FINANCIAL ANALYSIS AND ASSESMENT OF THE LAND CONSOLIDATION PROJECT NADALJ 2

ФИНАНСИЈСКА АНАЛИЗА И ПРОЦЕНА КОМАСАЦИОНОГ ПРОЈЕКТА НАДАЉ 2

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Summary: In this paper, an assessment of the profitability of land consolidation projects is performed and presented. The study analyzes whether the future benefits exceed the expenses of initialization and realization of land consolidation projects. The material for this study includes land consolidation project, planned in the cadastral municipality of Nadalj2. Standard statistical methods and calculation of the expenses involved in agricultural production and feasibility were used for the analysis of the material. All things considered, the study showed that the land consolidation is an effective and feasible land management tool, which enables the return of invested funds in the following period of four to five years.

Keywords: land consolidation, land consolidation projects, financial analysis

1. INTRODUCTION

Land consolidation may be depicted as a planned re-adjustment and re-arrangement of land parcels and their

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Land consolidation is also defined as a process by which segmented land parcels are integrated to form centralized and contiguous lands in areas where the agricultural lands are not efficiently used (Yan J. et al., 2012.). Land consolidation is of vital importance for providing the economical stability of the rural areas, facilitating environmental management, as well as for urban growth rationalization (Sonnenberg, 1996; Van Lier, 2000; Crecente et al., 2002).

In many European Union (EU) countries, land consolidation is one of the key tools used for rural development (Muchová et al., 2016.). Land consolidation is implemented in 26 out of 28 European Union countries, as well as in many other countries around the world, like China (Yana et al., 2015.), Thailand (Sakuma et al., 2001), Morocco (Semlali, 2001), Australia (GSA, 2013.), Turkey (Cay et al., 2010.), Albania, Moldavia, Bosnia and Herzegovina (Primožič and Lisec, 2015.), Macedonia and Serbia (Budanko et al., 2013.; Trifkovic et al., 2016.).

The necessity for land consolidation is also portrayed in the enlargement of agricultural land, with the final goal of therational use of agricultural mechanization and the development of market economy. According to the research performed in Serbia, only agricultural households with a property size over 10 acres can be considered as basic carriers of modern market agricultural production on the country (Trifković et al., 2016.; Marinković et al., 2016.). According to the research performed in the USA, rational and efficient use of agricultural mechanization is achieved by agricultural households which property size ranges from 16 to 64 acres (Ishii, 2005).

Some authors (Liesec, 2014.; Korthalsand Bong, 2011; Pražan and мале земљишне парцеле интегришу и формирају централизована и кон- тинуирана земљишта у областима где се пољопривредно земљиште не искориштава ефикасно (Yan J. i dr., 2012.). Комасација земљишта је од суштинског значаја за обезбеђивање економске одрживости руралних подручја, опашава управљање животном средином, као и рациона- лизацију урбаног раста (Sonnenberg, 1996; Van Lier, 2000; Crecente et al., 2002).

Комасација земљишта је у многим земљама Европске уније (ЕУ) један од кључних апата који се користи за рурални развој (Muchová i dr., 2016.). Комасација се примењује у 26 од 28 земаља Европске уније (ЕУ) и у више других држава широм света, нпр. у Кини (Yana i dr., 2015.), Тајланду (Sakuma et al., 2001), Мароку (Semlali, 2001), Аустралији (GSA, 2013.), Турској (Cay i dr., 2010.), Албанији, Молдавији, Босни и Херцеговини (Приможич и Лисец, 2015.), Македонији и Србији (Буданко и др., 2013.; Трифковић и др., 2016.). Потреба за комасацијом се огледа и у укрупњавању пољопривредног земљишта, са циљем рационалног кориштења пољопривредне механизације и развоја тржишне економије. Према истраживању спроведеном у Србији, једино пољопривредна домаћинства са величином поседа преко 10 ха могу да буду основни носиоци модерне тржишне производње на селу (Трифковић и др., 2016.; Маринковић и др., 2016.). Према истраживању спроведеном у САД, рационално и ефикасно коришћење пољопривредне механизације остава- рују пољопривредна домаћинства са величином поседа од 16-64 хектара (Ishii, 2005).

Неки аутори (Liesec, 2014.; Korthals and Bong, 2011; Pražan and Dumbrovsky, 2010.), деле мишљење да важност комасације може бити специфичирана и сагледана из ownership (WANG Jun et al., 2015.).
Dumbrovsky, 2010.), share the opinion that the importance of land consolidation can be specified and perceived from different perspectives. The aspect of perceiving land consolidation effects in this paper is financial, that is, this paper estimates the profitability of land consolidation projects.

