



## CHARACTERISATION OF LAND UNSUITABLE FOR AGRICULTURE AND POSSIBILITIES OF ITS DEVELOPMENT IN RURAL AREAS

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### Summary

Rural areas are influenced by many natural, social and economic factors. The historical conditions of social development, such as the rate of population growth, low yields and chronic food shortages, leading to the development of less useful areas with low production potential for agricultural purposes, have had an impact on the current state of rural areas. In addition, there is considerable fragmentation of agricultural land in these areas and a focus on production to meet farmers' own needs. Scientific literature comprises many proposals to define agriculturally unsuitable land in relation to the marginal, problem or abandoned land. This depends mainly on the research discipline, the authors and the approach to the issue under discussion. This paper aims to review the terminology and characterisation of land unsuitable for agriculture in Poland and selected European and Asian countries. Moreover, studies have been conducted into the reasons for the expansion of these areas and the ways of their development (e.g., performing forestry functions, growing crops for energy purposes, promoting tourism and recreation as well as pedestrian or hippie bicycle routes, creating ecological areas, terracing the slopes), which in the result is the main priority of agricultural development and improvement of the spatial structure of farms. Realising the specific functions the presented land is intended for should determine the direction of changes in their alternative development. All solutions for the development of these areas should be managed with a necessary consideration of social, economic and environmental aspects.

### Keywords

land unsuitable for agriculture • marginal land • problem areas • abandoned land • rural areas • spatial structure of farms

### 1. Introduction

The state of agricultural production space is an image of historical, legal, socio-economic and demographic processes. Currently, rural areas face a significant problem of land unsuitable for agriculture, as well as fragmentation of agriculture, which without deep restructuring will not be able to fulfil production functions (e.g. production of raw materials and agricultural products in conditions of high competition), or non-productive

functions (e.g. enrichment of landscape values, environmental protection). Due to the diversity of natural and soil conditions, agricultural production is carried out both in favourable and extremely unfavourable conditions, equally in lowland, foothill and mountain areas, where the use of agricultural land is particularly arduous. It can be seen that these are the most severely affected by any systemic changes and transformations. Land unsuitable for agriculture includes marginal land, problem agricultural areas, depression areas, abandoned areas, agriculturally unproductive areas, etc. [Banski 1999].

The main factors that contributed to developing less suitable areas for agricultural purposes, with low production potential, include, among others [Jadczyszyn 2009]:

- intensity of exploitation and unreasonable use of natural resources that increase erosive degradation or acidification of soils,
- historical conditions of social development, such as the rate of population growth, low yields and chronic food shortages,
- concentration of arduous industrial production, location of landfills and dust emissions that contribute to local pollution of agricultural land soils,
- delays in economic development in areas with limited productive potential and lower population growth.

The paper aims to review the terminology and to characterise land unsuitable for agriculture. In addition, the paper intends to indicate the reasons for the expansion of these areas, as well as the methods of their management, which in effect is a priority for the development of agriculture and improvement of the spatial structure of farms.

## 2. Review of terminology of land unsuitable for agriculture

In the scientific literature, there are many different proposals for defining the terminology relating to the problem of land unsuitable for agriculture. First of all, definitions depend on the research discipline, the authors or different approaches to the issue under discussion. Scientific items on this subject use, e.g., such terms as: conflict areas, scarcity areas, depressed areas, difficult areas, areas of production reserves, disadvantaged areas, threatened areas, pathological areas, underdeveloped areas, areas of development retardation, marginal areas, etc. [Bański 1999]. Typically, these are synonyms of problem areas or land unsuitable for agriculture, but these terms must not be used casually, as not to cause confusion and errors.

In the literature on this issue, one can find statements that problem areas, which are part of geographical space, are characterised by the negative phenomena: '(...) from the social, economic and technical spheres, which cause specific internal anomalies (in the spatial structure) and area abnormality' [Zagożdżon 1988]. A problem area is also a geographical unit indicating: '(...) certain development anomalies (...)' [Więckowicz 1989].

