



Stakeholders' perception of defragmentation of new plots in a land consolidation project: Given the surprisingly different Slovak and Czech approaches



Zlatica Muchová^{a,*}, Kateřina Jusková^b

^a Slovak University of Agriculture in Nitra, Faculty of Horticulture and Landscape, Engineering, Department of Landscape Planning and Land Consolidation, Hospodárska 7, 949 01 Nitra, Slovakia

^b Czech Technical University in Prague, Faculty of Civil Engineering, Department of Geomatics, Thákurova 7, 166 29 Praha 6, Czech Republic

ARTICLE INFO

Keywords:

Questionnaire
Land fragmentation
Merging of plots
Perception of owners
Sole ownership
Shared ownership

ABSTRACT

There is a fundamental difference in the way of merging the fragmented plots of one owner within a land consolidation (LC) in Slovakia (the Slovak Republic, SK) and the Czech Republic (CZ). All the scattered shares of a single owner in SK are merged into a minimum amount of new plots in the proportion of 1/1; the shares of one owner in CZ are merged only to a group of owners who are on the same ownership title.

Through an LC project a Slovak owner automatically acquires sole ownership and the Czech one remains in an unchanged ownership in equal shares. Authors wondered what general public and the owners themselves in particular think of these two ways of merging. A simple online questionnaire for all surveyed groups (representatives of owners, public administration officials, LC designers/experts) for a virtual model territory was created. The results based on the questionnaire (563 responses, 10–25% estimated rate of return, were evaluated at the time of preparing the contribution) show that there is a clear preference (90–98%, estimated margin of error 5–16%) for the exclusive ownership. The (surprising) differences in merging as well as subsequent findings provoked an informed debate about the causes which is still pending.

1. Introduction

Land consolidation (LC) is a tool that can bring benefits to a territory such as ensuring conditions for improving the environment, soil and water management protection, increasing the ecological stability and related improvement in the quality of rural life. LC has always been regarded as an instrument or entry point for rural and agricultural development (FAO, 2003). According to Thomas (2006), typical measures in the implementation of land consolidation procedures are the merging of fragmented parcels, ownership, farms (land tenure), creation of an appropriate design of plots, construction of rural roads, landscape development, soil conservation, creation of irrigation and/or drainage infrastructure, measures for village renewal, creation or rehabilitation of water supply, sewage systems and other rural infrastructure, flood protection, measures for recreation and leisure, etc. There are no doubts about multidisciplinary approaches to the whole LC process. This is witnessed by a large number of contributions of authors who classify LC benefits according to their areas of impact. For example Sklenicka (2006), Hiironen and Niukkanen (2012), Long (2014), Platonova and Baumann (2014), Zhang et al. (2014) define LC

as a standard tool for increasing the effectiveness of soil use with a subsequent significant economic impact on rural development. Social benefits with the objective of implementing a new policy in relation to the basis of land ownership and managing are described e.g. in the works of Pašakarnis and Maliene (2010), Sikor et al. (2009), Goodale and Sky (1998), Li et al. (2014). Land consolidation has a great impact on diversity and ecological functions in different areas through technical and biological measures as stated by Wang et al. (2015), Yu et al. (2010), Yin et al. (2011), Kupidura et al. (2014), Gábor et al. (2016) etc. mention methods of landscape evaluation and perception in terms of land consolidation for the development of rural tourism and politics.

All the economic and landscape benefits of LC must be reconciled with the conditions for rational management of land owners (social aspects). It is necessary to create new merged plots with clarified ownership rights. The owners see (for more than 100 years) a gradual reduction in the value of the land that once formed the basis of their livelihood. Obviously, the fragmentation of land ownership is (potentially) significantly increasing with each new generation, which is the consequence of past/present inheritance laws. Fragmented ownership is

* Corresponding author.

E-mail addresses: zlatica.muchova@gmail.com (Z. Muchová), katerina.juskova@gmail.com (K. Jusková).

a serious problem for the future in many countries, not only in Europe (Hartvigsen, 2014). According to McPherson (1983); Krčilková and Janovská (2016) the existence of land fragmentation can be a major barrier to agricultural development.

King and Burton (1982) define land fragmentation as the existence of a number of spatially separate plots of land farmed as single units. According to Kopeva et al. (2002) land consolidation is simply understood as means to solve the situation of land fragmentation by reducing the number of individual plots.

The land re-allotment process (also referred to as land pooling, land re-allotment planning, re-allotment design) is the most difficult and the most important step in land consolidation studies. Oldenburg (1990), among others, sees land re-allotment as an exchange of private ownership and the location of spatially dispersed plots of farms to form new holdings containing a single (or as few as possible) plot(s), with the same or similar value as the original areas. Land re-allotment is a core part of land consolidation which comprises the distribution of property to different person, i.e. division of property into different portions according to each one's contribution (Grossman and Brussaard, 1988). The process is used to improve efficiency with larger plots of better shape, reduction of distances and improved parcel layout. Re-allotment of land aims at bringing together the small scattered pieces of land into compact units (Mitra and Singh, 2015; Jusková and Muchova, 2014; Muller, 2015). The points which the farmers and implementers pay attention to in land re-allotment can be (Cay and Iscan, 2011): location of the biggest and the second biggest parcels of a farmer, parcel density of an owner, location of immovable facilities. Each owner's total post-consolidation holding should be same in size as his or her total pre-consolidation holding (Gonzalez et al., 2007). A traditional principle has been that an owner should not be worse off after the consolidation than before (FAO, 2012). Projects often aim at ensuring that an owner's holding after consolidation is equal in value to the original holding; if the value of the holding is smaller after consolidation, equivalency can be achieved by paying financial compensation. Equal value is thus not only a question of soil values but includes all factors that have a substantial impact on the use of the land, FAO (2003).

