

Full-chain Cost Control of Origin-based Fresh Processing Projects for Chinese Medicinal Materials from the Perspective of Business-finance Integration

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Abstract: Driven by policies for the inheritance and innovative development of traditional Chinese medicine, the value of origin-based fresh processing of Chinese medicinal materials in improving quality and efficiency has become increasingly prominent. At present, fresh processing projects generally suffer from problems such as extensive cost accounting, fragmentation of business and financial data, and the absence of quality cost accounting, making it difficult for cost management to effectively support operational decisions. In view of this, from the perspective of business-finance integration, this paper constructs a closed-loop framework for full-chain cost control featuring “pre-planning – in-process control – post-analysis.” Centering on this framework, implementation pathways are proposed from three dimensions: refinement of the accounting system, integration of data links, and systematization of value management. These include establishing a batch- and process-based activity-based costing system, building a full-chain data traceability mechanism, and constructing a value management system that coordinates quality and cost. This study enriches the application scenarios of management accounting in the field of Chinese medicinal material agriculture, provides theoretical reference and practical guidance for the transformation of origin-based fresh processing projects from extensive operation to refined management, and holds significant practical implications for promoting the standardized and high-quality development of the Chinese medicinal material processing industry.

Keywords: Business-finance Integration; Fresh Processing; Full-chain Cost Control; Activity-based Costing

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1. Introduction

With the gradual implementation of policies and regulations such as the Opinions of the Central Committee of the Communist Party of China and the State Council on Promoting the Inheritance and Innovative Development of Traditional Chinese Medicine and the Good Agricultural Practice for Chinese Medicinal Materials, the quality control of the entire industrial chain of Chinese medicinal materials has been continuously extended to the planting source. Fresh processing refers to the process of directly conducting cleaning, cutting, drying, and other treatments on medicinal materials while they are fresh after harvesting^[1]. Its practical value in reducing circulation losses, retaining active ingredients, and stabilizing raw material quality has gradually gained widespread recognition and application in the industry. Many Chinese herbal decoction piece

enterprises and origin cooperatives have moved the processing stage forward, directly establishing facilities in the fields and creating contiguous fresh processing projects, gradually forming an integrated industrial chain of cultivation, processing, and sales.

Chinese medicinal materials possess the dual attributes of primary agricultural product processing and pharmaceutical raw material production. On the one hand, they face unstable factors such as natural risks in agricultural production, seasonal fluctuations, and the perishability of fresh products; on the other hand, they must meet the strict requirements of pharmaceutical production regarding quality control and batch traceability. The characteristics of origin-based fresh processing projects—including a long full-chain span, high biological activity of fresh materials, and strong inter-process correlation—pose challenges to cost control that far exceed those of ordinary processing and manufacturing industries. At present, cost management in most fresh processing projects remains at a rudimentary stage. The finance department aggregates data at the end of the month and allocates expenses based on output or labor hours, resulting in significant deviations in costing. Business departments primarily focus on quantitative indicators such as output and yield rate, lacking sufficient awareness of the cost drivers behind resource consumption. Budgeting is often disconnected from harvesting and processing activities, failing to provide timely warnings of abnormal losses and efficiency losses during production and operation. The root of these problems lies in the lag in synchronization between the logistics and personnel information generated by business activities and the capital flow information in the financial system. As a result, cost accounting is reduced to a post-event numerical summary and fails to truly fulfill its management function.

Business-finance integration is an important development direction in the field of management accounting in recent years. Its core concept is to extend financial management to front-end business activities, drive cost information with business activities, and then use cost information to guide and optimize business decisions, thereby enabling two-way empowerment of business and finance. This model breaks down the traditional barrier of independent operation between business and financial departments, facilitating their integrated development ^[2]. Introducing this concept into fresh processing projects can connect the entire chain, from cultivation, harvesting, fresh product transportation, cutting and drying, grading and packaging, to sales, clearly defining the cost composition of each link and providing systematic data for cost planning, control, analysis, and evaluation. This enables the transformation of cost control from an extensive mode to a refined mode, ensuring the precision of cost management. To this end, from the perspective of business-finance integration, this paper systematically explores the basic framework and implementation pathways for full-chain cost control of origin-based fresh processing projects of Chinese medicinal materials, with a view to enriching the application research of management accounting in the field of Chinese medicinal agriculture and providing reference for cost reduction and efficiency improvement practices in related enterprises.

