BIBLIOGRAPHIC DATA SHEET

1. CONTROL NUMBER	2. SUBJECT CLASSIFICATION (695)
PN-AAH-911	AE70-1300-G748

3. TITLE AND SUBTITLE (240)

Improving marketing of persihable commodities: a case study of selected vegetables in Taiwan

4. PERSONAL AUTHORS (100)

Calkins, P. H.; Wang, H. M.

5. CORPORATE AUTHORS (101)

AVRDC

6. DOCUMENT DATE (110)	7. NUMBER OF PAGES (120)	8. ARC NUMBER (170)
1980	68p.	TW38Ø.1415.C155

9. REFERENCE ORGANIZATION (130)

AVRDC

10. SUPPLEMENTARY NOTES (500)

11. ABSTRACT (950)

12. DESCRIPTORS (920)

Taiwan
Vegetables
Production
Market survey
Marketing
Prices

13. PROJECT NUMBER (150)

931007500

14. CONTRACT NO.(140)	15. CONTRACT TYPE (140)
AID/DSAN-G-0085	

16. TYPE OF DOCUMENT (160)

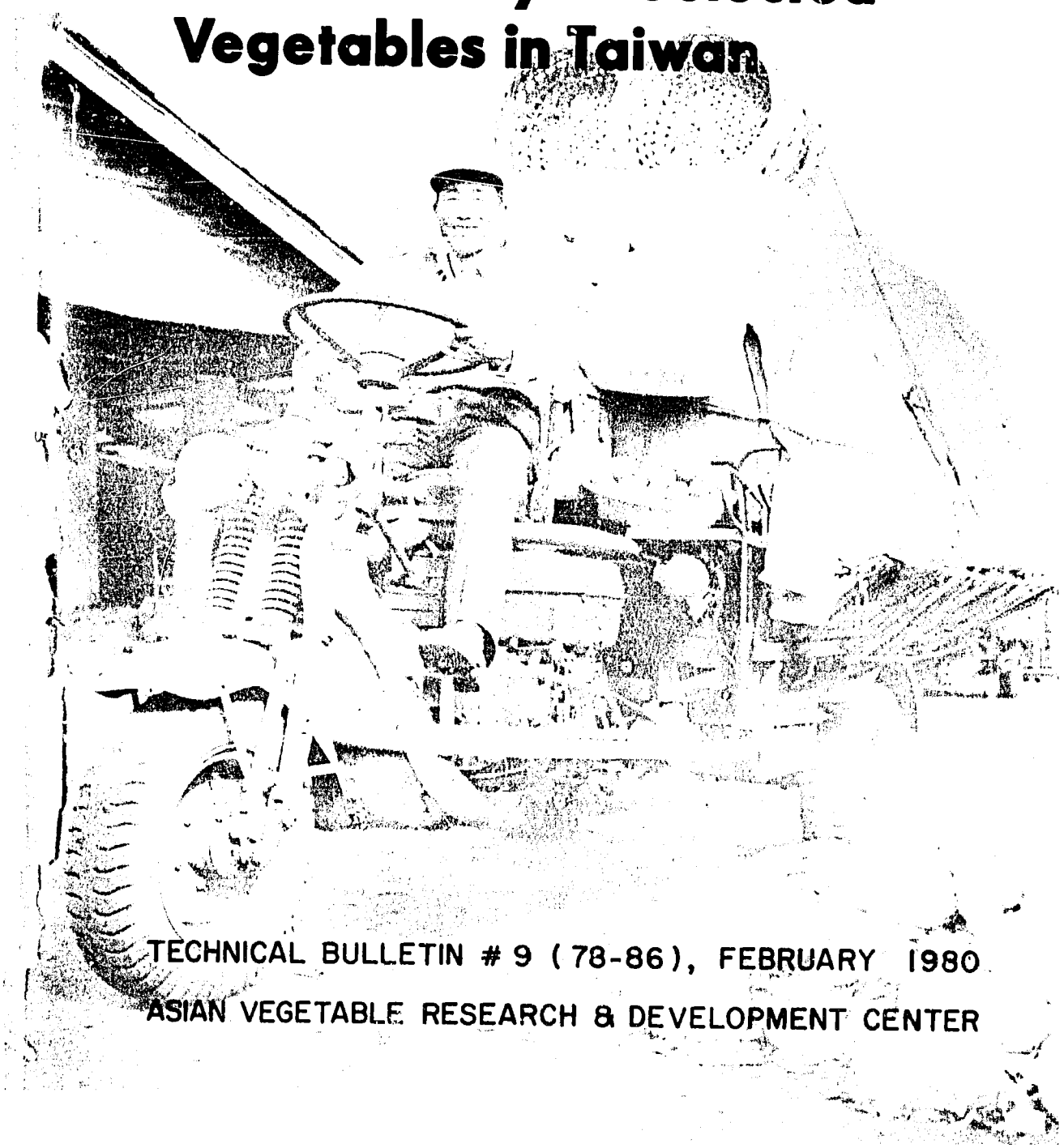
AID 590-7 (10-79)

TW
380.1415
C155

PN-AAH-911

Improving Marketing of Perishable Commodities:

A Case Study of Selected Vegetables in Taiwan



TECHNICAL BULLETIN # 9 (78-86), FEBRUARY 1980

ASIAN VEGETABLE RESEARCH & DEVELOPMENT CENTER

IMPROVING THE MARKETING OF PERISHABLE COMMODITIES:

A CASE STUDY OF SELECTED VEGETABLES IN TAIWAN

by

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ABOUT THIS REPORT

Data in this report are presented in metric units. Monetary values have been converted to U.S. dollars at the current (May, 1978) exchange rate.

A double asterisk (**) means significant at the 1% level; a single asterisk (*) means significant at the 5% level; and a cross (†) means significant at the 10% level.

We wish to acknowledge financial support from the Joint Commission on Rural Reconstruction provided in Grant No. 77-C22-R-512 to carry out this project.

Information and conclusions reported herein are solely the responsibility of AVRDC. Additional copies of this report may be obtained by writing The Office of Information Services, P. O. Box 42, Shanhua, Tainan 741, Taiwan, R.O.C. Please quote the publication number.

Correct citation: Calkins, P.H. and H.M. Wang. 1978. Improving the marketing of perishable commodities: a case study of selected vegetables in Taiwan. AVRDC Tech. Bul #9 (78-86). Shanhua, Taiwan, Republic of China.

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Chapter one: Introduction

Taiwan's economy is developing rapidly, and the demand for a constant supply of high quality fresh or processed perishable commodities is growing. The bulk of the population since 1968 has moved to the urban sector, living more and more on commodities produced as farm surpluses; and processors, storage operators, and greater numbers of transport operators and wholesalers are appearing. With increased population and more abundant capital in the urban sector, the demands for non-staple goods in the cities have also risen, so that the role of traditional markets is giving way to supermarkets and the packaging of convenience foods. This process is further promoted by the higher levels of education, nutritional awareness, and per capita income in the urban areas; and the association of processed and imported foods with social prestige and a higher quality of life.

Thus, there is continuous change in the types of products which are favored as the economy develops. In this process, individual perishable commodities have each developed a distribution network composed of many types of marketing channels, of which the parameters must be measured to plan for future growth. It is important to determine whether or not there are trends in the growth of certain sectors of the economy, and to relate such growth to the international economic situation. With many forces at work in the development process, the formulation of practical analytical techniques has become imperative. Furthermore, with the particular problems of the handling, storage, and processing of perishable commodities, the identification of technologies for increasing the efficiency of such operations could be of great service to government planners and private sector entrepreneurs, and ultimately the producer and the consumer.

A REVIEW OF LITERATURE ON MARKETING

The economic writings on marketing are broad in scope and objective. Perhaps the most common are commodity and/or region-special marketing studies (8, 13, 20, 26, 40, 41, and others). One of the most useful of these as a background for the present study is Southworth's (26) collection of 11 studies which list for specific commodities the marketing channels, gross margins, and marketing costs in a number of Asian countries. Probably the most profuse source of such studies in Asia is the Philippines' Special Studies Division survey group, which has published 80 monographs on commodity marketing and consumer buying patterns. When marketing studies include the provision of inputs to the farmer and a complete analysis of the distribution and final uses of the product, they are called agribusiness studies. The most comprehensive is Goldberg et al (14).

The second type of marketing study deals with analytical techniques designed to improve the efficiency of business firms (3, 10, 22, 24, 38, and others). Day (10) develops a quadrant analysis to classify a firm's commodities as "problem children", "stars", "cash cows", and "dogs" based on market growth rate and market share dominance. Weston (38) describes

how and what such a firm should produce in order to operate most efficiently.

A third type of marketing study deals with understanding the consumer's preferences and is most often also used in surveys by business firms. Vinson et al (37) discuss the meaning of values, operational value paradigm, the impact of social values on product perception, and implication for marketing practices. Green et al (15) establish probability-of-adoption predictions for telecommunications services using logit and log-linear models. Although the methods they use are sometimes recondite, the results are often straightforward: people who move more invest less in telecommunications services.

A fourth type of marketing study deals with almost purely statistical and econometric procedures (3, 15, 24, 39, and others). An example is Oppedijk van Veen and Beazley (24) which shows that the method of data analysis does not significantly affect the estimate of trade-off utilities which consumers assign to brands or products.

The final broad category of marketing studies deals with the evaluation of marketing efficiency (1, 5, 11, 14, 25, 27, 36, 38). These will be discussed in more detail at the beginning of Chapter Five.

There are already a number of excellent studies on the production, transportation, marketing, storage, and processing of vegetable products in Taiwan. The Provincial Department of Agriculture and Forestry has publications on transportation and marketing costs, cold storage, wholesale transaction volumes and prices (8, 34) which provide a framework of costs, gross margins, and a comparison of selected technologies for the post-harvest handling of vegetable products. The Taiwan Canners' Association publishes numerous reports on the export of canned food from Taiwan (30) which takes the researcher one step farther in charting the course of products from the producer to the most distant possible consumer. National Taiwan University has made ten-year projections for food supply and demand for selected commodities in Taiwan, as well as individual production cost studies (7). These help to put the vegetable situation into a context of technological trends over time. The Academia Sinica's Institute of Economics has investigated the effects of exports on employment and the effects of population growth on consumption patterns for various commodities in Taiwan.(2) This is a step towards constructing long-term consumption trends in the demand for vegetables. To these may be added the work on household consumption of aggregate food groups and individual commodities (16, 21). There have been studies of Taiwan's 10 specialized production areas for perishable commodities (33) which offer insight into the means of organizing producers into stable, large-scale joint marketing operations in order to share risks.

