

integrated services at critical farming periods. Supporting services such as seedling cultivation, pest management, drying, storage, and transportation must be organized into a coordinated production chain. This issue is particularly important for small-scale farmers, who often cannot afford independent machinery investment but still require professionalized and standardized services to avoid yield and quality losses (Cai et al., 2024; Zeng et al., 2025).

The greening of rice production adds another layer to this challenge. Green agricultural production does not imply reducing mechanization; instead, it requires more precise and scientifically managed mechanized operations. Studies conducted in southern China demonstrated that agricultural socialized services can improve fertilizer-use efficiency and enhance technical performance among small rice farmers by lowering information barriers and increasing access to specialized agricultural knowledge. Other studies also showed that mechanization contributes not only to labor saving and output growth, but also to improvements in green grain productivity when combined with low-carbon production practices and trans-regional machinery coordination (Ma et al., 2023; Shi et al., 2023; Cai et al., 2024).

Zhejiang Province provides a particularly valuable context for this discussion. In 2024, Zhejiang Province issued policy guidelines encouraging the accelerated construction of modern agricultural service centers, aiming to establish a professionally managed agricultural service network by 2027. The policy emphasized full-process mechanized farming, centralized seedling cultivation, grain drying, digital agriculture, emergency agricultural response systems, and brand-oriented agricultural development as key directions for future modernization. At the local level, Shangyu District has been recognized for four consecutive years as a major grain-producing county in Zhejiang Province. According to the 2024 regional statistical communiqué, the district maintained approximately 483,200 mu of grain-sown area, while local government documents also identified Shangyu as a pilot area for rice machine-transplanting subsidy programs. These policy and production conditions make Shangyu an important case for understanding how regional agricultural service centers translate provincial modernization strategies into practical agricultural operations.

This study therefore focuses on one central question: how does a regional agricultural service center transform full-process mechanization into a practical model for the green and efficient production of high-quality rice? To answer this question, the study takes Mashan Agricultural Service Center as a representative case. The center is not treated as a universally perfect model, but rather as a practical operational example that helps translate abstract agricultural modernization policies into observable field practices. The study links recent research on agricultural mechanization and socialized agricultural services with a traceable local case involving seedling cultivation, mechanized field management, emergency harvesting, grain drying, processing, and rice brand development.

2 Overview of the Study Area and Agricultural Service Center

2.1 Basic situation of rice production in Shangyu District

Shangyu District is located in Shaoxing, in the economically dynamic and agriculturally intensive part of eastern Zhejiang. In such areas, rice production operates at the intersection of two strong forces. On one side, there is pressure from urbanization, labor transfer, and competition for land and labor. On the other, there is strong policy support for grain security, high-standard farmland, higher yields, better quality, and greener production methods. The district's 2024 development statistics reported 483,200 mu of grain-sown area and highlighted Shangyu's role as a grain-producing county, its machine-transplanting subsidy pilot work, and the establishment of large high-yield rice demonstration blocks. These facts suggest that Shangyu is not a marginal rice area, but a place where rice remains an important component of local agriculture and where policy attention to rice production is unusually strong.

Rice production in eastern China is also increasingly quality-oriented. Nationally, rice output growth has depended heavily on yield enhancement, but local consumers and public procurement systems now care not only about quantity, but also about eating quality, uniformity, safety, and market identity. Zhejiang's 2024 provincial notice on leading crop varieties and promoted technologies, together with its long-running "Zhejiang Good Rice"