2. Cost Structure and Control Difficulties of Origin-based Fresh Processing Projects for Chinese Medicinal Materials Introduction

2.1 Cost Structure

The complete business chain of origin-based fresh processing of Chinese medicinal materials begins with the cultivation of medicinal materials in the field and ends with the delivery of dried products to decoction piece factories, pharmaceutical manufacturers, or medicinal material markets. According to the sequence and internal logic of business flow, the entire chain is divided into five stages, each incurring corresponding cost expenditures that collectively constitute the total project cost.

2.1.1 Cultivation and Field Management Stage

As the starting point of the entire chain, costs are mainly reflected in seedling purchase fees, fertilizer and pesticide inputs, irrigation electricity and water charges, field operation labor costs, and land transfer rents. Some standardized planting bases also involve salaries for technical guidance and quality management personnel. This stage directly determines the initial value and intrinsic quality of fresh medicinal materials. However, because agricultural production is greatly affected by natural factors such as climate, diseases and pests, the relationship between cost input and output is not a simple linear one, and cost fluctuations between different years and different plots are often quite obvious.

2.1.2 Stage Harvesting and Fresh Product Transportation Stage

The harvesting of Chinese medicinal materials is highly labor-intensive, especially for root and rhizome types, where the

degree of mechanization is limited and labor costs account for a large proportion. After harvesting, fresh products have high water content and strong respiration, making them extremely prone to heat generation and mildew, thus imposing strict requirements on timeliness and temperature control. The main costs include harvesting labor, turnover baskets, packaging consumables, pre-cooling energy consumption, and short-distance transportation from the field to the processing plant. Practice shows that this is the first high-risk point for fresh product losses; delayed loading and transportation or inadequate cold chain assurance can significantly increase abnormal losses.

2.1.3 Fresh Processing Stage

The fresh processing stage generally includes operations such as cleaning and impurity removal, washing, cutting and shaping, drying and dehydration, and sorting and grading. It is the core stage with concentrated costs and complex processes. Costs cover direct labor wages, depreciation of cutting and drying equipment, energy power fees such as electricity and natural gas, as well as consumption of auxiliary materials and packaging materials. Among these, energy consumption in the drying process is often a key focus of cost control; in some projects, drying energy consumption can account for more than half of the total processing cost. The cutting loss rate in the cutting process directly affects the finished product yield, serving as a key indicator of processing technology level.

2.1.4 Warehousing and Logistics Stage

Generally, the dried finished products need to be stored under controlled temperature and humidity conditions to prevent moisture regain, insect infestation, and mildew. The costs include warehouse rent or depreciation, energy consumption of dehumidification equipment, in-storage maintenance labor, and expenses for batch quality sampling inspections. The speed of inventory turnover directly affects capital occupation costs and potential impairment risks. Projects with slow turnover typically incur additional maintenance costs and price decline losses.

2.1.5 Sales and After-sales Stage

The main costs involve sample delivery, customer maintenance, return and exchange processing, and litigation compensation costs due to quality issues. Many large downstream pharmaceutical companies have strict quality audit requirements for suppliers, and the project parties also bear relevant audit costs. Although these costs appear at the end of the chain, they directly reflect the ultimate effectiveness of the entire chain's quality management and cost control.

2.2 Control Difficulties

Based on field research of multiple fresh processing projects, current cost control generally faces the following difficulties, which directly constrain further improvement in cost quality and economic benefits.

2.2.1 Overly Extensive Accounting Methods, Insufficient Support for Control Decisions

Most fresh processing projects treat the entire factory or a calendar month as the cost accounting object, allocating indirect costs using a single standard such as output or labor hours, thereby directly smoothing out the real cost differences among different origins, batches, and processes. Moreover, cost reports are generated only at the month-end closing, resulting in severely lagged information that cannot meet the timeliness requirements of fresh processing measured in hours. This traditional accounting model can neither accurately identify cost drivers and cost reduction opportunities nor provide in-process warnings and corrections. Decision-makers cannot obtain a panoramic view of information throughout the business process and can only make decisions based on one-sided, lagging data, resulting in severely insufficient decision support.

