JOURNAL of Horticulture, Forestry and Biotechnology
Volume 29(2), 2025, 180-184
https://jhfb.ro/index.php/jhfb
Print ISSN: 2066-1797
Online ISSN: 3045-1876

Low-productivity forests in Working Unit III Jitin

Georgeta-Cătălina BLAJ[1], Cornelia BUZATU-GOANȚĂ*

[1] University of Life Sciences "King Mihai I" from Timisoara, Faculty of Engineering and Applied Technologies, Department of Forestry, e-mail: blaj_catalina@yahoo.com, cornelia.buzatu_goanta@usvt.ro

*Corresponding author: cornelia.buzatu_goanta@usvt.ro

Manuscript received: 9 July 2025; revised: 16 September 2025; accepted: 23 September 2025

Abstract
Working Unit III Jitin, administrated by Forest District Oravita, Caras Severin Forest Directorate is in The South of the Banat Mountain and occupies the high hilly of Semenic. The most representative unit of relief is the slope. Low-productivity forests occupied 39% of the total area of the working unit. There are low-productivity natural stands, low-productivity modified stands, middle-productivity modified stands and low-productivity artificial stands. The research has focused on low-productivity modified stands and low-productivity artificial stands representing 6.5% of the working unit forest to highlight the potential to increase productivity. The modified stands analyses are forests with a high percentage of European hornbeam and manna ash. The artificial stands are plantations with pine and European beech mixed with species naturally regenerated by seed or sprout like sessile oak, manna ash, silver fir and different hardwood species. There are also black locusts regenerated naturally by sprouting. Of the 259.16 ha of low-productivity stands, 93% are stands located in low-productivity habitats (low-productivity modified stands and low-productivity artificial stands), 7% stands in middle-productivity habitat (low-productivity modified stands – 3% and middle-productivity modified stands-4%).

Keywords: site quality, stand density, natural stand, artificial stand, modified stand

Introduction

Forests provide a range of ecosystem services that bring significant benefits to human society, including timber production and carbon sequestration. At the same time, they support fundamental ecosystem functions that are essential for maintaining the natural balance [5,12]. These services have both direct and indirect effects on human quality of life and well-being, which is why their evaluation and management represent an important element in the sustainable management of forests. Integrating these ecosystem services into forest management strategies offers a valuable tool for protecting and utilizing natural resources [14]. Research focusing on the capacity of forest ecosystems to simultaneously provide multiple functions and ecosystem services has expanded significantly [6,15].

Low-productivity forests, often growing on shallow, skeletal, or eroded soils, represent ecosystems with limited commercial value but high ecological significance. These forest types tend to occur in marginal environments, steep slopes, and edaphically constrained areas where biomass accumulation and timber yield are reduced [3,8,9].

Despite their low productivity, these forests harbor unique biodiversity, play a role in carbon storage, and offer important ecosystem services such as erosion control and habitat connectivity. On the other hand, research shows that forests with low productivity generally harbor lower levels of biodiversity compared to high productivity forests. This is explained by the low availability of resources and by reduced structural heterogeneity factors that limit the size and stability of species populations [4,7,10].

Before 1948, the forest stands of this working unit largely belonged to the former U.D.R. company (Ironworks and Domains of Reșița), but also to some private owners who, in addition to agricultural land, also owned forests. For these forests, a uniform shelterwood system of a 100-year management cycle was applied. The goal was to achieve natural regeneration and to fill in gaps through plantations. The forests that belonged to private domains were generally managed through the coppice system [1,2].

The forests represent a vital natural resource for the region's economy. Low-productivity stands are increasingly common in various forests in this area, and understanding the causes of this decline in productivity is essential in formulating solutions to ensure proper forest resource management. At the same time, such an approach contributes to the implementation of sustainable forestry management, which respects both ecological and economic principles of forest use.

Print ISSN: 2066-1797
Online ISSN: 3045-1876

The importance of this topic is becoming increasingly evident in the current context, where climate change and human pressure on forest land are generating negative effects on the quality of the stands and, implicitly, on their productivity. On the other hand, the efficient management of low-productivity stands can significantly contribute to biodiversity conservation and to reducing soil degradation risks, such as erosion.