The present study, based on marketing surveys conducted by the Asian Vegetable Research and Development Center (AVRDC) in 1977-78, is primarily a commodity and region-specific study. It compares the particular problems and technical achievements of marketing agents for seven specific perishable commodities in Taiwan. The study also sets down analytical techniques to overcome practical problems in describing the costs and returns to marketing and the relative efficiency of several types of marketing channels. Not only is factual information supplied for government planners in Taiwan but also cost data and simple analytical procedures are given for use by marketing researchers in Asia and the tropics.

OBJECTIVES

1) identify and trace present structure of marketing channels in Taiwan for representative perishable commodities; and determine the structure of marketing costs for each channel;

2) determine the marketing margin of each type of marketing channel as a whole, and between different types of marketing intermediaries;

3) evaluate each system in terms of its technical and economic efficiency, identifying problems and ways to solve them;

4) suggest the single best marketing technology and channel to allow for maximum growth of each commodity industry in the future; and,

5) assess the effect of relative perishability on market structure and efficiency.

METHODOLOGY

We conducted the project in four stages:

1) Selection of target commodities. We analyzed seven commodities of varying perishability, choosing five from those designated by AVRDC for intensive research: mungbean, soybean, sweet potato, fresh-market tomato, and Chinese cabbage.[a] These are listed in increasing order of water content at the farm gate, which we found was a good index of perishability. For comparative purposes, we added bamboo shoots, which had the highest percentage value of vegetable commodities in Taiwan in 1976; and common cabbage to compare with Chinese cabbage. All these commodities flow through a variety of marketing channels, allowing for a comparison within a commodity of the efficiency of various distribution systems. Furthermore, these commodities were included in an AVRDC household consumption survey conducted in 1977-78 in five Taiwan cities. (Taipei, Taichung, Changhua, Kaohsiung, and Taitung; Fig. 1). The survey determined for individual commodities the relative response of demand to increases in income as well as to decreases in price due to improvements in distribution systems. This information helps identify the commodity for which demand will increase most following reduction in price (especially among low income groups) and, hence, the one in which government or private sources could invest to improve marketing efficiency.

2) Selection of production areas. Figure 1 shows that the production areas may be divided into those for the most perishable crops: bamboo shoots, tomato, common cabbage, and Chinese cabbage (concentrated in Taichung, Changhua, Yunlin, and Nantou); and those for the less perishable and generally lower value crops: mungbean, soybean, and sweet potato

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[a]The final AVRDC target commodity, white potato, was not selected because 80% of its limited production is concentrated in Taichung district, and marketing is not well developed. However, statistics on white potato and on the byproducts of mungbean and soybean will be given for comparative purposes where relevant.

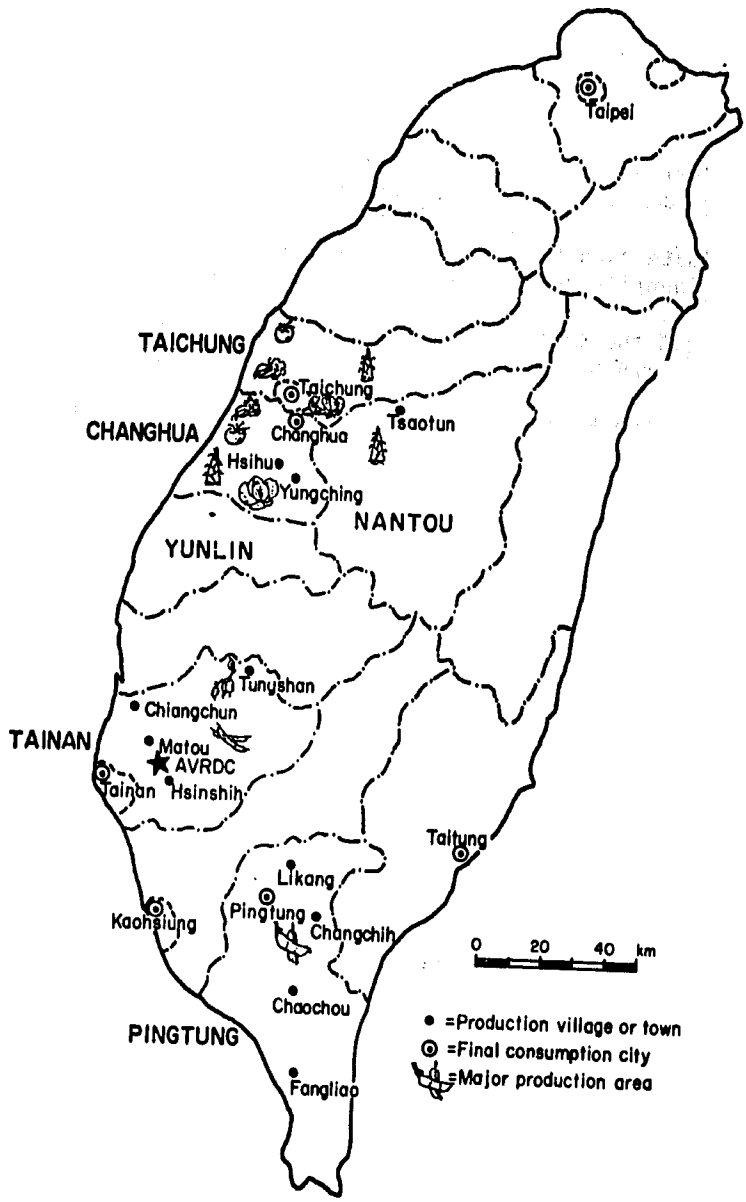

Fig. 1. Production and final consumption areas in the AVRDC marketing and consumption surveys, 1977-78; AVRDC, 1978.

(Pingtung and Tainan). With help from the county governments, we selected target towns and villages for the production survey of 312 farm households[a]. Farmers' associations in each location quided us in conducting interviews on the budgets and motivations for growing the target commodities in each area. Interviews were conducted with the assistance of students from the Department of Agricultural Economics at National Taiwan University.

3) Interviews of marketing agents. We surveyed a sample of 75 agents in successive links of the marketing channels.

4) Analysis of the data. We constructed marketing flow charts to identify the channels for each commodity. Production costs for farmers were divided into operations through to the end of harvest, and post-harvest operations. Marketing costs and prices received from marketing agents were computed by type of agent. Then we compared the economic and technical efficiency of complete marketing channels. Finally, we assessed the aspirations of both producers and marketing agents, and their evaluations of and problems with the target commodities.

FORMAT

This report is divided into six chapters. Chapter 2 describes vegetable marketing in Taiwan and its place in economic development. We analyze trends in the production and marketing of vegetable and non-vegetable commodities.

Chapter 3 concentrates on the vegetable producer as the first link in the marketing chain. Key aspects of his production and marketing decisions, and his attitudes and preferences are highlighted.

Chapter 4 discusses vegetable marketing agents, their physical and economic losses, mark-up patterns, preferences for suppliers and buyers, and desired changes to solve their current problems. We emphasize areas where the perceptions of producers and marketing agents differ.

Chapter 5 describes the major marketing channels for each commodity studied. The most efficient channel for each commodity and the most efficient commodity for each channel determined. Marketing margins, economic efficiency, and technical efficiency also are measured in an effort to pinpoint at what stages the current marketing channels for the commodities might be improved.

Finally, chapter 6 reviews the major conclusions and suggests improvements in the marketing of perishable commodities, either through technological or policy measures.

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[a]The sample was selected so that no less than 45 growers were interviewed who grew each crop, and as many growers as possible who produced more than one.

Chapter Two

Trends in Vegetable Production and Marketing in Taiwan

Agriculture in Taiwan has been undergoing dramatic changes in the past 20 years. Productivity has increased, and the sophistication of cropping systems has reached unprecedented levels. Table 1 shows indices of agricultural productivity in Taiwan, 1960-76. There has been a steady climb, not only in physical tonnage, but also in the value of production per hectare farmed. Taiwan's agriculture is a m of steady development which has allowed more and more people to leave the land to pursue non-agricultural occupations. As recently as 1968, 50% of the population employed worked in agriculture, while only 34% of a vastly expanded work force was so employed in 1976.

Table 1. Trends in overall and per hectare agricultural productivity in Taiwan, 1964 - 1976; AVRDC, 1978.

Year	Total Agricultural Production[a] (1971=100)	Value of production per hectare farmed[b]	
		Actual	Adjusted[c]
		------- US$100	----------
1964	83.5	n.a.	n.a.
1965	90.2	n.a.	n.a.
1966	91.6	7.1	15.7
1967	95.4	7.6	16.1
1968	99.3	8.2	16.1
1969	95.3	7.7	14.5
1970	99.9	8.4	15.3
1971	100.0	8.3	14.6
1972	101.1	9.2	15.9
1973	102.1	12.4	20.0
1974	107.6	17.8	19.2
1975	104.7	20.4	21.1
1976	n.a.	20.3	20.3

[a]Ref. 35; [b]Ref. 29; [c]Adjusted for inflation by the consumer price index so that all figures are in constant 1976 US$.

Labor has become a major constraint on the complexity of farming systems, and the multiple cropping index has declined steadily since its peak in 1964 (Table 2). If agricultural economies pass from subsistence through mixed-intensive culture to commercial mono-culture in the course of economic development (6), Taiwan has already begun to leave the mixed-intensive culture. It is important to understand not only why and how intensive agriculture systems in Taiwan have worked so well (and hence how the principles they embody may be extended to other developing agricultures), but also what changes are occurring now as Taiwan enters commercialized mono-culture.

Table 2. The increasing role of vegetable production in the agriculture of Taiwan, 1964-76; AVRDC, 1978[a].

Year	CI[b]	Land/ family	Cropped land/ family	Area Cropped to Veg.	Yield[c]	VCI[d]	RVCI[e]	Vegetable production/ family
		------ha-----		-1000ha-				- t -
1964	189.7							
1965	188.8							
1966	188.2	1.05	1.98	113	8.52	13	7	1.13
1967	188.0	1.04	1.96	115	9.15	13	7	1.21
1968	188.0	1.03	1.94	118	10.25	13	7	1.38
1969	183.5	1.03	1.89	134	10.93	15	8	1.65
1970	183.0	1.03	1.88	141	11.95	16	9	1.91
1971	179.4	1.03	1.85	147	12.01	16	9	2.01
1972	176.4	1.02	1.80	149	11.44	17	10	1.94
1973	174.9	1.01	1.77	158	11.91	17	10	2.14
1974	179.3	1.04	1.86	168	11.54	18	10	2.21
1975	180.9	1.06	1.92	187	11.90	20	11	2.56
1976	174.6	1.06	1.84	191	12.74	21	12	2.81

[a]Adapted from ref. 29; [b]CI = Cropping Index = $\frac{\text{total ha cropped}}{\text{total ha available}}$ X 100;
[c]Yield = $\frac{\text{tons vegetable production}}{\text{area cropped to vegetable}}$;
[d]VCI = Vegetable Cropping Index = $\frac{\text{ha cropped to vegetable}}{\text{total ha available}}$ X 100;
[e]RVCI = Relative Vegetable Cropping Index = $\frac{\text{ha cropped to vegetables}}{\text{total cropped ha}}$ X 100.