The profitability of land consolidation projects which should be initialized and realized can be determined based on presumptions on elevating the values and incomes for the given agricultural area.

The profitability of land consolidation is a complex category since it involves social, natural, legal, economic and financial parameters. Thereby the effects of social, natural, and legal parameters can not be objectively and efficiently measured by applying economic methods. The valuation of land consolidation is a complex problem since it includes different interest-groups (small agricultural manufacturers, state institutions, local self-management, etc.). For that reason, quantitative grading of the land consolidation effects is quite difficult, so subjective, that is quality grading may prevail. However, negative opinion on land consolidation is not present in neither of the interest groups, besides the fact that the priorities may differ and that individual opinions are focused on different problems (Podhrázská, 2015).

Social parameters refer to an increase in the attractiveness of the rural areas and a decrease of migrations to urban areas. Natural effects of land consolidation refer to environmental protection, as well as on the reduction or elimination of the erosion effects. Measuring of these effects with economical methods is possible providing that there are assumptions on the gravity of the potential damage developed if land management was omitted, and land consolidation process is the most efficient and the most economical for achieving these goals.

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Legal effects of the land consolidation are portrayed in an increase of the property legal arrangement, which can be measured by the number of unresolved subjects before and after land consolidation took place. This land consolidation effect is hard to precisely express with economic parameters, but it is also indubitable that the legal disarrangement can act somewhat disincentive on the investors. Establishing of the geodetic basis for the realization of land consolidation proceedings, which is permanent, also contributes to an increase in the land management efficiency. An increase of the values of factors above indubitably has positive economica effects, but because their precise, economic measurement is not possible, they will not be considered as an object of the further analysis of the economical justification of land consolidation. The basic and primary goal of the research presented in this paper is to establish whether the financial effects of land consolidation justify the investment (and in which period), that is whether the direct financial effects which can be expected based on the experiences gained so far, indicate there is an economical viability of land consolidation, based on the example of the project in CM Nadalj 2.

2. MATERIAL AND METHODS

2.1. Material

The data on the cadastral municipality of Nadalj 2 gathered in this research are obtained from the competent authority of Municipality of Sombor, and the Real Estate Cadastre of Srbobran. Entities in charge of operations performed in the services above, were contacted in August 2017 (these services are directly related to the activities involved in the land consolidation performed in the municipality of Srbobran). Authority services provided the necessary
detailed information, specified so they include the total CM area, the number of future land consolidation participants, the number of lots in land consolidation territory, the area of arable land and another land in land consolidation territory, as well as other data relevant for the research. The total surface of CM Nadalj 2 (included in land consolidation area) is around 223 acres, divided into 446 lots. Table 1 presents a review of the number of the lots and real estate folios with an average area of lots and properties.

<table>
<thead>
<tr>
<th>CM</th>
<th>Land cons. area [ac]</th>
<th>Number of parcel</th>
<th>Average area of parcel [ac]</th>
<th>Average property area [ac]</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nadalj 2</td>
<td>222.6616</td>
<td>466</td>
<td>0.48</td>
<td>1.08</td>
<td>206</td>
</tr>
</tbody>
</table>

A total number of real estate folios is 206, which implies that the average number of lots in one real estate folio is 2.26.

Table 2 provides a review of total agricultural land territory according to the cadastral cultures.

<table>
<thead>
<tr>
<th>Culture</th>
<th>Area (ac)</th>
<th>Number of parcel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fields</td>
<td>193.0098</td>
<td>385</td>
</tr>
<tr>
<td>Orchards</td>
<td>2.4785</td>
<td>7</td>
</tr>
<tr>
<td>Vineyards</td>
<td>3.7779</td>
<td>21</td>
</tr>
<tr>
<td>Meadows</td>
<td>14.1515</td>
<td>29</td>
</tr>
<tr>
<td>Pastures</td>
<td>0.6632</td>
<td>2</td>
</tr>
<tr>
<td>Cane fields/swamps</td>
<td>0.2302</td>
<td>1</td>
</tr>
<tr>
<td>Other land</td>
<td>8.1505</td>
<td>21</td>
</tr>
<tr>
<td>Sum</td>
<td>222.6616</td>
<td>466</td>
</tr>
</tbody>
</table>

We can perceive that the field cultures are most abundant in the land consolidation area of Municipality of Nadalj 2, with 193.0098 ac, which is around 86.68%. In this case, the situation in the real estate folio...
varies significantly from the situation on the field, since the ways in which agricultural land is used changed, and they are not registered in the cadastral record. Table 3 presents a review of areas by property forms and cadastral classes for the field culture. Table 4 provides a review of areas, number of folios and the number of lots, according to the property size. Table 5 provides a review of areas, number of folios and lots, according to the property forms.