Research has been conducted in low-productivity stands from U.P. III Jitin, managed by the Oravița Forest District, under the Caraș-Severin Forest Directorate. The area occupied by low-productivity and temporary stands is 1,442.06 hectares, representing 36% of the forest fund. Among these, the largest share is held by naturally fundamental stands with low productivity (82%), the rest being fully derived stands of medium (1%) and low (9%) productivity, as well as artificial stands with low productivity (8%).

Material and Method

Working Unit III Jitin is situated in the southern sector of the Banat Mountains, encompassing the high hill region of the Semenic area, located south of the Caraș River [1]

From a phytoclimatic standpoint, the forest stands within this working unit are distributed across the following vegetation zones: the Hilly Oak Belt (comprising sessile oak, Turkey oak, Hungarian oak, and their mixtures) and, the Hilly Belt of Sessileoak, beech, and mixed Sesille oak–beech stands, as well as the Montane–Premontane Beech Belt, which together occupy a surface area of 423.53 hectares.

The predominant geomorphological feature is the hillside. Altitudinally, the working unit ranges between 120 and 850 meters above sea level, with an average elevation between 201 and 400 meters. The climate is temperate continental with distinct Mediterranean influences, characterized by a humid regime, frequent cloud cover, and substantial precipitation.

The mean annual temperature varies with elevation and falls within the range of 6°C to 8°C.

57% of the total area consists of medium site-quality, while the remaining 43% consists of lower site-quality

Low-productivity forest stands cover a total of 1,442.06 hectares, representing 39% of the overall forest area. The forest stands analysed in this study are modified stands (145.49 ha) and low-productivity artificial stands (113.67 ha). All of these represent 46 subcompariment covering an area of 259.16 ha.

The necessary data for the study were taken from the Forest Management Plan of Working Unit III Jitin and verified in the field. The data were processed and synthesized in graphical format using bar charts. This process helped to outline a clear picture of the low-productivity stands in the area studied.

Results and Discussion

The low-productivity modified stands analyzed in this study are characterized by a significant presence of hornbeam (Carpinus betulus L.) and manna ash (Fraxinus ornus L.).

The artificially established low-productivity stands consist primarily of pine (Pinus spp.) and beech (Fagus sylvatica L.) plantations, mixed with small proportions of Turkey oak (Quercus cerris L.), manna ash (Fraxinus ornus L.), fir (Abies alba Mill), and various hardwood species originating from seed or sprout regeneration.

Among the low-productivity stands, 93% are located on inherently low-productivity sites (poor soils, unfavorable topography) and 7% are situated on medium-productivity habitats, which suggests potential for rehabilitation (Figure 1)

Seven forest site were identified: 6 forest site located in low site productivity (5112 – Hilly sessile oak forests, rocky terrain and excessive erosion; 5121 – Hilly sessile oak forests, rendzic soil, low edaphic volume; 5131 – Hilly sessile oak forests, podzolic soil, low edaphic volume, with Cytisus – Genista; 5221 – Hilly beech forests, rendzic soil, low and very low edaphic volume; 5231 – Hilly beech forests, various podzolic soils, low edaphic volume, with Vaccinium and Luzula; 6131 – Hilly mixed oak forests (sessile oak, Turkey oak, Hungarian oak), podzolic soil, medium edaphic volume, with acidophilic mesoxerophytic species) and one located in medium site productivity (5132 – Hilly sessile oak forests podzolic and argillic-podzolic soils, with mesophytic flora dominated by grasses).

According to the data above, forest site type 5221 – “Hilly beech forests, rendzic soil, low and very low edaphic volume” holds the largest area of land covered with modified and artificially regenerated stands of low productivity, totaling 97.41 hectares (38%). This indicates a significant influence of rendzic soil on the development of forest vegetation. The reduced fertility and limited water retention capacity lead to slow stand development, making natural regeneration difficult. In this situation, it is recommended to introduce black pine in a mixture with maple, linden, and manna ash up to 40–50% [1]

JOURNAL of Horticulture, Forestry and Biotechnology
Volume 29(2), 2025, 180-184
https://jhfb.ro/index.php/jhfb
Print ISSN: 2066-1797
Online ISSN: 3045-1876

