

Policy brief

Exploring the potential of shiitake mushroom cultivation in Finnish forests

Is there potential for shiitake cultivation in Finnish forests?

What is the sustainability performance of shiitake cultivation in forest?

Project name:
Leverage points for organic and sustainable food systems (FOODLEVERS)

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Summary

Finland's forests offer an opportunity for eco-friendly food production, including the cultivation of shiitake mushrooms (*Lentinula edodes*), a high-value mushroom. This study assesses the sustainability performance of growing shiitake mushrooms in Finnish forests using birch, alder, aspen, and oak logs.

The farm produced 79 kg of shiitake mushrooms annually in a forest area of about 1200 m², which would be equivalent to about 658 kg/ha per year. Sustainability performance was good in most dimensions of sustainability. At the whole farm level, sustainability scores were high in areas like landscape diversity, soil and fertilizer management. The scores for “energy and carbon”, “food security”, agricultural system diversity” and “social capital” were still good but here small improvements could be considered to improve the system even further.

Shiitake cultivation presents an interesting opportunity for sustainable forest use in Finland. By diversifying income sources for forest owners, enhancing biodiversity, and by the creation of local value chains, shiitake farming can become an interesting source of side-income for farmers and forest owners. Training, education, technical assistance, and research will be essential to realizing this potential.



Photo 1. Shiitake cultivation on a forest slope in southern Finland. Photo Michael den Herder

Finland's vast forest resources are a significant opportunity for eco-friendly food production

Introduction

Finland's vast forest resources, covering approximately 75% of the country's land area, represent a significant opportunity for enhancing sustainable land use practices. Among these is the cultivation of shiitake mushrooms (*Lentinula edodes*), a high-value mushroom with global demand. This brief explores the viability of integrating shiitake mushroom cultivation into Finnish forests, contributing to biodiversity, rural economic development, and sustainable forest management.

Shiitake mushrooms thrive in temperate climates and require decomposing wood. Forests in southern Finland, provide a suitable environment for this type of cultivation, particularly with birch, alder or aspen logs, which are abundant in the country's mixed-forest ecosystems. Although less common, oak logs are also suitable as a growing substrate.

Cultivating mushrooms in forests can be an eco-friendly and efficient way of food production. Instead of producing only wood, the forest is now also used to produce a food crop. In addition, mushroom cultivation can be a source of additional income for interested forest owners.

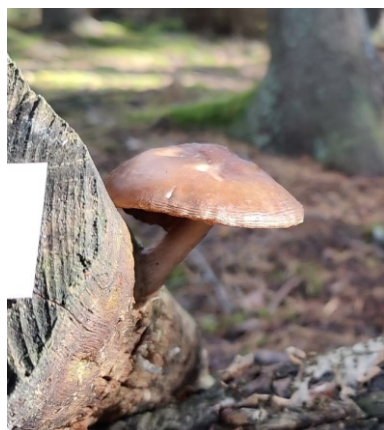


Photo 2. Shiitake mushroom growing on an oak log. Photo Michael den Herder.

Key points

Shiitake cultivation aligns well with circular economy principles, utilizing forest by-products (such as small-diameter birch logs from forest thinning) for sustainable agricultural production.

Shiitake cultivation in forests aligns with Finland's climate and biodiversity goals. The cultivation process has a low environmental impact, requiring minimal external inputs. By maintaining forest cover and utilizing deadwood, it contributes to carbon sequestration while preserving the ecosystem's natural functions.

As a relatively low-tech agricultural practice, shiitake cultivation provides opportunities for local entrepreneurship and skill-building in forest management and sustainable agriculture.

Assessing the sustainability performance of shiitake cultivation in forests

Methods

In this study, we analysed the sustainability impacts of shiitake cultivation in forests. For the assessment, we used an existing sustainability assessment tool, the Public Goods Tool (Gerrard et al. 2012).

The tool allowed us to assess various aspects of sustainability and identify key practices and system characteristics that affect performance from multiple perspectives of resource efficiency such as environment, economy, social and governance.

Results, implications of the results and conclusions

Reliance on external inputs (water, electricity, fertiliser) is low, resulting in a low environmental impact

The annual yield of shiitake mushroom varied between 60 and 103 kg and was on average about 79 kg per year. This yield was achieved on a relatively small cultivation area in a mixed forest of about 1200 m², which means an average yield of about 658 kg/ha/yr. Inputs include small-diameter tree logs (with a diameter of about 10 cm, about 2.5 m³ per year), water from the own well, and purchased organic shiitake substrate.

