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Full Length Research Paper

Financing instruments and strategies of agribusiness: Evidence from Taiwan

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Improvements and developments in agricultural industries, and the promotion of agriculture biotechnology for entrepreneurial operations and industrial management in agribusiness, are major strategic objectives of the Council of Agriculture in Taiwan. Interestingly, the understanding of capital finance mechanisms, through financing instruments and strategies analysis, are essential to successfully advance development of agribusiness. This research primarily investigates six aspects of financing instruments and strategies of agribusiness, and uses the opinions of interviews with experts of the Agricultural Biotechnology Park in Taiwan to design questionnaires. Then, this study received 15 valid questionnaires from the experts at the Agricultural Biotechnology Park to determine the main financing instruments and strategies, as well as the dependent relationships between capital effects factors. This study contributes to providing capital financing instruments and strategy factors of agribusiness for related official authorities in their future policy decisions.

Key words: Agribusiness, banking, financing strategies, DEMATEL.

INTRODUCTION

Taiwan's agriculture is characterized by small scale and intensiveness, as well as its very best traditional agricultural cultivation technological basis in the world. After Taiwan's entry into WTO, to enhance the competitiveness of Taiwan's agriculture, Taiwanese government has been committed to the counseling and promotion of the agricultural biotechnological industry. In fact, Taiwan's agricultural technological development has great advantages and a solid foundation for the development of biotechnology industries using agricultural materials. The applications of biotechnology cover a considerably wide range, but mainly in the areas of medicine and agriculture, while pharmaceutical R and D is long-term and achievements cannot be made in relatively short times. With solid background in agriculture, Taiwan has the potential for agricultural R and D capabilities and technologies, as well as governmental commitment to the promotion of agricultural technology upgrades and transitions. With the active development of local niche commodities to enhance competitiveness, Taiwan's agribusiness continuously produces breakthroughs in product R and D and technological developments for great achievements in the biotechnological industry, and thus, timely access to financing has become a key factor of success.

Wann, Lu, Lu and Chen (2005) pointed out that financing policies of Taiwan's agricultural biotechnological businesses states that companies should have their own financial planning strategies, and complementarily, the government should provide loans of preferential interest rate and establish project capitals or channels of raising capitals. Namely, companies should focus on self - financed planning, while the government should provide relevant preferential polices in cases of capital inadequacy to facilitate agribusiness development. According to the statistics of Taiwan Institute of Economic Research in 2005, the funding of Taiwan agricultural biotechnological companies mainly comes from individual investors, which accounts for 63.10%, followed by domestic companies (23.80%) and governmental funding (1.90%), while foreign investment and venture capital sources are less. The finding also revealed that the development of Taiwan's agribusiness is largely subject to three main factors, including incomplete legislation

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(19.20%), lack of funding (14.80%) and lack of professional talents (12.20%), resulting in a slow development of Taiwan's agribusiness. Legislation adjustments and training of professionals require relatively large human resources and time, while obtaining capital sources could immediately solve the problem of lack of funds. Therefore, how to obtain capital has become an important topic for agribusiness. In addition to the governmental funding policies, the various relevant preferential measures and guidance policies are indispensable. In particular, the funding of venture capitals or capitalization by going public (over-the-counter trading) should play an important role in the development of Taiwan's agricultural biotechnology industries.

However, most of Taiwan's existing agricultural biotechnological companies are newly established small and medium enterprises of relatively small capital sums. In addition, most companies lack their own technologies, economic scale, sales channels, and self - created brands. Therefore, Taiwan's agricultural biotechnological industries require considerable fostering in aspects of technology, capital, legislation amendments, and market developments in order to expand company size, and enhance upgrades and developments of agribusiness. This study aims to analyze the capital sources and relevant financial instruments of Taiwan's agricultural biotechnology industries to identify the types of financing instruments that are most important for funding supply and demand in developmental processes of Taiwan's agribusinesses, in order to assist both industry and government in completing supplementary measures and planning. Therefore, this study first interviews experts from the Agricultural Biotechnology Park of Taiwan and designed questionnaires accordingly. Then, the DEMETAL (Decision Making Trial and Evaluation Laboratory) method is employed for analysis of this expert group's opinions to extract the impact factors of the financing instruments and capital sources of Taiwan's agribusiness. The contribution of this study is to provide the government and relevant institutions with an understanding of the roles they should play in the expansion and transition of the economic scale of Taiwan's agribusiness. Secondly, the major capital suppliers and future funding demands, as well as applications, can be better understood through this study. Furthermore, by the analysis of the three major financing instrument aspects (bank credit, credit guarantee, and financing assistance), this study identifies the types of guidance policies and financing instruments that can better assist agribusiness to effectively obtain capital resources. Finally, through discussions of the corresponding financing instruments of agribusiness capital sources, a further understanding of the guidance policies can be provided regarding expansion of capital raising channels and capital measures, which should be taken by the competent authorities in agribusiness developmental processes in order to perfect Taiwan's agricultural financial environment.

LITERATURE REVIEW

The development and transition of Taiwan's agribusiness

Tweeten and Zulauf (2008) indicated that when a nation becomes wealthy enough to support farm income, then public policy should be adjusted to raise farm receipts by improving the performance of markets. In recent years, the development of Taiwan's agriculture has transited from traditional intensive agriculture to biotechnology-based. In the 1980s, Taiwan's agricultural biotechnology R and D was mainly subsided by the government. In addition, in the 1990s, developments were mainly in the application aspect, with products such as genetically modified organisms, bio - fertilizers, and bio - pesticides. Globally speaking, the agricultural biotechnology industry is a very promising and highly anticipated industry of the future. Battles and Thompson (2000) pointed out that agriculture in the 21st century is an evolving field in both technology and business practices, and producers should take advantage of biotechnology and genetics.

