Construction of Performance Evaluation Index System for Enterprises Implementing Green Food Certification Based on BSC

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Abstract　According to the investigation results of 70 green food enterprises in Sichuan Province, the strategic targets of enterprises implementing green food certification are discussed by borrowing ideas from the Balanced Score Card. Balanced Score Card index system is selected and improved according to the changes of enterprises before and after implementing the green food certification system. Then, the performance evaluation index system of enterprises implementing green food certification is established. This index system has five strategic directions of finance, customer, internal management, social ecology, and learning and growth, and has 11 strategic targets, such as increasing operating profit, expanding market, improving the quality of staff, improving the production technology level, enhancing the core competence of enterprises, ensuring food safety, improving the physical quality of human, and protecting ecological environment. According to the principles of guidance, scientificity, comparability, feasibility, and significance, a total of 24 evaluation indices are established, including the change of product cost, change of product sales revenue, change of profit rate, change of return on investment, change of internal and external lost cost, change of the proportion of certified products in total sales and so on.

Key words　Balanced Score Card(BSC), Green food certification, Evaluation index, China

　　In the aspect of performance evaluation, Balanced Score Card method (BSC) provides a relatively mature evaluation index system based on the evaluation of strategic target, from the four aspects of finance, customer, internal management, and learning and growth, which provides new methods for solving the construction problems in performance evaluation index system of enterprises implementing green food certification. Based on the investigation data of 70 green food production enterprises, we discuss on the strategic targets of enterprises implementing green food certification by borrowing ideas from the Balanced Score Card, and select and improve the Balanced Score Card index system according to the changes of enterprises and the characteristics of green food certification system. Giving attention to both long-term and short-term targets, financial and non-financial indices, lagging and leading indices, and external and internal performance indices, a performance evaluation index system of enterprises implementing green food certification is established from the two dimensions of economy and ecology and the five aspects of finance, customer, internal management, social ecology, and learning and growth.

1　Balanced Score Card

　　Balanced Score Card is put forward by professor Robert Kaplan in Harvard University and the executive officer David Norton in Nolan Norton Institute in the 1990s. Since then, Bal-

anced Score Card has been widely applied in the western business. It has been named the Most Influential Management Concept in the Past 80 Years by *Harvard Business Review*. Taking the strategy and perspective plan of enterprises as a precondition, Balanced Score Card establishes a comprehensive index system including four basic indices (finance, customer, internal management, learning and growth) and several sub-indices[1]. The core of Balanced Score Card is to help enterprises and organizations to implement the strategies and to finally realize the strategic target of organizations.

　　According to the research results of Robert Kaplan and David Norton, strategic Balanced Score Card index system consists of four aspects of finance, customer, internal management, and learning and growth.

1.1　Finance　Generally, finance performance index mainly includes the income increase index, cost reduction or productivity increase index, and asset utilization or investment strategy index. The concrete finance index can be set according to the requirements of enterprises, which usually includes the economic value added, the return on net assets, the asset-liability ratio, the return on investment, the sales profit rate, the sales growth rate, the turnover ratio of receivable accounts, the inventory turnover, the rate of cost reduction, the net operating profit, and the net cash flow.

1.2　Customer　The indices used to evaluate the performance of customers are mainly the market share, the customer retention rate, the obtained rate of customer, the customer satisfactory degree, and the customer's profit.

1.3　Internal Business Process　The performance index of internal management can best show the difference between the

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strategic Balanced Score Card and the financial performance evaluation method, which includes the indices of product-manufacturing period, product quality grade, product design level, process modification ability, new product development capability, utilization rate of production capacity, machinery intact rate, production return rate, equipment utilization rate, safe productivity, product warranty period, and product maintenance days.

