Environmental Protection Tools in Agricultural Management Works

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Abstract. Land consolidation is a fundamental instrument for agricultural management. It facilitates comprehensive changes in the agricultural, social, and ecological domains. Consolidation and post-consolidation development-related investments are an opportunity to improve living conditions in rural areas, and simultaneously ensure its positive impact on the environment. One of the primary goals of consolidation, directly specified in the Act on land consolidation, is to improve farming conditions. In Poland, consolidation is possible due to EU funds: RDP 2007–2013 and RDP 2014–2020. In order for individual villages to be granted EU funds for consolidation and post-consolidation development under the Rural Development Programme 2014–2020, their consolidation has to implement actions with positive impact on the environment and the landscape. The goal of this paper is to analyse documentation in the form of assumptions for a land consolidation project enclosed to an RDP 2014–2020 grant application and project information sheets as the basis for environmental impact assessment in the context of detailed presentation of environmental protection solutions that ensure a positive impact of the project on the environment and landscape. The detailed study involved 9 villages in the Malopolskie Voivodeship, which applied for EU grants for land consolidation in the current financial perspective. The paper specifies the existing state of the analysed villages as regards the natural environment, lists agricultural management instruments that have a positive impact on the environment, and demonstrates that planning of actions aimed at environmental protection is a necessary element of assumptions for land consolidation projects.

1. Introduction

Land consolidation plays a significant role in rural space management e.g. Crncerte et al. [1] as it stimulates the areas to fulfil their functions as regards economic, social, ecological, and other domains e.g. Trystuła [2]. It is also a tool for improving efficiency of land cultivation and enhancing development of rural areas [3].

Rural development achieved through land consolidation has been used in many European countries, [4]. There are undoubtedly differences in objectives and procedures of land consolidation between countries, such as administrative procedures, cultural or historical trends, and legislation-dependent circumstances [4]. Despite the differences in goals and details of solutions, in practice, land consolidation primarily increases output and income and influences protection of the environment and improvement of its condition e.g. Zhang, Chen [5].

Consolidation is furthermore perceived as a process of reconstruction of the ecological system of regional environment [6]. In Poland, any negative environmental results of the consolidation are prevented by environmental studies. Their goal is to profile components of the environment and
landscape, and specify the environmental impact of designed solutions. Technological progress of the last decades has contributed to degradation of the natural landscape and resulted in a loss of biological and cultural heritage [7]. Therefore, protection of the existing qualities of the environment and landscape is an important component of agricultural management [7]. Today, planned solutions in the form of land consolidation projects not only are neutral for the environment but also contribute to improvement of natural and farming conditions and their interdependencies to a considerable extent [5].

The goal of this paper is to analyse documentation in the form of assumptions for a land consolidation project enclosed to a Rural Development Programme 2014–2020 grant application and project information sheets as the basis for environmental impact assessment in the context of detailed presentation of environmental protection solutions that ensure a positive impact of the project on the environment and landscape.

2. Materials and Methods

The detailed study involved 9 villages in the Malopolskie Voivodeship, which applied for EU grants for land consolidation in the current financial perspective. The location of the study area is shown in Figure 1.

![Figure 1. Location of the studied villages in Europe, Poland, and the Malopolskie Voivodeship](image)

The paper specifies the existing state of the analysed villages as regards the natural environment, lists agricultural management instruments that have a positive impact on the environment, and demonstrates that planning of actions aimed at environmental protection is an indispensable element of assumptions for land consolidation projects.

The analysis involved materials from documentation in the form of assumptions for a land consolidation project enclosed to an RDP 2014–2020 grant application and project information sheets...
for the following villages: Czubrowice, Dolany, Krzeczow, Lusina, Marcinkowice, Popedzyna, Strzelce Wielkie, Ujście Solne, and Wysoka.