However, as Taiwan's agribusiness is still an emerging industry in biotechnological developments, the average innovation efficiency of agricultural biotechnology firms in Taiwan is 0.816, which means that firms possess high competitiveness and should magnify their activity scale (Hsieh, Wann and Lu, 2007). From the encouragement of Taiwan's competent authorities to an agricultural transition and agricultural science - technology program, it is undeniable that the industrialization of Taiwan's agricultural biotechnology has made preliminary achievements; however, it is necessary to collect resources to develop the agricultural biotechnology industry. Such concentration of resources, including R and D achievements and commercialization of agricultural products, the formation of the industry, relevant legislation, funding, and talents will all play important roles in the developmental process of agribusinesses. As the data of the Biotechnology Industry Study Center of the Taiwan Institute of Economic Research suggests, the market size of the global agricultural biotechnology industry has expanded yearly, to $280 billion USD in 2006, and may amount to as high as $660 billion USD by 2015. In addition, according to the expectations of global biotechnology industries for 2000 - 2013, as quoted from the OECD data by the Taiwan Agricultural Biotechnological Industry Development Strategy Planning Report, in areas of biotechnological medicine, biochemistry, biotechnological environmental protection, biotechnological foodstuffs, biotechnological energy, biotechnological agriculture, and biotechnological manufacturing and measuring systems, the output in 2008 was $125 billion USD, and it is expected to amount to $210 billion USD by 2013. The output of agricultural biotechnology is expected to increase from the $2.7 billion USD in 2000 to $12.6 billion USD in 2013 by nearly

4 times. Taiwan Institute of Economic Research also predicted that the market size of Taiwan's agricultural biotechnology industry will expand year by year. The market size of Taiwan's agricultural biotechnology in 2006 was $48.3 billion NTD (1USD=32.5NTD), and is expected to grow to $71 billion NTD in 2010. Despite the uncertainty of market predictions, the considerable space and degree of growth of agricultural biotechnology industries, the outlook of agribusiness is considered as optimistic.

Agribusiness financing instruments and strategies

Taiwan's agribusiness has a traditional operational mode of small scale, and most agricultural biotechnological companies are located sparsely, and thus, are relatively lacking the characteristics of industrial clusters. Although there have been a number of achievements on the basis of the agricultural biotechnology, the R and D achievements of Taiwan agribusinesses are faced with an inability of commercialization and industrialization. As found from the data of Taiwan's "Ministry of Economy," more than 99% of Taiwan's agribusiness companies are small and medium enterprises (enterprises of agriculture, forestry, fishery, and animal husbandry, with turnover less than $100 million NTD or less than 50 employees). A lack of financial sources, combined with problems of governmental policies, regulations, human resources, and market sales channels, the development of agribusiness is limited.

Pissarides (1999) pointed out that small and medium - sized enterprises constitute the most dynamic firms in an emerging economy, and are most likely to move into areas of comparative advantage and high added value. Cull, Davis, Lamoreaux, and Rosenthal (2006) indicated that although large firms account for the lion's share of aggregate economic activity in most developed countries, small and medium - sized enterprises plays a more significant role than their proportion of total employment statistics might suggest. Small and medium - sized enterprises can dominate many sectors of economic activity and are an ongoing source of new products and technological innovations. However, small business firms have access to a subset of financial assets and liabilities, as opposed to large business firms, due to a lack of public issues and non - disclosure of financial statements (Berger and Udell, 1998); therefore, banks consider the credit risks higher for small and medium - sized enterprises than for larger firms, because small and medium - sized enterprises are generally unable to offer adequate collateral (Pissarides, 1999). Hence, in cases of Taiwan's small and medium enterprises of agribusiness companies, although they have advanced agricultural technologies and biotechnological development, many agribusiness companies cannot obtain bank credit freely, due to relatively small company size, inadequate pledged assets, and bank's lack of professional technologies and intellectual property appraisal staffs. Financing provided to intermediaries is necessarily intended, and creating appropriate financing channels is necessary to ease the small and medium - sized enterprises' liquidity constraints (Pissarides, 1999). Battles and Thompson (2000) demonstrated that debt finance for agribusiness is not as important as equity capital, because agribusiness hold a large proportion of their collateral land, as opposed to shorter - term assets. Iliopoulos (2002) indicated that for agricultural co-operatives, equity capital is typically financial tools, rather than direct investment, retained patronage refunds, or per-unit capital retains. Furthermore, Meyer (1998) explained that commercial banks are the single most important source of external credit to small firms, providing a reliable supply of credit, transactions, and deposit services. The banking relationship is important to small business financing is because banks can efficiently gain valuable information on a small business, and then use the information to help make pricing and credit decisions. The financial conditions of small firms are usually incomplete for investors, and the costs of issuing securities directly to the public are prohibitive for most small firms (Meyer, 1998).

In addition, past studies pointed out that financial instruments and strategies can help small and medium - sized agribusiness. Holmes and Park (2000) indicated that the financial decisions of small business are one of the primary determinants of the vitality of the firm. They investigated the influence of owners and firm characteristics on small agribusiness financial decisions of long - term debt holdings, and found that the age of a firm and plans for growth affected financial portfolio decisions. Iliopoulos (2002) suggested that European agribusiness co-operatives have realized the need for innovative methods to finance their long - term strategies, and through combined relevant organizational structures, agribusiness can sufficiently use financial instruments. Weatherspoon, Cacho, and Christy (2001) argued that, in developed markets, agribusinesses may be motivated to internationalize through globalization for increased competition between industries for financial capital, productive resources, and consumer markets. Competitive agribusinesses, financed primarily with private capital, may invest across borders to mitigate supply risks, expand consumer markets, and diversify products. Deeds and Hill (1996) pointed out that the key factor of successful innovative high - tech biotechnological business is the development of new products, and the advantages of such products on the market. However, investments in biotechnology industries have relatively high risks and require the investment of a large amount of resources. Therefore, financial support is a necessary factor to maintain long - term stability (Roberts and Mizouchi, 1989). Therefore, through the strengthening of governmental guidance to agricultural biotechnological companies, as well as cooperation between academia and industry in strategic alliances, indirect investments, and subsidies to manufacturers can increase their

Table 1. Questionnaire aspects and evaluation criteria.