THE EFFECTS OF DEVELOPMENT ON THE TARGET COMMODITIES

Table 2 shows that although the overall cropping index and hectares cropped per family have declined steadily since 1964, the area planted to vegetables, relative vegetable cropping index, and aggregate vegetable yield have all risen. Thus, in the trend of decreasing labor but increasing total agricultural output, there has been an expanding role of vegetable crops in the development of Taiwan's agriculture from an intensive mixed to a commercial mono-cropped economy.

Table 3 ranks the crops in this report according to various economic indicators over the period 1966-76. The commodities are divided into three groups:

I. Increasing yield and planted area:
- bamboo shoots
- fresh tomato
- Chinese cabbage (except for constant yield)

II. Fairly stable patterns
- mungbean
- common cabbage (except for improving yield)

III. Declining yield and planted area
- soybean
- sweet potato

Table 3. The trends in planted area, yield, and value of the 7 survey crops, Taiwan, 1966-76; AVRDC, 1978.[a]

	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976
Planted area (1000 ha)											
Bamboo shoots	4.2	4.5	5.0	5.5	5.5	6.2	7.4	13.7	20.9	19.3	18.5
Fresh market tomato	3.0	3.1	3.5	3.7	3.4	3.7	3.7	3.4	3.6	4.0	5.1
Chinese cabbage							4.5	5.3	6.2	7.9	8.4
Common cabbage	8.9	9.1	10.4	11.0	12.2	12.4	11.9	10.4	10.7	11.2	11.0
Mungbean							3.5	4.3	4.7	4.3	3.4
Sweet potato	235.6	236.8	240.4	233.8	229.7	225.5	210.7	201.0	180.4	156.7	123.9
Soybean	51.3	52.3	49.5	45.3	42.7	40.2	36.1	36.5	44.5	41.4	35.5
Total cropped ha (%)											
Bamboo shoots	0.25	0.26	0.30	0.33	0.33	0.38	0.47	0.87	1.27	1.16	1.15
Fresh market tomato	0.18	0.18	0.20	0.22	0.21	0.23	0.23	0.21	0.22	0.24	0.32
Chinese cabbage							0.28	0.34	0.38	0.48	0.52
Common cabbage	0.53	0.54	0.61	0.66	0.73	0.76	0.75	0.66	0.65	0.68	0.68
Mungbean							0.22	0.28	0.29	0.26	0.21
Sweet potato	13.97	13.97	19.21	13.93	13.81	13.92	13.30	12.83	10.97	9.45	7.72
Soybean	3.04	3.08	2.92	2.70	2.58	2.48	2.28	2.33	2.70	2.50	2.21
Yield index (1966=100)[b]											
Bamboo shoots	100	110	120	124	128	137	163	199	157	140	144
Fresh market tomato	100	109	121	127	137	118	121	141	140	141	137
Chinese cabbage							100	102	99	97	104
Common cabbage	100	109	128	148	141	146	139	150	147	152	154
Mungbean							100	154	159	157	160
Sweet potato	100	107	98	108	102	102	95	109	105	104	102
Soybean	100	117	120	120	124	123	135	135	122	121	121
Price (US$/t)											
Bamboo shoots	57	64	66	72	74	80	94	84	77	84	99
Fresh market tomato	46	49	49	57	46	46	59	76	110	148	112
Chinese cabbage							44	72	84	86	76
Common cabbage	26	29	29	32	40	33	43	65	81	82	69
Mungbean							409	354	386	361	405
Sweet potato	19	21	21	22	21	21	26	32	34	40	47
Soybean	157	165	165	153	144	139	172	291	278	277	293
Total crop value (%)											
Bamboo shoots	0.25	0.30	0.36	0.46	0.46	0.59	0.87	1.36	0.90	0.73	0.86
Fresh market tomato	0.22	0.26	0.30	0.41	0.30	0.28	0.32	0.34	0.35	0.47	0.45
Chinese cabbage							0.32	0.49	0.44	0.49	0.50
Common cabbage	0.41	0.47	0.58	0.82	1.00	0.83	0.92	1.01	0.85	0.83	0.69
Mungbean							0.06	0.09	0.07	0.06	0.05
Sweet potato	10.24	11.08	9.83	11.52	9.43	9.45	8.64	9.20	5.72	5.17	4.68
Soybean	1.56	1.80	1.64	1.45	1.24	1.26	1.19	1.59	1.13	0.92	0.83

[a]Ref. 29; [b]For tomato and mungbean, 1972 = 100.

Price trends have had a strong correlation with these developments in yield and planted area. This suggests not only that planted area and yield are responsive to trends in demand, but also that the marketing structure (through which that demand is translated) is a major stimulus to both production and technological change.

THE INFLUENCE OF INCREASED DEMAND

Figures 2 and 3 show consumption trends in the target commodities, 1973-76. The data are for Taipei city in the absence of data for the province as a whole, and are converted into constant 1976 prices. Among group I commodities, tomato consumption is increasing rapidly. In showing an overall decline, bamboo shoots and Chinese cabbage also follow recent production and yield data closely.

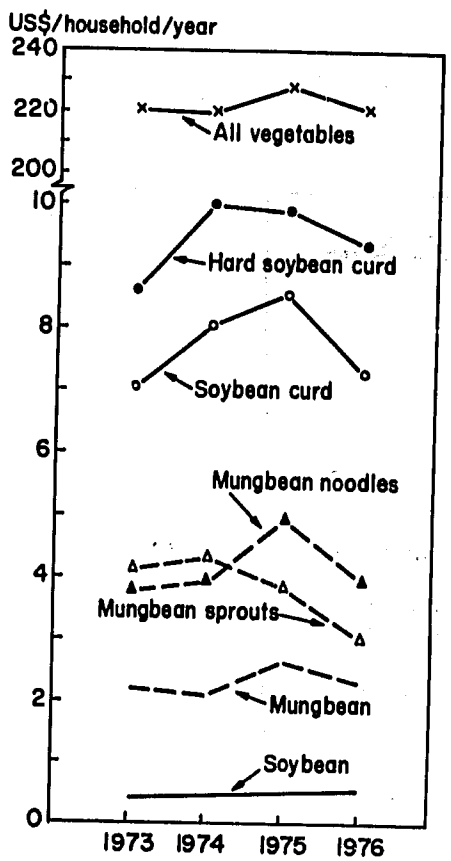

Fig. 2. Trends in expenditures on all vegetables & selected leguminous commodities, 1973-76; AVRDC, 1978.[a]

[a]Ref. 28.

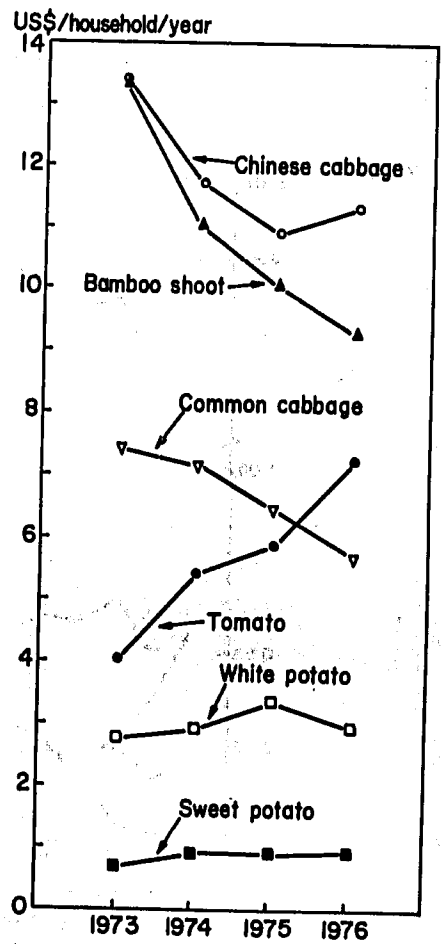

Fig. 3. Trends in expenditures on selected vegetable commodities per household, 1973-76; AVRDC, 1978.[a]

[a]Ref. 28.

The group II vegetables are declining in quantities consumed. Group III vegetables are declining in urban consumption[a] just as they are in planted area and yield. Sweet potato, in particular, has declined in area due to the switch from this crop to maize in the hog-feed mix and from staple consumption to occasional snack status for humans. Domestic soybean production has also declined as imports continue to be cheaper. However, there has been a rise in the consumption of processed forms, such as hard and soft soybean curd.

Therefore, trends in planted area and yield are induced by trends in demand.

The rise in planted area and consumption of these vegetables over the past few years in Taiwan is remarkable for two reasons: first, seasonal consumption patterns are quite irregular for cabbage, Chinese cabbage, tomato, and mungbean, although they are fairly constant for mungbean noodles, beansprouts, soybeans, and hard and soft bean curd (Figs. 4 and 5). Second, income elasticity of demand for vegetables is greatest at lower incomes and tends to flatten out quickly (Fig. 6) as incomes rise.

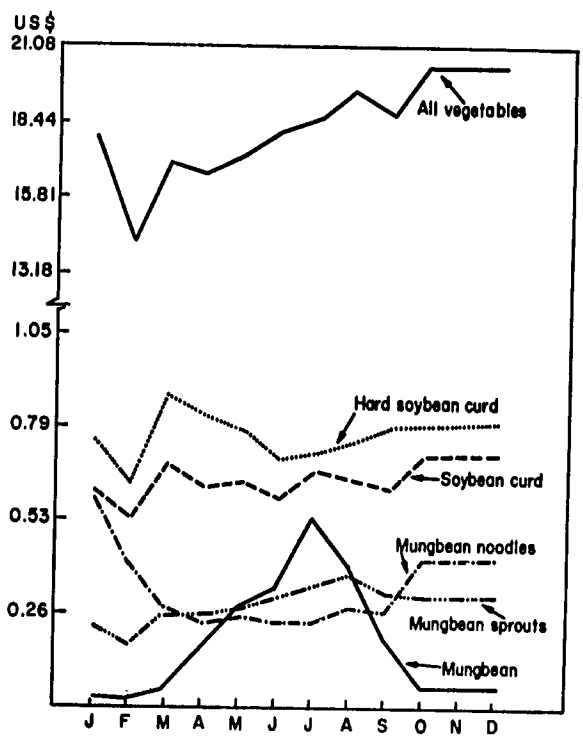

Fig. 4. Seasonal patterns in total vegetable purchases compared with those of the target legume commodities, averaged by month, 1973-76, Taipei City; AVRDC, 1978.