2.1. Land consolidation as the legal and technical tool for improving landscape quality

The primary purposes of land consolidation e.g. Act of 1982 [8] involve creation of more favourable conditions for land management by improvement of spatial structure of agricultural holdings, forests and forest lands, and rational formation of vast areas of land; and construction of a functional network of roads to buildings and arable and forest land. These multidimensional benefits of land consolidation are an aggregate of economic, environmental, social, and landscape profits. Economic gains of agricultural management result from practice on national economy and agricultural land subjected to consolidation. Environmental benefits of land consolidation are brought by an analysis of the structure and function of the natural ecosystem and environment. Whereas landscape benefits from land consolidation owing to an appropriate observation and interpretation of rural landscape of holdings subjected to consolidation [5].

Modern agricultural, urbanistic, and recreational practices pose a threat to existing cultural landscapes [9]. Simple solutions applied during agricultural management works can protect such areas to a significant extent. Environmental development is a conscious and planned intervention in the natural environment aimed for economic exploitation of ecosystems [10], (e.g. for agricultural or nature-related purposes) or restoration of ecological function of ecosystems and landscapes (land restoration, renaturalisation). Environmental development is defined as purposeful and conscious shaping of the natural environment of the man in order to increase its capacity.

Environmental development during land consolidation involves determination and marking off of forest and wooded areas, wildlife corridors, and protected landscape areas. Protection of existing qualities of the environment and landscape, the environment itself, and natural habitat involves among other activities protection against erosion of soil, conservation and restoration of qualities of meadows and pastures, land restoration, regulation of water balance, and improvement of migration conditions for wildlife.

2.2. Study of the existing state with regards to components of the natural environment

The fundamental issue for preparation of assumptions for land consolidation projects is a detailed and in-depth analysis of the existing state of the whole area included in the project in terms of agricultural production space, qualities of the environment and landscape, cultural heritage, and environmental development. The analysis involves land use and ownership structures, existing technical infrastructure network, and potential objects that require protection or whose condition needs to be improved. Assumptions for a land consolidation project specify first and foremost any activities necessary to improve these factors, which will verify whether the whole project should be implemented.

3. Results and Discussions

Based on the assumptions for the consolidation project, a detailed specification was prepared. Its content was analysed for factors that may influence the environment and activities aimed to improve qualities of the environment and landscape. The results of the profiling of the environment and landscape of the villages are shown in Table 1. There is detailed inventory of objects that are valuable in terms of the environment, landscape, history, and culture and should be protected during the consolidation process or whose existing state is in need of improvement.

The other analysis involved planned environment and natural landscape protection activities. A list of activities planned for each village was compiled based on information in the assumptions for the consolidation project (Table 2).
According to Table 1, all nine study areas included historic objects that should be protected. The land they are located on should be excluded from the consolidation or separated during the consolidation and transferred to the municipality, if possible. Areas of protected landscape, for which specific limitations and guidelines should be followed as per relevant norms when designing agricultural management activities, were similarly common. In six out of nine study areas, there were wildlife corridors that were suggested to be preserved based on current planning documents. Furthermore, the need to include wildlife corridors in future planning by protection of the area from development and shaping the new arrangement of land during the consolidation in such a way so that it would prevent occurrence of ecological barriers was demonstrated for five villages. A total of 20 natural monuments are located in four villages. These include mainly old oaks and limes.

### Table 1. Inventory of objects that are valuable in terms of the environment and landscape

| Community     | Historic buildings | Monuments | Natural monuments | Landscape | Parks | Parks | Natural park | Archaeological sites | Wildlife corridor | Nature 2000 | Buffer strip |
|---------------|--------------------|-----------|-------------------|-----------|------|------|-------------|---------------------|------------------|-------------|-------------|
| Czubrowice    | 17                 | x         | x                 |           |      |      |             |                     |                  |             |             |
| Dolany        | 3                  |           |                   | 3         | 7    | x    |             |                     |                  |             |             |
| Krzeczow      | 8                  | 5         | x                 |           |      |      |             |                     |                  |             |             |
| Lusina        | 10                 | 12        | x                 |           |      |      |             |                     |                  |             |             |
| Marcinkowice  | 14(7)              | x         | x                 |           |      |      |             |                     |                  |             |             |
| Popedzyna     | 3(0)               |           |                   |           |      |      |             |                     |                  |             |             |
| Strzelce Wielkie | min. 10         | 2         | x                 | x         | x    | x    |             |                     |                  |             |             |
| Ujsie Solne   | 2                  |           | x                 | x         |      |      |             |                     |                  |             |             |
| Wysoka        | 4                  | x         | x                 | x         |      |      |             |                     |                  |             |             |
| **Total**     | **71**             | **1**     | **20**            | **1**     | **9** | **8** | **6**       | **2**               | **3**            |             |             |

