

Supplier's Marketing Alternative of Consumption-Type Fruit and Vegetable Wholesale Markets in Taiwan*

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I、Introduction

It has been over 40 years of continuous efforts for Taiwan to improve agricultural marketing efficiency. The main activities of marketing enhancement supported by the government have been the construction of city (consumption-type) and local (production-type) wholesale markets, the improvement of facilities and transaction methods in wholesale markets, the encouragement on the expansion of marketing alternatives, etc. However, the expansion of marketing alternatives has not been fully developed until recent ten years. In the past, traditional wholesale marketing and local dealer could handle all products when the consumption outlets were not sufficient. The rapid economic development and growing supermarket businesses in recent years provided the opportunity for the expansion of marketing alternatives. It is unfortunately that the new MARKET TRANSACTION LAW and MARKET MANAGEMENT RULES amended in 1985 could have ignored the legal development of multi-dimensional marketing system and have left some possible policy conflicts with respect to marketing efficiency of agricultural products as they were.

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The development of various marketing alternatives available for farmers or dealers has increased the instability of product supply in each market. Farmers may choose to market their products through cooperative marketing for consumption-type wholesale markets and/or to sell their products to local wholesale market, a local dealer and to directly transport their products to retailers, supermarkets, restaurants, exporters, etc. The development of direct marketing for small farmers in some way have competed away the market share of cooperative marketing encouraged by the Law. As a result, cooperative marketing for fruits and vegetables are discouraged and the target toward transaction system of mass marketing becomes difficult.

Similar to farmer's marketing alternatives, suppliers in major consumption-type wholesale markets are facing various marketing alternatives. In the consumption-type wholesale markets, most suppliers are registered as a farm organization, agribusiness unit, dealer and importer. Since cooperative marketing is encouraged and direct marketing is not defined clearly by the Law, suppliers may direct their products to any marketing alternative with higher profits. Wholesale markets are no longer dominantly distributing agricultural products in major cities.

The decentralization of agricultural marketing resulted from not only the new policy orientation but also from changing consumption pattern and structure of market outlets over time. The production of fruits and vegetables are increased accompanying the increased national income, (Table 1). The share of fruit production value over total value of crop production increased steadily between 1975 and 1989. Vegetables, on the other hand, showed quite unstable share of total value in the 1980s. All these changes may imply that domestic consumers favor more fruits over vegetables. Such demand patterns may alter supplier's decision of choosing product outlets. Moreover, the number of new market outlets such as small-scale supermarkets have increased significantly in all populated cities attracting direct sales of agricultural products from production area.

In addition, the market handling charge are complained by many inside-market suppliers and buyers. According to the "Agricultural Products Market Transaction Law", fruit and vegetable suppliers and buyers have to pay maximum of 0.5 percent of their sale as management charge to the wholesale markets. Comparing to outside-market trading, suppliers and

buyers must take this charge as their marketing costs. However, the concentration of varieties and better grading and packing standards in the wholesale market provide incentives for traders to participate.

The related factor decreasing the inside-market trading may be the sluggish price performance in the consumption-type wholesale markets. Fruit wholesale prices in the largest wholesale market of Taipei and other cities are increasing while vegetable wholesale prices are decreasing over time in the 1980s, (Table 2). Facing more imports of fruits, fruit wholesale prices are under great pressure. Unstable weather condition also dampens vegetable prices and its stability. All these problems on price formation in the consumption-type wholesale markets further appreciate outside-market trading and direct marketing.

II 、 Literature Review

Past researches focusing on the choice alternatives of selling agricultural products are reviewed for the model specifications and data collections. This paper will put great efforts on specifying the proper choice model and the involved important information for the estimation and evaluation of the results.

For Taiwan's fruit and vegetable marketing research, only Hwang and Wu in 1991 studied the selling choice of cabbage farmers in Taiwan. The purpose of the Hwang-Wu work was to examine the choice structure of cabbage farmers for four marketing alternatives including the wholesale marketing. Hwang and Wu set up a system of equations of four marketing alternatives faced by cabbage producers. The dependent variable for each equation is the percentage sale of total cabbage output of each farmer through each marketing channel. The explanatory variables were chosen to include all possible important influencing factors without specific categorizations. However, their study successfully capture the decision factors for cabbage farmers on marketing alternatives by quantitative instead of qualitative approach.