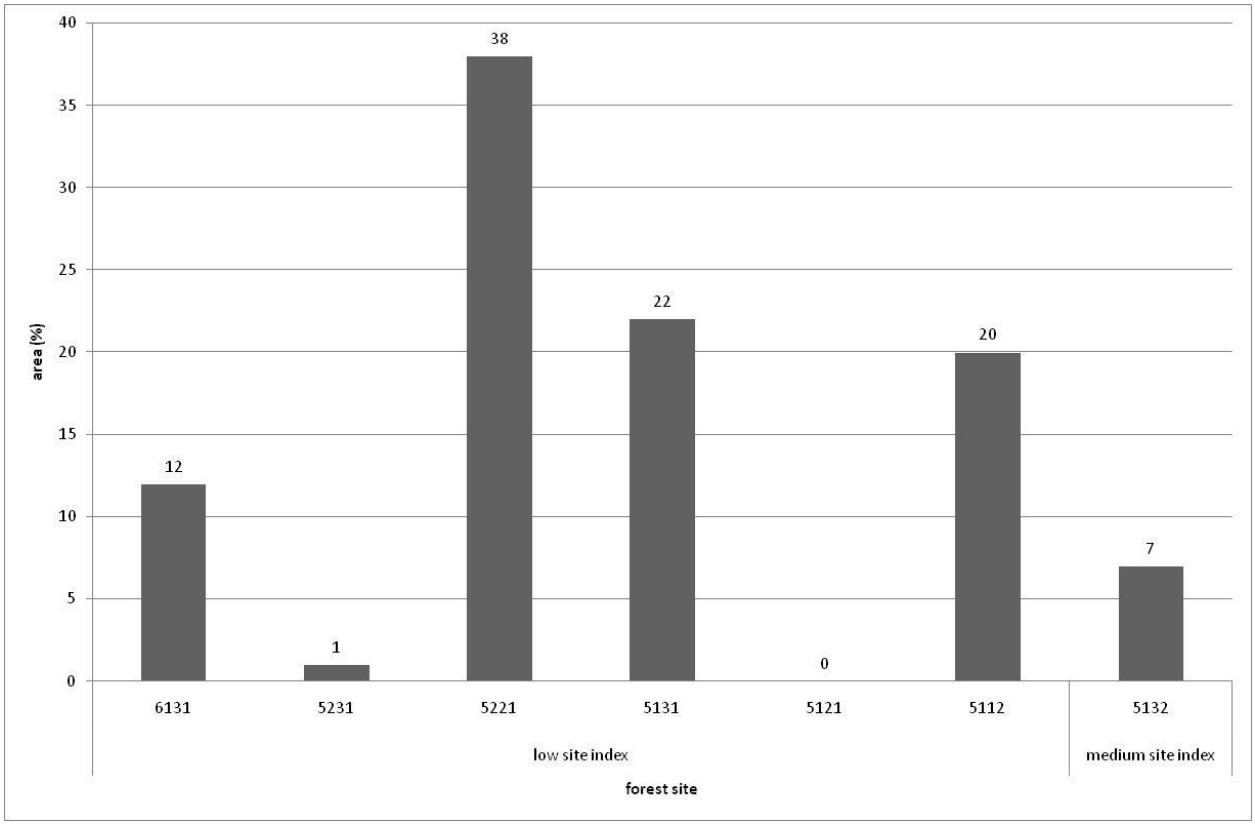

Figure 1. Forest site productivity

An area of 55.87 hectares (22%) is represented by stands located in forest site type 5131 – “Hilly sessile oak forests, podzolic soil, low edaphic volume, with Cytisus – Genista” where forest species show slow growth and poorly diversified structure due to low fertility, difficulties in root development, and the presence of invasive shrubs that hinder natural regeneration. It is recommended to introduce Scots pine in a mixture up to 50% as a main species alongside sessile oak, with careful regeneration cuttings adapted to the requirements of oak seedlings [1,11].

Another forest site type typical for low-productivity stands is 5112 – “Hilly sessile oak forests, rocky terrain and excessive erosion” covering an area of 51.38 hectares (20%), where the forest composition is poor, with small-sized and slow-growing trees.

According to the stand structure and composition (Figure 2), there are differences between modified forest stands and artificial ones. Modified forest stands are predominantly composed of species such as European hornbeam and manna ash. Such species, while naturally occurring, are indicative of forest degradation and often dominate after overexploitation or mismanagement. The artificial stands consist primarily of planted pine and European beech, interspersed with naturally regenerated species such as sessile oak, manna ash, silver fir, various native hardwoods, and black locust, typically regenerated by sprouting.

