

literature, followed by a healing and acclimatization period before transplanting into the protected structure (Sabatino et al., 2022). High graft success is repeatedly reported when compatible rootstocks are used, including complete success in some interspecific and wild-rootstock combinations, which supports the feasibility of protected-cultivation trials at commercial scale. Treatment structures also increasingly include integrated inputs intended to test sustainability rather than grafting alone. Recent greenhouse studies combined grafting with arbuscular mycorrhiza, microbial or seaweed-derived biostimulants, or vermicompost so that performance could be evaluated under a broader low-input management framework. This broader design logic is useful for protected cultivation, where growers are interested not only in absolute yield but also in nutrient use efficiency, reduced disease risk, and improved return on intensive infrastructure and input costs (Figure 2) (Sabatino et al., 2022).

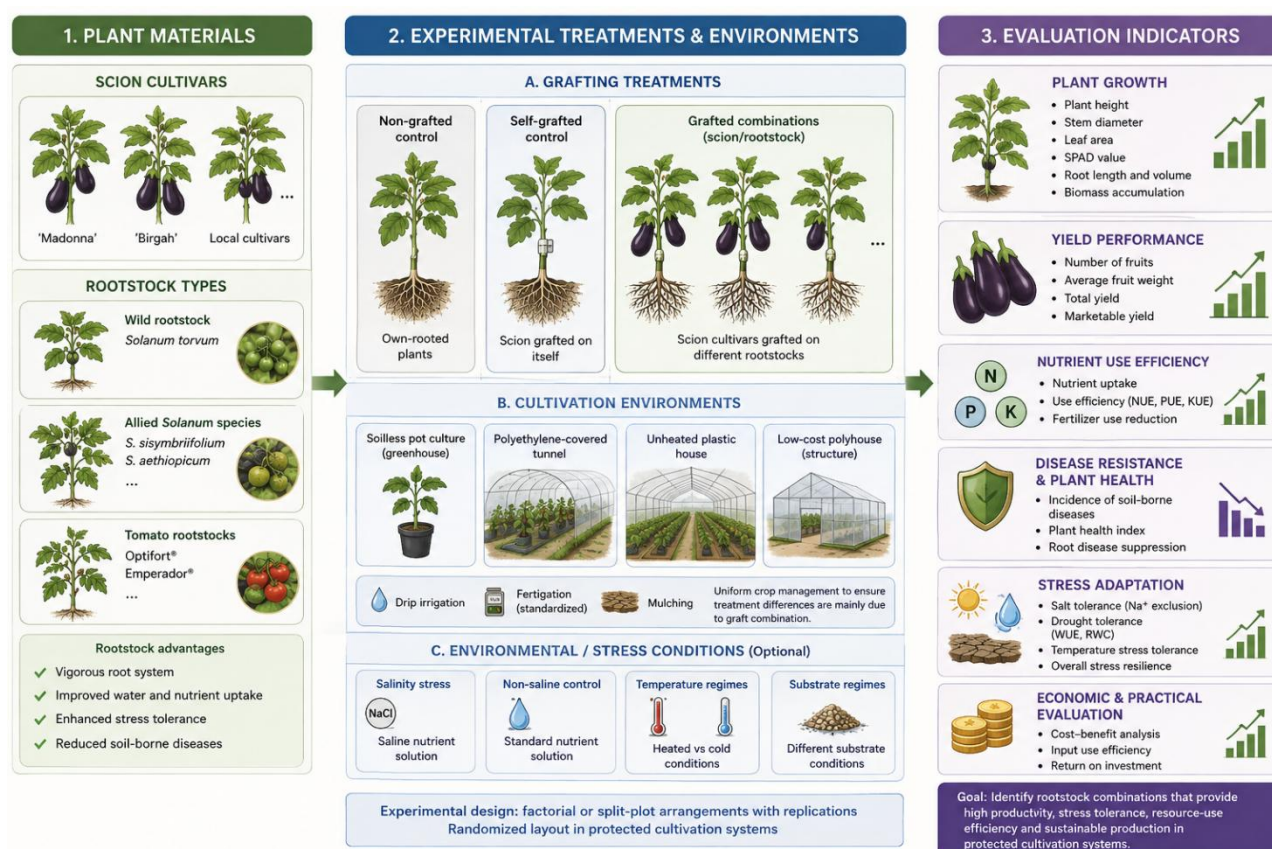


Figure 2 Experimental framework commonly used in protected-cultivation studies evaluating eggplant grafting performance

6.2 Effects of different grafting treatments on growth and physiological traits

Across protected systems, different grafting treatments produce clear differences in vegetative growth and physiological status. In greenhouse eggplant, grafted plants commonly show larger stem diameter, higher SPAD values, and greater general vigor than self-rooted controls, and these responses are strongest with vigorous *Solanum* rootstocks such as *S. torvum* or selected wild eggplant materials (Sabatino et al., 2022). In seedling and early growth analyses, rootstock effects also extend belowground, with *Solanum* rootstocks tending to produce larger root volume and wider xylem development, traits that are associated with stronger subsequent growth and better crop performance. Physiological improvement under protected cultivation is closely tied to rootstock-mediated uptake and transport processes. Stronger roots improve water and nutrient acquisition and help maintain chlorophyll status and photosynthetic efficiency, which explains why grafted plants often outperform non-grafted plants even when greenhouse management is otherwise optimized (Kappel et al., 2024). Under salinity in protected soilless culture, grafted plants maintained higher photosynthetic pigment concentrations and chlorophyll fluorescence while retaining more Na⁺ in roots than in shoots or fruits, indicating that ion partitioning is a major mechanism of physiological protection (Mozafarian et al., 2023).