Aspects	Criterion
Funding supply	Own capital Relatives and friends Bank credit Venture capital Governmental project credit Going public with over-the-counter trading
Funding demand	Land and plant establishment Purchase of machinery and equipment Operating funds Purchase of raw materials and supplies Research expenditure Overseas investment
Bank credit	Securities Credit processing Interest rate Financial statement data Collateral setting
Credit guarantee	Credit guarantee system Small and medium enterprise credit guarantee System Agricultural credit guarantee system
Financing assistance	Agribusiness finance assistance institutions Institutions dominated by government Institutions established by the small business Integrated assistance center
Governmental project finance	Credit processing Line of credit Interest rate Number of credit application banks

financial capital (Hsieh, Wann, and Lu, 2007).

With regard to capital funding, in addition to the assistance relating to governmental policies, Taiwan's agribusiness companies are relatively weak as most are small and medium enterprises. However, if they rely on their own capital only, they cannot expand to realize the integrated development of agribusiness and economic value. Hence, how to increase the capital raising channels of Taiwan's agribusiness has become an important topic. As discussions about types of financing instruments and policies have greater impact and demand, from the perspective of agribusiness, are relatively few in the past, this study provides a further understanding on the major impact factors of the enterprises, government, and financial institutions in terms of financing instruments and policies in cases of small and medium enterprises in agribusiness to provide competent authorities a major reference for the formulation of measures in response to future policy making.

RESEARCH METHOD

Research design

To understand the agribusiness - related financing instruments, this study first interviewed the governing authorities of the Agricultural Biotechnology Park, and examined the developmental polices and capital raising channels of Taiwan's agribusiness through seminars with Taiwan's agricultural competent authorities and agriculture - related financial institutions. Then, it designed the questionnaire by integrating the opinions of scholars, experts, and the industry. The content of the questionnaire, regarding the agribusiness financing instruments and polices, were categorized into 27 evaluation criteria in 6 major aspects, as shown in Table 1.

By issuing 20 expert questionnaires, this study interviewed companies in the Agricultural Biotechnology Park, and collected 15 valid samples (valid return rate of 75%), including companies of "foodstuff biotechnology" business (5), "plant seedling

biotechnology" (3), "livestock and poultry biotechnology" (3), "bio-pesticide" (1), and "testing and diagnosis biotechnology" (1), "cosmetic" (1), and "comprehensive biotechnological" business (1).

Research method - DEMATEL

With rapidly changing business environments, DEMATEL has been employed to handle the chaotic and irregular situations and phenomena in social sciences and study (Tamura, Nagata, and Akazawa, 2002; Hung, Chou, and Tzeng, 2007). It is a very strict research tool to explain complex relationship structures (Seyed-Hosseini, Safaei, and Asgharpour, 2006; Wu and Lee, 2007; Wu, 2008).

DEMATEL uses expert knowledge to design and arrange a systematic architectural pattern (Liou, Yen, and Tzeng, 2008), and constructs interactive relationships between variables based on the characteristics of each item (Hung, Chou, and Tzeng, 2007). In addition, it can convert causal relationships between variables into a systematic architectural pattern (Lin and Wu, 2008). DEMATEL can find out and integrate response situations and developmental trends into a complete system (Hung, Chou, and Tzeng, 2007), thus, it is used in this study to understand the key factors of agribusiness finance instruments and strategies and extracts the major impact factors. This study refers to the studies of Lin and Wu (2008); Liou, Yen, and Tzeng (2008); Wu and Lee (2007); Hung, Chou, and Tzeng (2007); Seyed-Hosseini, Safaei, and Asgharpour (2006); Gabus, and Fontela (1972), and explains the definitions and steps of the DEMATEL Method, as follows:

Step 1: Generating a direct - relation matrix - invite expert scholars to compare pairwise actors and define 4 degrees of relationships including: no impact, low impact, moderate impact, and high impact, respectively represented by numbers 0, 1, 2, and 3. Construct scores of the pairwise relation strengths into n × n matrix, where aij represents the impact of criterion I on criterion j, then A = [a_{ij}]n×n. The purpose is to illustrate precise relationships between pairs of factors.

$$A=\begin{matrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{matrix}$$

Step 2: Normalizing the direct - relation matrix—normalize matrix A to produce the normal matrix X, X=[x_{ij}]n×n, and $0 \le x_{ij} \le 1$. By Equation (1) and (2), normalize the diagonal line of the matrix NTD as 0.

$$s = \frac{1}{\max_{1 \le i \le n} \sum_{j=1}^{n} a_{ij}} \quad (1)$$

$$X = s \times A \quad (2)$$

In this study, X is termed as a normal matrix, because

$$\lim_{k \to \infty} X^k = [0]$$

Step 3: Attaining the total-relation matrix—by Equation (3) add the relation matrixes to produce a total - relation matrix T, below I is the unit matrix.

$$T = X + X\,2 + \ldots + Xk = X\,(I\text{-}X)\,\text{-}1 \quad (3)$$

Step 4: Producing a causal diagram - add the columns and rows of the relation matrix T, respectively.

$$T = [tij],\ i,j \in \{1,2,\ldots,n\}, \quad (4)$$

$$[r_i]_{n \times 1} = \sum_{j=1}^{n} t_{ij}\ _{n \times 1} \quad (5)$$

$$[c_j]_{1 \times n} = \sum_{i=1}^{n} t_{ij}\ _{1 \times n} \quad (6)$$

Where, vector r and vector c represents the sums of the rows and columns.

Step 5: Obtaining the inner dependence matrix - matrix r represents the addition of column values of the total-relation matrix T, with its impact value determined from the impact relation of factor i on factor j. Similarly, matrix c represents the addition of the row values of the total-relation matrix T, with its impact value determined from the impact relationship of factor i on factor j. In addition, when I = j, then (ri+cj) represents the impact strength of the item. If (ri - cj) is positive, it indicates that factor i tends to affect other factors. On the contrary, if (ri - cj) is negative, it indicates that factor i tends to be affected by other factors. In fact, the value of (ri - cj) has more roles and applications than (ri+cj) because (ri - cj) is a good judgment value in terms of prioritization of multiple choices.

Basically, the DEMATEL method is more appropriate to analyse an expertise based questioner than a large sample survey. The reason is simple, if we focused on an exploratory question. Experienced experts who have acquired sufficient knowledge regarding the discussed issues would be a better group rather than the non - experienced large sample. As an initial effort, the sample size may make sense in an effort to "fine - tune" the model.