The findings highlight the need for targeted silvicultural interventions in low-productivity forest stands. For modified stands dominated by pioneer species, enrichment planting or selective thinning could shift the composition towards more productive, ecologically valuable species. Artificial stands present mixed opportunities—some areas may benefit from underplanting and soil amendment, while others may require complete reforestation due to poor survival rates or species mismatches.

JOURNAL of Horticulture, Forestry and Biotechnology
Volume 29(2), 2025, 180-184
https://jhfb.ro/index.php/jhfb
Print ISSN: 2066-1797
Online ISSN: 3045-1876

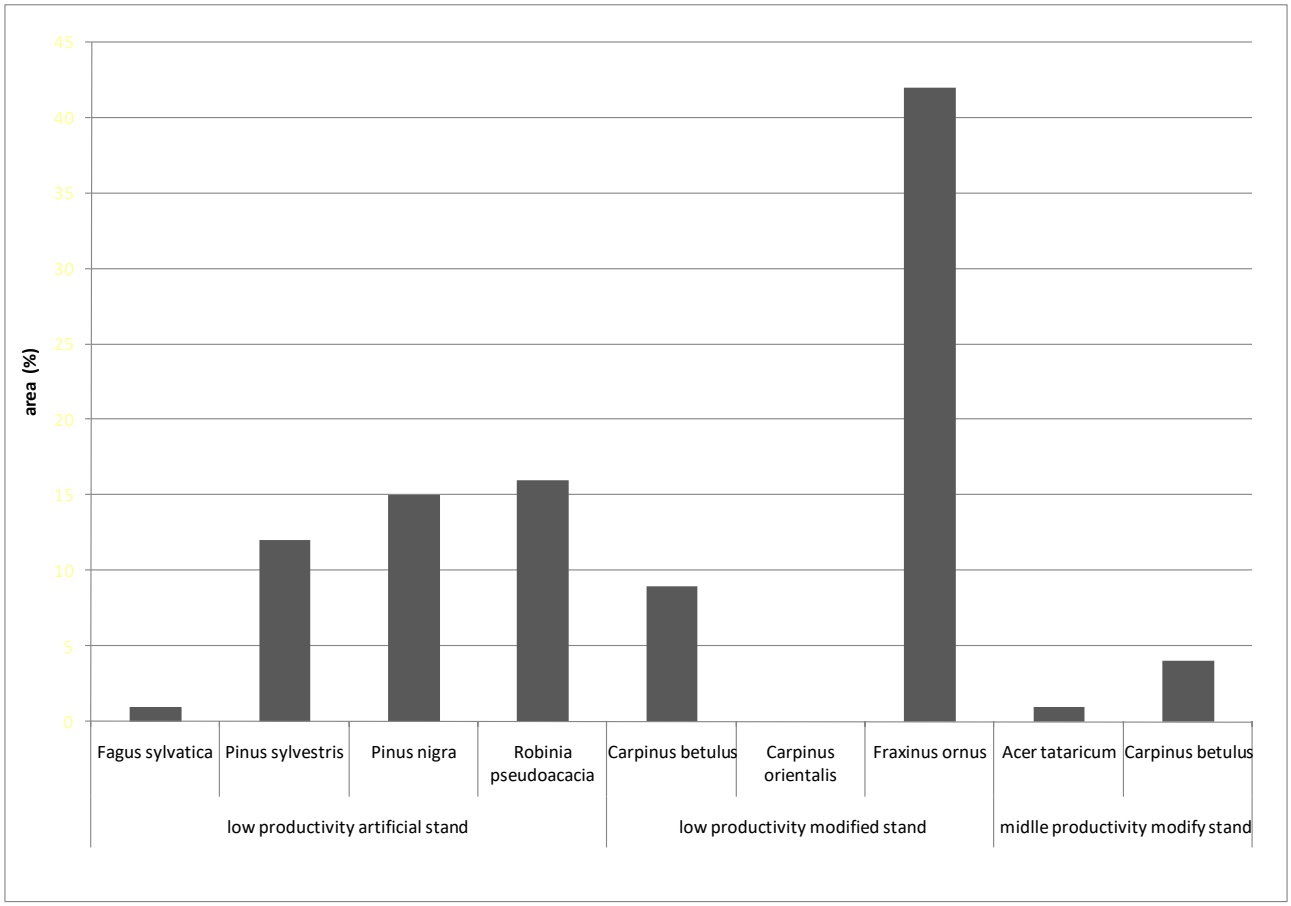

Figure 2. The current character of the forest stand and the species with the highest proportion in the stand composition

Conclusions

Low-productivity forest stands in Working Unit III, Jitin demonstrates a complex interplay between site quality, species composition, and historical management. Focused interventions in modified and artificial stands can yield significant improvements in forest productivity, particularly on middle-productivity sites.