1.1. Comparison of methodological procedures in Slovakia and the Czech Republic

Land (plot) affected by LC can be owned A) by one person in **exclusive ownership** (it refers simply to ownership by one individual), B) in **co-ownership** (owned by a number of people, in a certain share expressed by a fraction) C) as a **marital property** (undivided co-ownership of spouses established on the basis of marriage and property acquired after the date of the wedding is entered under an 1/1 share) or D) by a land community in **shared ownership** (all plots form a common property and the owners cannot manage them separately due to common legal regime). All co-owners (in all forms of ownership) are registered in Slovakia (SK) and the Czech Republic (CZ) on one ownership title (OT – a public document which contains an inventory of property owned by a particular owner or a group of co-owners in a given area, a common registry based on an imperial patent of the Austrian Empire from 1852, when the registration of land-books insertions, OT predecessors, started). Goals at input (claim) and output (draft of new plots) in the LC process are the same in Slovakia and the Czech Republic and are based on their respective national legislation. The basic law on land consolidation in the Slovak Republic is Act No. 330/1991 Coll. Act No. 139/2002 Coll. plays the role in the Czech Republic. In Slovakia, LC projects generally have 3 basis stages (Table 1). In the Czech Republic, the situation is similar, i.e. 3 basis stages too (Table 2).

1.1.1. The research problem

One of the goals of the LC is to process owners' claims and propose new maximally merged plots accessible from public roads with a

suitable location and shape for farming or other use.

The property inventory for owners entering the plot merging is created in stages known as *the Register of the Original State* in SK and *the Inventory of Claims* in CZ. The aim of these stages in both countries is to create input data (descriptive and graphic information) on the land ownership which LC will address. The intention of both stages is the same but the way of processing is radically different and has a significantly different impact on the owner.

It can be assumed that differences, which have a long lasting impact on resolving ownership issues, occurred when implementing the initial/first methodological procedures in both countries. Neither legislation nor the methodologies specify the defragmentation procedures. In Slovakia, claims of individual owners are processed without binding to the original ownership title. However, in the Czech Republic, the system works with OT (i.e. with a group of property owners and usually there is no separation of individual owners at defragmenting/merging). These are common practices that appear to have originated in the first pilot projects and were generally accepted.

The new land arrangement is carried out in a step of a same name in both countries: *the Plan for the Re-allotment of New Plots*. Again, the two countries significantly differ already in the basic idea for merging. Plots are consolidated for individual owners in SK and for owners grouped together on a single OT in the Czech case.

Revealing this entirely different approach is also surprising for the authors. Relevant literature (including methodological approaches) mentions merging/consolidation of ownership in both cases, which leads/led to the conviction about the same procedures. Nobody before pointed out the differences and dealt with their causes and consequences. Merging on OT is significantly easier, which (when excluding this fact) leads to arguments about better CZ practices.

Reflection on this subject leads to changing the point of view on the long-established approaches in LC processing. One gets to the issue why the two neighboring states, with a common history, differ so much in the way of merging the plots in the LC. With logical reasoning, even at the beginning of the research, one could clearly conclude that the Slovak approach is more convenient for the owner, bringing huge benefits in contrast to the Czech owners. Authors wanted to substantiate this statement based on the stakeholders' opinion (especially the owners themselves) through an online questionnaire as a means for data gathering and evaluation. The results of the questionnaire are an indicator of the public view on land ownership processing within the LC.

1.1.2. Research objective

Authors tried/try to get the support or rejection of the assumption about the advantage of the Slovak procedure (merging to the exclusive property) for the owner but also for the other stakeholders in a transparent manner.

2. Material and methods

2.1. The proposal of a virtual model project

For the sake of visualization of the land ownership merging processes in both countries, a model LC project has been proposed. The project includes 5 ownership titles with the description of the owners and properties owned by them (Table 3). The input data on the properties, ownership and descriptive and graphic information (Fig. 1) as well are the same for both countries. 7 owners in 31 property relations on 11 plots placed on a virtual territory. A potential respondent for the questionnaire in owner's role was denoted as "YOU" for better identification with the case (Table 4).

We defined the basic parameters of the project as follows: the perimeter of the LC project has 26300 m², comprised of 97.6% of arable land, 2.4% in other areas (unpaved lane, original unregistered public property).

Table 1
A simplified scheme of LC process in SK according to the legislation.

Elaboration of LC project	1. LC project area operate 2. Actualization of estimated soil-ecological unit and land-value maps 3. Initial state registry 4. General principles of functional organization of the territory in the area of LC 5. Principles of the placement of new plots 6. Plan of common facilities and measures and plan of public facilities and measures 7. Plan for re-allotment of new plots
Implementation of LC project	8. Transition process into the new arrangement 9. Staking-out of boundary and break point monumentation of new property plots boundaries 10. Partitioning plan in the form of the geometrical plan or in the form of reconstruction of the cadastral operate by new mapping – land registration
Implementation of measures	11. Construction of the common facilities and measures

Table 2
A simplified scheme of LC process in CZ according to the legislation.

Preparation phase	1. Assessment and, if necessary, actualization of estimated soil-ecological units 2. Analysis of the current state 3. Positional survey point field preparation 4. Survey of property boundaries in the perimeter of LC and unresolved plots 5. Survey of the actual state of planimetry and altimetry 6. Determination the perimeter of LC – notation to cadastre of real estates 7. Calculation of ownership claims
Design phase	8. Plan of common facilities 9. Plan for re-allotment of new plots 10. Renewal of cadastre documentation
Implementation phase	11. Staking-out of boundary and break point monumentation of new property plots 12. Construction of common facilities in terrain

Table 3
Input data (descriptive and graphical information, simplified extract from ownership titles) on land ownership in the LC perimeter.