Табела 3 – Преглед површина по облицима својине и катастарским класама за културу њиве

Table 3 - Review of the areas according to property forms and cadastral classes for the field culture

<table>
<thead>
<tr>
<th>Culture number of parcel</th>
<th>Area</th>
<th>Number of parcel</th>
<th>Private property</th>
<th>Number of parcel</th>
<th>State property</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ac</td>
<td>ar</td>
<td>m²</td>
<td>ac</td>
<td>ar</td>
</tr>
<tr>
<td>Field 1</td>
<td>2</td>
<td>0</td>
<td>57</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Field 2</td>
<td>154</td>
<td>73</td>
<td>89</td>
<td>152</td>
<td>72</td>
</tr>
<tr>
<td>Field 3</td>
<td>146</td>
<td>77</td>
<td>15</td>
<td>140</td>
<td>73</td>
</tr>
<tr>
<td>Field 4</td>
<td>83</td>
<td>41</td>
<td>38</td>
<td>81</td>
<td>40</td>
</tr>
<tr>
<td>Sum</td>
<td>385</td>
<td>193</td>
<td>98</td>
<td>375</td>
<td>187</td>
</tr>
</tbody>
</table>

Табела 4 – Преглед површина, броја листова и броја парцела, према величини поседа

Table 4 - Review of areas, number of folios and parcel, according to the property size

<table>
<thead>
<tr>
<th>PROPERTY SIZE</th>
<th>AREA (ac)</th>
<th>%</th>
<th>1-3 ac</th>
<th>%</th>
<th>3-5 ac</th>
<th>%</th>
<th>5-10 ac</th>
<th>%</th>
<th>10-20 ac</th>
<th>%</th>
<th>sum</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA (ac)</td>
<td>91</td>
<td>41</td>
<td>103</td>
<td>46</td>
<td>16</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>13</td>
<td>6</td>
<td>223</td>
<td>100</td>
</tr>
<tr>
<td>No. of parcel</td>
<td>202</td>
<td>43</td>
<td>210</td>
<td>45</td>
<td>33</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>21</td>
<td>5</td>
<td>466</td>
<td>100</td>
</tr>
<tr>
<td>No. of folios</td>
<td>140</td>
<td>68</td>
<td>61</td>
<td>30</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>206</td>
<td>100</td>
</tr>
</tbody>
</table>

Табела 5 – Преглед површина, броја листова и броја парцела, према облицима својине

Table 5 - Review of areas, number of folios and parcel, according to the property forms

<table>
<thead>
<tr>
<th>PROPERTY FORM</th>
<th>LAND CONSOLIDATION AREA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER OF</td>
</tr>
<tr>
<td></td>
<td>PARCEL</td>
</tr>
<tr>
<td>PRIVATE</td>
<td>434</td>
</tr>
<tr>
<td>STATE</td>
<td>20</td>
</tr>
<tr>
<td>PUBLIC</td>
<td>12</td>
</tr>
<tr>
<td>SUM</td>
<td>466</td>
</tr>
</tbody>
</table>
Based on these data, by applying methodology developed on Faculty of Technical Sciences in Novi Sad (Trifković and Marinković, 2010.), a price was established, that is the expenses of the land consolidation project realization in the cadastral municipality of Nadalj 2, reached 6 941 000 RSD.

2.2. Economical analysis of the land consolidation on agricultural production

Economical effects of land consolidation can be measured through a total increase in agricultural production viability. According to economic literature (e.g. Pejanović, 2009), considering agro-business, profitability can be measured in two ways:

\[
\text{Profitability} = \frac{\text{realized product surplus}}{\text{completed realization}} \quad (1)
\]

Or

\[
\text{Profitability} = \frac{\text{realized product surplus}}{\text{invested business assets}} \quad (2)
\]