1.4 Learning and Growth The strategic Balanced Score Card focuses on the future investment projects, which requires that the staff and managers of a certain enterprise should receive new technology and knowledge training, and establish effective information system and good incentive mechanism, so as to stimulate the enthusiasm of all staff and to meet the needs of the times. The indices of learning and growth are mainly the satisfactory degree of staff, the retention rate of staff, the work efficiency of staff, the knowledge level of staff, the training times of staff, the management level, the growth rate of research and development fees, and the update level of information system. There are certain correlation between the indices and the finance, customer, internal management, and learning and growth of strategic Balanced Score Card. Fig. 1 illustrates their relationship structures[1].
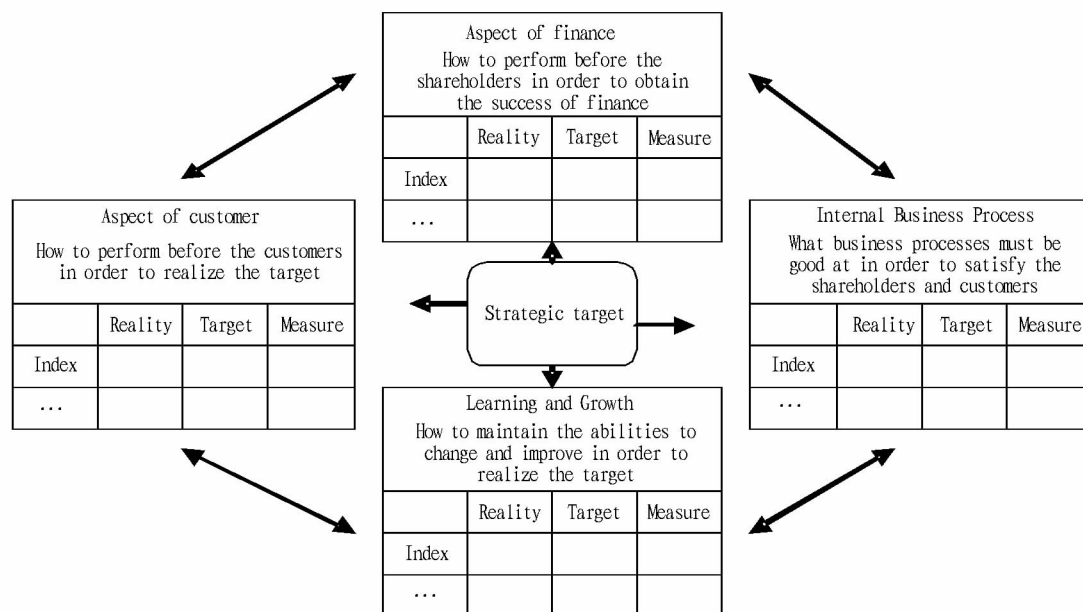

Fig. 1 Structure of the Balanced Score Card

Moreover, indices of the four aspects of strategic Balanced Score Card are not fixed. Enterprises can reduce or increase the indices according to their own situations. The strategic Balanced Score Card mainly includes as less as two or three aspects, or more than five aspects.

2 Empirical analysis on the strategic target of enterprises implementing green food certification

Since food quality and safety issues have become increasingly prominent and have attached great attention, more and more food production enterprises have applied for, and implemented, the green food certification system. In order to find out why these enterprises select green food certification, what achievements they want to obtain, what are the driving factors of implementing green food certification, and how is the implementation status of green food certification, we have investigated in all 73 green food enterprises in Sichuan Province, and have carried out survey on the strategic target of enterprises implementing green food certification in the forms of interviews and questionnaires. A total of 73 questionnaires are sent out, and 71 questionnaires are retrieved, a response rate of 97.26%.

Among them, 70 questionnaires are available, and there is only 1 invalid questionnaire, an effective rate of 98.59%.

2.1 Establishment and screening of the strategic target of enterprises implementing green food certification Based on the investigation on the green food enterprises in Sichuan Province, the strategic target system of enterprises implementing green food certification is established initially (Table 1). Questionnaires are sent out to 70 green food enterprises in Sichuan Province, China. Enterprises are invited to evaluate the importance degree of these targets by using 1 – 5 scaling. Normalized score data are obtained by linear scale transformation. And then, decision-making methodology of multiple-attribute utility theory is adopted to determine the strategic targets of enterprises implementing green food certification.

2.1.1 Data normalization. Linear scale transformation is used to carry out standard process of the data. After using the benefits-oriented attribute conversion formula, the evaluation score X_{ij} of the ith *i*tem in the *j*th questionnaire after standardization is obtained:

$$X_{ij} = x_{ij}/x_j^+, \quad x_j^+ = \max x_{ij}$$

2.1.2 Importance degree of the evaluation target items. Based on quantifying the attribute evaluation value, comprehensive evaluation indices are aggregated by the utility function

of decision scheme. Calculation equation of the importance degree $U_{(A_i)}$ of primary target item X_i is

$$U_{(A_i)} = \sum_{j=1}^{n} w_j X_{ij}, \ i \in M$$

where $U_{(A_i)}$ is the importance degree of the target, X_{ij} is the score of the ith item in the jth questionnaire, w_j is the weight of the jth questionnaire ($w_j = 1/n$), m is the total number of primary target items, and n is the number of questionnaires.

Obviously, $0 \leqslant U_{(A_i)} \leqslant 1$, and the importance degree of the ith item increases as the value gets close to 1.