OT identification	Ownership nature Land parcel number	Owners – Share
OT No. 1	123/1; 562; 875/1	YOU – 1/3; Bela – 1/3; Cyril – 1/3
OT No. 2	105/1; 1006	YOU – 1/2; Dušan – 1/2
OT No. 3	205/1; 705/1; 1011	Bela – 1/4; Dušan – 1/4; Eugen – 1/2
OT No. 4	211/1; 725	YOU – 1/4; Bela – 1/4; Cyril – 1/4; public land – 1/4
OT No. 5	100	municipality – 1/1

Subsequently, a “Plan for the location of new plots” was drawn up. New plots for individual owners according to the Slovak methodology are given in Fig. 2 and Table 5. Ownership shares are merged into one, except for one case with two plots, observing the criteria of adequacy given by the legislation. New land parcels are appropriate A) by area when not differing by more than ± 5% from the original land area (after deduction of the contribution to the common facilities); B) by reasonable price when not differing by more than ± 10% from the initial price of the land (including the contribution for common facilities and measures); C) when located in a reasonable project block. Project blocks are formed with regard to the future use of the territory, lucrative blocks are singled out and merging of plots takes place within. In the case when the owner also owns land outside these lucrative blocks, those plots are merged together within other project blocks. Then the owner will have more plots on the new OT, each in a different project block, but also in exclusive sole ownership. The whole new plots allocation approach and proposal philosophy is based on perfectly negotiated owners’ claims for re-allotment in a separate previous LC project step. There is a private hearing with each individual owner.

Merging for individual ownership titles according to the Czech methodology can be seen in Fig. 3 and Table 6. This means that the merging was carried out for ownership groups while respecting the criteria of adequacy, which are valid for the Czech Republic (new plots are appropriate A) by the area when not differing by more than ± 10% from the original one (after deduction of the allowance for common facilities); B) by the price, if not different by more than ± 4% from the original one (after deduction of the contribution to the common facilities); C) by the distance, if not different by more than ± 20% from the original position). Our aim was to propose the re-allotment of the plots in accordance with the methodological procedures for both countries and provide a maximal merging of input claims possible. The future size of plots is ensured by a minimum area of new land (400 m²

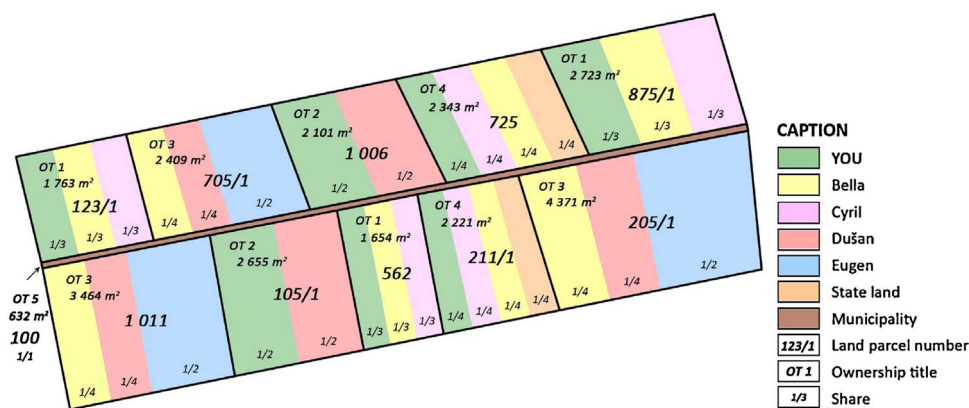


Fig. 1. Graphical display of input claims. The spread of ownership within the plots is only indicative, not applicable in reality. A “YOU” is represented in the project as a co-owner of shares.

Table 4
Input data (descriptive and graphic information) on land ownership in the LC perimeter for the “YOU” respondent.

OT No. 1			OT No. 2			OT No. 4		
Owners, other authorized persons			Owners, other authorized persons			Owners, other authorized persons		
Ownership right	Share		Ownership right	Share		Ownership right	Share	
YOU	1/3		YOU	1/2		YOU	1/4	
Bela	1/3		Dušan	1/2		Bela	1/4	
Cyril	1/3					Cyril	1/4	
						State land	1/4	
Ownership nature - Land			Ownership nature - Land			Ownership nature - Land		
Plot number	Area [m ²]	Type of the land	Plot number	Area [m ²]	Type of the land	Plot number	Area [m ²]	Type of the land
123/1	1763	arable land	105/1	2655	arable land	211/1	2221	arable land
562	1654	arable land	1006	2101	arable land	725	2343	arable land
875/1	2723	arable land						
Total	6140		Total	4756		Total	4564	

Slovak way of re-allotment of plots

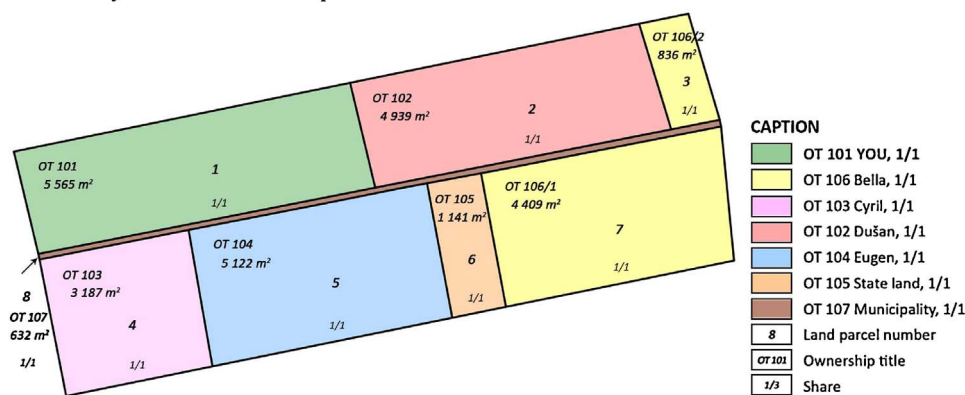


Fig. 2. Graphical display of output claims according to the Slovak methodology. The spread of ownership within the plots is final.