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[a]The decline of sweet potato consumption in rural areas has been much more dramatic.

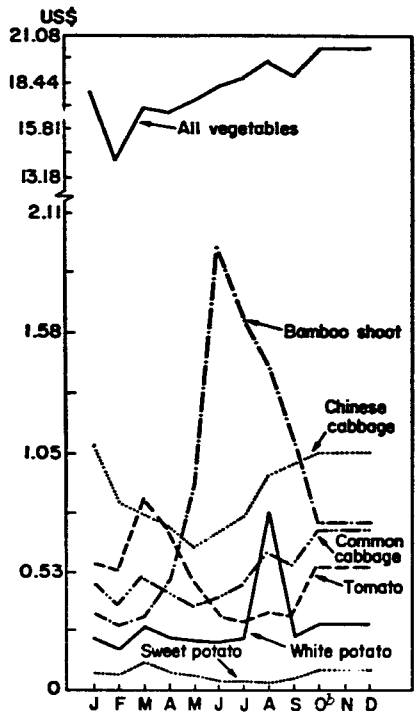

Fig. 5. Seasonal patterns in total vegetable purchases compared with those of the target vegetable commodities, averaged by month, 1973-76, Taipei City; AVRDC, 1978[a].

[a]Ref. 28. [b]Because of incomplete data, expenditures for Oct-Dec are yearly averages.

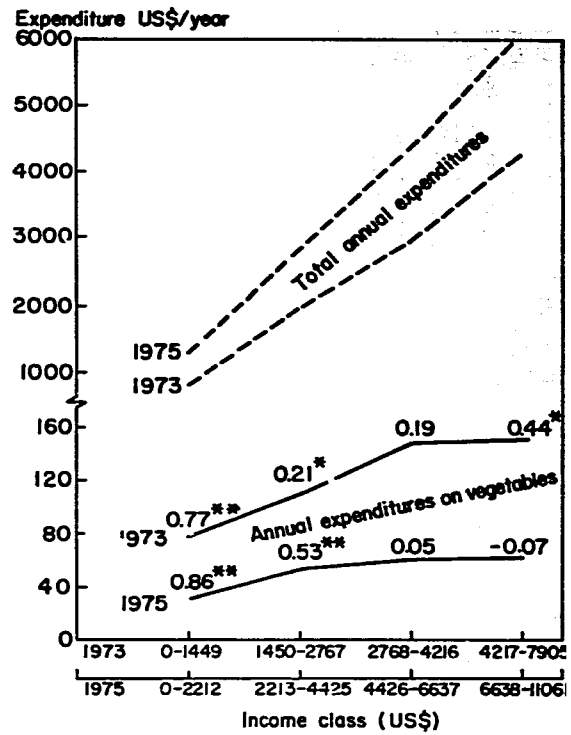

Fig. 6. The relationship among income class, total annual expenditure, and annual expenditures on vegetables; AVRDC, 1978[a].

[a]Ref. 28. All values are in constant US$. Overall elasticity for 1973 was 0.39**, and for 1975 was 0.40*.

THE INFLUENCE OF IMPROVED MARKETS

Table 4 shows that the transaction volume of fruit and vegetable marketing has increased over twice as fast as that of hogs and fish. One reason for this increased ability to handle large volumes is the further concentration of markets in the west-central portion of Taiwan, particularly in Taichung and Nantou districts (Fig. 7). Four markets have been eliminated where they have ceased to be necessary, and eight new markets have been added where they most facilitate local needs. A second improvement has been the establishment in Taipei district of a Management Board composed of government representatives, farmer's association personnel, and marketing agents. The Board encourages marketing agents to work for improved marketing efficiency. A third reason has been the expansion in scale of many existing markets.

Table 4. Transaction volume and value for fruit and vegetables, hogs, and fish, 1968-76; AVRDC, 1978.[a]

	1968		1976		1968-76	
	Volume	Value	Volume	Value	Volume	Value
	1000t	1000US$	1000t	1000US$	-% growth rate-	
Fruit and Vegetables	702.4	37.3	1,508.9	196.3	+115	+527
Hogs[b]	1,134.8	52.2	1,675.0	153.2	+ 48	+293
Fish	390.6	81.9	593.3	267.6	+ 52	+327

[a]Adapted from ref. 34. [b]The volume and value of hogs supplied by butchers themselves are not included.

Which commodities has this concentration of the marketing system tended to favor? Although complete data on all commodities chosen for study are not available, of the group I vegetables, bamboo shoots are now marketed in one extra market (Yunlin) in comparison with 1972, and the marketing season has been lengthened in Nantou, Chiayi, and Tainan districts. Chinese cabbage has grown in the Taoyuan market since 1972 and is marketed over a longer period in six different markets. Fresh tomato has added a month to its marketable season in Chiayi.

Thus, there is evidence that the growth of markets has brought size and space concentration to the most quickly growing commodities, and induced technological improvements in both production and marketing which allow the marketing season to continue longer.

TRENDS IN EXTERNAL TRADE

Table 5 shows the pattern of exports for some of Taiwan's major fresh horticultural products.

The trade patterns for the dried and canned forms of the target vegetables exhibit a very different trend. Table 6 shows the following export and import patterns for soybean, mungbean, canned bamboo shoots, and canned tomatoes:

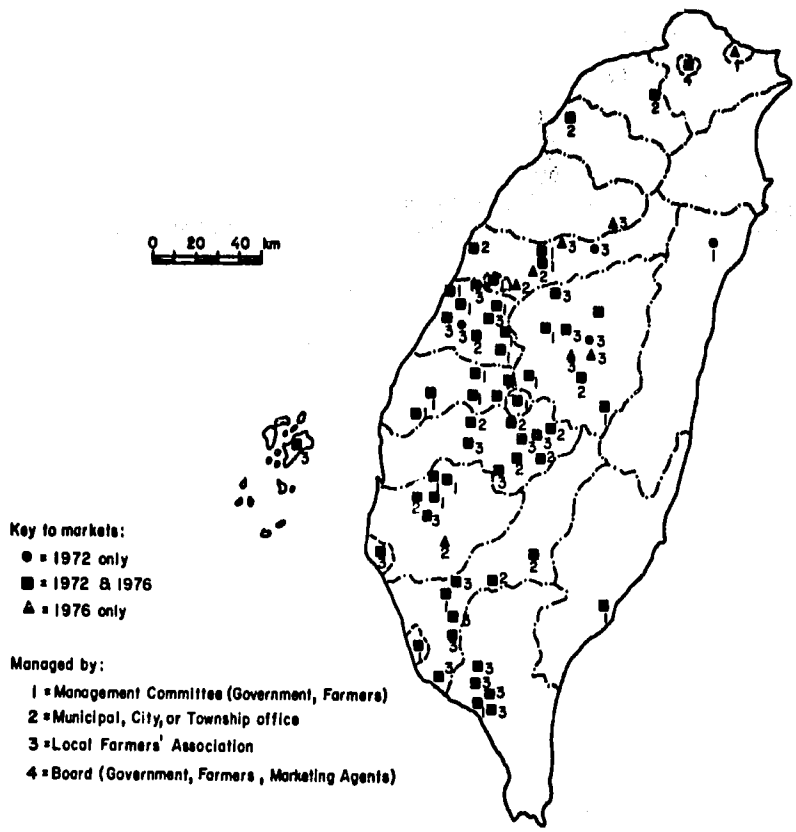

Fig. 7. Shifts in fruit and market distribution, 1972-76; AVRDC, 1978[a].

[a]Ref. 34.

Table 5. Volume and stability of major horticultural exports to Hong Kong (H.K.) and Singapore (Sing.), Taiwan, 1969-76; AVRDC 1978[a].

Commodity	Export Volume							
	1969		1976		1969-76			
					Avg.		C.V.	
	H.K.	Sing.	H.K.	Sing.	H.K.	Sing.	H.K.	Sing.
	1000 t						%	
Fresh tomatoes	5.5	0.9	7.0	0.02	5.7	0.2	91	393
Chinese cabbage	0.9	1.9	1.0	1.1	0.9	1.2	134	175
Common cabbage	0.7	3.6	1.8	1.6	1.5	2.1	114	210
Bamboo shoots	149.4	1.1	28.3	0.6	491.2	5.4	99	154
Sweet potato	0.4	0	2.6	0	1.6	n.s.	193	1832
White potato	3.5	2.7	4.3	6.8	3.9	2.9	85	108

[a]Ref. 31.

1) Taiwan is a net importer of soybean and mungbeans. Mungbeans are exported to Japan only because they are of a different type than those from Thailand and Iraq. It is simply less expensive to import than to produce at home.

2) Bamboo shoots are almost exclusively exported. The rise in export volume and value between 1969-76 has been a major outlet for (and stimulus to) the increases in planted area and technological change.

3) Like bamboo shoots, canned processing tomato has risen rapidly in the export market. This has largely been the result of the contractual system inaugurated by various Japanese tomato processing firms located in southern Taiwan. Although we are only concerned with marketing commodities in their fresh form, the varieties, production practices, risk and profit levels, and marketing structure of fresh market and processing tomatoes differ substantially.

Table 6. Trends in the import and export of dried and canned forms of the target commodities, 1969-76; AVRDC, 1978[a]

	Soybean				Mungbean				Canned bamboo shoots				Canned tomato	
	Import		Export		Import		Export		Import		Export		Export	
	Tons	1000 US$	Tons	1000 US$	Tons	1000 US$	Tons	1000 US$	1000 standard cases	1000 US$	1000 standard cases	1000 US$	1000 standard cases	1000 US$
1969	472,212	55,319	22	1.3					30.3	n.a.	933.5	112	41.5	187
1970	617,540	77,632	0	0							1,015.1	126	62.7	n.a.
1971	524,877	72,423	0	0							1,071.0	130	63.6	n.a.
1972	711,611	101,803	0	0	15,212	2,283	42	20			1,273.1	144	60.1	364
1973	626,034	163,669	870	309	19,024	3,067	199	97			1,334.2	168	316.6	2,872
1974	528,618	154,787	0	0	22,126	4,682	85	44			1,276.2	205	832.7	9,214
1975	1,654,874	443,575	0	0	20,738	5,065	3	2			1,909.3	284	1,324.0	12,316
1976	799,529	183,775	265	91							3,034.4	489	1,556.3	13,128

[a]Ref. 30 and 31.