The data employed by Hwang and Wu are the survey on randomly selected 81 cabbage farmers in 13 major producing counties in 1990. The questionnaire is designed to elicit each farmer's characteristics and his decision factors. The decision factors include responses on price, quantity, marketing service, technology, marketing costs, etc. Hwang and Wu reached

the following conclusions concerning the wholesale marketing efficiency. Both experienced farmers and farmers who intend to expand prefer wholesale marketing directly or indirectly through cooperative organizations. It is obvious that those farmers taking the marketing costs and market services including cash receipts and friendships into account would prefer wholesale marketing. Moreover, the managerial charges and product grading are detrimental to the wholesale marketing efficiency.

To evaluate the choice alternative of farmers' selling decisions, Fletcher and Terza in 1986 adopted the 1982 survey data of Georgia wheat producers in a multivariate probit model.

It is distinguished that wheat producers face five available marketing alternatives, namely the forward price contracting, deferred price contracting, storage for later sale, hedging on the futures market and government loan programs. All these marketing alternatives are assumed to reduce price risk through farmers' intention on the diversification of marketing portfolio.

Assuming utility maximization and taking the works of others on the application of basic probit model as references (Hill and Kau, 1973; Thompson and Eiler, 1974; Turner, Epperson, and Fletcher, 1983), Fletcher and Terza constructed a multiple binary decision model. The utility function is then defined as:

$$(1) \quad u_{jt} = X_{jt}B_j + e_{jt} \quad (j = 1, \dots, J) \\ (t = 1, \dots, T)$$

where X_{jt} is the row vector of farmer-specific variables, B_j 's denote column vectors of parameters to be estimated, and $e_{jt} = [e_{jt1}, \dots, e_{jtj}]$ is multivariate normally distributed with mean zero and covariance matrix Σ .

By setting up a constant threshold specific to the j th alternative, m_j , a particular marketing method is selected if and only if $u_{jt} > m_j$. The selection of a particular marketing method is valid only if the standard normal distribution value of B_j , apart from m_j multiplying X_{jt} is greater than the standard normal distribution value of e_{jt} in negative term, that is $-e_{jt} < X_{jt}(B_j - m_j)$.

A likelihood function for each marketing alternative is then constructed. The authors acknowledged that the J individual probit functions must be analyzed one for each of the J al-

ternatives at the current estimation technology. Although Amemiya in 1974 suggested the estimation method on the nonindependent multivariate probit model, the applied survey data are not qualified and the estimation procedure is complicated.

Despite the complicated statistical settings on the evaluation of farmers' selling decisions, the most important contribution of Fletcher-Terza work for this marketing efficiency study is the characteristics and the categorization of the adopted data and variable definitions. Data are obtained from the 1982 survey of Georgia wheat producers in ten counties. One hundred wheat producers were chosen through random selection from the Agricultural Stabilization and Conservation Service (ASCS) office. The questionnaire included sections pertaining to the characteristics of farms and managers and marketing methods.

The independent variables in X_i for the explanation to farmers' marketing strategies are grouped into 3 categories: (1) demographic variables, (2) production variables and (3) information variables. Maximizing the likelihood functions by the Newton-Raphson method for each of the marketing alternatives, the estimated results shows the proper classification of the producers for all three marketing alternatives and the validity of the model from the likelihood ratio test. The authors concluded that young and less educated farmers without storage capacity prefer to select spot sale at harvest as a marketing alternative while income attributable to farming, diversification, farm scale and information are not influencing the selection of spot sale at harvest. Contract sales are likely preferred by the educated farmer with large operation residing in north Georgia who has storage facility and uses information. Moreover, sale after storage is likely employed by the typical farmer who has a large operation, resides in north Georgia, has access to storage facilities and does not use information sources.

Finally, the policy implications drawn by the authors are the extensional program direction and government support. It is proposed that the use of multiple marketing alternatives could be beneficial to a farmer which needs efforts of education in using the strategies properly. The extension education should be directed toward one-to-one individual help on those young and less-educated farmers who are likely to use only spot sale at harvest. However, such practice necessitate an increase in government funding support.

Working on the similar decision model, Fu et al. in 1988 estimated attitudes of peanut

producers toward different market alternatives for the development of more efficient marketing systems assuming the absence of government support program. It is proposed that the information content of prices to peanut producers are distorted by the absence of a central market, high price supports in government programs and related rigidities in commonly used pricing arrangements between producers and handlers. Thus, a forward deliverable contract, a futures market, and/or an electronic market were advocated and evaluated through the discovery of producer attitudes toward new market alternatives. The possible correlations among attitudes toward market alternatives were also considered.