Low-productivity forests are shaped by edaphic stressors, low edaphic volume, poor fertility, and erosion, and are dominated by vegetation types adapted to harsh substrate conditions rather than optimal growth.

Despite their limited timber output, these ecosystems provide important services, biodiversity, slope stability, and carbon storage.

Low-productive stands elevate multiple problems related to the way in which limiting factors influence their development. The influence of soil, species choice, and the impact of modified forests constitute future research directions.

References

[1] Anonymous (2018 a), *Amenajamentul silvic al Unității de Producție III Jitin, Ocolul Silvic Oravița*. p.455
[2] Anonymous (2018 b), *Studiul General al Ocolului Silvic Oravița*. p.262
[3] Bontemps, J.D., & Bouriaud, O. (2014), *Predictive approaches to forest site productivity: recent trends, challenges and future perspectives.* Forestry: An International Journal of Forest Research, 87(1), pp. 109–128.
[4] Chase, J. (2010), *Stochastic community assembly causes higher biodiversity in more productive environments*. Science (New York, N.Y.). 328, pp. 1388-91
[5] Duncker, P., Raulund-Rasmussen, K., Gundersen, P., Katzensteiner, K., Jong, J., Ravn, H., Smith, M., Eckmüllner, & O. Spiecker, H. (2012), *How Forest Management affects Ecosystem Services, including Timber Production and Economic Return: Synergies and Trade-Offs*. Ecology and Society. 17(4): 50.

[6] Gamfeldt, L., Snall, t., Bagchi, R., Jonsson, M., Gustafsson, L., Kjellander, P., & Bengtsson, J. (2013). *Higher levels of multiple ecosystem services are found in forests with more tree species.* Nature Communications, 4: 1340
[7] Hämäläinen, A., Strengbom, J., & Ranius, T. (2019), *Low-productivity boreal forests have high conservation value for lichens*. Journal of Applied Ecology. 57, pp.43-54.
[8] Hernea, C, (2009). *Afforestation*. Ed Eurobit, Timisoara p. 105
[9] Larson, A. J., Lutz, J. A., Gersonde, R. F., Franklin, J. F., & Hietpas, F. F. (2008). *Potential site productivity influences the rate of forest structural development*. Ecological Applications, *18*(4), pp. 899-910.
[10] Liang, J., Crowther, T. W., Picard, N., Wiser, S., Zhou, M., Alberti, G., Schulze, E. D., McGuire, A. D., Bozzato, F., Pretzsch, H., de-Miguel, S., Paquette, A., Hérault, B., Scherer-Lorenzen, M., Barrett, C. B., Glick, H. B., Hengeveld, G. M., Nabuurs, G. J., Pfautsch, S., Viana, H., … Reich, P. B. (2016). *Positive biodiversity-productivity relationship predominant in global forests.* Science (New York, N.Y.), 354(6309), aaf8957.
[11] MMAP, (2022), *Ghidul de bune practici privind compoziții, scheme și tehnologii de regenerare a pădurilor și de împădurire a terenurilor degradate, din 28.09.2022*.
[12] Nolander, C., & Lundmark, R. (2024). *A Review of Forest Ecosystem Services and Their Spatial Value Characteristics*. Forests, 15(6), pp. 919.
[13] Skovsgaard, J. A., & Vanclay, J. K. (2008), *Forest site productivity: a review of the evolution of dendrometric concepts for even-aged stands*. Forestry, 81(1), pp. 13-31.
[14] Verkerk, P. J., Mavsar, R., Giergiczny, M., Lindner, M., Edwards, D., & Schelhaas, M. J. (2014). *Assessing impacts of intensified biomass production and biodiversity protection on ecosystem services provided by European forests*. Ecosystem Services Elsevier, vol. 9(C), pp. 155-165.
[15] van der Plas, F., Manning, P., Soliveres, S., Allan, E., Scherer-Lorenzen, M., Verheyen, K., … Fischer, M. (2016). *Biotic homogenization can decrease landscape-scale forest multifunctionality*. Proceedings of the National Academy of Sciences of the United States of America, 113(13), pp. 3557-3562.