Since land consolidation is an investment, financing of land consolidation can be regarded as the financing of business assets. This is followed by the conclusion that formula (2) can be used for evaluation of the financial viability of land consolidation. Formula (2), applied on the evaluation of land consolidation viability may have the following form:

\[
R_{pp} = \frac{\text{Pr}_{\text{AFTER}} - \text{Pr}_{\text{BEFORE}}}{n} = \frac{\Delta \text{Pr}}{T_n - \Delta T} \quad (3)
\]

Where the parameters indicate:
$R_{pp}$ – increase of agricultural production profitability due to the land consolidation;

\[ \text{где је:} \quad R_{pp} \quad \text{повођање рентабилности пољопривредне производње услед комасације;} \]
Formula (3) implies that the invested business assets per year are equal to the \( n \)th part of the land consolidation investment and are reduced for the positive effects of land consolidation (i.e. for the reduction of agricultural production expenses, which are a consequence of property enlargement).

The overall profitability of agricultural production is an agrarian parameter that indicates the overall economic effects of land consolidation for the observed area. In order for the land consolidation to be economically profitable, there must be \( R_{pp} > 1 \). An increase of the overall agricultural production profitability has an informative character for the investors and justifies the investment in the land consolidation process, but does not offer a precise information about the financial effects of the land consolidation which depict a direct relation of the investment and the expected refund, for the invested funds in a specific period.

\[
R_{pp} = \frac{\Delta Pr}{T_n - \Delta T}
\]

Since total costs of agricultural production are unfamiliar, we can accept

\( P_{after} \) – incomes after the land consolidation;
\( P_{before} \) – incomes after the land consolidation;
\( T_{before} \) – expenses of agricultural production before the land consolidation;
\( T_{after} \) – expenses of agricultural production after the land consolidation;
\( T_k \) – expenses of the land consolidation;
\( n \) – number of years in which the land consolidation effects will be exploited;
\( \Delta Pr \) – difference in the income before and after land consolidation;
\( \Delta T \) – difference in the expenses before and after land consolidation;
\( T_n \) – \( n \)th part of the land consolidation expenses (by the number of years in which the realization of land consolidation benefits are expected).

\( P_{posle} \) – приноси после комасације;
\( P_{pre} \) – приноси пре комасације;
\( T_{pre} \) – трошкови пољопривредне производње пре комасације;
\( T_{posle} \) – трошкови пољопривредне производње после комасације;
\( T_k \) – трошкови комасације;
\( n \) – број година у којима ће се експлоатисати ефекти комасације;
\( \Delta Pr \) – разлика приноса после и пре комасације;
\( \Delta T \) – разлика трошкова пре и после комасације и
\( T_n \) – \( n \)-ти део трошкова комасације (одговара броју година у коме се очекује остваривање користи од комасације).

У формули (3), уложена пословна средства по години су једнака \( n \)-том делу инвестиције у комасацију и умањују се за позитивне ефекте комасације (односно за смањење трошкова пољопривредне производње који су последица укрупњавања поседа).

Укупна рентабилност пољопривредне производње је агрегатни параметар који указује на укупне економске ефekte комасације за посматрано подручје. Да би комасација била економски рентабилна, мора да важи \( R_{pp} > 1 \).

Повећање укупне рентабилности пољопривредне производње је информативног карактера за инвеститоре и имплицира оправданост инвестиције у комасације радове, али не даје прецизну информацију о финансијским ефектима комасације, који приказују директан однос улагања и очекиваног повраћаја, на уложена средства у одређеном временском периоду.
that $\Delta T = 0$. The assumption that agricultural production costs will not be decreased after performed land consolidation is not true, because through the land consolidation effects, both travel and channel network are optimized. However, due to their unfamiliarity, we will agree that these expenses are equal, so the formula (4) gets the following form:

$$R_{pp} = \frac{\Delta Pr}{T_n}$$

Furthermore

$$R_{pp} = \frac{\Delta Pr}{T}$$

that is

$$R_{pp} = \frac{n \Delta Pr}{T}$$

2.3. 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:

- Increase of agricultural areas for 10% and
- 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% and 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:

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

where:
- \( C \) – total land consolidation financial effect per year;
- \( \Delta P \) – total increase of agricultural areas in the land consolidation process in %;
- \( \Delta p \) – increase of the incomes due to the better lots orientation in %;
- \( \pi \) – average incomes per area unit;
- \( \overline{c} \) – average price of the agricultural products.