The purpose of this study was to extend market choice framework of Miller, Smith, and Williams and Turner, Epperson, and Fletcher to take correlated producer attitudes toward various market alternatives into account. Data adopted were random sample, stratified by states, on a list of quota holders in 1983 among seven major peanut producing states (Georgia, Alabama, Florida, Virginia, North Carolina, Texas and Oklahoma). The selected respondent was an active peanut producer in 1984. Total of 412 observations were collected without any missing data.

The questionnaire made an effort to elicit attitudinal responses from producers of farmers' stock peanuts about the various market alternatives. Responses were grouped into four categories: (1) information on farm production, management and price discovery, (2) producers' attitudes toward present marketing methods and the proposed market alternatives, (3) financial management, (4) demographic factors. Closed questions were built up except the description of reasons for negative or positive responses. Producers were asked to respond their attitudes on five market alternatives: (1) the existing private treaty market, (2) cash and forward contract market, (3) proposed forward deliverable contract market, (4) futures market and (5) computerized market.

Fu et al. further assumed that there may be correlations on the attitudes toward market alternative. Pearson correlation coefficients were calculated and the results were positive and significant at the 10 percent level for the existing private treaty markets, pairs of the proposed centralized markets, the cash and futures markets and the informal forward contract and futures markets. Thus, a joint estimation is proposed and proceeded in the study.

The authors suggested that consistently and efficiently estimating the coefficients B_j by

a series of five independent binary probit or logit models is simple. However, to jointly estimate the system of five probit or logit models may be difficult. One alternative method is the Seemingly Unrelated Regression technique with percentages instead of binary value in the dependent variables, suggested by Amemiya in 1974 and by Zellner and Lee in 1965.

Variable identification was based on the literature dealing with adoption and diffusion processes for innovations. Early adopters of new technology and methods are having relatively more education, information seeking, ability to take risks and willingness to change. Socio-economic variables on the perception group of data are the satisfaction of current private treaty markets and the acknowledgement of receiving a fair price for quota peanuts. The information variables are the importance of peanut organizations and the importance of peanut buyers as sources of marketing information. The management variables are represented by the number of farm enterprises and the percentage of net worth to assets. Finally, the demographic variables are expressed by the college education and three regional variables.

The authors make six distinguished conclusions. If a centralized market for farmers' stock peanuts is attempted, all the three proposed organized alternatives are supported from the analysis. The forward deliverable contract market has the least support. The least impacts on the conventional marketing structure is the computerization of the existing cash and forward contract markets with a change in trading format. The potential group of traders are sensitive to the choice of proposed alternatives. Peanut growing region is an important factor in the organized alternatives other than a computerized market. Finally, the empirical profiles associated with the proposed organized markets support the expected profile of early adopters of new methods and technology.

As a result, several conclusions can be made for the application in the modeling work of seller's choice structure of fruit and vegetable wholesale markets. Firstly, the choice model or decision structure must be based on supplier's utility or profitability maximization. Secondly, model with alternative dichotomous choices may have to consider the correlation of attitudes among alternatives and estimate jointly. Thirdly, the data used in a choice model should include at least five groups of variables such as management, attitudes, demographics, information and market services.

III 、 Model Specification

There are several assumptions to be made before constructing the choice model for suppliers in the consumption-type wholesale markets. First, a perfectly competitive environment is assumed. Thus, traders are price takers in each market. Second, supplier's identification is released. In fact, government officials have in fact unofficially released the regulation on the traders' identifications for the entrance to the fruit and vegetable wholesale markets Since 1975. This has led to free entrance of traders in most markets except Taipei and Sanchung markets. Third, supplier's marketing strategy is to maximizing his own utility. Sellers in the wholesale markets not only sell products through wholesale marketing but also through other marketing alternatives under utility maximization.

Following from past researches, suppliers in the consumption-type wholesale markets are hypothesized to be utility maximization based on their economic factors such as personal characteristics, demographic characters and informative sources. The linear utility function is then defined as equation (1). It is realized that a threshold level to distinguish the 'strong' and 'weak' willingness to participate in wholesale marketing can be clearly defined. Suppliers inside the wholesale markets are willing to participate in wholesale marketing despite of other available alternatives. Combined with other marketing alternatives, traders in the wholesale markets are hypothesized to maximize their utility based on their attitudes toward economic factors such as personal characteristics, demographic basis, and available information. Thus, dependent variable represented by the utility can not be defined as 'yes' or 'no'. Instead, the percentage distribution of their products may be of more appropriate to represent their utility of choosing alternatives.