This issue is defined by Jakobsche [1985], for whom a problem area is characterised by a large accumulation of disputed functions in the same areas, and divergences occurring in development. They are manifested by a low standard of living, emigration as well as degradation of the natural environment [Jakobsche 1985].

Another definition of problem areas is proposed by Zagożdżon [1980]. He writes: 'The peripheral system in the spatial-functional structure of a particular whole is the part of the area with peripheral characteristics, located outside the zone of greatest economic activity.' [Zagożdżon 1980]. Peripheral areas are also known as marginal areas [Bański 1999]. Furthermore, it should be noted that location is also an important factor regarding this issue.

Agricultural scientists, attempt to define problem areas in terms of agriculture. According to Falkowski [1990], agricultural problem areas are characterised by low agricultural productivity in relation to natural, historical and economic conditions, as well as to the investment in fixed and current agriculture assets [Falkowski 1990]. Meanwhile, according to Bis [1990], these are the areas where agricultural production is inefficient and arduous: '(...) agricultural production in particular regions depends on natural conditions, which almost *automatically* cause underdevelopment of the whole infrastructure and agricultural culture, which in effect causes the region's underdevelopment' [Bis 1990]. Whereas Skawińska [1993] claims that agricultural problem areas are: '(...) areas of land which fulfil or can fulfil the leading agricultural function due to the favourable quality of agricultural production space and the achieved efficiency of agricultural production, but the realisation of this function is threatened' [Skawińska 1993]. Bański [1999] writes that this author in her study divides problem areas into three categories: areas of productivity depression (which do not utilise the possibilities created by natural and economic conditions), conflict areas (characterised by the concentration of many functions limiting the development of agriculture) and marginal areas (having unfavourable natural conditions) [Bański 1999].

A different division of problem areas was made by Kulikowski [1992]. He distinguished two groups: depressed areas: '(...) remain underdeveloped in comparison with other surrounding areas with similar natural and economic conditions of production (...) ' and conflict areas: '(...) characterised by a concentration of many functions (e.g. agriculture, industry, communication, etc.), so the development of one of these functions is often at the expense of others' [Kulikowski 1992].

A review of numerous literature items shows that conflict areas can also be problem areas. According to Bański [1999], conflict situations in space and conflict classifications studied by Kołodziejski [Kołodziejski 1982a, 1982b, 1987; Bański 1999]. In their view, the main reasons for conflicts are: '(...) struggle for access to space, to its values and resources (...) ' waged by entities managing these spaces, which pursue various social and economic goals [Kołodziejski 1982a]. Bański [1999] points out that conflicts are unmeasurable and therefore many authors frame the issue of conflicts subjectively [Bański 1999].

Pursuant to Article 2(7) of the Act of 27 March 2003 on spatial planning and development, a problem area should be understood as: 'An area of specific spatial management phenomenon or spatial conflicts indicated in the spatial development plan of a voivodeship or defined in the study of conditions and directions of the spatial development of a municipality' [Ustawa 2003].

Four important definitions of problem areas should be specified [Bański 1999]:

- A problem area, being a part of geographical space, which is characterised by negative phenomena ‘(...) from the social, economic and technical sphere, which cause certain internal anomalies (in the spatial structure) and abnormality of the area’ [Zagożdżon 1988].
- A problem area are those parts of a voivodeship where: ‘(...) there are problems that are particularly troublesome or difficult to solve’ [Domański 1987].
- An area with low effectiveness of socio-economic and spatial structures, thus requiring special measures to solve the problems from the perspective of planning and regional policy [Ciok 1991].
- A problem area is a spatial unit characterised by an abnormality of one or more elements of space [Bański 1999].

It is noted that problem areas are sometimes referred to as marginal land. It can be assumed that their definitions are similar, but the term marginal land has a longer history and only partially coincides with the features typical for problem areas.