Table 5
Output data (descriptive and graphic information) on the land ownership in the LC perimeter for the new state – Slovak methodology (single new ownership title: OT No. 101).

OT No. 101		
Owners, other authorized persons		
Ownership right	Share	
YOU	1/1	
Ownership nature - Land		
Plot number	Area [m ²]	Type of the land
1	5566	arable land
Total	5566	

Czech way of re-allotment of plots.

on agricultural land and 2000 m² on forest land) in Slovak methodology. If the new plots would be smaller than the limits, they may be redeemed or must go into joint ownership.

Plans for the new arrangement of plots are created in the easiest way, focusing only on two basic methodological approaches of land merging (Slovak – merging to the owner or Czech – merging on

ownership titles). Whole model area is located on same quality soil to avoid land valuation. The territory concerned by the LC is located on a same type of land (arable land). It is only divided by plot with the parcel number 100 (other area land type used as access lane). The LC perimeter is considered to be a closed territorial unit reasonably remote from urban areas, not particularly lucrative in terms of future real estate development and other activities. Overall, the area can be seen as homogeneous in terms of soil quality (Konc, 2008), development activities and distance from urban areas.

Graphical outputs were made in the PÚTaČ program, Version 2.0 for Geoplot (<http://www.gok.sk/>, <http://www.geoplot.sk/>) and Proland Version 12.53 for Kokeš (<http://www.gepro.cz/>).

Slovak way of re-allotment of plots
Czech way of re-allotment of plots

2.2. Creation of the questionnaire

The aim of the questionnaire creation was to simplify it so that it will be comprehensible to all groups, and to limit it to the factual evaluation of methodological approaches for allocation of new plots. We excluded other wider territorial interests which would make the project more complicated and distract attention from the main purpose. Likewise, the origin of specific approaches on land consolidation was not given, respondents did not know which is the Czech and which the Slovak way (the Czech approach was denoted as the first method and Slovak as the other one), in order to exclude eventual bias. The questionnaire was sent to experts, practitioners, relevant scientists

Czech way of re- allotment of plots

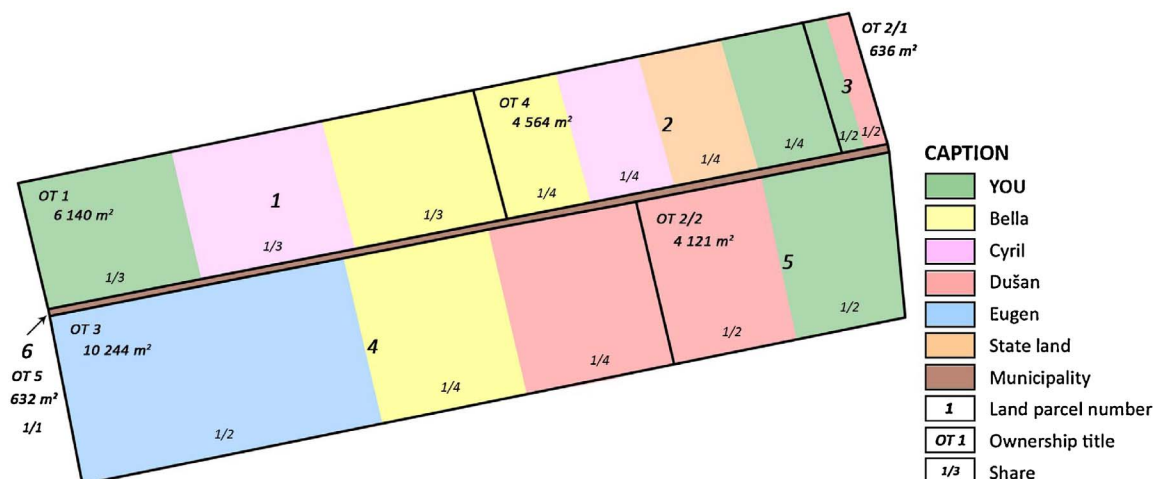


Fig. 3. Graphical display of output claims according to the Czech methodology. The spread of ownership within the plots is only indicative, not applicable in reality. A “YOU” is represented in the project as a co-owner of shares.

Table 6
Output data (descriptive and graphic information) on the land ownership in the LC perimeter for the new state – Czech methodology.

OT No.1		OT No. 2		OT No. 4	
Owners, other authorized persons		Owners, other authorized persons		Owners, other authorized persons	
Ownership right	Share	Ownership right	Share	Ownership right	Share
YOU	1/3	YOU	1/2	YOU	1/4
Bela	1/3	Dušan	1/2	Bela	1/4
Cyrl	1/3			Cyrl	1/4
				State land	1/4
Ownership nature - Land		Ownership nature - Land		Ownership nature - Land	
Plot number	Area [m ²]	Type of the land	Plot number	Area [m ²]	Type of the land
1	6140	arable land	3	636	arable land
			5	4121	arable land
Total	6140		Total	4757	
				Total	4564

and potential landowners who have already been affected by an LC project or would be in a future. The main mission of the questionnaire was to find out the views of respondents as the owners. The opinions and answers of the respondents as the owners should be free from their personal interest in the property. It is an exceptional opportunity because owners can express their opinion with some detachment as their real property is not involved. Usually, the owners become familiar with a LC project when their property is directly involved. Sometimes they may feel helpless in these circumstances and may be a priori against any change.