A vector of percentage variables representing the particular combination of marketing alternatives selected by the t^{th} trader is then denoted as

$$P_t = [p_1, \dots, p_n],$$

where p_i represents the percentage and $0 < p_i < 1$. The combination in P_t is assumed to max-

imize each supplier's choice utility. Thus, equation (1) can be redefined as:

$$(2) P_i = X_j B_j + e_j.$$

It is clear that the j^{th} residual term will be correlated across j equations of marketing alternatives. Moreover, P_i remains normally distributed.

Before the explanation of data collection and estimation, several statistical characteristics of variables and the model must be taken into account:

(a) Limited Dispersion of Variables

A variable is said to have limited dispersion when the difference of its mean and minimum value divided by its own range is not between 0.05 and 0.95. The variable with limited dispersion may imply too low variation to become significant explanatory variable other than the constant term. Such variable has little chance of being declared as statistically significant in the model (Harrell, p. 182). Variables without limited dispersion are then qualified to be examined under other statistical considerations.

(b) Collinearity of Explanatory Variables

Collinearity of explanatory variables is then examined by using the Belsley, Kuh, and Welsch diagnostic method which is available in SAS: Statistics, the COLLIN option under PROC REG model statement. The purpose of the above diagnostic procedure is to calculate the condition index and the variance-decomposition proportion. This procedure follows double conditions (Belsley, Kuh, and Welsch, p. 112) : (1) a singular value judged to have a 'large' condition index, and it is associated with (2) 'high' variance-decomposition proportion for two or more estimated regression coefficient variances.

The condition indices are the square roots of the ratio of the largest eigenvalue which is sometimes called the characteristic root to individual eigenvalue (see Chiang, pp. 340-342). The rule of thumb of 'large' condition index and 'large' variance-decomposition proportions proposed by Belsley et al. are values of '30-100' and 'greater than '0.5'', respectively.

The SAS COLLIN command in PROC REG program will be adopted for the exposure of collinearity of explanatory variables. Those variables with high condition index and variance-decomposition proportion will not be included in the model for estimation. Although collinearity is not a great problem in a large sample case, the examination of collinearity may help preventing estimation bias and low degree of freedom. It is especially important for the model having many possible important explanatory variables and limited sample size.

(c) Heteroscedasticity of the Covariance Matrix

In a single equation, the assumption of homoscedastic covariance matrix is frequently not plausible with cross-sectional observations, (see Kmenta p.705). Such disturbances of a model violates the homoscedastic assumption is called nonspherical disturbances. An equation with nonspherical disturbances will yield biased estimator. If the nonspherical disturbances prevail in a system of equations, the estimators of all equations in the system are biased in any case. Thus, Kmenta suggested the Breusch-Pagan test for homoscedasticity of a single equation (see Kmenta p.294).

Moreover, the possible heteroscedastic covariance matrix in a system of equations may result from the correlated disturbance matrices across equations. The estimation of such spherical model with respect to pooled cross-sectional and time-series observations using weighted two-stage least square (WTLS) method is suggested by Kmenta for full sample with heteroscedastic covariance matrix. However, it is further suggested that the Seemingly Unrelated Regression (SUR) technique may be appropriate for a system of equations with correlated disturbance terms across equations and the disturbance variances and covariances are assumed to be constant from equation to equation. It is clear that SUR is proper technique for the estimation of the equation system if possible heteroscedastic disturbance covariance matrix is resulted from the correlated disturbance across equations.

IV 、 Data and Estimation

Questionnaire is designed to elicit consumption-type wholesale market supplier's decision structure on available marketing alternatives. Closed questions are asked on the supplier's

satisfactory levels. Open questions are asked on the existing outcome faced by suppliers. Inside the questionnaire, questions are grouped into 5 categories other than percentage sale of each alternative. The five categories are: (1) management factors representing supplier's managerial attitudes toward current marketing portfolio; (2) attitudes toward current consumption-type wholesale marketing treaty; (3) demographic factors; (4) information; (5) market facility and service.

For management factors, willingness to expand supply through each alternative (PEXP) explains personal expectation on future profitability. The supplier may consider to provide his products to a market with shorter distance. Thus, the distance of marketing alternative outlet from original point of collection (DIS) may show the managerial change of cost saving portfolio. Moreover, the financial management must take the cashing ability of marketing alternative (CASH) into account. The suppliers may receive cash, checks, or both. Under the financial standard, supplier will market more of his products to the alternative with fastest cash receipt.

Attitudes toward current consumption-type wholesale marketing treaty include three major factors. First, supplier's feeling on the reasonable price formation of the consumption-type wholesale marketing (PRICE) is expected to have positive impact on wholesale marketing.