The concept of marginal soils appeared in the interwar period in European countries, i.e.: Germany, Austria and France, where the agricultural economy was mainly based on labour. After estimating the cash outlays on labour and the value of material outlays, it turned out that the costs exceeded the value of the obtained yield. Marginal soils are defined as soils of the lowest fertility, whose exclusion from use does not significantly reduce the agricultural holding profits [Michna and Rokicka 1998].

In Poland, the definition of marginal lands emerged in 1990 after the marketisation of agriculture. Labour and material costs significantly exceeded the value of crop. Therefore, the Agricultural Property Agency of the State Treasury (Agencja Własności Rolnej Skarbu Państwa, AWRSP), which took over the land of State Farms (Państwowe Gospodarstwa Rolne, PGR), separated 57.4 thousand hectares of agriculturally unprofitable soils, naming them marginal land. In 1993, after the assessment of soils belonging to the AWRSP, it was necessary to regulate legal issues related to marginal land. These estimates have led to a conclusion that a significant part of soils is excluded from agriculture and used for non-agricultural purposes. For this reason, there was a need to create procedures and criteria for the designation of land (soils) owned by the AWRSP, and land that did not meet the conditions of profitability of their cultivation under determined conditions [Michna 1998].

The institutions responsible for the methods of agricultural and non-agricultural development of marginal soils were the Ministry of Agriculture and Food Economy (MRiGŻ) and the Institute of Soil Science and Plant Cultivation (IUNG) in Puławy in 1992. The Department of Land Economy and Agricultural Devices of the Ministry of Agriculture specified the issue of marginal soils, defining them as soils still in agricultural use or in the register of agricultural land, which due to unfavourable natural, anthropogenic and economic conditions have relatively low productivity or are not suitable for healthy food production [Józefaciuk et al. 1996]. However, the Institute of Soil Science and Plant Cultivation (IUNG) gives the following definition: ‘Agricultural

marginal land (arable lands and grasslands) are soils remaining in the register of agricultural land, which, due to unfavourable natural features and conditions and the way of its use, are characterised by low productivity and low economic effects despite the application of proper agrotechnics' [Michna1998]. In 1993, the Ministry of Agriculture and Food Economy determined that: 'In the science of agricultural economics and organisation of work, the concept of marginal soils includes these soils on which it is already unprofitable or becomes increasingly unprofitable for agricultural production in its present range or the near future.' The above definition provided a basis for the grant commissioned by the Ministry of Science and Higher Education entitled 'The rationalisation of marginal soils.'

Three agricultural institutions have committed to this project, i.e.: the Institute of Soil Science and Plant Cultivation (IUNG) in Puławy, the Institute for Land Reclamation and Grassland Farming (IMUZ) in Falenty and the Institute of Agriculture and Food Economics (IERiGŻ) in Warsaw.

The purpose of this grant was to define the criteria by which soils with a small impact on farm profits would be designated and excluded from cultivation. In addition, the authors of the study addressed the issue of determining the rational use of these soils in agriculture and beyond. The initiator of the project was the Ministry of Agriculture and Food Economy, and it has established a set of studies for this project.

In 1996 IUNG has set out detailed guidelines that separate marginal soils from agricultural land [Józefaciuk et al. 1996]. According to the established criteria, there are four groups of soil [Kotańska 1999, following Józefaciuk et al. 1996]:

- 1) infertile soil of agricultural land where production is unprofitable due to adverse natural conditions and erosion,
- 2) soil of varying valuation classes, chemically contaminated due to human economic activity,
- 3) damaged or mechanically transformed soil, lacking a fertile layer,
- 4) soil with adverse natural and territorial conditions, i.e. cultivated soils with difficult access routes or difficult mechanical cultivation.

In addition, marginal soils are divided into:

- appropriate – arable, agriculturally unsuitable due to too light granulometric composition, unfavourable location, erosion or pollution,
- alternatively marginal – arable land that with the possibility of conversion to grassland or with the possibility of cultivation in exceptional economic circumstances, taking account of ecological or weather constraints.