2.2.2 Inadequate Integration of Business and Financial Data, Difficult Traceability of Cost Responsibilities

The operation records and material ledgers on the business side and the cost accounting on the financial side belong to two separate systems, and some even still rely on paper-based document circulation. Dynamic information on business activities is difficult to transmit to the financial system in a timely manner. The finance department experiences time lags in obtaining key business data such as fresh product loading quantities, acceptance qualification rates, process loss rates, and inventory turnover days^[3]. When problems such as fresh product deterioration or abnormal decline in yield occur, it is impossible to trace the cost loss back to specific operational steps and responsible subjects, making it difficult to form a closed loop of cost control.

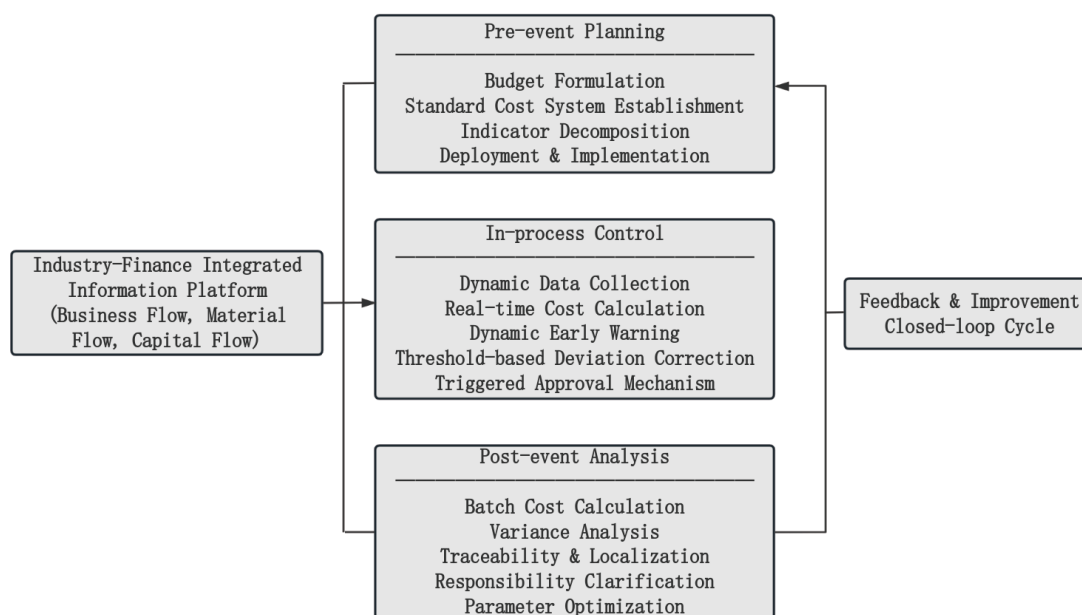
2.2.3 Quality Costs Not Separately Accounted for, Biased Value Orientation

The core value of fresh processing lies in preserving the active ingredients of medicinal materials and enhancing product quality. However, most costs directly related to quality, such as incoming inspection, in-process quality control, finished product testing, rework losses, and downgrade price differences, are not separately collected and accounted for. This makes it impossible to quantify the input-output of quality management. Cost control is not the same as simply cutting expenses^[4]. Under cost pressure, enterprises are prone to fall into the misconception of “emphasizing cost reduction over quality.” Seemingly controlling costs by reducing processing expenses in the short term actually damages product competitiveness and long-term brand value, contradicting the core logic of full-cycle value management in management accounting.

3. Basic Framework for Full-chain Cost Control from the Perspective of Business-finance Integration

Business-finance integration extends beyond simple coordination between operational and financial departments; its fundamental essence lies in an orientation toward enterprise value creation^[5]. Starting from the underlying logic of business-finance integration, the core of full-chain cost control for origin-based fresh processing projects of Chinese medicinal materials lies in promoting the real-time matching and collaborative linkage of three types of information: business flow, material flow, and capital flow. Among them, the business flow serves as the main thread throughout the entire process, completely recording information such as the harvesting time, transportation route, and processing parameters for each batch of fresh products. The material flow corresponds to the physical transfer process, accurately tracking the changes in physical quantities such as the input amount of fresh products, cutting losses in each process, and consumption of auxiliary and packaging materials. The capital flow serves as the value measurement scale, synchronously converting into monetary cost data according to established pricing rules. Once the three types of information are matched and linked in real time, each specific business operation can simultaneously generate accounting records with a clear cost attribution, gradually establishing a closed-loop system of “pre-planning – in-process control – post-analysis” (as shown in Fig. 1), thereby transforming cost control from a lagging, passive static record into real-time, proactive dynamic management.