The satisfactory level on the grading and packing standards (GRADE) supported by each consumption-type market is also considered to have positive influence on wholesale marketing. The management strategy of the market further determines the degree of outside-market trading. A popularity of outside-market trading (OUTRAD) will depress inside-market trading.

For demographic factors, three variables are originally set up. The experience (EXPC), age (AGE) and level of education (EDU) of supplier are the basic personal characteristics. The effects of demographic factors on sales are indeterminant before estimation. Another variable representing the share of wholesale revenue in total family income (INCOMP) is important to distinguish suppliers as full- or part-time worker.

The information variable (MULTIM) is the proxy for how well informed about the available wholesale market alternatives the supplier is. This specification tries to differentiate suppliers from supplying to the surveyed market only or supplying to various wholesale markets. The supplier deals with various wholesale markets is expected to have better information.

Finally, supplier's satisfactory level on the market facility and service (MFAC) further

reflects the competition among alternatives. Market facilities include basic constructions and trading equipments. Market service involves the friendship with market employees and satisfactory level on the method of transactions and receipts. All these factors are aggregated into one index variable showing different satisfactory level.

The above important factors are collected from a survey on 75 suppliers among 7 major consumption-type fruit and vegetable wholesale markets in Taiwan. Samples are randomly selected through the help of market managers. Three marketing alternatives are proposed to supplier's decision portfolio. The three marketing alternatives are the wholesale marketing, sold to local dealers and direct marketing. Direct marketing includes the sale by supplier to retail markets, supermarkets, restaurants, processing plants and exporters.

Before the estimation, several statistical procedures must be taken care of. Firstly, variables with limited dispersion will automatically deleted from the estimation. As a result, the information variable is scratched from the data bundle. It reflects that most suppliers in the consumption-type wholesale markets are not well informed.

Secondly, the multicollinearity of explanatory variables are diagnosed by using the condition number and variance-decomposition proportion as indicators. Condition number within the range '30-100' is considered as high multicollinearity in each model equation. The variance-decomposition proportion above 0.50 is considered as high collinearity between two variables. Maddala (1988) suggests that condition number measures the sensitivity of the regression estimates to small changes in data. However, there are problems involved in the characteristics of the condition number. Thus, condition number can be considered merely as a complaint that things are not ideal.

The solution to eliminate multicollinearity is time consuming. All data are put together in the specified model and calculated with COLLIN comment in SAS. The initial results were 65.16 for wholesale marketing equation, 52.77 for local dealer marketing equation, and 53.72 for direct marketing equation. The followed steps are the deletion of variables one by one to compare the reduction of condition numbers of three equations while at the same time trying to maintain most important variables. As a result, the final condition numbers are 32.32, 22.91 and 23.42 for wholesale, local dealer and direct marketing alternatives, respectively. The basic statistics of the variables accepted from the dispersion limits and multicollinearity test are ex-

pressed in Table 3.

Thirdly, the Breusch-Pagan test for homoscedasticity is performed for each equation. The resulted CHI-square estimates are 12.90, 45.52, and 45.37 for the respective marketing alternatives which representing significant heteroscedasticity of all three equations. The variance-stabilizing transformation suggested by Neter et al. (1973) is adopted for the correction of heteroscedasticity. All variables are weighted by the inverse of the variance of the residual term from the Ordinary Least Square regression.

Finally, the accepted and transformed data are used for the estimation of the supplier's decision structure on marketing alternatives. Table 4 shows the estimated results of the specified choice model and Table 5 defines all the originally specified variables. In Table 4, suppliers do respond to the ability of advancing cash in the three marketing alternatives. However, the signs are not as expected in the local dealer and direct marketing equations. The reason may be that less cash advance represents nice business relationship and larger volume of supply.

The other management factor possessing statistical significance on the estimated coefficient is the distance from collecting point in the direct marketing equation. Supplier who supplies part of his products through direct marketing does care about the distance. The longer distance of final consumption from this supplier, the more reluctant for supplier to market products through such channel.

In the category of supplier's attitudes toward wholesale market treaty and regulations, the estimated results shows reasonable relationships. Supplier who considers price formation in the consumption-type wholesale market as unreasonable will decrease his supply to this market and turn into direct marketing but not local dealers. If the consumption-type wholesale market possesses satisfied grading and packing standards, supplier will supply more to wholesale market which decreases the supply to direct marketing. Moreover, those suppliers who think that outside-market trading is popular will decrease the supply to such market and be willing to sell more to local dealers.

