

Impact of Invasive/Alien Plant Species on Biodiversity in Rice Fields: A Case Study from Northwestern Italy's Western Po Plain[1]

Overview:

This document explores how **alien plant species are affecting rice crops** in the Western Po Plain of Northwestern Italy, particularly in the **Vercelli and Novara districts**. The study looks at how these invasive plants have become more common due to changing farming practices and examines their impact on the biodiversity of rice fields, both in conventional and organic farming systems. By comparing current data with historical records from the 1950s, the study reveals significant changes in the plant life of rice paddies, highlighting the rise of invasive species and the decline of native biodiversity as a result.

Invasive Species Details And Their Rise:

Invasive species are **non-native** plants that, once introduced to a new area, spread rapidly and can cause significant ecological or economic harm. In this study, several invasive species were identified in rice paddies, with “*Murdannia keisak*” standing out as particularly **aggressive**. This plant has likely spread due to **changes in rice farming techniques**, such as **dry seeding** and the **reduced practice of continuous flooding**, which is used to help keep such species in check. The spread of “*Murdannia keisak*” and other invasive plants has been worsened by these modern farming practices, allowing them to dominate certain rice paddies and outcompete native plants. The sharp increase in alien species from 9.22% in the 1950s to 39.47% in the 2022 which is concerning.[1]

Impacts on Biodiversity:

The spread of invasive species has had a significant impact on the biodiversity of rice paddies, leading to several key changes:

1. *Significant Drop in Plant Diversity*: Over the years, the **number of plant species** in rice paddies has **drastically fallen, from 141 in the 1950s to just 38 in 2022**. This decline is mainly due to the dominance of invasive species like “*Murdannia keisak*”, which

outcompetes native plants and thrives in the disturbed soil conditions caused by modern farming methods.[1]

2. *Changes in Farming Practices:* **Modern agricultural techniques have shifted the balance** in favour of **short-lived herbaceous plants** (therophytes) over the more diverse native plants. This change has allowed invasive species to take over, further reducing the variety of plant life in these ecosystems.[1]
3. *Loss of Important Species:* The study also reveals that several species of conservation concern, like “*Isoëtes malinverniana*” and “*Marsilea quadrifolia*”, which were once common, have now become extremely rare or have disappeared entirely. These species have been particularly vulnerable to the spread of invasive plants.[1]
4. *Organic Farming's Double-Edged Sword:* Interestingly, **organic farming tends to support higher overall biodiversity, including a higher proportion of invasive species** compared to conventional farming. This suggests that while organic methods are good for maintaining biodiversity, they may also make ecosystems more susceptible to invasion by non-native species.[1]

Conclusion:

This study highlights how the spread of invasive species has deeply impacted the biodiversity of rice paddies in Northwestern Italy. The dominance of species like “*Murdannia keisak*” has resulted in a worrying decline in native plants and overall biodiversity. Interestingly, while organic farming is often seen as a more sustainable practice, it has, in this case, inadvertently contributed to the problem by creating conditions that favour these invasive species. The key takeaway here is that managing these fields requires a careful balance: we need strategies that not only control the spread of invasive species but also nurture the native plants that are vital to the ecosystem’s health. Moving forward, it's essential to consider the broader landscape and environmental factors that play a role in this delicate balance, ensuring that our conservation efforts are both effective and sustainable.

References (IEEE format)

- [1] I. Vagge and G. Chiaffarelli, "The Alien Plant Species Impact in Rice Crops in Northwestern Italy," *Plants*, vol. 12, no. 10, pp. 2012.1-2012.17, May 2023. doi: 10.3390/plants12102012.