x - occurrence of object (7) - the number of objects before the survey

### Table 2. List of planned environment and natural landscape protection activities

| Community     | Planting of trees along the roads | Protection against wind erosion | Protection of forest areas | Wildlife corridor | Land restoration | Preventing surface erosion | Elimination of illegal dumps | Area for afforestation | Lands covered by natural succession |
|---------------|----------------------------------|--------------------------------|----------------------------|-------------------|------------------|---------------------------|---------------------------|-----------------------|----------------------------------|
|               |                                  |                                |                            |                   |                  |                           |                           |                       | existing planned               |
|               |                                  |                                |                            |                   |                  |                           |                           |                       | m² x 10^4 m² x 10^4       |
| Czubrowice    | x                                | x                              | x                          | x                  |      | x                          |                           |                       | 0.9616 2.3412           |
| Dolany        |                                  |                                |                            |                   |      |                            |                           |                       |                     |
| Krzeczow      |                                  |                                |                            |                   |      |                            |                           |                       | 35.4948 50.0000 25.0556 |
| Lusina        |                                  |                                |                            |                   |      |                            |                           |                       | 0.6128 0.1816           |
| Marcinkowice  | x                                | x                              | x                          | x                  |      | x                          |                           |                       | 0.0253 2.3615           |
| Popedzyna     | x                                |                                |                            |                   |      |                            |                           |                       |                     |
| Strzelce Wielkie | x                              |                                |                            |                   |      |                            |                           |                       | x 0.0253 2.3615       |
| Ujsie Solne   |                                  |                                |                            |                   |      |                            |                           |                       | x 0.0253 2.3615       |
| Wysoka        | x                                | x                              | x                          | x                  |      |                            |                           |                       | 11.5161 4.8045          |
| **Total**     | 5                                | 3                              | 1                          | 5                  | 8    | 2                          | 2                         |                       | 6                  |
The planned interventions aimed to improve the condition of the environment and landscape of the villages involved mainly erosion. Change of technical parameters of existing ditches and construction of new field and road drains in order to prevent water erosion and intensification of suffosion were planned as well. Additional rows of trees alongside roads, buffer zones, and field planting as a form of prevention of wind erosion in open agricultural fields and a countermeasure to excessive noise from main roads. Examples of these solutions are shown in Figure 2.

In five villages, new areas were earmarked for afforestation; and forest boundaries were updated as a result of a survey: in most cases they had to be delineated anew to reflect the actual state. Additionally, areas of ecological succession of trees were enlarged in three villages.

Figure 2. Inventory of objects that are valuable in terms of the environment and landscape:
- a) acoustic protection railways,
- b) buffer zone of trees,
- c) supplement courses cover,
- d) tree rows along the road

4. Conclusions

According to the Act on disclosure of environmental information and its protection, public participation in environment protection, and on environmental impact assessment, land consolidation has been classified as an undertaking with potential significant impact on the environment. Therefore, environmental impact assessment is carried out as part of proceedings to obtain environmental permits. The majors of the district (person who is head of a second-tier administrative unit in Poland) where the consolidation is to take place decides whether an environmental impact assessment is necessary.

The results have demonstrated that planning of actions aimed at environmental protection is an indispensable element of assumptions for land consolidation projects. Areas covered by assumptions for land consolidation projects require a thorough survey of the existing state including information on potential needs for renovation, reconstruction, or restoration of the natural state of objects valuable for the environment or landscape. There is a trend of particular protection against erosion and creation of conditions favourable for migration of animals.

The results have demonstrated that the necessity to protect natural and cultural heritage is a common phenomenon, and land consolidation, which is a fundamental tool for agricultural management, is capable of improving these conditions significantly.

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