EMPIRICAL RESULTS

Descriptive statistics

Table 2 shows the descriptive statistics of the basic data of the questionnaire, which indicates that, according to the valid expert questionnaires collected from the tested agribusiness companies, the average capital sum of the companies is about $73.67 million NTD, and the difference in capital sum is relatively great (minimum a$1 million NTD, maximum at $350 million NTD).

Companies of small capital sums are mainly in the business of cosmetics, functional foodstuffs, and liquid

Table 2. Descriptive statistics.

Item	Mean	Standard deviation	Minimum	Median	Maximum
Corporation capital sum (10,000 NTD)	7,367	11,470	100	1,200	35,000
Corporation age	4	2	0	3	7
Number of employees	12	7	3	10	29

Table 3. Funding supply aspect relation matrix T.

Item	Own capital	Relatives	Bank credit	Venture capital	Governmental project credit	Going public, OTC trading
Own capital	1.255	1.106	1.522	1.185	1.463	0.941
Relatives	1.124	0.697	1.076	0.865	1.016	0.697
Bank credit	1.343	0.978	1.200	1.103	1.323	0.891
Venture capital	1.043	0.803	1.113	0.787	1.061	0.753
Governmental project credit	1.373	1.023	1.453	1.164	1.189	0.929
Going public, OTC trading	1.267	1.010	1.384	1.167	1.320	0.781

fertilizers, while companies of large capital sums are mainly in lines of R and D, manufacturing, and sales of functional healthy foodstuffs, fishery and husbandry services and edible mushroom cultivation. Regarding the corporation age, the companies are 4 years old on average, with the oldest company of 7 years, indicating that the development of agribusiness is in the early stages of growth. The average number of employees is 12, and companies with relatively more employees are mainly in lines of comprehensive businesses, including various agricultural biotechnological items. Therefore, greater human resources are required for different units.

Questionnaire analysis

Funding supply aspect

The questionnaire surveys summarize the results to obtain a complete relation matrix -T in the funding supply aspect, as shown in Table 3. The first column represents the strength of impact of “own capital” on other indicators. For example, the strength of impact of “own capital” is 1.255, 1.106 for “relatives and friends”; meanwhile, the first row represents the strength of impact of other indicators on “own capital.” For example, the strength of impact of “own capital” is 1.255, and 1.124 as being affected by “relatives and friends.” The relation strengths of other indicators of the funding supply aspect are as shown in Table 3. The strength of impact of “own capital” on “bank credit” is the greatest (1.522); the impact of strength of “relatives and friends” on “own capital” is the greatest (1.124); the impact strength of “bank credit” on “own capital” is the greatest (1.343); the impact strength of “venture capital” on “bank credit” is the greatest (1.113); the impact strength of “governmental project credit” on “bank credit” is the greatest (1.453); the impact strength of “going public, over-the- counter trading” on “bank credit” is the greatest (1.384). On the other hand, “own capital” is relatively affected by “governmental project credit” (1.373); “relatives and friends” is relatively affected by “own capital” (1.106); “bank credit” is relatively affected by “own capital” (1.522); “venture capital” is relatively affected by “own capital” (1.185); “governmental project credit” is relatively affected by “own capital” (1.463); and “going public over-the-counter trading” is relatively affected by “own capital” (0.941).

Table 4. Statistics and integration of funding supply aspect D+R and D-R.

item	D+R	D-R
Own capital	14.877	0.067
Relatives	11.092	-0.141
Bank credit	14.585	-0.912
Venture capital	11.831	-0.710
Governmental project credit	14.505	-0.240
Going public, OTC trading	11.923	1.937

As shown in Table 4, experts believe that, the (D - R) value of (1.937) “going public over – the - counter trading” is maximum and positive, which is the most conspicuous, and has the greatest affect on other indicators in the entire system of criterions. The “accelerant” can affect other indicators, and thus, can be categorized into the “cause group.” In addition, own capital (0.067) has more

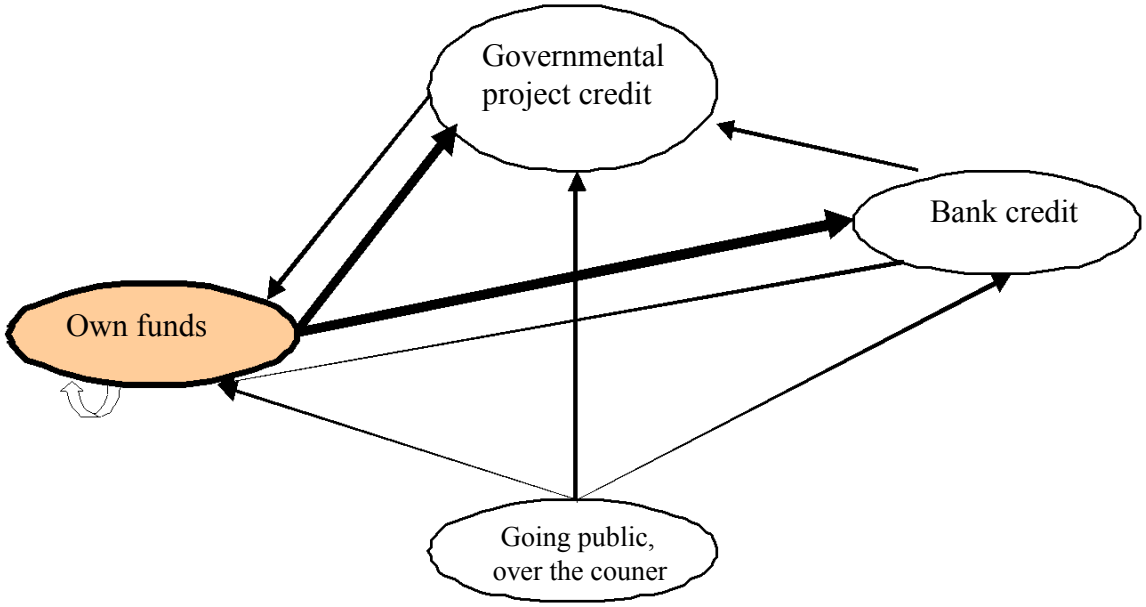

Figure 1. Funding supply aspects.