3. RESULTS AND DISCUSSION

By applying the formula (8) and following the assumptions that: cereals are being made, the income is average, and the prices on the product market in Novi Sad on 16.08.2017 are reliable, we obtain a financial expression of the land consolidation effects value for CM.
If the price of land consolidation performance for CM Nadalj 2 is $C_k= 6941000$ RSD, the refund period is:

$$t = \frac{C_k}{C} = 4.49$$

With the real scenario, the period necessary for the refund of assets invested in land consolidation is slightly above four years.

If we also include the effects produced by an increase of infrastructural potential for 20%, we get:

$$t = \frac{C_k}{1.2 \times C} = 3.74$$

that is, in the case of optimistic scenario, the period necessary for the refund of investment in land consolidation processes in Nadalj 2 is slightly shorter than four years.

According to the formula (7) (if we accept that $n=5$; $\Delta Pr = 1546728$ RSD and $T= 6941000$ RSD), the value for CM Nadalj 2 is:

$$R_{vp} = \frac{5 \times 1546728}{6941000} = 1.11$$

This signifies that the coefficient of agricultural production profitability for five years has a value of 1.11, i.e. the investment in land consolidation is profitable during the following four to five years.

We shouldn't overlook the fact that the analysis doesn't include the parameters which additionally increase agricultural production profitability, meaning that the land consolidation effects certainly increase
agricultural land profitability during a shorter period as well. The values in formula (7) are accepted based on the expected increase of agricultural production after performed land consolidation in Nadalj 2 which is 12.5% of the average 3200 kg/ac income and cereal prices of 17 RSD/kg (product market Novi Sad on 16.08.2017).

4. CONCLUSION

After land management on the territory of Serbia, natural and economical differences in agricultural production were noticed, compared to the situation before the land consolidation. Thus the same is expected after performed land consolidation in the CM Nadalj 2 area as well.

After management of land areas, significant changes in the conditions of agricultural production are expected. This primarily refers on the regulation of water-air regime on the land and an increase of the lots, that is properties. This way, exceptional conditions for a unique agricultural production are created, where the land potential and cultivated cultures will be maximally expressed.

Financial effects of land consolidation for CM Nadalj 2 justify the investment in the period of four to five years, that is the direct financial effects which can be expected based on the so far experiences, indicate there is a high profitability of the project.

If we also include a long-term increase of the agricultural production profitability as well as indirect economical and financial effects into consideration, then the land consolidation project is directly profitable.

Additional values gained through land consolidation, which do not have a direct financial expression, but their existence is proved (increase of the legal property management, geodetic formatting basis, increase of the land

сигурно повећавају рентабилност пољопривредне производње и на краћи период. Вредности у формули (7) усвојене су на основу очекиваног повећања пољопривредне производње после комасације у КО Надаљ 2 које износи 12.5%, просечног принос од 3200 кг/ха и цени житарица од 17 РСД/кг (продуктна берза Нови Сад на дан 16.08.2017 године).

4. ЗАКЉУЧАК

Након уређења земљишта на подручју Србије уочене су, поред натуралих и економске разлике у пољопривредној производњи, у односу на стање пре комасације, па се то очекује и након изведене комасације на подручју КО Надаљ 2. Након уређења земљишних површина очекује се да ће доћи до значајних промена у условима пољопривредне производње. Ово се пре свега односи на регулисање водно-ваздушног режима на земљишту и повећању парцела, односно поседа. На тај начин стварају се изванредни услови за јединствену пољопривредну производњу, где ће до максималног изражаја доћи потенцијалне могућности земљишта и гајених култура.

Финансијски ефекти комасације за КО Надаљ 2 оправдавају инвестицију за четири до пет година, односно директни финансијски ефекти који се могу очекивати на основу досадашњих искустава, указују на високу исплативост пројекта.

Уколико се у разматрање узму и дугорочно повећање рентабилности пољопривредне производње, као и индиректни економски и финансијски ефекти онда непосредно следи да је пројекат комасације исплатив. Додатне вредности добијене комасацијом, које немају свој директан финансиски израз, али су доказано присутне (повећање правне уређености власништва, успостављање
management effectiveness, decrease of the potential damage developed as consequence of providing conditions for effective establishing of adequate hydro-technical infrastructure, optimization of land processing expenses, etc), increase the value of the land consolidation area CM Nadalj 2. All things considered, we can conclude that the direct financial effects justify the land consolidation in Nadalj 2, while the additional effects of land consolidation, although without the possibility of a precise estimation and financial expression during the project idea phase, additionally increase the value of the land in CM Nadalj 2, where the land consolidation project will be performed.

REFERENCES