Table 1　The strategic targets after screening

Primary strategic target X_i	Importance degree $U_{(A_i)}$	Primary strategic target X_i	Importance degree $U_{(A_i)}$
Increasing operating profit	0.925 6	Protecting ecological environment	0.805 0
Enhancing the competitiveness of product	0.814 0	Optimizing the resources combination	0.805 0
Expanding market	0.805 0	Enhancing the production and management capacity	0.707 0
Improving the quality of staff	0.805 0	Adapting to the current trend of food consumption	0.435 2
Improving the production technology level	0.805 0	Imitating after peer authentication	0.412 0
Enhancing the core competence of enterprises	0.805 0	Obtaining policy support	0.302 1
Ensuring food safety	0.805 0	Reducing investment cost	0.214 0
Improving the physical quality of human	0.805 0		

2.2　Establishing the strategic target system of enterprises implementing green food certification　According to the importance degree reflected by the $U_{(A_i)}$, indices with $U_{(A_i)}$ greater than 0.5 are selected as the strategic targets of enterprises implementing green food certification. Based on the theory of Balanced Score Card, the interrelated strategic targets are categorized into the five aspects of finance, customer, internal management, learning and growth, social and ecology, according to the actual situation of the enterprises implementing green food certification. Table 2 reports the strategic target system of enterprises implementing green food certification.

Table 2　Strategic targets and performance evaluation index system of enterprises implementing green food certification

Strategic direction	Strategic target	Evaluation index
Finance A	Increasing operating profit A_1	Change of product cost A_{11}
		Change of product sales revenue A_{12}
		Change of profit rate A_{13}
		Change of return on investment A_{14}
		Change of internal and external lost cost A_{15}
		Change of the proportion of certified products in total sales A_{16}
Internal Business Process B	Improving the production technology level B_1	Change of breakeven time after adding authentication cost B_{11}
		Change of product quality index B_{12}
	Enhancing the operation and management level B_2	Change of product qualification rate B_{21}
		Change of product-manufacturing period B_{22}
	Improve the product competitiveness B_3	Change of science and technology application level B_{31}
		Effects of optimization of resources combination on the production efficiency B_{32}
Customer C	Expanding market C_1	Change of customer retention rate C_{11}
		Change of the obtained rate of customer C_{12}
		Change of market share C_{13}
		Change of order fulfillment rate C_{14}
		Change of training times C_{15}
Learning and Growth D	Improving the quality of staff D_1	Change of the satisfactory degree of staff D_{11}
	Enhancing the core competence of enterprises D_2	Change of production, supervision capabilities D_{21}
		Effects of production and processing on the environment D_{22}
Social and ecology E	Protecting ecological environment E_1	Change of the "green" degree of production E_{11}
	Improving the physical quality of human E_2	Influence on human health E_{21}
	Optimizing the resources combination E_3	Effects of integrated operation on social cost E_{31}
	Ensuring food safety E_4	Government support and incentives E_{41}

3　Performance evaluation index system of enterprises implementing green food certification based on BSC

3.1　Construction principle of evaluation index system

Implementing the performance evaluation index system of green food certification in enterprises should reflect the objective reality of current green food certification, show the general significance of enterprises implementing green food certification, evaluate the performance of enterprises implementing certification system, and provide direction and motivation for the future

conducive to the popularization of high-efficiency use mode of straw. We should also make farmers be aware of the value of high-efficiency use of straw, act in concert with the transformation of use model of straw actively, positively promote use rate of resources and save resources so as to promote the low-carbon and sustainable development of agriculture.

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development of enterprises. Several principles should be followed when constructing the performance evaluation index system.

3.1.1 The principle of guidance. The aim of enterprises implementing green food certification is not only to evaluate the benefits of enterprises during the implementation of green food certification system, but also to guide and encourage more enterprises to take the road of green and sustainable production and management.

3.1.2 The principle of scientificity. Evaluation index system has rigorous and rational basic concepts and logical structure, seizes the essence of enterprises implementing green food certification, and has certain pertinency.

3.1.3 The principle of comparability. Indices should reflect the common attributes of green food enterprises; and the evaluation results should be comparable. The vertical comparison is the comparison between two periods before and after enterprises implementing green food certification. And the horizontal comparison is the comparison among different enterprises implementing green food certification. Then, evaluation index system should be designed according to their common grounds.

3.1.4 The principle of feasibility. Index system should simplify and reduce the indices having little impacts on the evaluation results as much as possible. Index and data collection method should be designed reasonably in order to ensure the reliable and easily accessible sources of information.

3.1.5 The principle of significance. Major aspects, but not all the aspects, should be selected, which affect the performance of enterprises implementing green food certification.

3.2　Establishment of evaluation index system　According to the strategic target system and the Balanced Score Card index system and combining with the specific work of enterprises in order to obtain high performance of certification, the performance evaluation index system of enterprises implementing green food certification is established, based on the changes of enterprises before and after implementing certification.

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