Table 5. Funding demand aspect relation matrix T.

Item	Land and plant est.	Purchase of machinery and equipment	Operating funds	Purchase of raw materials and supplies	Research expenditure	Overseas investment
Land and plant establishment	1.366	1.724	1.479	1.551	1.306	0.689
Purchase of machinery and equipment	1.630	1.543	1.511	1.610	1.360	0.713
Operating funds	1.316	1.442	1.117	1.344	1.121	0.588
Purchase of raw materials and supplies	1.397	1.543	1.374	1.254	1.213	0.625
Research expenditure	1.409	1.556	1.344	1.417	1.068	0.666
Overseas investment	1.037	1.141	1.018	1.044	0.901	0.421

affect, than being affected by other indicators, and thus, can be categorized into the “cause group.” Hence, improvement of the conditions and environments for agribusiness’s “going public, over - the - counter trading” will facilitate the enhancement of the entire core capabilities, and even improve other indicators of the “cause group.” Namely, the enhancement of “going public, over- the - counter trading” can increase agribusiness’s own capital and capital sources to further improve the core capabilities as a whole. The (D+R) value (14.877) of “own capital” is maximum, indicating that it is deeply affected by the other indicators of the funding supply aspect. It thus can be observed that “own capital” is the main axis of the change of entire core competencies. Figure 1 indicates a causal relationship and the interactions between indicators in the funding supply aspect. The bold frame illustrates the D+R maximum values, where it can be seen that, “own capital” affects other factors, as well as being affected by other factors of the funding supply aspect, and thus, is a major hub of the aspects as a whole. In addition, the impact of own capital on other indicators may create a loop effect of self-impact through the feedback of other indicators. Moreover, “going public, over-the-counter trading” may affect other major factors of the funding supply aspect, and thus, can be regarded as an “accelerant” of the aspect.

Funding demand aspect

The complete relation matrix - T of the funding demand aspect is as shown in Table 5. The impact strength of the first column “land and plant establishment” on its own is 1.366, the impact strength on “purchase of machinery and equipment” is 1.723; the strength of impact of the first

Table 6. Statistics and integration of funding demand aspect D+R and D-R.

Item	D+R	D-R
Land and plant establishment	16.270	-0.040
Purchase of machinery and equipment	17.315	-0.580
Operating funds	14.773	-0.914
Purchase of raw materials and supplies	15.626	-0.814
Research expenditure	14.429	0.489
Overseas investment	9.264	1.860

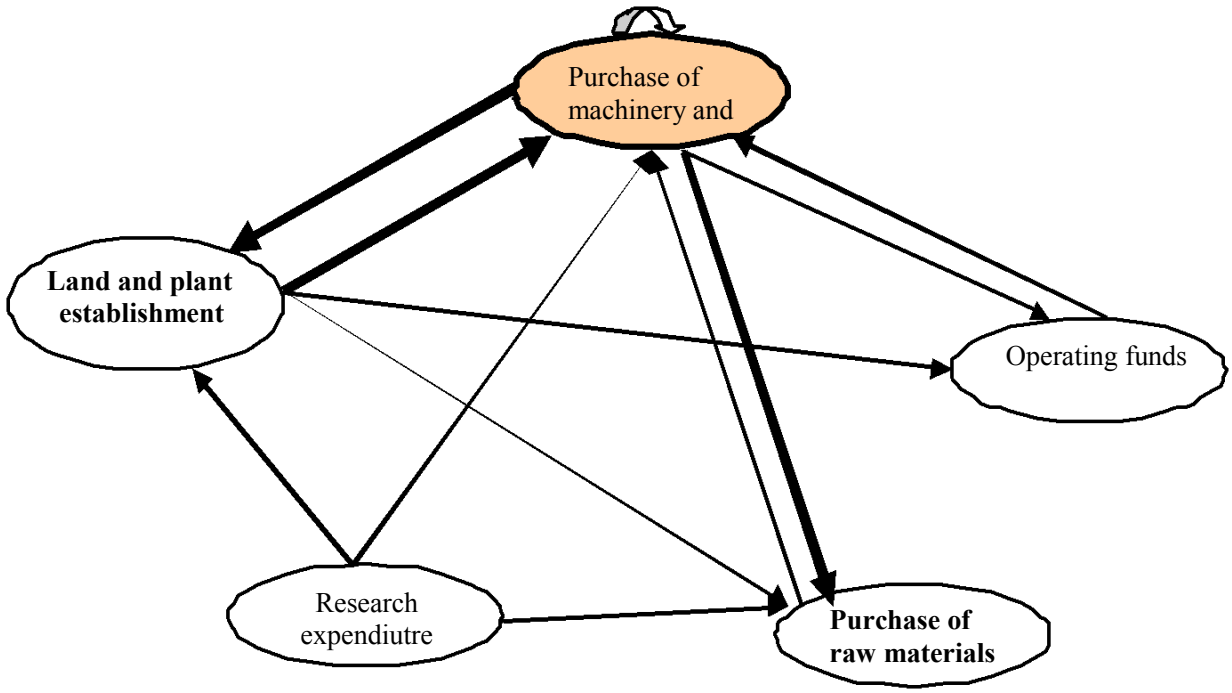

Figure 2. Funding demand aspects.

row “land and plant establishment” on its own is 1.366, and the strength of impact by the “purchase of machinery and equipment” is 1.630. The relational strengths of other indicators of the funding demand aspects are as illustrated in Table 5.

Table 6 shows that, the (D - R) value (1.860) of “overseas investment” is maximum and positive of the “cause group.” In addition, research expenditure (0.489) affects more than it is affected by other indicators, and thus can be categorized into the “cause group.” Hence, if “overseas investment” can be enhanced, the core competencies of agribusiness could be improved accordingly, and may even facilitate improvements of other “cause group” indicators of other funding demand aspects. The (D + R) value (17.315) of the “purchase of machinery and equipment” aspect is maximum, indicating the impact of other criterions as well as its impact on other indicators. The significance of “purchase of machinery and equipment” in funding demand aspect of the agribusiness is thus represented. Figure 2 shows the relationship in the funding demand aspect, and the interactions of indicators are represented in the figure. The bold frame illustrates the D + R maximum values; it can be seen that, “purchase of machinery and equipment” affects other factors of the funding demand aspect, as well as being affected by other factors of the funding supply aspect. Moreover, it could be regarded as the major hub of the aspects as a whole. In addition, the impact of “purchase of machinery and equipment” on other indicators may create a loop effect of self - impact through the feedback of other indicators.