The basis for determining soil quality and suitability is to determine the soil's valuation class [Michna 1998]. The uniform soil classification performed across the entire country took into account the physical properties and morphological features of soil, providing descriptive and cartographic material in the form of classification maps made at the scale of a cadastral map [Len 2010, following Rozporządzenie 1956 (Resolution 1956)].

Another meaning of marginal soil can also be found in the subject's literature. It refers to land that has never or rarely been used for agriculture or is not recorded in the agricultural land register but is too unfruitful to be used for agriculture. At the 1992 Earth Summit in Rio de Janeiro, it was suggested that such soils should not be turned into agricultural land, because their incorporation into agriculture will not improve the food balance to any noticeable degree. At the same time, their use for agricultural purposes usually reduces the forest cover of the continents, which increases all kinds of threats to the environment [Michna 1998].

In Poland, the term 'marginal land' was used until Polish accession to the European Union. Since 2004, the definition of problem areas in agriculture has been implemented.

In addition, many developed countries, such as Japan and the European Union (EU), have been struggling for decades with the problems of land unsuitable for agriculture and subsequent abandonment of agricultural land. The method of determining land abandonment is a key problem for government policymakers and scientists [Keenleyside and Tucker 2010, Terres et al. 2013, Renwick et al. 2013, Li and Li 2017, Ustaoglu and Collier 2018, Perpina Castillo et al. 2018, Ito 2019].

This is due to the process of long-term cultivation of agricultural land and its degradation. It is connected to high reconstruction costs, but also has a significant impact on the surrounding ecosystem [Koshida and Katayama 2018]. In addition, agricultural land is an important and indispensable factor in food production. Preventing the formation of land unsuitable for agriculture is an important component of food security [Renwick et al. 2013, MAFF 2021, Zavalloni et al. 2019, Xu et al. 2019].

Over the years, numerous studies have been carried out on the formation of agriculturally unsuitable land and then determining the causes for abandoning agricultural land. Japan is an example, where the problem of abandoned agricultural land is becoming more serious. Several researchers analysed the determinants of abandoning agricultural land [Senda 1998, Senda 2021, Yoshida et al. 2004, Hoi et al. 2004, Takayama and Nakatani 2021, Matsui et al. 2014, Takeyama 2015, Su et al. 2018]. They used data from census surveys conducted by the Ministry of Agriculture, Forestry and Fisheries (MAFF) [MAFF 2015]. However, these data are based on subjective information from the farmers' declarations. Therefore, they may contain measurement errors stemming from subjective judgments and prejudices of the inhabitants of a given area [Krumpal 2013]. In addition to subjective data, field studies are carried out in Japan at the initiative of the agricultural committees (called 'Nougyoiinkai') established in each municipality. The collected information is stored in databases. This type of research, known as 'agricultural land inspection', is regulated by the amended Agricultural Land Act and is carried out at least once a year on all agricultural land [MAFF 2009, National Chamber of Agriculture 2021].

In many countries where agriculture has lost its comparative advantage due to economic development, the increase of abandoned agricultural land has become a serious problem. Japan was one of the first Asian countries where achieved industrialization and accelerated economic development led to an increased alternative cost of agricultural work [Pingali 1997]. However, it was inevitable that it would lose its comparative advantage in agriculture due to the inelastic supply of arable land and

a small area of arable land per farmer, which consequently increased the transaction costs of agricultural land among farmers [Hayami and Ruttan 1970, Otsuka 2013, Otsuka et al. 2016]. In addition, socio-economic factors such as declining and ageing populations have led to a shortage of agricultural labour, which has accelerated the abandonment of agricultural land.