Chapter Three: The Vegetable Producer

We conducted a survey of 312 vegetable farmers in central and southern Taiwan in 1977-78 to determine production, post-harvest handling, and sales patterns during the last harvest of the designated crop. Each farmer was asked his production budget for one crop. We also requested a comparison of this crop with any other target commodities he might grow. We selected the survey districts for each crop to represent major production area (Table 7).

Table 7. Sample distribution of 312 vegetable farmers; AVRDC, 1978.[a]

Crop	No. of farmers	Districts
Mungbean	47	Tainan
Soybean	44	Pingtung
Sweet potato	48	Tainan
Bamboo shoots	42	Nantou, Taichung
Tomato	45	Changhua, Taichung
Cabbage	45	" "
Chinese cabbage	41	" "

[a]Also see Fig. 1.

CHARACTERISTICS AND MOTIVATIONS OF GROWERS

Table 8 shows that vegetables contribute a larger share of total farm income as vegetable income rises. The average cultivated area per farm and the percentage membership in specialized vegetable production areas (SVPAs) also increase. An exception was the group with second highest vegetable incomes. Cultivated area on these farms averaged only 0.97 ha, even smaller than a medium-sized farm for the sample as a whole. The same group also had the highest percentage membership in SVPA's.

Table 8. Characteristics of sample farmers by vegetable income category, 1978; AVRDC, 1978.

Vegetable income category/ year	Average vegetable income of total income	Average cultivated area/farm	Membership in SVPA	Participation in group marketing	Average total income/farm
---US$---	--%--	--ha--	--%--	--%--	--US$/yr--
Below 237 (N=47)	15.2	0.81	11.5	6.9	1271
237-422 (N=45)	28.3	0.92	13.9	8.3	1201
423-527 (N=38)	30.3	1.01	18.0	21.1	1633
528-1054 (N=55)	37.0	1.32	29.1	14.9	2319
1055-1581 (N=47)	44.9	1.76	34.9	11.8	2918
1582-2372 (N=38)	66.7	0.97	51.3	20.0	2963
Above 2372(N=40)	66.9	2.00	42.5	15.0	9253

Land utilization is more intense in SVPA areas, largely because of greater area planted to and income from vegetables. Labor also becomes limiting if farm size is too large.

Table 8 shows no clear relationship, however, between participation in group marketing and income. To further investigate farmers' attitudes toward the SVPA's and group marketing, we interviewed farmers in Central Taiwan familiar with both programs (Table 9). The results showed that the number of participants in the SVPA program remained unchanged between 1976 and 1977 while the percentage of those involved in group marketing declined by one-half. Although farmers had more confidence in cooperative marketing organized by themselves or farmers' associations in SVPA areas than in other areas, the majority still felt group marketing was unsatisfactory.

Table 9. Farmers' participation rate in, and evaluation of, Taiwan's specialized vegetable production area and group marketing programs, 1977; AVRDC, 1978.

% Participation in				% Farmers Satisfied with Group Marketing Program		
SVPA Program (N=173)[a]		Group Marketing (N=173)		Organized by FA's		Organized by Farmers (N=78)
before 1976	1976-77	before 1976	1976-77	in SVPA (N=112)	Not in SVPA (N=92)	
51	47	47	24	35	24	36

[a]Sample includes only farmers from central Taiwan because there are no special production and marketing programs for soybean, mungbean, and sweet potato.

Farmers also evaluated other government policies relating to improving vegetable marketing systems (Table 10). Out of 11 policies, only 4 were considered helpful.

Farmers who produced bulky or less perishable commodities (ie. sweet potatoes and mungbean) desired more government assistance. Such crops are not currently included in government programs because of low monetary value and profitability. For these same reasons, few farmers in central Taiwan, especially in SVPA's, grow these crops. Only farmers in the south, where environmental conditions do not favor more profitable crops, were willing to produce such crops on a large scale.

PLANTING DECISIONS

We asked farmers questions regarding price and yield fluctuation, problems in transport and storage, and types of marketing agents with whom the producer would like to deal (Table 11). In both regions, day to day and season to season price fluctuations were greatest in Chinese cabbage. Tomato and bamboo shoots came second in the central region, and cabbage second in the south.

Chinese cabbage had the least predictable output per hectare of all crops in both regions, with tomato second in the central region and cabbage second in the south. Given their relatively high price fluctuations, the

Table 10. Farmer evaluations of government policies to improve vegetable marketing systems in Taiwan, 1977-78; AVRDC, 1978.

	Chinese cabbage	Cabbage	Tomato	Bamboo shoots	Sweet potato	Mungbean	Soybean
	% in favor						
Governmental market with space & facilities	89	87	100	93	100	100	0
Governmental market to represent farmers	32	37	33	78	87	67	0
Specialized vegetable production area	81	88	77	76	100	100	87
Assisting producers to develop group marketing	48	50	46	55	87	54	90
Guarantees on vegetable prices	90	98	93	98	96	96	45
Promoting grading, equal-weight packaging	44	44	30	49	56	56	0
Encouraging farmers to grade	47	71	79	37	25	26	0
Developing pre-sale in:							
Small consumer pack	22	26	26	6	25	17	0
Plastic material	32	13	41	12	33	33	0
Box	25	34	54	3	0	0	0
Establishing tele-typewriter network to disseminate price information	94	100	94	83	100	100	0

Table 11. Farmers' ranking of selected commodity criteria by region, 1977; AVRDC, 1978.[a]

Commodity	Farmers growing the 6 commodities		Day-to-day price fluctuation		Season-to-season price fluctuation		Season-to-season yield fluctuation		Difficulty in transport & storage	
	Central	Southern	Central	Southern	Central	Southern	Central	Southern	Central	Southern
	%									
Chinese cabbage	71	6	1.4	2.2	1.2	2.2	1.3	2.3	0.4	0.2
Cabbage	76	8	0.5	2.0	0.6	1.9	0.4	1.0	1.4	0.4
Tomato	52	20	1.0	0.5	1.0	0.4	1.0	0.4	0.5	0.2
Bamboo shoots	27	2	0.1	2.0	0.1	0.5	0.1	-	0.3	2.0
Sweet potato	5	77	0.2	0.2	-	0.2	-	0.3	1.5	0.4
Mungbean	1	51	-	0.9	-	1.0	-	0.8	1.0	1.3

[a]Except for "Farmers growing...," all scores are weighted averages of rankings of all crops grown by individual growers (highest score = n-1; lowest score = 0), further adjusted by the number of farmers ranking each crop. Responses exclude soybean because growers interviewed for soybean grew none of the other crops and could make no comparisons.

revenue from these crops was doubly unpredictable. This helps explain why the area planted to Chinese cabbage has not increased over the past few years.

The central farmers listed sweet potato and the southern farmers bamboo shoots as the easiest commodity to transport. Neither commodity is stored and both suffer minor damage in shipment.

The average, minimum, and maximum areas planted to the seven crops are shown in Table 12. Farmers grew the smallest average area (0.16 ha) to Chinese cabbage, followed by tomato, cabbage, and mungbean. Large areas were grown to bamboo shoots. They are the best alternative for marginal mountain slopeland in central Taiwan, where mature bamboo may be used for furniture and handicraft materials and shoots for vegetable consumption. Thus, the farmers put into practice their evaluations of the relative riskiness of the target crops by planting the smallest area to the least dependable crop.

Table 12. Area planted per farm to seven vegetable crops, 1977; AVRDC, 1978.

	Average	Maximum	Minimum	C.V.
	----------ha----------			-%-
Chinese cabbage	0.16	0.39	0.01	48
Cabbage	0.20	0.98	0.05	98
Tomato	0.18	0.43	0.04	47
Bamboo shoots	2.47	12.62	0.12	168
Sweet potato	0.52	1.55	0.12	75
Soybean[a]	0.87	2.70	0.05	54
Mungbean	0.22	0.48	0.03	46

[a]Data computed from a separate soybean production survey conducted by AVRDC in late 1977. See Tables 18 and 19.

Between the years 1975 and 1977, the farmers sampled planted consistent areas to most crops (Table 13). High price motivated farmers to grow more mungbean. The labor shortage in rural areas (p.11) also forced many farmers to reduce the production of labor-consuming crops such as Chinese cabbage. Growers in central Taiwan have been motivated by high profit to raise summer Chinese cabbage, cabbage, and tomato. However, price fluctuations and labor shortage have prevented them from increasing production of these crops.

PRICE INFORMATION AND BARGAINING POWER

Table 14 shows that farmers in the central region obtained price information not only from other farmers and marketing agents, but also during market transactions, from price bulletin boards, and in local farmers' associations. They supplemented their knowledge through mass media announcements. In contrast, southern farmers turned to local

Table 13. Trends of change in planted area by crop and region, 1975-77; AVRDC, 1978.

Crop & region	Increase	Decrease	Unchanged
	----------%----------		
Chinese cabbage			
Central	18	22	60
South	100	0	0
Cabbage			
Central	14	30	56
South	25	38	37
Tomato			
Central	25	32	43
South	32	43	25
Bamboo shoots			
Central	21	12	67
Sweet potato			
South	25	23	52
Mungbean			
South	52	34	14
Soybean			
South	11	39	50

Table 14. Price information media used by farmers by region; 1977; AVRDC, 1978.

	Central (N=173)	South (N=139)
	-----%-----	
Television and radio	30	3
Price bulletin board in markets	31	2
Newspapers	8	6
Other farmers	83	64
Marketing agents	47	84
Price bulletin board in FA	25	3
Transactions in markets	93	18
Extension workers	13	5

farmers and marketing agents for their information. Distance from vegetable assembly markets restricted the price knowledge needed during market transactions, especially when transportation facilities were not suitable. Consequently, southern farmers tended to have weaker bargaining power.

Central farmers used loans and subsidies more frequently to purchase marketing equipment, while southern farmers paid for production or consumption (Table 15). Investments in marketing facilities were concentrated in transportation. Southern farmers had fewer investments of this kind, other than for oxcarts (Table 16). Improved transport could strengthen their bargaining power by increasing the mobility of both the farmer and his produce.

Table 15. Use of loans and subsidies from farmers' associations or other government agencies; AVRDC, 1978.