The questionnaire contains the following sections:

A: Project introduction: Imagine that you are the co-owner of seven plots in an area, of an even soil quality, where a LC was just implemented in two ways. Please check the following proposals and

evaluate them from your point of view as the owner (you act as “YOU” in the project).

B: Entry to the consolidation project: It contains Fig. 1 + Tables 3 and 4

C1: The first way of allocation of new plots: It contains Fig. 3 + Table 6 (the respondents do not know that it is the Czech approach)

C2: The second way of allocation of new plots: It contains Fig. 2 + Table 5 (the respondents do not know that this is the Slovak approach)

D: Questions from the questionnaire:

Question No 1: Which way of allocation of new plots do you consider to be better and more profitable for the owner?

Question No 2: If you have any experience as a public administra-

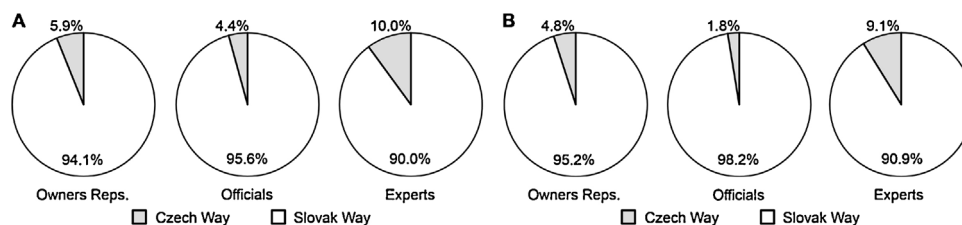


Fig. 4. Aggregate percentages (SK on panel A, CZ on panel B) of responses are given.

tion official, please select a more appropriate way of allocation of new plots according to you.

Question No 3: If you have any experience as a **LC designer**, please select a more appropriate way of allocation of new plots according to you.

Respondents were choosing either the first method or the second one from the Question 1 options. For Questions 2 and 3 targeted on officials and designers, they had the third choice “I ignore the question” when not applicable to them, i.e. when responding as owner only. There was also the possibility to include a personal opinion.

The online questionnaire was created with Google Forms (<https://www.google.com/forms/about/>) technology and it had been distributed using databases of the Slovak and Czech Chambers of Land Consolidation, municipal councils and personal contacts to LC designers/experts, public administration officials and owner representatives on LC boards for recent projects. By the November 30 2016, 563 (420 CZ, 143 SK) responses have been collected and subsequently evaluated. Size of the surveyed groups (estimated group sizes, EGS) has been estimated as follows: representatives of landowners on LC boards (usually 5) for recent projects (according to the LC chambers, personal communication), CZ 586, SK 74 projects, ~2930 CZ, ~370 SK; officials ~530 CZ, ~420 SK (expert estimate by government officials, personal communication), LC designers/experts ~500 CZ, ~120 SK (according to the LC chambers, personal communication). Estimated rates of return (RoR, responses) for owner representatives are 10.6% (CZ) and 18.4% (SK), for officials 10.4% (CZ) and 10.7% (SK), for experts 11.0% (CZ) and 25.0% (SK). Margins of error (MoE, for the worst case 50:50 and 95% Confidence Level) are as follows: owner representatives 5.3% (CZ) and 10.8% (SK), officials 12.5% (CZ) and 13.8% (SK), for experts 12.5% (CZ) and 15.6% (SK).

The online version is still available at <http://goo.gl/forms/9yl7hkPMcZ>. However, authors do not expect further regular responses to differ much from the ones already collected. Preliminary information on available results had to be revealed to the interested respondents for discussion purposes. This means that the identification of the variants in the questionnaire is now in principle possible. Continuing public availability and higher “visibility” of the online version may also lead to some spurious responses in the future. While preferences of the respondents remain stable, new responses are becoming rare.

3. Results

Summary of the results for both states can be found in Fig. 4.

In both countries, respondents liked the Slovak approach (exclusive ownership) most, i.e. preferred shares to be merged for owner regardless of the initial ownership title. On the new land, there would be exclusive sole owners, having a new ownership title in the share of 1/1. More than 94% SK and 95% CZ respondents representing owners from both countries were inclined toward this way of drafting new land plots. The vast majority of respondents, also the Czech ones, wish to own their land as exclusive owners, thus preferring the Slovak method of merging to the established Czech one.

Most respondents representing public administration officials (96% SK, 98% CZ) would choose the Slovak variant of drafting new plots. Interestingly enough, almost none of the Czech respondents selected the Czech way, which is the preferred method in the methodology used at present in the Czech Republic. Based on the most of personal opinions from respondents, the other way is preferable for public administration. It is easier and faster to negotiate the location of new plots with one owner than with several co-owners at once.

Respondents representing LC designers/experts also preferred the Slovak method (merging for owner). In Slovakia, 90% of them were inclined toward the Slovak way and 10% toward the Czech one. In the Czech Republic, nearly 91% of experts preferred the Slovak way and only 9% of respondents the Czech one, although it is the current Czech methodological approach.