Bank credit aspect

The complete relation matrix - T of the bank credit aspect is shown in Table 7. The impact strength of the first column “securities” on its own is 3.585; the impact

Table 7. Bank credit aspect relation matrix T.

Item	Securities	Credit processing	Interest rate	Financial statement data	Collateral setting
Securities	3.585	3.117	3.907	3.365	3.915
Credit processing	3.458	2.688	3.555	3.107	3.559
Interest rate	3.578	2.910	3.468	3.177	3.677
Financial statement data	3.624	2.982	3.745	3.057	3.737
Collateral setting	3.659	2.983	3.756	3.233	3.543

Table 8. Statistics and integration of bank credit aspect D+R and D-R.

Item	D+R	D-R
Securities	35.793	-0.014
Credit processing	31.048	1.688
Interest rate	35.239	-1.621
Financial statement data	33.084	1.204
Collateral setting	35.604	-1.257

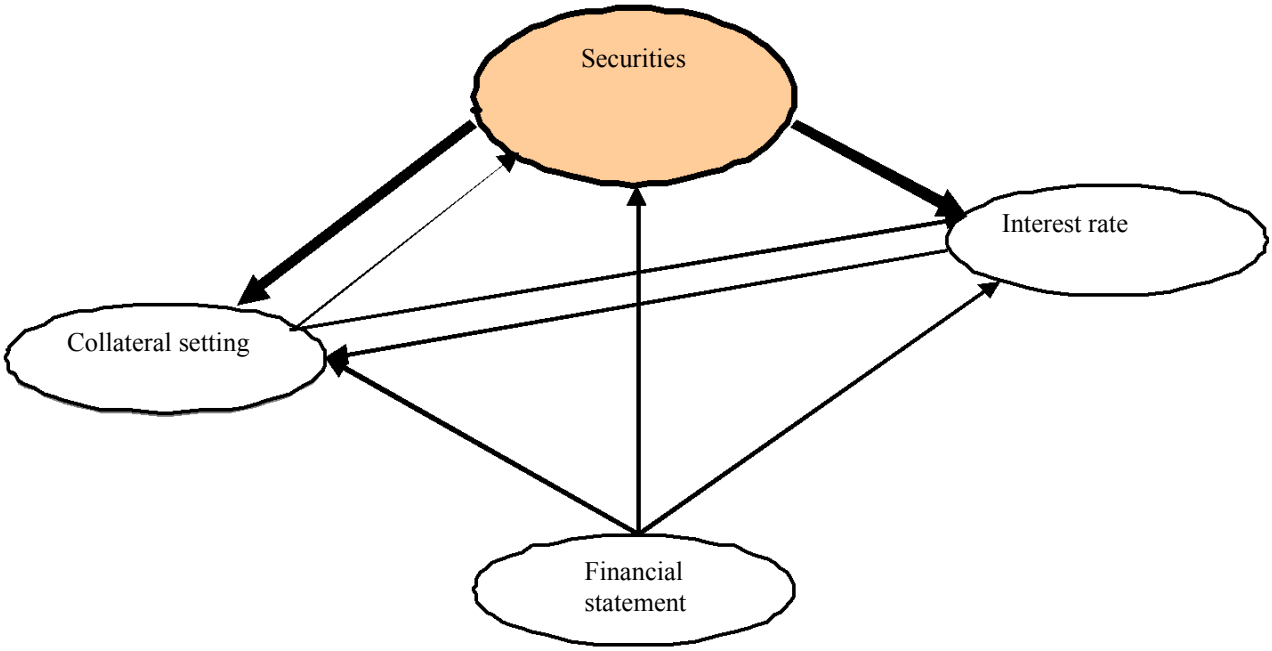

Figure 3. Bank credit aspects.

strength on “credit processing” is 3.458. The relational strengths of other indicators of the bank credit aspect are as illustrated in Table 7.

Table 8 indicates that, experts believe the (D - R) value (1.688) of “credit processing” is the maximum and positive, which means it is the most significant of the entire system of criterions and affects, rather than being affected, other factors of the bank credit aspect. Thus, it is the major accelerant of the bank credit aspect and can be categorized in the “cause group.” In addition, “financial statement data” (1.204) can also be regarded as a “cause group.” Namely, improvement of “credit processing” or “financial statement data” can facilitate obtaining bank financing. In addition, the (D + R) value (35.793) of “securities” is the largest, indicating that it is deeply affected by other indicators, as well as affecting others. Therefore, “securities” is a key factor of impact on the credit aspect. Figure 3 shows the relationship in the bank credit aspect. The bold frame illustrates the D + R maximum values, and it can be seen that, “securities” affects other factors of the bank credit aspect, as well as being affected by other factors of the funding supply

Table 9. Credit guarantee aspect relation matrix T.

Item	Credit needs to be tied in with credit guarantee system	Agribusiness credit should be tied in with small and medium enterprise credit guarantee system	Agribusiness credit should be tied in with agricultural credit guarantee system
Credit needs to be tied in with credit guarantee system	7.279	7.466	8.163
Agribusiness credit should be tied in with small and medium enterprise credit guarantee system	7.367	6.928	7.898
Agribusiness credit should be tied in with agricultural credit guarantee system	7.204	7.072	7.387

Table 10. Statistics and integration of credit guarantee aspect D+R and D-R.

Item	D+R	D-R
Credit needs to be needs to be tied in with credit guarantee system	44.758	1.057
Agribusiness credit should be tied in with small and medium enterprise credit guarantee system	43.659	0.728
Agribusiness credit should be tied in with agricultural credit guarantee system	45.112	-1.785

aspect. Moreover, it can be regarded as a major hub of the aspects as a whole.