As for the supplier's characteristics, educational level becomes important variable affecting supplier's decisions. It is clear that supplier with higher education will choose marketing channels other than wholeale marketing. The experience of suppliers on wholesale marketing

does not show any influence on decisions. In addition, supplier who has the lower percentage of wholesale earnings in total family income would market more products through direct marketing. This has implied that the direction toward mass marketing of fruits and vegetables is discouraged by some part-time suppliers in the consumption-type wholesale market. Future marketing policy should explicitly take this situation into account.

Finally, higher quality of service and facility in the consumption-type wholesale market will encourage direct marketing but not wholesale marketing. This is a very confusing result. The possible explanation for this may be that more satisfied market facility and service may imply higher control over market. Thus, price discovery in the consumption-type market may be distorted which in turn encourages direct marketing. If possible, the liberalization of the consumption-type markets to more privately operated market should be considered in the future.

V 、 Conclusion

This paper studies the consumption-type fruit and vegetable wholesale market supplier's decisions toward marketing alternatives. 74 observations are collected through survey on randomly selected suppliers in 7 major consumption-type wholesale markets. After the corrections on the limited dispersion, collinearity and heteroscedasticity, the system of three equations for three marketing alternatives is then estimated using the Iterative Seemingly Unrelated Regression technique.

The estimated results suggest that suppliers may want to receive noncash payments in order to gain business in both local dealer and direct marketing alternatives. The two-day lag of receiving sale's price in the wholesale market shows depressing incentive for supplier to expand supply into the wholesale market. Moreover, supplier in the consumption-type wholesale market supply part of his product through direct marketing would not be willing to market for a long distance. Thus, an efficient collection of products to retail outlets will be the major issue in the future.

Suppliers care very much about the price formation in the consumption-type wholesale markets. When price formation is found unreasonable, suppliers will decrease marketing volume in the consumption-type wholesale market and increase supply to direct marketing. On the contrary, the grading and packing standards in the consumption-type wholesale markets is proved to be important for suppliers to expand wholesale marketing and decrease incentives to direct mar-

keting. Moreover, the consumption-type wholesale market with popular outside-market trading will depress wholesale marketing and stimulate the sample suppliers to sell for local dealers.

As for the supplier's characteristics, supplier with higher education in the consumption-type wholesale market would choose marketing channels other than wholesale marketing. Part-time supplier in the consumption-type wholesale market, on the other hand, has the impact on the decentralization of mass marketing in Taiwan. Future marketing policy must be careful on preventing such development of part-time supplier in the consumption-type wholesale markets.

Finally, better consumption-type wholesale market facility and service does not improve wholesale marketing. Instead, direct marketing is stimulated when wholesale market facility and service are improved. One possible explanation to such strange results is that better facility and service may imply higher degree of market control by the market or the government. As a result, high degree of control over wholesale market may have distorted the price formation in the market as compared to other marketing alternatives. One suggestion could be made is the liberalization of the consumption-type wholesale market operation. Policy toward encouraging privately owned and operated consumption-type wholesale market may be proper in the future to improve wholesale marketing efficiency and compete with the direct marketing.

From the above results, suggestions on the marketing alternative for imported fruits is explicit. Imported fruits may choose between wholesale marketing and direct marketing. Wholesale market in Taiwan does not provide cash advance for products sold into the market. Moreover, price formation in the wholesale market may be distorted. Better grading and packing standards of imported fruits may be advantageous to go into wholesale markets. For those imported fruits seeking for larger market share may be better off to go for direct marketing channel. This is further proved by the fact that fruits are imported from the border near major consumption area. Thus, direct marketing may result in better price and traded volume.

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Table 1 Basic Statistics of Fruit and Vegetable Production in Taiwan, 1952-1989.
Changes in the Fruit and Vegetable Composition of Crop Production.
(based on current prices)