In other developed countries, the phenomenon of the formation of land unsuitable for agriculture, and consequently the abandonment of agricultural land, has become a problem related to food security, among others in the case of crop failure and embargo [Tanaka and Hosoe 2011, Terres et al. 2015]. For this reason, many governments are placing the prevention of this phenomenon as an important political issue [Ohizumi 2010, MAFF 2020]. In addition, the abandonment of agricultural land is accompanied by a loss of multi-functionality in agriculture [MAFF 2021], which is very important in this field of the economy. The increase in the area of land unsuitable for agriculture means a decrease in a significant factor of agricultural production, and the cost of land reclamation is relatively high. This phenomenon, for example in Japan, also has a negative impact on the long-term efforts made by the government to increase food self-sufficiency [MAFF 2020].

More importantly, preventing the abandonment of agricultural land is closely linked to payments for multi-functionality measures (PAEMF), as well as direct payments to farmers in foothills and mountainous areas (DPFHM). Measures are also being taken to compensate for the difference in production costs between plains and foothill or mountainous areas, as well as to support agriculture in disadvantaged areas.

A review paper by Huang et al. [2020] points out that the number of studies on the abandonment of agricultural land has increased over the last decade. For Huang, socio-economic factors are the most important among the causes of abandonment of agricultural land and therefore their research should continue, as they are very important for agriculture.

Terres et al. [Terres et al. 2015] investigated land abandonment in EU countries using large-scale and widely aggregated data. However, they admitted that abandoning agricultural land is a local phenomenon and that local data from individual municipalities are needed for assessing the risk.

Corbelle-Rico et al. [2012] also carried out a causal analysis of the long-term abandonment of agricultural holdings in Spain using categorical data and polynomial logistic models. They concluded that this situation is a complex local phenomenon, which should also be analysed, as this is specified in Terres et al. [2015], based on data obtained in municipalities.

Meanwhile, Shi et al. [Shi et al. 2018] used processed GIS data and multiple regression analysis to examine the factors of abandonment of agricultural land in mountainous areas in China, but these studies did not take into account a sufficient number of socio-economic factors and related policies and therefore are not complete.

Another study, conducted by Takayama and Nakatani [2021] using a rich dataset, included six prefectures in Japan. However, they used a pre-2000 census, with a binary dependent variable indicating whether the community has abandoned arable land.

Now that almost every community has a sizeable area of land unsuitable for agriculture, analyses must focus on the percentage of agricultural land abandoned in the area, instead of applying a simple binary variable.

The review of studies shows that the countries of the Mediterranean also face an alarming growth rate of agriculturally unsuitable land – the marginalisation of arable land because this region is considered a critical hotspot for the phenomenon of desertification of land, which is associated with climate change in Europe [Briassoulis 2011, Salvati et al. 2016, Karamesouti et al. 2018]. Greece is also struggling with the problem of increased desertification, and its islands are listed as areas with a high risk of desertification due to intense relief and low plant cover [Karamesouti et al. 2015].

Another problem, also among the many Mediterranean or Aegean islands, is the terrain specificity and the slope. Therefore, a cultivation plan should be adapted to the area concerned based on its specificities. Therefore, knowing the soil profile, including the condition of nutrients, soil type and organic matter content, is considered crucial in the decision making process on crop selection, and in the management of integrated agricultural systems and natural resources. Geomorphological maps and spatial research are the basis for designing and managing terraces, as well as landscape and threat assessment [Raso et al. 2020]. Additionally, remote sensing techniques (e.g. LiDAR) and the geographical information system (GIS) are implemented in the terraced landscape mapping to assess the instability of slopes [Tarolli et al. 2021]. The spatial mapping of the terraced landscape on the island of Andros is still ongoing, and once completed will provide a useful tool for land management policy. The conducted soil analyses in the sampling areas provided assessments of the condition of the topsoil layer [Paul 2016, Shahbaz et al. 2017]. The results showed, among other things, that winter crops such as cereals and legumes can be grown in a rainfall system, taking full advantage of the annual rainfall distribution on the Andros island during critical stages of crop development. The detailed meteorological data collected by a widespread network of weather stations during the growing seasons (2018–2021) showed a period of high rainfall on the island (from October to early May), followed by a hot and dry period (from June to September). Thanks to this data, it is possible to select appropriate plants for cultivation in any given area.