Region	Production		Investment in Marketing facilities
	Investment	Expense	
	%		
Central (N=23)	26	44	30
South (N=22)	25	73	2

Table 16. Investments in transportation facilities by region, 1977; AVRDC, 1978.

Region	Marketing Facilities						
	Truck	Motorcycle	Power trailer	Oxcart	Bi-tricycle	Bicycle trailer	Threshing machine
	%						
Central (N=173)	1	52 (2)[a]	13	2	25 (8)	49 (2)	-
South (N=139)	-	17 (1)	2	22	15 (1)	7	6

[a]Numbers in parentheses are the percentage of growers using more than one corresponding facility for transportation.

HARVEST SEASONS

The harvesting patterns for the six non-perennial target commodities differed by region (Fig. 8).

SALES PRACTICES

Table 17 shows the farmers'selling patterns in the central and southern regions for the target commodities. Central region farmers sold over four-fifths of the time to marketing agents. In the south, over half sold to marketing agents and over one-third to processing factories, showing the importance of processing in the region.

Table 18 shows the transaction sites for the producers in both regions. The majority of respondents in the central region sold in markets in the area of production, with 18% also selling through group marketing programs organized in connection with SVPA's. In the south, by contrast, 74% of the farmers sold in their fields or at home, showing the greater role of processing factories and local assemblers.

In the central region, where the fruit and vegetable marketing system has been developed to a greater degree, over 80% of transactions were in the market place. In the south, however, most sales were through free exchange outside the market. In 19% of transactions the standing crop was sold in the field.

Central region farmers liked to buy their Chinese cabbage and cabbage seed from seed stores and raise their own tomato, bamboo shoots, and sweet potato stock. They preferred to sell Chinese cabbage, cabbage, and tomato

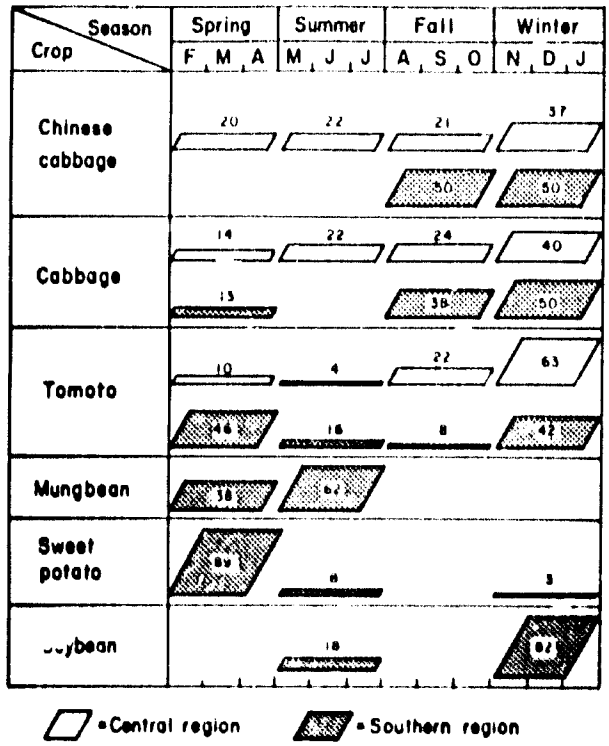

Fig. 8. Percentage of farmers harvesting target crops by season, 1977-78; AVRDC, 1978.

Table 17. Transaction patterns adopted by vegetable farmers, 1977; AVRDC, 1978.

Region	Sold after harvest					Sold before harvest
	In vegetable markets		Group marketing	Outside of vegetable market		
				Bargaining		
	Auction	Bargaining		With marketing agents	With consumers	
Central (N=168)	8	72	7	8	3	2
Southern (N=129)	-	6	-	82	-	12

Table 18. Vegetable farmers' transaction sites, 1977; AVRDC, 1978.

Region	Farm house	Farm gate	Roadside	Production area market	Consumption area market	Assembling station	Processing factory	Buyer's stand
Central (N=149)	-	-	2	76	6	18	-	-
Southern (N=132)	46	37	-	2	-	-	3	14

to non-retailing shippers, bamboo shoots to processors, and sweet potatoes directly to general consumers. Farmers in the southern region were more limited in their agribusiness choices. They preferred to buy stock for Chinese cabbage and cabbage from seed stores, tomato from contractual processing factories, and self-supply bamboo shoots, sweet potato, and mungbean stock. They sold Chinese cabbage, bamboo shoots, and sweet potatoes to non-retailing shippers, cabbage and tomato to processing factories, soybeans to local assemblers, and mungbeans to general consumers.

PRODUCTION BUDGETS

All seven crops were profitable to grow in terms of farm income, defined as total revenue minus all costs except those for self-labor (Table 19). Tomato was the most profitable crop and mungbean the least, figures which also reflect their relative yields. In terms of net income, defined as total revenue minus all costs including home labor, sweet potato becomes the most profitable crop, followed by tomato. In general, farmers with low ratios of available family labor to land are more interested in net income and would avoid planting such crops as Chinese and common cabbage. Conversely, those farmers with otherwise underemployed family members are interested in farm income and would still find these crops satisfactory in yielding a good return to the fixed components of their farm operations.

Table 19. Production budgets for the target commodities, 1976-77; AVRDC, 1978.

	Mungbean	Soybean[a]	Sweet potato	Bamboo shoots	Tomato	Cabbage	Chinese cabbage
Harvest quantity (kg/ha)	524	1993	31,029	25,911	42,358	26,430	20,688
Farmprice (US$/t)	702	440	32	67	86	40	54
TOTAL REVENUE (US$)	368	877	993	1,736	3,643	1,057	1,117
TOTAL COST (US$)	345	500	475	1,695	3,380	1,365	1,404
Capital (US$)							
Fertilizer	12	74	90	411	504	323	304
Pesticide	26	51	7	9	268	134	153
other capital inputs	54	52	153	33	540	126	85
Labor							
Preharvest self - hrs	191	250	222	590	2,015	752	863
US$	101	135	97	401	1,173	497	570
hired- hrs	47	180	126	1,429	523	224	205
US$	17	97	43	220	223	95	70
Harvest self - hrs	198	53	66	812	1,123	273	332
- US$	73	29	31	578	622	155	202
hired- hrs	182	115	153	76	129	76	55
US$	61	62	54	43	49	34	23
NET INCOME (US$/ha)	23	377	518	41	263	-308	-289
FARM INCOME (US$/ha)	197	541	645	1,020	2,059	344	483

[a]Data for soybean in Tables 18 and 19 were computed from a separate soybean production survey conducted by AVRDC in late 1977. Per hectare averages for soybean were computed directly from totals over all farms rather than by first standardizing the data from each farm to values per hectare.

POST HARVEST BUDGETS

To determine the relative profitability of post-harvest technology and transport operations performed by the farmer, we developed standardized post-harvest budgets for the seven commodities (Table 20). These are very similar to the production budgets of Table 19, except that the relevant quantity is that marketed by the farmer and the relevant price the difference between the price of the harvested crop in the field and that after post-harvest handling. These may be multiplied to derive post-harvest revenue, from which costs may be subtracted. The definitions of net income and farm income are comparable to those under the production budgets.

Although farmers received a higher price if they took their produce to the market or buyer's stands for sale, it was not always profitable for them to do so in terms of net revenue. Table 20 shows that, in the case of Chinese cabbage, bamboo shoots, and mungbean, what farmers earned by post-harvest handling was not enough to compensate for the added costs. Tomato had the highest post-harvest net revenue.

However, when there was surplus labor on the farm (post-harvest farm income index), it was in all cases profitable for farmers to handle the crops themselves. Tomato was the most profitable and mungbean the least. Tomatoes ranked very well in terms of both the level and the stability of expected returns.

The post-harvest handling operations and materials used by farmers differed by commodity. Generally, mungbean farmers were able to handle all post-harvest operations - such as home-threshing, sorting, packing, and transporting - by themselves. Only 6% of the farmers had to hire outside labor for these tasks. Material inputs were low because mungbeans were mostly sold loose, with only 11% of farmers using cloth bags.

Most of the soybean post-harvest labor was for transporting from the field and for drying, cleaning, and bagging. About equal numbers of hired and self-labor were used for these operations.

A full 75% of sweet potato farmers sold their produce immediately after harvest and performed no post-harvest operations. The remainder transported the roots by oxcart, and then shredded them into chips before sale. Less than 5% of the farmers required outside help in shredding.

Due to the large scale of bamboo plantations, 20% of the farmers hired labor for such post-harvest operations as cleaning, sorting, packing in bamboo baskets, and transporting to market.

Fresh tomatoes were cleaned, graded, and packed in bamboo baskets or occasionally in cloth bags. Almost all farmers preferred to deal with merchants in public markets, accounting for the high post-harvest costs of tomato. A majority (62%) of tomato farmers delivered their produce themselves while the remainder hired transportation services.

Farmers handled cabbage and Chinese cabbage in similar fashion. About 50% of producers cleaned, sorted, and packed these crops in bamboo

Table 20. Post-harvest handling budgets for the target commodities, 1976-77; AVRDC, 1978.

	Mungbean	Soybean	Sweet potato	Bamboo shoots	Tomato	Cabbage	Chinese cabbage
Volume handled (kg/ha)	524	1,993	31,029	25911	42,358	26,430	20,688
Price differential[a] (US$/t)	22	21	3	4	16	11	12
TOTAL POST HARVEST REVENUE (US$)	11.5	41.9	93.9	103.6	677.7	290.7	248.3
TOTAL POST HARVEST COSTS (US$)	17.3	20.8	9.3	281.0	548.2	193.4	271.0
Capital (US$)							
Machine use	0	0	4.6	1.7	106.5	4.9	23.5
Material	0.3	0	0	9.2	17.3	6.8	8.0
Market charge	0	0	0	42.4	140.1	47.9	36.1
Labor							
Self - hrs	37	20	10	293	511	200	300
US$	15	10.4	4.3				
Hired- hrs	5	19	1	26	0	0	0.4
US$	2	10.4	0.4	16.4	0	0	6.6
POST-HARVEST NET REVENUE (US$/ha)							
Average	-5.8	21.1	84.6	-177.4	129.7	97.7	-22.7
Maximum	23.9	n.a.	134.3	1,481.4	2,330.4	1,250.0	526.3
Minimum	-123.9	n.a.	-14.3	-1,324.3	-1,904.6	-438.8	-1,165.1
Coefficient of Variation (%)	446	-	53	361	275	249	1,130
POST-HARVEST FARM INCOME (US$/ha)							
Average	9.2	31.5	88.9	34.0	413.9	231.0	174.0
Maximum	37.1	n.a.	134.3	922.4	2,633.8	1,282.0	1,100.0
Minimum	-17.1	n.a.	-3.6	-243.3	-302.0	-46.1	-361.5
Coefficient of Variation (%)	108	-	42	572	115	98	119

[a]Defined as difference between the price in the field and that when sold in the market.

baskets with a net capacity of 60-100 kg. Over 90% transported their produce to public markets. They usually used oxcart, motorcart, motorcycle, and three-wheeled vehicles of their own, but a few hired transportation services.