Figure1: framework for full-chain cost control



3.1 Pre-planning: Promoting the Deep Integration of Standard Costs and Business Plans

budget management can help enterprises plan ahead and plan the use of funds in advance (Wu, 2025). Before the start of each planting season or production cycle, the finance department should intervene in advance in the business process, collaborating with departments such as cultivation, production, and sales to jointly compile a full-chain cost budget. The compilation process should comprehensively refer to historical batch cost data, current process technology standards, energy and labor price expectations, and market sales plans, ultimately forming an actionable standard cost index system covering core data

such as unit output fresh product harvesting cost, standard yield rates for each process, and unit product energy consumption and labor hour quotas. Once established, the standards should be broken down into resource consumption control targets for each team and position, and simultaneously incorporated into the information management system, serving as the benchmark for efficiency evaluation and cost control in subsequent production operations. Through business-finance integration, cost control is embedded throughout the entire design process, achieving an optimal balance between technology and cost (Wu, 2025).

3.2 In-process Control: Real-time Accounting-based Dynamic Warning and Correction

During the operation of harvesting, transportation, processing, warehousing, and other business processes, devices such as scanning terminals, intelligent metering equipment, and environmental sensors deployed at key nodes can automatically collect business data such as labor hour consumption, energy consumption, and input-output for each batch of materials in each process. The back-end financial accounting module synchronously converts the business data into cost amounts according to preset activity-based costing rules. In addition, a dynamic warning mechanism should be established. When indicators such as the cutting loss rate of a single batch or the unit energy consumption for drying deviate from the standard threshold, the system can immediately push warning information to on-site management personnel and financial personnel, urging them to investigate the causes and implement corrective measures. This shifts the intervention point of cost control from post-month analysis to the very moment when deviations occur.

3.3 Post-analysis: Implementing Cost Responsibility Traceability and Management Closure

At the end of each monthly or quarterly cycle, the finance department should prepare a detailed batch cost variance analysis report, comparing the actual cost of each batch with the pre-set standard cost item by item, calculating various differences such as quantity variance and price variance, and tracing the differences back to the specific processes and causes along the entire chain. The causes of differences usually cover multiple aspects, such as increased cleaning labor due to excessive soil moisture during the harvesting period, increased energy consumption in a process due to equipment aging, and labor cost increases caused by fluctuations in temporary worker wages. The analysis results should be used not only for current performance evaluation, clarifying the work effectiveness of each responsible entity, but also to feed the problems and optimization directions back into the next round of pre-planning, to correct standard cost parameters, optimize production processes, and adjust resource allocation plans, thereby promoting continuous improvement in cost management.

4. Implementation Pathways for Full-chain Cost Control from the Perspective of Business-finance Integration

The above basic framework of “pre-planning – in-process control – post-analysis” needs to be translated into actionable practice pathways in combination with the cost control difficulties of origin-based fresh processing of Chinese medicinal materials. In response to the current problems of insufficient accounting refinement, disconnection between business and financial data, and lack of quality cost accounting, progress can be made at three levels: refining the accounting system, integrating data links, and systematizing value management. By embedding the management logic of business-finance integration into the entire fresh processing chain from cultivation, processing, and warehousing to sales, cost control is transformed from a conceptual level into concrete management measures.

4.1 Refining Accounting Granularity and Establishing a Batch- and Process-based Activity-based Costing System

The fresh processing of Chinese medicinal materials has typical multi-step, multi-driver characteristics, making it very suitable for adopting activity-based costing (ABC) to replace the past practice of simple allocation based on output. First, identify and define the main activity centers. According to the process flow of fresh processing, these can generally be divided into cleaning activity center, cutting activity center, drying activity center, sorting and packaging activity center, etc. Second, allocate resource costs to activity centers. Distribute the monthly expenses such as water, electricity, natural gas, labor wages, and equipment depreciation to each activity center according to resource drivers such as meter readings and working hour records. Third, select appropriate cost drivers for each activity center. For example, the cleaning activity uses fresh product weight as the driver, the cutting activity uses the number of cuts or machine runtime as the driver, and the drying activity

uses the amount of evaporated water or steam consumption as the driver. Finally, based on the actual consumption of each activity by different product batches, accurately trace the costs accumulated in the activity centers to each batch of products. In addition, a supporting batch-based dynamic accounting mechanism should be established, completing cost accumulation synchronously based on operational data collected in real time from the business side. This allows the generation of single-batch full cost data without waiting for the month-end closing, providing instant decision support for plantation input-output evaluation and processing scheduling adjustments, thereby overcoming the predicament of lagging cost information and reliance on experience for management decisions.