### 3. Conditions for expanding the land unsuitable for agriculture

With the continuous growth of the Earth's population, maintaining the size and productivity of agricultural land is becoming increasingly important for producing a sufficient amount of food [Mazahreh et al. 2019]. However, serious spatial conflicts on the line of agricultural and non-agricultural land threaten food security and the sustainable development of agriculture in many parts of the world.

Currently, agricultural production is a key factor in global food security, and meeting the challenges of food security in the future will depend on it. This applies to many countries, on all continents, with particular emphasis on African countries, where large quantities of food, such as rice, are imported from other continents.



In addition, on the one hand, a large number of high-quality agricultural land is at risk of being turned into construction sites [Zou et al. 2019], while on the other hand, the development of agriculture has destroyed important ecological elements of space with low suitability for plant production, leading to deforestation, soil erosion and habitat destruction [Akpoti et al. 2019].

Assessment of land suitability for agriculture is urgently needed as a basis for spatial planning and decision-making, to reduce the area of agriculturally unsuitable land [Danvi et al. 2016, Song et al. 2019]. It is important to refer to the assessment of the potentials and objectives of agricultural land restrictions [Maleki et al. 2017].

The problem of land unsuitable for agriculture described in Poland as agricultural problem areas or in other countries abandoned agricultural land, in many areas is not a precedent problem. Poland's accession to the European Union has created a new situation for rural areas [Sobolewska-Mikulska 2009]. Old members of the EU have also experienced similar difficulties at the time of their integration. Countries with mountain soils, such as France, Austria and Italy, have far less fertile soils than the average soils of EU countries. Sweden and Finland, on the other hand, have a problem with the soils that cover northern areas, i.e. limited agricultural production space, short days and low temperatures.

Therefore, among the premises for delimiting problem areas, one can distinguish natural factors, as well as demographic, socio-economic and economic factors.

When discussing natural factors, it should be noted that the diversity of agricultural production potential results from the spatial variability of the natural environment, mainly including soil, water, and climatic conditions.

Poland has favourable conditions due to its terrain. Its area is mostly characterised by flat plains and small hills. However, there is a threat of erosion in Poland, both wind and water erosion of soils. A relatively large variety of natural conditions can be distinguished, which allow for significant diversification of the structure of sowings.

In many countries, these problem areas are expanding due to natural factors, such as:

- a direct risk of flooding,
- a high risk of flooding,
- landslides of varying degrees of intensity,
- a risk of erosion,
- a low land valuation class and a weak agricultural suitability complex.

Moreover, the demand for agricultural products from soils of the V and VI valuation classes is low. Therefore, actions aimed at optimising the use of soils, in particular the weakest soils, are important. There are several directions for such optimization, i.e.:

- the development and implementation of agrotechnical techniques and technologies for increasing soil fertility,
- changing some parts of arable land to grassland (this applies to the weakest soils, which are located, for example, in river valleys, and by changing the water manage-

ment in these valleys, it is possible to water the current arable land so that it can become a grassland),

- searching for plants more suited for cultivation, e.g. on light soils.

It can be concluded that the cultivation of weak arable land in mountains, where heavy rainfall significantly hinders its use, is difficult. There is a need to turn slopes into terraces or to dedicate them, e.g. to ecological uses. This applies especially to several hundred thousand hectares of wetlands. It is extremely urgent to recognise wetlands as agricultural ecological land, which create the so-called ecological balance in agriculture. Also, eroded soils should be converted into agricultural ecological land. Even though numerous mountain slopes and undulating areas are still cultivated, maintaining arable land in these areas is unreasonable due to the significant steepness of slopes. Only planting shrubs and afforestation of these eroding slopes can benefit agriculture [Michna 1998].

Among the socio-economic and socio-demographic limitations, we can distinguish such factors as depopulation and ageing of villages, as well as the lack of young heirs to farms. The development of areas affected by these problems is impeded, and farms are becoming less competitive, thus referred to in the literature as neglected, problem or abandoned areas.