Year	National Income (mil. NTS) a	Consumer Price Index (1952=100)	Value of Production (1,000 NTS)		Value of Crop Production (mill. NTS)	Share of the Value of Fruits in Crop Production (%)	Share of the Value of Vegetables in Crop Production (%)
			Fruits	Vegetable			
1952	16,335	100.00	---	239,316	4,996	3.5	4.8
1953	21,796	118.79	---	277,060	7,471	2.4	3.7
1954	23,824	120.77	---	320,782	6,075	3.1	5.3
1955	28,331	132.74	---	386,647	7,721	3.2	5.0
1956	32,377	146.69	---	431,540	8,601	3.1	5.0
1957	37,535	157.73	---	474,412	9,963	3.6	4.8
1958	41,880	159.74	---	699,782	10,999	4.2	6.4
1959	48,130	176.62	---	767,892	12,130	4.8	6.3
1960	58,106	209.19	698,788	930,843	16,496	4.2	5.7
1961	65,214	225.57	754,173	84,445	18,343	4.1	5.4
1962	71,806	230.85	922,854	1,098,957	18,163	5.1	6.1
1963	81,288	236.02	1,114,830	1,108,678	19,070	5.8	8.3
1964	95,073	235.55	1,856,561	1,189,817	23,666	7.9	6.2
1965	104,844	235.36	2,746,123	1,555,129	24,225	11.4	8.0
1966	117,526	240.04	2,956,922	1,773,179	25,407	11.6	8.9
1967	135,587	248.08	3,344,990	1,924,821	27,570	12.1	9.4
1968	157,796	267.73	3,599,172	2,683,278	29,405	12.2	11.5
1969b	182,641	281.22	3,376,834	3,288,577	28,150	12.0	13.2
1970	209,985	291.29	3,587,486	4,356,755	30,405	11.8	16.0
1971	243,889	299.53	3,838,836	4,176,101	30,048	12.8	16.3
1972	291,905	308.55	3,834,064	4,527,336	32,954	11.6	17.3
1973	378,952	333.76	4,575,541	6,178,079	42,191	11.3	16.7
1974	509,092	492.20	5,667,243	8,034,855	62,356	9.1	14.4
1975	541,011	517.99	5,889,137	9,293,506	70,906	8.2	14.2
1976	645,957	530.94	7,307,246	10,676,920	70,842	10.3	16.3
1977	755,245	568.32	8,071,261	12,260,627	72,029	11.2	19.4
1978	904,768	601.11	9,130,227	14,485,069	73,778	12.4	23.3
1979	1,095,161	659.72	12,650,363	17,680,728	87,111	14.5	23.2
1980	1,368,574	785.13	14,590,647	21,085,721	100,667	14.5	23.2
1981	1,614,934	913.42	17,469,412	21,704,677	110,235	15.8	22.1
1982	1,731,757	940.46	23,727,766	25,971,290	127,001	18.7	22.6
1983	1,917,111	953.16	27,607,610	26,555,047	130,571	21.2	22.4
1984	2,161,164	952.97	30,721,775	26,494,104	131,105	23.4	22.7
1985	2,282,388	951.35	29,164,550	26,506,480	126,809	23.0	22.3
1986	2,671,115	958.01	28,385,020	26,610,154	119,927	23.7	23.7
1987	3,008,416	962.99	30,828,648	28,203,913	126,167	24.4	26.1
1988	3,282,512	975.32	37,482,149	28,127,815	135,172	27.7	23.4
1989	3,626,601	1,018.33	40,429,269	27,788,145	138,078	29.3	22.3

Data Sources : Taiwan Statistical Data Book and Taiwan Agricultural Yearbook, Various Years.
BASIC AGRICULTURAL STATISTICS, REPUBLIC OF CHINA (1990 EDITION), by the Council of Agriculture.

a : Excluding servicemen and foreign nationals.

b : Since 1969, including servicemen.

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Table 2 Price Formation of Fruit and Vegetable Wholesale Markets in Taipei City
(N.T. \$/100KG), 1975-1989

Year	Vegetable		Fruit	
	Price	Index (1985=100)	Price	Index (1985=100)
1975	511	54.07	---	---
1976	467	49.42	---	---
1977	652	68.99	---	---
1978	619	65.50	---	---
1979	687	72.70	---	---
1980	745	78.84	---	---
1981	969	102.54	---	---
1982	806	85.29	1,376	91.61
1983	1,005	106.35	1,342	89.35
1984	874	92.49	1,480	98.54
1985	945	100.00	1,502	100.00
1986	1,089	115.24	1,501	99.93
1987	1,147	121.38	1,398	93.08
1988	1,171	123.92	1,340	89.21
1989	1,241	131.64	1,384	92.14

Data Source : TAIWAN AREA AGRICULTURAL PRODUCTS WHOLESALE

MARKET YEARBOOK, Various Years.

--- : Not Available



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Supplier's Marketing Alternative of Consumption-Type
Fruit and Vegetable Wholesale Markets in Taiwan

Table 3 Consumption-Type Fruit and Vegetable Wholesale Market Supplier's Responses,
March 1992.