4.2 Establishing a Data Link between Business and Finance and Building a Full-chain Cost Traceability and Accountability Mechanism

To address the problem of fragmented business and financial data and the difficulty in tracing cost responsibilities, the primary task is to unify the data standards and flow channels of business and finance. The project should build an integrated management information platform, using the batch number as a unique identifier throughout the entire chain. Data such as planting plot codes, harvesting dates and batch numbers, temperature control records of transport vehicles, process parameters of processing equipment, warehouse location information, and shipping details of sales orders are linked together on the same data chain according to chronological order and flow logic. The information platform typically adopts a three-tier architecture: the front-end is aimed at frontline operators, providing data collection operations like code scanning and touch-screen selection to minimize interference with on-site work; the middle tier is the rule engine layer, equipped with cost calculation models, budget standard databases, and warning threshold settings; the back-end is the analysis application layer, providing customized management accounting reports to managers, supporting queries of project costs from any batch, any process, and any cost item. Once a cost anomaly or excessive loss occurs, it can be traced back along the business chain to the specific batch, specific process, and responsible entity, achieving traceable losses, investigable causes, and assignable responsibilities, truly forming a closed-loop management of cost control.

4.3 Separately Listing Quality Cost Categories and Building a Value Management System Coordinating Quality and Cost

In the existing cost accounting system, separately list quality cost categories to independently account for and analyze the inputs and losses related to quality, effectively avoiding the problems of non-separate collection of quality costs and biased value orientation. Quality costs can be divided into three categories: first, prevention costs, covering expenses such as incoming fresh product inspection, in-process quality control, and personnel compliance training; second, appraisal costs, including costs for active ingredient testing of finished products and batch quality sampling inspections; third, failure costs, including rework losses due to substandard quality, downgraded sales price differences, and customer quality compensation. Through separate collection and periodic analysis, the economic benefits of quality management investments can be continuously quantified, visually demonstrating the positive effect of quality improvement on product premium and customer stickiness, thereby avoiding the blind compression of processing inputs that harms the core quality advantage of fresh processing. At the same time, incorporate quality costs into the full-chain assessment system, guiding all business links to maintain the quality baseline of medicinal materials within a controllable cost range, achieving long-term synergy between cost control and product value.

Conclusion

At present, origin-based fresh processing projects for Chinese medicinal materials are in a critical period of transformation from traditional extensive operation to modern refined management. The level of cost control capability directly relates to the profitability and sustainable development potential of these projects. Based on the management perspective of business-finance integration, this paper systematically sorts out the full-chain cost composition and control difficulties of origin-based fresh processing of Chinese medicinal materials, constructs a basic cost control framework of “pre-planning – in-process control – post-analysis,” and proposes implementation pathways from three aspects: accounting refinement, data integration, and value management systematization. This provides theoretical reference and practical direction for improving the quality of cost management in the field of primary processing of Chinese medicinal materials.

At the same time, it should be recognized that this study still has certain application limitations. For example, Chinese medicinal materials are highly diverse in categories with significantly different processing characteristics; the general control framework proposed in this paper needs parameter adjustments based on specific varieties, resulting in insufficient universality. Additionally, the current main operators of origin-based fresh processing are mostly small and medium-sized cooperatives with a weak digital foundation and a shortage of professional management talent, presenting a realistic threshold for the comprehensive promotion of the business-finance integration system.

In the future, with the deep advancement of smart agriculture and the digitalization of the pharmaceutical industry, the cost control of origin-based fresh processing projects for Chinese medicinal materials has ample room for optimization, and business-finance integration will also develop towards deeper digital intelligence. Subsequent research can further explore the deep integration of the cost control system with the full-process quality traceability system for Chinese medicinal materials, link with cultivation, decoction piece enterprises, and pharmaceutical manufacturers to establish a collaborative cost management mechanism, and construct a comprehensive value management tool integrating cost management, quality assurance, and environmental impact assessment. It can also promote the formation of unified fresh processing cost accounting standards and quality cost disclosure norms, guiding the industry from extensive expansion to refined operation, and providing data support for the precise implementation of industrial support policies, ultimately facilitating the standardized and high-quality development of the Chinese medicinal material industry.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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