Credit guarantee aspect

The complete relation matrix - T of the credit guarantee aspect is shown in Table 9. The impact strength of the first column “credit needs to be tied in with credit guarantee system” on its own is 7.279, the impact strength on “agribusiness credit should be tied in with small and medium enterprise credit guarantee system” is 7.466; the strength of impact of the first row “credit needs to be tied in with credit guarantee system” on its own is 7.279, and the strength of impact by the “agribusiness credit should be tied in with small and medium enterprise credit guarantee system” is 7.367. As shown in Table 10, experts believe that, the (D-R)value of (1.057) “credit needs to be tied in with credit guarantee system” is maximum and positive, which is the most significant, and thus, has the greatest affect on other indicators in the entire system of criterions. The “accelerant” can affect other indicators, and thus can be categorized into the “cause group.” Hence, improvement of “credit needs to be tied in with credit guarantee system” or “agribusiness credit should be tied in with small and medium enterprise credit guarantee system” would facilitate the enhancement of the entire core capabilities, and even improve other indicators of the “cause group.” The (D + R) value (44.758) of “agribusiness credit should be tied in with agricultural credit guarantee system” is the maximum, indicating that it is deeply affected by the other indicators of the aspect. It thus can be observed “agribusiness credit should be tied in with agricultural credit guarantee system” is a major key factor to obtain financing for agribusinesses.

Figure 4 illustrates the relationship in the credit guarantee aspect. The D + R maximum value of “agribusiness credit should be tied in with agricultural credit guarantee system” is the maximum, indicating that it affects other factors of the funding demand aspect as well as being affected by other factors of the funding supply aspect. Moreover, it can be regarded as a major hub of the credit guarantee aspect as a whole. On the other hand, the impact of “agribusiness credit should be tied in with agricultural credit guarantee system” on other indicators may create a loop effect of self-impact through the feedback of other indicators.

Financing assistance aspect

The complete relation matrix - T of the financing assistance aspect is as shown in Table 11. The impact strength of the first column “agribusiness financing assistance institutions” on its own is 8.066, the impact strength on “government - dominated institutions” is 8.605; the strength of impact of the first row “agribusiness

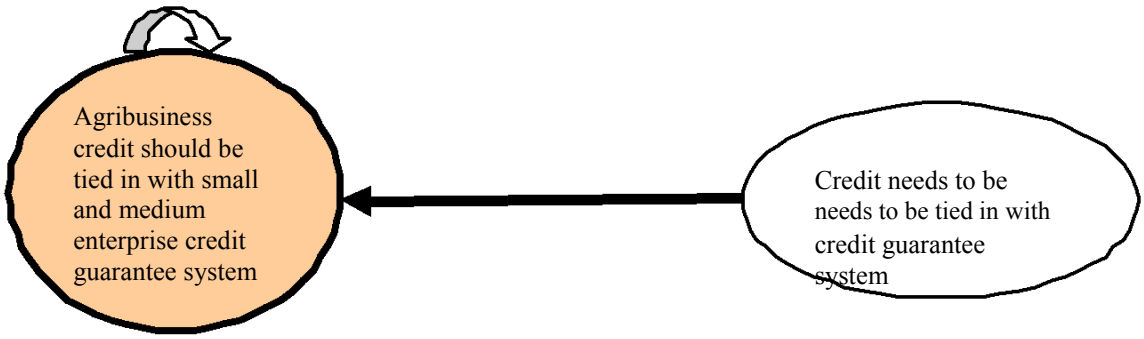

Figure 4. Credit guarantee aspects.

Table 11. Financing assistance aspect relation matrix T.

Item	Agribusiness financing assistance institutions	Government-dominated institutions	Institutions established by the small business integrated assistance center
Agribusiness financing assistance institutions	8.066	8.605	7.379
Government-dominated institutions	8.308	8.117	7.277
Institutions established by the small business integrated assistance center	7.728	7.890	6.522

Table 12. Statistics and integration of financing assistance aspect D+R and D-R.

Item	D+R	D-R
Agribusiness financing assistance institutions	48.152	-0.053
Government-dominated institutions	48.314	-0.910
Institutions established by the small business integrated assistance center	43.318	0.963

financing assistance institutions" on its own is 8.066 and the strength of impact by the "government-dominated institutions" is 8.308. As shown in Table 12, the (D - R) value of (0.963) "Institutions established by the small business integrated assistance center" is maximum and positive, which means it affects other indicators much more than being affected in the financing assistance aspect. The "accelerant" can be categorized into the "cause group." Hence, improvement of "Institutions established by the small business integrated assistance center" will facilitate the enhancement of the entire core capabilities. The (D + R) value (48.314) of "government - dominated institutions" is the maximum, indicating that it is deeply affected by the other indicators of the financing assistance aspect. It means the core competencies, as a whole, can be observed by the criterion of "government - dominated institutions."

Figure 5 shows DEMATEL cause - and - effect relationship diagram of the factors of the financing assistance aspect. The bold frame in Figure 5 of D + R maximum value means "Institutions established by the small business integrated assistance center" affects other factors of the financing assistance aspect as well as being affected by other factors of the funding supply aspect. Moreover, it can be regarded as the major hub of the credit guarantee aspect as a whole. On the other hand, "agribusiness financing assistance institutions" may create a loop effect of self - impact through the feedback of other indicators.