The main factor inhibiting agricultural development in Poland is the impact of the economic recession in agriculture. This results in a decrease in the profitability of agricultural production. In addition, many agricultural areas are slowly absorbed by dynamically growing large cities. This process poses a significant threat to agricultural and forestry complexes, which can be developed through investments. The lack of profitability and possibilities for modernisation and technical restructuring poses another challenge.

The factor that significantly limits agricultural income is the fragmented agrarian structure, i.e. small areas of farms. This problem particularly applies to the south-eastern [Leń 2018, Postek et al. 2019, Wójcik-Lień et al. 2019], central [Wójcik and Leń 2015] and eastern Poland [Król 2014]. Under Polish conditions, the fact of a large dispersion of land, referred to as a burdensome land chessboard, is important. The problem of the soil chessboard in the above-mentioned areas of the country was examined in many scientific publications [Len 2012, Len et al. 2016, Len and Mika 2016a, b, Król and Len 2016, Noga and Król 2016, Stręk et al. 2021]. The structure of fragmented soil is usually accompanied by a defective network of agricultural transport roads, narrow and run-down roads, not adapted to the transport of heavy equipment and the use of agricultural machinery [Radziszewska and Jaroszewicz 2012].

Depopulation has also been observed in rural areas in a very large number of countries. This process was mainly connected to the migration of young people of mobile working age to large urban and industrial centres. As a consequence of this phenomenon, a decrease in the birth rate in rural areas can be observed. The exceptions are municipalities located on light soils, close to industrial centres and relatively close to large concentrations of recreational, sports, tourist and leisure centres. Municipalities

with a high share of the weakest soils, located close to industrial and recreational centres, continue to develop similarly to municipalities on good soils. In these municipalities, areas of fallow land are increasing rapidly. In such situations, agricultural families, finding well-paid non-agricultural work, abandon farming on the weakest land.

#### 4. Methods of developing land unsuitable for agriculture

In the 1990s there was an increase in the intensity of spatial differentiation processes in rural areas, between high and low developed areas [Bański 1999]. The biggest collapse can be seen on land unsuitable for agriculture. They require particular attention from governmental and local authorities at all levels.

In Poland, problem areas were susceptible to various pathological phenomena during the economic restructuring processes and adapting to EU standards. Support for these areas should include foresight analyses and a detailed development strategy, bearing in mind that each area has a unique structure. Attention should be paid to areas with a lower level of development and with a low quality of agricultural production space, as they have no chance of further development. Therefore, other functions should also be promoted in these areas, including: maintaining forestry functions, growing plants for energy purposes, promoting tourism and recreation as well as walking, cycling and equestrian routes, creating ecological areas, terracing slopes, etc.

In the long term, multifunctional development of agriculturally unsuitable land may halt or inhibit negative processes in agriculture.

Therefore, a harmonious combination of agriculture with the promotion of tourism and agritourism is one of the opportunities for rural areas. The income generated by tourism can match or even exceed that generated by agricultural production. Another benefit may be the directing of existing labour surpluses to the broadly understood tourist traffic service.

A vast majority of areas with a lower level of development and low quality of agro-ecological values are characterised by attractive natural environment conditions, conducive to the development of recreation infrastructure. The use of land for non-agricultural and non-forestry purposes may initiate the establishment of holiday cabin settlements, which will encourage the population from urban areas to use this form of recreation [Dudzińska et al. 2014].

In areas of the degraded natural environment, rational agrotechnical measures reducing pollution should be sought. It is important to optimise mineral fertilisation and to supplement it to a greater extent with natural fertilisers. Another procedure that should be introduced is plant cultivation and afforestation of poorer quality soils and buffer strips. It is reasonable to share knowledge with villagers about the role of buffer strips in shaping the agricultural production space [Dudek and Polak 2016].

