7.3 Demonstration and promotion of standardized techniques

Demonstration and promotion are necessary because scientific production techniques are often not adopted automatically, even when they outperform traditional practice (Shah et al., 2022). Evidence from fruit systems shows that both traditional and digital agro-technology promotion significantly increase farmer adoption of improved production technologies, and the two modes can complement each other rather than function as substitutes in all cases (Zhang et al., 2024). Systematic service models appear especially effective when they combine training with diagnosis and follow-up support: in apple, a six-in-one model including soil testing, pest and disease diagnosis, course training, meteorological monitoring, on-site guidance, and experimental demonstration raised adoption of integrated management technologies to 84.4% and stabilized yields over time (Duan et al., 2023). These results are directly relevant to fingered citron because standardized propagation and orchard establishment also require coordinated action across soils, weather, plant protection, and management skills.

Field demonstration remains one of the strongest extension tools. In fruit production extension, practical demonstrations were the most preferred communication method for adopting technical knowledge, and training raised impact levels markedly while full adoption varied by practice. Frontline demonstrations in banana increased yield by 30.77% and improved gross return, net return, and benefit-cost ratio relative to farmer practice, showing that on-farm demonstration can accelerate both adoption and economic gains (Desai et al., 2025). In citrus-specific training systems, each additional training event increased the probability of adopting multiple green production technologies, and enterprise-led training showed the strongest promotion effect, although a diversified extension system remained the recommended model. Certified seedling distribution programs likewise show the value of pairing material supply with farmer empowerment, because seedling mortality remained relatively low at 12%, but continued constraints in water availability, weather forecasting, and grower support limited outcomes (Mufidah et al., 2021).

8 Summary and Future Prospects

The future high-quality fingered citron seedling system should shift from experience-based nursery work to whole-process quality control built around crop plans, standard operating procedures, verified mother stock, propagation-material sanitation, nursery environment management, and final seedling grading. Citrus rootstock studies show that seed quality, pretreatment, substrate, nutrition, container type, and transplant timing can all influence nursery performance, but these results should be used as comparative references rather than direct production parameters for fingered citron. For fingered citron itself, the priority is to establish a traceable mother-stock system, optimize cutting and grafting protocols with local material, strengthen root-system and health assessment, and reject substandard seedlings before orchard use. Future work should therefore focus on developing fingered citron-specific technical thresholds for propagation success, seedling vigor, root quality, and field readiness, so that nursery standards are based on its own biological characteristics and production performance.

Standardized orchard establishment for fingered citron should be optimized around site-specific suitability and the coordination between seedling quality and field conditions. Citrus research demonstrates that rootstock choice, rootstock-scion compatibility, soil condition, drainage, irrigation, canopy vigor, and planting density can interact strongly with orchard performance. These findings provide a useful framework, but exact rootstock combinations, spacing values, irrigation schedules, and disease-management measures should not be transferred directly from sweet orange, mandarin, grapefruit, or other citrus crops to fingered citron. Fingered citron orchard standards should therefore emphasize verified healthy seedlings, suitable sites, sound drainage and irrigation infrastructure, careful transplant handling, root-system integrity, and density matched to local tree vigor and management capacity. Long-term field validation across major production regions is needed to convert these general citrus principles into fingered citron-specific orchard-establishment parameters.

The future industrialization of fingered citron should emphasize standardized production bases, technical training, and integrated service systems so that nursery quality can be translated into stable orchard performance. Extension studies in fruit and citrus production show that field demonstration, repeated training, digital and traditional