyzed cadastral municipalities is two years.

By performing an analysis of the profitability of agricultural production in the Municipality of Apatin, we can conclude that the investment in land consolidation is profitable within the period of three to four years, whereby the average value of profitability coefficient is 1.23

The best profitability coefficient is in CM Sonta,and amounts 1.34, i.e., the investment in land consolidation in this cadastral municipality is profitable within the period of two to three years. The lowest profitability coefficient is found in CM Svilojevo, and amounts 1.07, i.e., the investment in land consolidation in this cadastral municipality is profitable in the period of three years.

It is important to emphasize the fact that the analysis did not include the parameters which additionally increase the profitability of agricultural production. That means that the effects of land consolidation certainly increase the profitability of agricultural production on a shorter period as well. Values based on an expected increase of the agricultural production after land consolidation is performed in the analyzed cadastral municipalities are accepted for the calculation, and amount 12.5 %, the average income is 3200 кг/ac, and cereal price is 17 RSD/kg (product market Novi Sad, on 16.08.2017)

With an analysis of obtained data and according to the goal of the research, we can conclude that the financial effects of land consolidation for the Municipality of Apatin justify the investment for a period of two to three years, i.e., direct financial effects expected based on the experiences so far, indicate on a high profitability rate of the project.

Some additional effects which lack of direct financial expression, are portrayed through a renewal of the diameter, solving of property – legal relations, increased efficiency of land management through enlarged properties and decreased expenses of the treatment, production and transport, arranged system of road and channel network, etc. These effects additionally increase the value of land consolidation and make of it an inevitable module on the way towards the development of rural areas and modern agriculture.

The study demonstrated that the benefits which can be achieved surpass the expenses of launching and realization of land consolidation projects on the territory of Municipality of Apatin, that is, the listed factors completely justify the investment.

The stated conclusion is supported by many European countries in which land consolidation is intensively implemented and in which it is recognized as a tool that encourages rural development and leads to economic and social development. In the Republic of Serbia, the price of land consolidation per acre is multiple lower than in European countries, which is the moment that should be used for land management.

Accordingly, a new direction of future research is opened, which should aim for the financial analysis of the profitability of land consolidation projects on the territory of the Republic of Serbia.

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АНАЛИЗА ИСПЛАТИВОСТИ КОМАСАЦИОНИХ ПРОЈЕКАТА: СТУДИЈА СЛУЧАЈА АПАТИН

Резиме: Комасација земљишта представља ефикасан алат управљања земљиштем, који има за циљ обезбеђивање ефикасније и економичније пољопривредне производње, што директно утиче на развој и просперитет локалних заједница у којима се комасациони пројекти реализују. Управо зато, у многим земљама широм света, комасација је препозната као основно средство

које доводи до економског и друштвеног развоја подручја. Предмет истраживања овог рада су комасациони пројекти, са аспекта процене исплативости реализованих пројеката. У складу са тим, у раду је извршена и презентована процена исплативости комасационих пројеката на примеру Општине Апатин, са циљем да се утврди да ли будући бенефити премашују трошкове покретања и реализације пројеката комасације. Студија треба да покаже да ли постигнути ефекти оправдавају инвестицију и у ком временском периоду се може очекивати повраћај уложених средстава.

Кључне речи: комасација, комасациони пројекти, исплативост