In areas of ecological threat, it is necessary, among others, to use plants resistant to a given type of pollution, reduce the establishment of fruit plantations in areas of increased emission of dust containing chemical compounds harmful to human health, conduct constant monitoring of pollution.

Terracing has been proven over the years to be the ideal agricultural method for growing crops on sloping terrain [Stanchi et al. 2012]. The construction of artificial terraces on the slopes for cultivation is considered to be the only anthropogenic designed landscape, which has an impact on the modification of the terrain, on all landscape factors in a given area. These measures improve the absorption of rainfall, reduce soil erosion, reduce high temperatures in the summer, but also mitigate the risk of floods and forest fires [Csorba 2021].

The use of terraced landscapes dates back to antiquity and is closely linked to early human settlement and primary human agricultural activities [Pérez Rodríguez 2016, Pietsch and Mabit 2012]. Since then, terraces have been widely used in various landscapes to increase land productivity and to protect the local environment and human infrastructure from strong mass movements and landslides [Kraemer et al. 2016, Brandolini 2017]. Arable terraces are an important element of the Mediterranean agricultural landscape and are used to serve as the main cultivation system supporting primary production on the Aegean archipelago (Greece). It is known that terracing brings many benefits to the ecosystem of services and human well-being, depending on the use of the area and its topography [Liu et al. 2011].

There are many advantages of terraced slopes over non-terraced slopes. They affect erosion control, reduction of water runoff, biomass accumulation, soil water replenishment and nutrient enrichment in soil [Wei et al. 2016]. All these measures are necessary to support the sustainable development of rural agriculture and, more importantly, to reduce the effects of climate change in areas that are not suitable for agriculture.

To turn away from terraces may lead to serious consequences for the environment and cause structural damage due to heavy rainfall, as was the case in the Liguria region (Italy) in 2014 [Giordan et al. 2017]. Studies have shown that the process of soil erosion and degradation is accelerated on terraces left without care and plant protection compared to well-maintained areas [Gardner and Gerrard 2003, Stavi et al. 2018, Ackermann et al. 2019]. Choosing the right materials and construction techniques is fundamental when creating terraces for land conservation [Agnoletti et al. 2019]. These can be terraces made of stones – dry-stone walls on terraced fields that are appropriately chosen for the specificity of the terrain (found, for example, on the Greek island of Andros).

It should be noted that in Poland the future of land unsuitable for agriculture, threatened with degradation, will depend primarily on decisions on spatial planning. Currently, local governments have a significant impact on the management of space. Decisions taken prudently may help to reduce or weaken the process of environmental degradation.

Improving the level of agriculture in the areas concerned can be mainly achieved through:

- the possibility of organic food production – development of organic farming [Kisiel and Grabowska 2014],
- the development of agritourism, thanks to favourable natural conditions (clean environment, large forest area, low level of industrialisation and urbanisation, unique landscape values),

- the relevant area structure of the holdings,
- the opening up to foreign markets,
- the possibility of developing large areas of land for non-agricultural purposes.

## 5. Summary

Global food security is one of the most important issues that humanity must currently face. According to the Organization for Food and Agriculture (FAO), the growing demand for food is likely to increase by 70% by 2050. Sustainable agricultural production is a key factor in maintaining the global balance of food production.

In every agricultural space, it is possible to distinguish land unsuitable for agriculture, with unfavourable natural and soil properties, or resulting from demographic and socio-economic factors. Previously referred to as marginal land, and now as problem areas or abandoned areas require profound changes and structural tools that enable their transformation to obtain the most efficient land resources.

The review of publications on the terminology and characterisation of the discussed soils proves that the concepts are similar but differently understood and defined depending on the discipline. The rationale discussed for expanding problem areas and the prospects for agricultural development in problem or abandoned areas indicate that these issues are important to address at various administrative levels, in many countries around the world.

The direction of changes in their alternative development should be determined if the presented land is to perform intended specific functions. All solutions for the development of these areas should be managed with a necessary consideration of social, economic and environmental aspects.

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