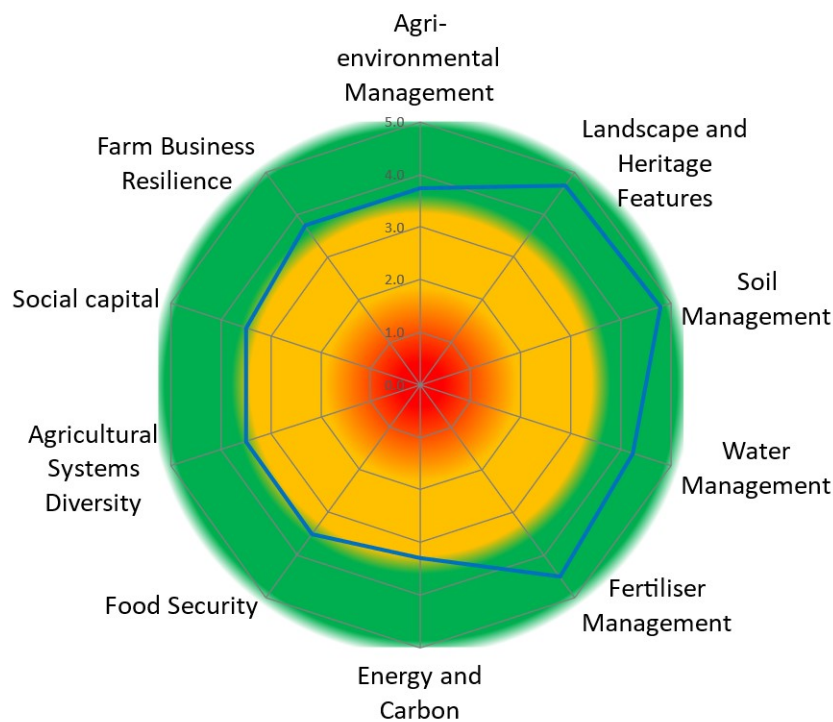


Figure 1. Overview Public Goods Tools scores for the Finnish case study on shiitake cultivation in forests

The results of the ecosystem service evaluation provide information on the sustainability performance of the Finnish case study farm practicing shiitake cultivation in forests. Overall, the performance of the farm was good (>3.5 out of 5) in most of the sustainability dimensions (Fig. 1). The highest scores were for “landscape and heritage”, “soil management” and “fertilizer management” reflecting that the landscape of the farm is diverse, and that soil and fertilizer management is important to the farmer. A lower scoring category was “energy and carbon” followed by “food security”, “agricultural systems diversity” and “social capital” although the performance above average. Reliance on external inputs (water, electricity, fertiliser) is low, resulting in a low environmental impact. Almost no electricity is needed for the cultivation of shiitake mushrooms in the forests. In addition, forest cultivation reduced the reliance on water, as forests create the appropriate microclimatic conditions for mushroom cultivation.

Challenges

Need to develop technical know-how

Although the environmental conditions in southern Finland are suitable, there are challenges to shiitake mushroom cultivation.

- Cultivation of shiitake in Finnish forest is still very new and quite rare. Most farmers and forest owners are unfamiliar with this. There is a need for education and training for farmers and forest owners to develop the technical know-how required for successful mushroom cultivation.
- Most Finnish families are familiar with Finnish mushroom species and many families collect mushrooms themselves. Shiitake mushrooms are however relatively unknown and are not yet part of the Finnish dining culture. There are however opportunities for shiitake in local or more specialized restaurants, local markets but also local supermarkets.

Recommendations

Opportunities for short-value chains and integration in sustainable forest management

- **Training and Education Programs:** Develop training programs for local farmers and foresters to build expertise in mushroom cultivation. These programs should focus on the practicalities of cultivating shiitake mushrooms in Finnish forests and highlight the potential economic and environmental benefits.
- **Research and Pilot Projects:** Initiate pilot projects to test the viability of shiitake cultivation in different regions of Finland. Shiitake cultivation has been tested in southern Finland but from more northern areas there is no information. These projects should focus on the economic and ecological outcomes of integrating mushroom cultivation in forests.
- **Technical assistance** would be needed to shiitake producers seeking organic certification, helping them to enter the organic market. Extension services can provide training on how to adapt shiitake farming methods to organic standards.
- **Market Development:** Invest in market development initiatives, including local marketing campaigns for Finnish-grown shiitake mushrooms. Creating direct-to-consumer markets and establishing partnerships with Finnish supermarkets or restaurants could stimulate demand.
- **Sustainable Forest Management Integration:** Encourage the integration of mushroom cultivation into Finland's national forest management plans. This would promote the use of non-wood forest products and foster biodiversity through diversified forest utilization.

Further reading

Gerrard CL, Smith LG, Pearce B, Padel S, Hitchings R, Measures M, Cooper N (2012) Public Goods and Farming. Farming for Food and Water Security. In: Lichtfouse E (ed) Farming for Food and Water Security. Sustainable Agriculture Reviews, vol 10. Springer, the Netherlands, pp 1-22.

den Herder M, Westaway S, et al. 2024. Report on Ecosystem Services. Deliverable 2.1 report of FOODLEVERS project, available online at: <https://www.foodlevers.org/materials-results>

den Herder M, Westaway S, et al. (submitted). Evaluating the sustainability and leverage potential of innovative organic systems.

FOODLEVERS project website: www.foodlevers.org

Video on shiitake cultivation in forests in Finland, available online: <https://youtu.be/NciHqUXBhIQ?si=AmWCfHtQUS64Dk9k>