tools to reduce human error and improve data credibility. Its significance lies not only in improving internal quality management and rapid responsibility tracing, but also in supporting green certification implementation, enhancing consumer trust, and increasing the market competitiveness of high-quality regional agricultural products. At the industry level, such a system can help transform scattered production records into standardized, shareable, and auditable data assets, support the modernization of chrysanthemum production bases, and provide a reference model for other medicinal and edible agricultural products pursuing green development and digital governance.

2 Overall Framework of the Quality Traceability System for Green Production Bases of Hangzhou White Chrysanthemum

2.1 Principles for constructing the quality traceability system

The overall framework of a quality traceability system for green production bases of Hangzhou White Chrysanthemum should be built around the full-chain objectives of quality assurance, safety control, and provenance reconstruction. Traceability systems are designed to let stakeholders reconstruct the entire flow of activities and transactions related to a product from origin to final sale, while supporting quality control, regulatory compliance, and consumer access to product history. More generally, traceability is now treated as a core mechanism for food quality and safety management and for improving supply-chain performance, transparency, and recall efficiency (Tagarakis et al., 2021). For Hangzhou White Chrysanthemum, this means that the framework should not stop at simple origin labeling, but should connect pre-harvest management in the base with post-harvest circulation data, because sustainability and quality claims increasingly depend on what happens before harvest as much as after it.

In terms of construction principles, the system should follow four basic requirements: clear identification, accurate recording, effective integration, and accessible sharing (Islam and Cullen, 2021). At the technical level, the stored information should be secure, reliable, transparent, and resistant to tampering, while still remaining scalable and adaptable to changing regulatory requirements Research on agri-food traceability further shows that effective systems depend on common standards for data formats, labeling, exchange protocols, and interoperability, especially where many actors must collaborate across organizational boundaries (Moysiadis et al., 2023). Accordingly, the Hangzhou White Chrysanthemum traceability framework should adopt standardized batch coding, unified key data elements, and open interfaces that allow data from production bases, processors, distributors, retailers, and regulators to be linked into one consistent chain (Latino et al., 2022).

2.2 Traceability participants and allocation of responsibilities

The allocation of traceability responsibilities should begin with the identification of traceability information providers at each critical traceability event. Studies of agri-food systems emphasize that information providers must be clearly identified before data collection, that each provider is responsible for the accuracy of the information it enters, and that the required information should be defined as key data elements linked to known physical events in the chain. In the case of Hangzhou White Chrysanthemum, the main participants should include agricultural input suppliers, green production bases, processing enterprises, logistics and distribution organizations, sales terminals, and regulatory or certification bodies, which is consistent with the actor structures proposed in broader agri-food traceability research (Ehsan et al., 2022). Because successful implementation depends on multiple stakeholder perspectives, the framework should assign rights and duties in a way that matches each actor’s operational role and data-generation capacity.

At the production-base stage, growers or base managers should record the source of seedlings and inputs, cultivation plots, irrigation and fertilization measures, pest-control actions, environmental conditions, and harvest information, because pre-harvest activities and sustainability practices are crucial to downstream quality claims (Prashar et al., 2020). This is especially important for Hangzhou White Chrysanthemum, whose quality formation is sensitive to flowering regulation, cultivation measures, water and nutrient management, and harvest-stage decisions (Zhang et al., 2023). Processing organizations should record processing conditions, batch transformation relations, storage, packaging, operators, and finished-product labels. Distribution and sales organizations should