Governmental project finance aspect

The complete relation matrix - T of the governmental project finance aspect is as shown in Table 13. The impact strength of the first column "credit terms" on its own is 2.781, the impact strength on "line of credit" is 3.098; the strength of impact of the first row "credit terms"

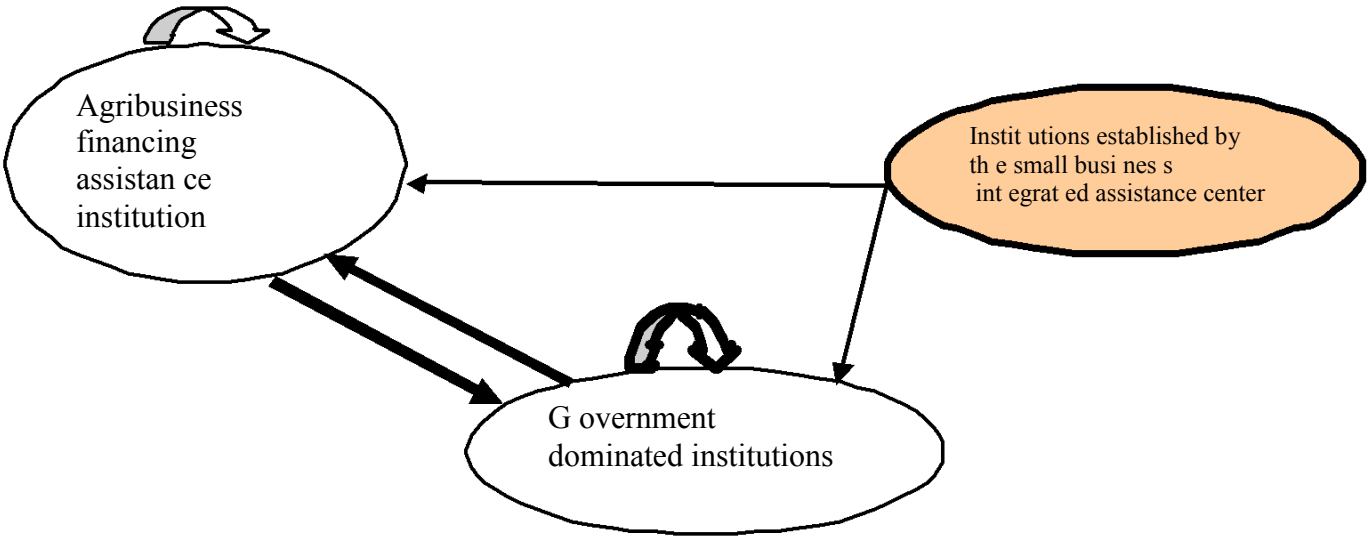

Figure 5. Financing assistance aspects.

Table 13. Governmental project finance relation matrix T.

Item	Credit terms	Line of credit	Interest rate	Number of credit application banks
Credit terms	2.781	3.098	3.090	2.277
Line of credit	2.905	2.673	2.923	2.155
Interest rate	2.832	2.865	2.610	2.100
Number of credit application banks	2.510	2.552	2.570	1.732

Table 14. Statistics and integration of governmental project finance aspect D+R and D-R.

Item	D+R	D-R
Credit terms	22.275	0.218
Line of credit	21.846	0.533
Interest rate	21.601	0.786
Number of credit application banks	17.629	1.101

on its own is 2.781, and the strength of impact by the “line of credit” is 2.905.

As shown in Table 14, the (D - R) value of (1.101) “number of credit application banks” is maximum and positive, and thus, is an “accelerant” that can be categorized into the “cause group.” Hence, improvement of “number of credit application banks” will facilitate the enhancement of the entire core capabilities. Credit terms (0.218) may produce the same effect as it also belongs to the “cause group.” Namely, enhancement of “number of credit application banks” may facilitate the improvement of core competencies as a whole. The (D+R) value (22.275) of “credit terms” is maximum, indicating that it is deeply affected by the other indicators of the governmental project finance aspect. Figure 6 illustrates DEMATEL cause - and - effect relationship diagram of the factors of the governmental project finance aspect. The bold frame of D + R maximum value means “credit terms” affect other factors of the financing assistance aspect, as well as being affected by other factors of the govern-mental project finance aspect. Moreover, it can be regarded as a major hub of the credit guarantee aspect as a whole.

Conclusion

As suggested by the DEMATEL analysis results, with the exception of “own capital,” “going public, over - the – counter trading” is also a major accelerant of funding

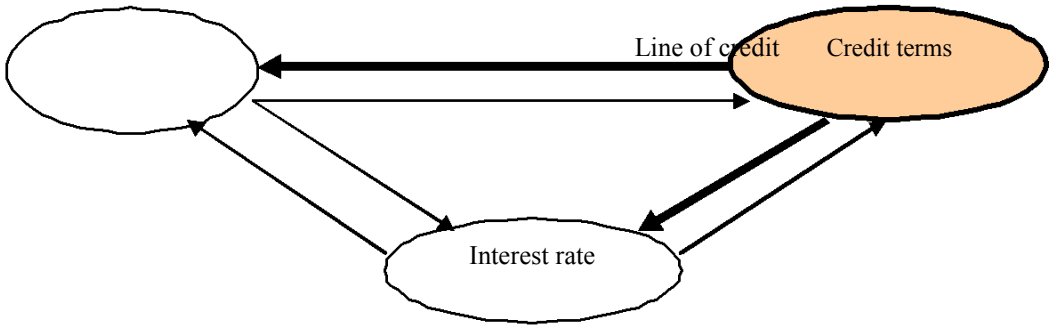

Figure 6. Governmental project finance aspects.

supply. Hence, it is necessary for the competent authorities to formulate relevant supporting measures to assist agribusiness to obtain capital from market systems and legislation aspects; as also suggested by questionnaire analysis, the "purchase of machinery and equipment" is a major factor of the agribusiness funding demand aspect. In the aspect of credit, improvements to credit processing and financial reports can help agribusiness to obtain bank financing smoothly. However, "securities" will be the key factor. In addition, as companies of agribusiness are often small, "needs to be tied in with credit guarantee" is a significant factor, and at present, "credit tied with agricultural credit guarantee" has considerable contribution. To help business continuity for agribusiness, the government should give financing assistance, establish similar "small business integrated assistance center" to help financial planning, and provide operational counseling. In project credit, the results of questionnaire analysis indicate that, "credit terms" will be a major key factor, thus, improvements to credit terms would better assist agribusiness in obtaining governmental financing at low interest rates.

Finally, published discussions on financing instruments and strategies of agribusiness are few; hence, the aim of this paper is to better understand financing instruments and strategies that are needed in contemporary developmental processes for agribusiness. In addition, the companies, government, and relevant financial institutions should improve cooperative efforts regarding policies in order to assist agribusinesses in terms of obtaining capital sources to promote the economic core value of Taiwan's agribusiness as a whole.

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