Chapter Four: The Vegetable Marketing Agent

The vegetable marketing agent is responsible for taking perishable commodities from the farmer to the consumer. This chapter focuses on three aspects of this service: (1) How agents determine the amount of price markup. This gives an idea of the revenue generated from marketing as well as the difference in margins depending on the relative perishability of the commodity. (2) The costs which the marketing agent must bear to achieve his revenues. These costs are not only economic (labor and material inputs), but also physical (moisture losses and product deterioration). And, (3) The problems and aspirations of marketing agents.

PRICE MARKUPS

A price markup is the difference between the price paid in purchasing a commodity and the price received when the commodity is sold. It is often expressed as a percentage of the price paid. We surveyed marketing agents to determine what such markups would be at average prices paid and received over a seven-day period. However, it was difficult for marketing agents to calculate a weighted average of prices received and paid. Therefore, we asked maximum and minimum prices to establish the range. Variations in the quality of product received, even within a single shipment, were largely responsible for this range. They reported, however, that minimum prices are received only in cases of extremely poor quality. Therefore, maximum prices indicate the more normal situation and can be used to estimate the size of average markups. A comparison of these markups by commodity and type of marketing agent allowed us to test hypotheses about the relationships among risk, perishability, and profit. Specifically, we tested whether:

1) as the number of intermediaries from the farmer to a given agent increases, so does the average markup, and

2) as the perishability of the commodity increases, the size of the average markup decreases.

The least perishable commodity under study was mungbean. Because there were few handling problems and the option of storage to await favorable price conditions, all agents, regardless of whether they were assemblers and jobbers, wholesalers or retailers, asked no more than a 0-30% markup at maximum prices (Fig. 9). There was no differentiation in markup by type of marketing agent because mungbean is just as easy to handle near the farm as it is when it reaches the final consumer in the marketing chain.

A slightly more perishable commodity was soybean (Fig. 9). The majority of marketing agents (75%) asked only 0-30% markup. However, soybean had greater losses than mungbean because it was bought with a higher moisture content and had to be dried by the marketing agent. Also, it had greater price variability and higher storage costs because it was

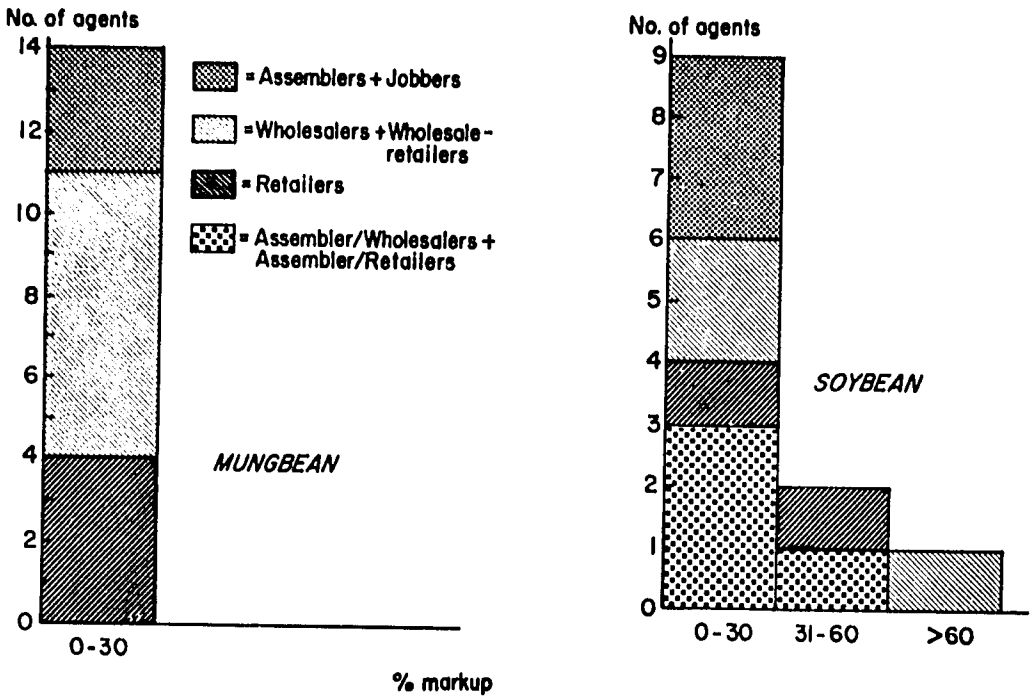

Fig. 9. Distribution of markups at maximum prices paid and received by marketing agents for sweet potato and bamboo shoots, 1977-78; AVRDC, 1978.

often stored longer than mungbean. Therefore, 17% of agents also asked between 30 and 60% markup and 8% asked more than 60%. These latter handled wholesale and retail operations. We thus found support for hypothesis one.

Sweet potatoes have a broad range of markups (Fig. 10). Fifty percent of the agents received less than 30% markup; 44%, 31-60%; and 6%, over 60%. Agents close to the farmer tend to take lower markups than those farther away. In general, agent markups tend to be inversely proportional to the volume of produce handled.

Bamboo shoots (Fig. 10) are a slightly more difficult commodity to market because they are more perishable than sweet potatoes. They also have a higher price per kilogram than sweet potatoes. Therefore, it is not surprising that fully 62% of the agents asked a markup of less than 30%, 33% received 31%-60%, and only 5% received over 61%. Agents closer to the farmer and who handled large volumes received less markup.

The distribution of markups at maximum prices for tomato continued the trend (Fig. 11). Seventy-one percent of all agents took a markup of less than 30%, and the remainder took between 31 and 60%. There were no agents who took a markup of more than 61%. Even though there were no commission agents in the sample, proportionately more assemblers were in the low markup group and more retailers in the high markup group.

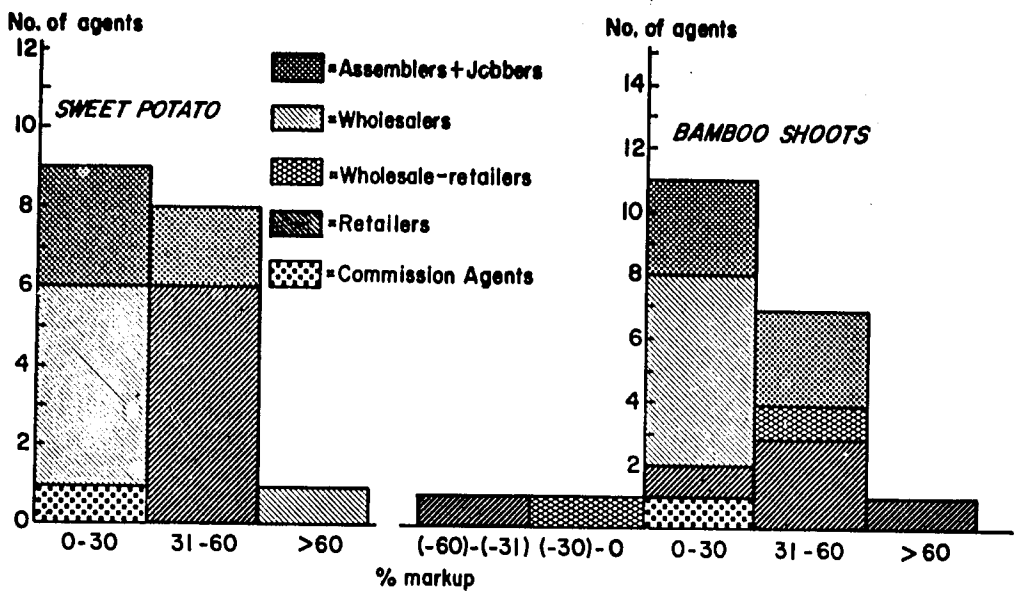

Fig. 10. Distribution of markups at maximum prices paid and received by marketing agents for sweet potato and bamboo shoots, 1977-78; AVRDC, 1978.

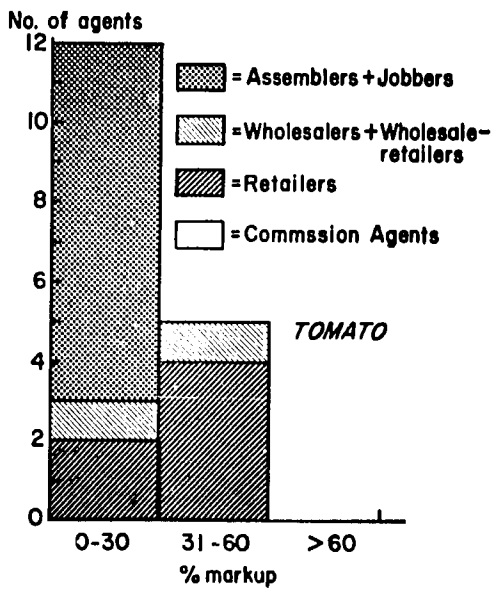

Fig. 11. Distribution of markups at Maximum prices paid and received by marketing agents for tomato, 1977; AVRDC, 1978.

Cabbage (Fig. 12) is slightly more perishable than tomatoes. Similar markups occurred: 68% of marketing agents were satisfied with a markup of less than 30%, while only 27% and 5%, respectively, received markups of 31-60% and over 61%.

Chinese cabbage (Fig. 12) is the most perishable of the target commodities. We accepted hypothesis two, that the size of the average markup decreases as the perishability of the commodity increases. About 85% of all Chinese cabbage agents received less than 30% markup, with 11% in the 31-60% range, and 4% over 61%.