4. Discussion

The questionnaire shows that the vast majority of the respondents tend to split joint ownership, as it is implemented in Slovakia. A change in legislation would help to resolve the situation in the Czech Republic if exclusive ownership (ownership share 1/1) would get a priority in land consolidation. In the event of a disagreement, the owners would remain in their original shares and in a joint ownership. If two co-owners on ownership title would disagree on the division of joint ownership, and one would agree, he/she would be automatically detached with a new OT and the other two, on the basis of the disagreement, would remain in the original mutual co-ownership on OT. Current approach of merging plots would change in this case in the Czech legislation. At present, the primary idea is to maintain the co-ownership on OT and to split it only with the mutual agreement of all parties on a deed of ownership. However, if one of the co-owners in CZ does not agree with the splitting, it is impossible.

Some designers evaluate the Czech approach (merging to OT) as easier to implement than the Slovak one (merging for a sole owner). For them it is less labor intensive and less time-consuming when drafting new plots. Available options of simplifying the process include e.g. multi-criteria decision-making methods (Guanghui et al., 2015; De Meyer et al., 2013; Nyeko, 2012; Kucukmehmetoglu and Geymen, 2016), fuzzy methods (Cay and Uyan, 2013; Malczewski, 2006), mental models (e.g. Demetriou et al., 2013). The defense of the Czech method based on a smaller labor input in the conditions of the current digital age does not seem relevant to us.

Joint ownership split is really a more convenient option, even in the case where the owner in the LC project is not communicating or there is an unknown owner in the co-ownership. According to Dirimanova (2005), co-ownership is a type of ownership where the co-owners must share not only benefits but also cost components. Emm and Singletary (2009) also claim that ultimately, a co-ownership split is a good deal for everyone because the fewer owners there are, the easier it is to do anything with the land. People wanting to purchase land have great difficulty in determining what land might be available for sale, and they often face problems in identifying who holds rights to the land. Records may refer to the original, often deceased, owners and current heirs may be difficult to locate, especially if they are not local residents, FAO (2003). Karki (2004) mentions that a land pooling project needs to seek the landowners’ consensus at each and every stage, it generates considerable controversy and disagreement throughout the life of the project, and is therefore subject to repeated interruption and delay especially with the large number of landowners.

It is clear from the results that the aspect of maintaining good relations with other co-owners is also important for an owner. The preservation of good relations need not necessarily be dependent on maintaining joint ownership. The quality of relationships is a variable factor and may change by only one misunderstanding. When splitting property among two siblings, their new plots would be drafted side by side. This is a common practice in Slovakia. Both siblings may use the plots together without trouble and if they would prefer to use them separately, it is already prepared. The division of common property of spouses is not implemented in SK, but it is in the Czech Republic.

There is also the opinion that the relationship between the owner and the land would be lost if we opted for splitting the joint ownership. It can be assumed that the current (second) generation of landowners on OT are already largely unknown to each other. At the same time, owners generally do not even know where their plots are located in the territory. Mostly they are somewhere within a large block of farmland managed by an agricultural enterprise and the land borders are not visible in terrain. LC should reduce land fragmentation as well as ownership fragmentation. Land consolidation for ownership titles means just reducing the land fragmentation and not the fragmentation of ownership relations.

From all the replies and views of the respondents is clear that

owners have an interest on joint ownership split. The question therefore is why the CZ LC focuses on OT (group of owners) and not directly the owners, as is the case in SK? In terms of comparing ownership fragmentation, a design on the owner would be far easier in the Czech Republic than in Slovakia. The folio of proprietary rights in SK usually contains a high number of co-owners, which results in a high number of ownership relations. SK registers 97.95 million ownership relations, whereas for CZ the number is much lower (10.15 million). At the same time, the SK is at least one third smaller than CZ (Jusková and Muchová, 2014). One plot in SR has on average seven times larger number of co-owners than a Czech one (Jusková and Muchová, 2013). The division of joint ownership is one of the very positive benefits of LC. The settlement of shared ownership should be easy and quick. It would resolve many disputes and problems for future generations.

Among those disputes/problems can be mentioned the virtually dysfunctional land market and land use issues. Unresolved situation allows well-connected players with resources (e.g. some corporations, managements of agricultural companies, interest groups) to promote their particular interests. Smaller investors, land users, companies, farmers, owners are effectively excluded from land market provided they do not have sufficient local knowledge/assistance. Serious land users, owners and local rural communities are often forced to tolerate a disadvantageous situation (e.g. land use without payment/permission, land speculation, unregulated development, problematic access to plots, soil deterioration, erosion, pollution, flooding, water shortages) that hinders sustainable regional development and landscape protection.

The survey also revealed that neither designers nor methodological experts in Slovakia have even thought of the possibility of working with ownership titles in LC so far. SK experts see no sense in creating new plots for groups of owners (for OT) instead of individual owners. The research also shows that the process of designing for ownership titles is considered to be inappropriate and obsolete.

5. Conclusions

In both countries (the Czech Republic and Slovakia), there are ownership titles, as public documents, containing the property inventory of a specific owner or a group of owners in an area. But they serve as the basis for land consolidation projects only in the Czech Republic and they are preferably maintained also in new conditions there.

The project, questionnaires and answers/findings sparked an informed debate that is still ongoing. So far no one (to our knowledge) has pointed out the surprising (perhaps “unwanted”, e.g. caused by “technocratic” decisions) differences in land consolidation in the two neighboring countries with a common history. It is possible that the understanding of the issues of plots merging in other (not only) European countries is (possibly also “accidentally”, e.g. due to “procedural” reasons) different and it would be worth an expert debate that could help to improve legislation.