Variables	Minimum Value	Maximum Value	Mean Value
I Management			
PEXP1	0.0	5.0	2.1
PEXP3	0.0	4.0	0.8
			12.7
DIS1	0.0	180.0	0.9
DIS3	0.0	13.5	
			2.1
CASH1	0.0	3.0	0.4
CASH2	0.0	3.0	0.3
CASH3	0.0	3.0	
II Attitudes			
PRICE	0.0	2.0	1.2
GRADE	0.0	5.0	2.9
OUTRAD	0.0	5.0	2.6
III Demographics			
EXPC	0.1	35.0	14.5
AGE	22.0	66.0	46.1
EDU	0.0	4.0	2.5
INCOMP	10.0	100.0	84.0
IV Market Service & Facility			
MFAC	0.0	5.0	3.0

Source : From the research survey.

Table 4 Estimation Results of the Supplier's Decision Structure on Marketing Alternatives, March 1991.
(Using Iterative Seemingly Unrelated Regression --- Iter=24)

Alternatives	Constant	PEXP	DIS	CASH	PRICE	GRADE	OUTRAD	EXPC	EDU	INCOMP	MFAC	DF	R ²	D-W
SWH	127.861*** (5.04)	-0.508 (-0.67)	0.024 (1.07)	-0.834* (-1.33)	-11.531** (-2.37)	5.095* (1.36)	-3.485* (-1.58)	-0.044 (-0.15)	-8.013** (-2.53)	0.018 (0.17)	-3.42 (-0.97)	63	0.218	1.891
SLD	-19.090 (-1.07)	—	—	3.972*** (5.89)	4.377 (1.27)	-2.302 (-0.87)	2.626* (1.68)	-0.069 (-0.34)	3.489* (1.55)	0.113* (1.51)	1.113 (0.45)	65	0.367	1.778
SDM	-0.547 (-0.08)	—	-1.823*** (-9.69)	8.290*** (13.27)	2.288* (1.83)	-1.633* (-1.70)	0.433 (0.76)	0.091 (1.21)	1.438* (1.76)	-0.069** (-2.53)	1.457* (1.62)	64	0.628	2.161

— : Deleted due to multicollinearity

* : Significance level at 0.20 (t=1.282)

** : Significance level at 0.05 (t=1.960)

*** : Significance level at 0.01 (t=2.576)



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(21)

Table 5 Variable Definition

I Dependent Variables

SWH : Percentage of total supply through wholesale marketing.

SLD : Percentage of total supply through local dealers.

SDM : Percentage of total supply through direct marketing.

II Explanatory Variables

A. Management

PEXP_j : Willingness of expanding business through jth marketing alternative, (j=1,2,3)
(0) no response (1) very reluctant (2) reluctant (3) no comment (4) willing
(5) very willing

DIS_j : Distance of marketing alternative outlet from original point of product collection,
(Kilometers).

CASH_j : Method of receiving sale's price, (0) no response or comment (1) cash (2) cash
and checks and others (3) checks and others.

B. Attitudes

PRICE : Reasonable price formation ? (0) no response (1) reasonable (2) unreasonable.

GRADE : Satisfactory level on the grading & packing standards of the wholesale market,
(0) no response (1) very unsatisfied (2) unsatisfied (3) no comment (4) satisfied
(5) very satisfied.

OUTRAD : Popular level of out-of-wholesale-market trading?
(1) no response or comment (1) very unpopular (2) unpopular (3) normal
(4) popular (5) very popular.

C. Demographics

EXPC : Experienced years in wholesale supply.

AGE : Current age of the supplier.

EDU : Educational level, (0) no response (1) not educated (2) primary school (3) middle
school (4) high school (5) college (6) above college

INCOMP : Percentage of wholesale revenue over family income in 1991 on average.

D. Information

MULTIM : Supply products in one or various wholesale market, (0) only one (1) more than
one.

E. Market Service & Facility

MFAC : Satisfactory level on wholesale market facility and service,(0) no response
(1) very unsatisfied (2) unsatisfied (3) no comment (4) satisfied (5) very satisfied.

消費地型態果菜批發市場供貨 人運銷通路決擇

黃琮琪*

摘 要

本文研究國內消費地型態的果菜批發市場供貨人運銷通路之決擇。利用看似無關反覆迴歸 (Iterative Seemingly Unrelated Regression) 對三條運銷通路決策結構式作系統分析，估計結果發現現行消費地果菜批發市場供貨人可能在面對販運商與直銷管道之競爭下而放棄立即現金收入。因此，果菜批發市場業務之改善重點應特別注重非現金收付之服務。而非現金收付之重要影響因素包括定價系統之合理性、分級包裝標準之建立、場外交易之減少與市場經營走向私營化等。至於對進口水果運銷通路之合意則有二。其一，有非常明顯分級標準而包裝的產品以選擇果菜批發市場為配銷通路應較佳。其二，其他散裝類型進口水果之運銷通路選擇則以直銷為佳。

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