In conclusion, the Slovak approach (merging of fragmented plots for the exclusive owner) is clearly more convenient for owners and it is perceived as such not only by the representatives of landowners (95.2 ± 5.3% CZ with 10.6% responses from possible 2930, 94.1 ± 10.8% SK, 18.4% responses from 370) themselves but also other stakeholders (public administration officials, 98.2 ± 12.5% CZ 10.4% responses from 530, 95.6 ± 13.8% SK 10.7% responses from 420; LC designers/experts, 90.9 ± 12.5% CZ 11.0% responses from 500, 90.0 ± 15.6% SK 25.0% responses from 120).

Acknowledgement

This work was supported by the Ministry of Education of the Slovak Republic and of Slovak Academy of Science [grants number VEGA 1/0673/16 and KEGA 008SPU-4/2017].

References

- Cay, T., Iscan, F., 2011. Fuzzy expert system for land reallocation in land consolidation. *Expert Syst. Appl.* 38, 11055–11071. <http://dx.doi.org/10.1016/j.eswa.2011.02.150>.
- Cay, T., Uyan, M., 2013. Evaluation of reallocation criteria in land consolidation studies using the Analytic Hierarchy Process (AHP). *Land Use Policy* 30, 541–548. <http://dx.doi.org/10.1016/j.landusepol.2012.04.023>.
- De Meyer, A., Estrella, R., Jaccsens, P., Deckers, J., Van Rompaey, A., Van Orshoven, J., 2013. A conceptual framework and its software implementation to generate spatial decision support systems for land use planning. *Land Use Policy* 35, 271–282. <http://dx.doi.org/10.1016/j.landusepol.2013.05.021>.
- Demetriou, D., Stillwell, J., See, L., 2013. A new methodology for measuring land fragmentation. *Comput. Environ. Urban Syst.* 39. <http://dx.doi.org/10.1016/j.compenvurbsys.2013.02.001>.
- Dirimanova, V., 2005. Land market with fragmented landownership rights in Bulgaria: an institutional approach. From Households to Firms with Independent Legal Status: The Spectrum of Institutional Units in the Development of European Agriculture. *Ashfordpp.* 9–10.
- Emm, S.K., Singletary, L., 2009. *People Of The Land*, 1st ed. University of Nevada Cooperative Extension, Nevada.
- FAO, 2003. *The Design of Land Consolidation Pilot Projects in Central and Eastern Europe*. FAO, Rome.
- FAO, 2012. *Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security of Tenure*. FAO, Rome.
- Gábor, M., Falán, V., Petrovič, F., 2016. Quantitative and qualitative approaches of delineation in detailed mapping of vineyard landscape. case study: vicinity of pezinok (Slovakia). *Ekológia (Bratislava)* 35, 240–252. <http://dx.doi.org/10.1515/eko-2016-0019>.
- González, X.P., Marey, M.F., Álvarez, C.J., 2007. Evaluation of productive rural land patterns with joint regard to the size, shape and dispersion of plots. *Agric. Syst.* 92, 52–62. <http://dx.doi.org/10.1016/j.agry.2006.02.008>.
- Goodale, M.R.G., Sky, P.K., 1998. *Owners' Relationships to Property and Land Consolidation: A Social Approach*, Reprint (University of Wisconsin-Madison Land Tenure Center). Land Tenure Center, University of Wisconsin-Madison, Wisconsin-Madison.
- Grossman, M.R., Brussaard, W., 1988. Planning, development, and management: three steps in the legal protection of Dutch agricultural land. *Washburn Law J.* 28, 86–149.
- Guanghui, J., Xinpan, W., Wenju, Y., Ruijuan, Z., 2015. A new system will lead to an optimal path of land consolidation spatial management in China. *Land Use Policy* 42, 27–37. <http://dx.doi.org/10.1016/j.landusepol.2014.07.005>.
- Hartvigsen, M., 2014. Land reform and land fragmentation in Central and Eastern Europe. *Land Use Policy* 36, 330–341. <http://dx.doi.org/10.1016/j.landusepol.2013.08.016>.
- Hiironen, J., Niukkanen, K., 2012. Land consolidation and its effect on climate. In: FIG (Ed.), FIG Working Week 2012–Territory, Environment, and Cultural Heritage. International Federation of Surveyors, Consiglio Nazionale Geometri e Geometri Laureati, Rome, pp. 1–15 (ISBN 97887-90907-98-3).
- Jusková, K., Muchová, Z., 2013. Land consolidation as an instrument for land ownership defragmentation in the Czech Republic and Slovakia. In: Škarpa, P., Ryant, P., Cerkal, R., Polák, O., Kovárník, J. (Eds.), *MendelNet 2013*. Mendel University in Brno, Brno, pp. 444–448 (978-80-7375-908-7).
- Jusková, K., Muchová, Z., 2014. Options and trends of land consolidation in the Czech and Slovak republics, with regard to common historical development of ownership and usage rights. *SGEM 2014 (Ed.)*, International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM. International Multidisciplinary Scientific Geoconference, Albena 471–478. <http://dx.doi.org/10.5593/sgem2014B22>.
- Karki, T.K., 2004. Implementation experiences of land pooling projects in Kathmandu Valley. *Habitat Int.* 28, 67–88. [http://dx.doi.org/10.1016/S0197-3975\(02\)00085-1](http://dx.doi.org/10.1016/S0197-3975(02)00085-1).
- King, R.L., Burton, S.P., 1982. Land fragmentation: notes on a fundamental rural spatial problem. *Prog. Hum. Geogr.* 6, 475–494. <http://dx.doi.org/10.1177/030913258200600401>.
- Konc, L., 2008. Analysis of soil conditions in land consolidation projects, case study Horné Hámre. In: Boltziar, M. (Ed.), *Ecological Studies VII*. Slovak ecological company, Bratislava, pp. 103–111 978-80-968901-5-6 (in Slovak).
- Kopeva, D., Noev, N., Evtimov, V., 2002. Land Fragmentation and Land Consolidation in the Agricultural Sector a Case Study From Bulgaria. Consolidation in CEEC: A Gate Towards Sustainable Rural Development in the New Millennium. FAO, GTZ, FIG, Arge Landentwicklung und Technische Universität München, Munich.
- Krčílková, Š., Janovská, V., 2016. Land tenure as a factor underlying agricultural landscape changes in Europe: a review. *Sci. Agric. Bohem.* 47, 68–81. <http://dx.doi.org/10.1515/sab-2016-0011>.
- Kucukmehmetoglu, M., Geymen, A., 2016. Optimization models for urban land readjustment practices in Turkey. *Habitat Int.* 53, 517–533. <http://dx.doi.org/10.1016/j.habitatint.2015.12.020>.
- Kupidura, A., Luczewski, M., Home, R., Kupidura, P., 2014. Public perceptions of rural landscapes in land consolidation procedures in Poland. *Land use policy* 39, 313–319. <http://dx.doi.org/10.1016/j.landusepol.2014.02.005>.
- Li, Y., Liu, Y., Long, H., Cui, W., 2014. Community-based rural residential land consolidation and allocation can help to revitalize hollowed villages in traditional agricultural areas of China: evidence from Dancheng County, Henan Province. *Land Use Policy* 39, 188–198. <http://dx.doi.org/10.1016/j.landusepol.2014.02.016>.
- Long, H., 2014. Land consolidation: an indispensable way of spatial restructuring in rural China. *J. Geogr. Sci.* 24, 211–225. <http://dx.doi.org/10.1007/s11442-014-1083-5>.
- Malczewski, J., 2006. GIS-based multicriteria decision analysis: a survey of the literature. *Int. J. Geogr. Inf. Sci.* 20, 703–726. <http://dx.doi.org/10.1080/>

- 13658810600661508.
- McPherson, M.F., 1983. Land Fragmentation in Agriculture: Adverse? Beneficial? And for Whom? 145th ed. Harvard University Harvard Institute for International Development (Development discussion paper).
- Mitra, M., Singh, S., 2015. Role of GIS in land consolidation. *Int. J. Sci. Eng. Res.* 3, 122–125.
- Muller, A., 2015. Standardization of land consolidation data in the Czech Republic, in: international multidisciplinary scientific GeoConference surveying geology and mining ecology management, SGEM. *Int. Multi. Sci. Geoconf.* 823–827. <http://dx.doi.org/10.5593/SGEM2015/B21/S8.105>.
- Nyeko, M., 2012. GIS and multi-criteria decision analysis for land use resource planning. *J. Geogr. Inf. Syst.* 4, 341–348. <http://dx.doi.org/10.4236/jgis.2012.44039>.
- Oldenburg, P., 1990. Land consolidation as land reform, in India. *World Dev.* 18, 183–195. [http://dx.doi.org/10.1016/0305-750X\(90\)90047-2](http://dx.doi.org/10.1016/0305-750X(90)90047-2).
- Pašakarnis, G., Maliene, V., 2010. Towards sustainable rural development in Central and Eastern Europe: applying land consolidation. *Land use policy* 27, 545–549. <http://dx.doi.org/10.1016/j.landusepol.2009.07.008>.
- Platonova, D., Baumanė, V., 2014. Engineering and economic calculations for assessing land consolidation. In: *Agriculture, L.U. (Ed.), Engineering for Rural Development – International Scientific Conference*. Latvia University of Agriculture, Jelgava. pp. 547–553 doi: ISSN 1691–5976.
- Sikor, T., Müller, D., Stahl, J., 2009. Land fragmentation and cropland abandonment in Albania: implications for the roles of state and community in post-socialist land consolidation. *World Dev.* 37, 1411–1423. <http://dx.doi.org/10.1016/j.worlddev.2008.08.013>.
- Sklenicka, P., 2006. Applying evaluation criteria for the land consolidation effect to three contrasting study areas in the Czech Republic. *Land Use Policy* 23, 502–510. <http://dx.doi.org/10.1016/j.landusepol.2005.03.001>.
- Thomas, J., 2006. Attempt on systematization of land consolidation approaches in europe. *zeitschrift für geodäsie. Geoinf. und Landmanagement* 131, 156–161.
- Wang, J., Yan, S., Guo, Y., Li, J., Sun, G., 2015. The effects of land consolidation on the ecological connectivity based on ecosystem service value: a case study of Da'an land consolidation project in Jilin province. *J. Geogr. Sci.* 25, 603–616. <http://dx.doi.org/10.1007/s11442-015-1190-y>.
- Yin, S., Wei, C.F., Yang, X.Y., Luo, Y.J., 2011. The ecological compensation of land consolidation and its evaluation in hilly area of southwest China. *Energy Procedia* 5, 1192–1199. <http://dx.doi.org/10.1016/j.egypro.2011.03.209>.
- Yu, G., Feng, J., Che, Y., Lin, X., Hu, L., Yang, S., 2010. The identification and assessment of ecological risks for land consolidation based on the anticipation of ecosystem stabilization: a case study in Hubei Province, China. *Land Use Policy* 27, 293–303. <http://dx.doi.org/10.1016/j.landusepol.2009.03.004>.
- Zhang, Z., Zhao, W., Gu, X., 2014. Changes resulting from a land consolidation project (LCP) and its resource-environment effects: a case study in Tianmen City of Hubei Province, China. *Land use policy* 40, 74–82. <http://dx.doi.org/10.1016/j.landusepol.2013.09.013>.