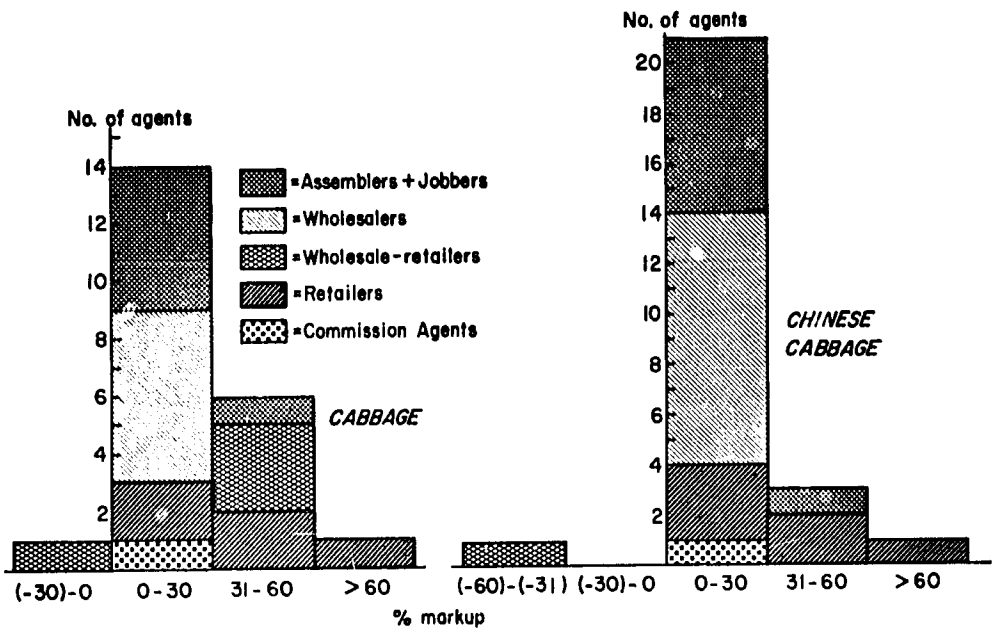

Fig. 12. Distribution of markups at maximum prices paid and received by marketing agents for cabbage and Chinese cabbage, 1977-78; AVRDC, 1978.

Table 21 shows for commodities of increasing perishability the distribution of markups at maximum prices for agents who accepted a given markup at minimum prices. For mungbean, we found that 93% of all agents took 0-30% markups at both maximum and minimum prices. Therefore, markups at minimum prices tended to reflect themselves in equal markups at maximum prices. The single exception out of the 14 agents surveyed was an agent who took a 31-60% markup at minimum prices but was willing to accept the usual 0-30% markup at maximum prices. This showed a tendency to try to equalize his earnings, and suggested that mungbean is handled by all agents because of its very stable expected returns.

Table 21. Percent of Marketing Agents Charging Given Combination of a Max. and Min. Price Markups for Seven Commodities 1977; AVRDC, 1978.

		%				
		+				Min Price Markup% / Max Price Markup%
60 - 31	30 - 0	0 - 30	31 - 60	61 - 100		
		Soybean 8 Chinese Cab. 4		Sweet Potato 6 Bamboo Shoot 5 Cabbage 4		100 61
Sweet Potato 6	Sweet Potato 6 Bamboo Shoot 5	Soybean 8 Sweet Potato 6 Bamboo Shoot 14 Tomato 18 Cabbage 9	Soybean 8 Sweet Potato 17 Bamboo Shoot 9 Tomato 12 Cabbage 14 Chinese Cab. 4	Sweet Potato 11 Bamboo Shoot 5 Cabbage 4 Chinese Cab. 7		60 31
Chinese Cab. 4	Tomato 6 Chinese Cab. 4	Mungbean 92 Soybean 75 Sweet Potato 33 Bamboo Shoot 38 Tomato 18 Cabbage 50 Chinese Cab. 54	Mungbean 8 Sweet Potato 11 Bamboo Shoot 9 Tomato 12 Cabbage 9 Chinese Cab. 11	Sweet Potato 6 Bamboo Shoot 5 Tomato 35 Cabbage 4 Chinese Cab. 7		30 0 +
		Bamboo Shoot 5	Bamboo Shoot 5 Chinese Cab. 4	Cabbage 4		0 30

The majority of soybean agents asked the same percentage markup at minimum prices as at maximum prices. The only exceptions were two agents who accepted 31-60% and over 61% markup at maximum prices when they accepted 0-30% markup at minimum prices.

There was still a strong tendency for a given markup at minimum prices to reflect itself in an equal markup at maximum prices for sweet potato. Agents who deal with sweet potato have a very stable profit.

For bamboo shoots, agents are willing to accept a lower markup and even to mark down the absolute price if necessary. Agents in both the 0-30% and 31-60% categories actually marked prices down, and two-thirds of those agents who accepted a greater than 60% markup at minimum prices accepted less than 61% at maximum prices.

Tomato marketing agents, likewise, had a tendency to mark down prices. While the majority of the agents in the less than 30% minimum markup category also accepted less than 30% maximum markup; in the 31-60% and greater than 61% category for minimum price markups, maximum markups tended overwhelmingly to the 0-30% range.

Looking at the most perishable commodities, we found that three-quarters of agents in the greater than 61% category were willing to accept less than 60% markups for cabbage, and all such agents were willing to accept less than 60% markups for Chinese cabbage. This was further proof of hypothesis two, that the more perishable a commodity, the less markup an agent is willing to accept in order to move it as quickly as possible.

MARKETING COSTS

The distribution of gross benefits and their relative variability are only one side of the marketing agent's decision frame-work: What about costs? These may be divided into fixed and variable marketing costs. Fixed costs refer to such elements as tax, water and electricity, storage, correspondence, sales outlet, marketing facilities, and permanent employees. These represent the marketing agent's fixed investment level regardless of volume transacted. We discovered very little difference by commodity in terms of the total value of these "general business operating expenses" A given agent handled many different commodities, and the one we asked about rarely represented a majority of his total transaction value. We did notice, however, that certain types of agents had different investment levels, with commission agents having the lowest fixed costs and jobbers the highest. The former were merely brokers, while the latter owned expensive transport equipment.

Through a study of variable marketing costs we determined the relative investment on individual commodities. Table 22 shows that sweet potato had the lowest level of investment and Chinese cabbage the highest. This suggests that the higher the perishability, the higher the per unit costs. Thus, perishability is positively correlated not only with high prices and low percentage markups, but also with higher marketing costs. Table 22 shows that costs rise as perishability increases.

Table 23 shows the variable marketing cost breakdown for sweet potato, a non-perishable commodity with a well-developed marketing

Table 22. Variable marketing cost by commodity and by marketing agents, 1977-78; AVRDC, 1978.

Marketing agents	Commodity						
	Mungbean	Soybean	Sweet potato	Bamboo shoot	Tomato	Cabbage	Chinese cabbage
	US$/t						
Local assemblers	18.2	5.5	10.2	34.9	44.6	50.5	64.4
Jobbers	35		13.70	-	38	42.5	43.5
Wholesalers	1.9	1.2	0	0	25.2	0	0
Wholesalers-retailers	2.8	18.	3.7	11.3	-	7.6	11.1
Assemblers/wholesalers	-	15.4	-	-	-	-	-
Assemblers/retailers	-	9.	-	-	-	-	-
Retailers	6.1	0	2.6	10.6	3.5	7.7	7.6
Commission agents	-	-	0.4	-	-	7	5.9

Table 23. Variable marketing costs by marketing agents for sweet potatoes, 1977; AVRDC, 1978.

	Variable marketing costs					
	Labor[a]	Materials	Transportation	Commission		Total
				Market	Other agents	
	US$/t					
Local assemblers	1.4	1.7	7.1	-	-	10.2
Jobbers	3.8	3	5.7	1.3	0	13.7
Wholesalers	0	0	0	0	0	0
Wholesaler-retailers	0	1.3	0.6	1.8	0	3.7
Retailers	0	0.1	2.4	0	0	2.6
Commission agents	0.4	0	0	0	0	0.4

[a]Imputed value included for own labor.

channel. Many potential cost categories were blank, and each type of agent had one major type of cost input. Thus, jobbers transported sweet potato, wholesalers passed it on, wholesale-retailers and retailers packaged it, but commission agents, ironically, put in the most labor. Sweet potato is reknowned as a low-input crop in terms of its production, as it also turns out to be in terms of its marketing.

Marketing costs for Chinese cabbage were quite different (Table 24).[a] All agents, from local assemblers to commission agents, contributed to each category of variable costs. The only exception was wholesalers, who only supplied labor and paid a commission. These costs were highest for commission changes, followed by transportation, labor, and materials. A highly perishable and high value crop such as Chinese cabbage needs (and is worth) a high level of investment to preserve its quality for the final consumer.

Table 24. Variable marketing costs by marketing agent for Chinese cabbage, 1977; AVRDC, 1978.

	Vegetable marketing costs					
	Labor[a]	Materials	Transportation	Commission		Total
				Market	Other agents	
	US$/t					
Local assemblers	3.4	11.4	13.9	21.3	14.4	64.4
Jobbers	7.1	0.3	6.2	29.9	0	43.5
Wholesalers	0	0	0	0	0	0
Wholesale-retailers	2.6	1.1	2.3	5.1	0	11.1
Retailers	6.4	0.6	0.6	0	0	7.6
Commission agents	0.6	2.7	2.6	0	0	5.9

[a]Imputed value included for own labor.

PHYSICAL LOSS

Table 25 shows that physical loss is also closely related to perishability. A full 50% of sweet potato marketing agents reported no weight loss, the remainder reporting no more than 10%. At the other end of the spectrum, only 29% of Chinese cabbage marketing agents reported 0% weight loss, while 7% show 21-30%. Common cabbage had similar losses.[b]

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[a]For remaining commodities, see Appendix. [b]Mungbean and soybean seemed exceptions to the pattern because many agents reported 1-10% loss for these easily handled and low-water content commodities. In reality, average figures for mungbean were close to 1% and represented weight losses from removal of sand and poor quality seeds rather than from deterioration. For soybean, unlike mungbean, farmers did not first dry the product before sale to the marketing agent. Thus, water content was as much as 23%. During storage 100 kg of seed might drop to 85 kg as the moisture content falls to 9%. This is especially true for the agents who sell the product as seed.

Table 25. Percentage of marketing agents reporting percentage weight losses for the target commodities, 1977-78; AVRDC, 1978.

Weight loss	Commodity (No. of marketing agents)						
	Mungbean (N=12)	Soybean (N=14)	Sweet potato (N=18)	Bamboo shoots (N=21)	Tomato (N=17)	Cabbage (N=24)	Chinese cabbage (N=28)
	%						
0%	7	17	50	38	29	36	29
1-10%	86	66	50	62	71	33	46
11-20%	7	17	-	-	-	21	18
21-30%	-	-	-	-	-	8	7

The data show that commission agents had 0% loss, and that wholesalers had the next lowest average losses. For sweet potato, bamboo shoots, and cabbage, retailers suffered the highest loss; but for soybean, tomato, mungbean, and Chinese cabbage, jobbers and/or wholesale-retailers had losses at least as high as those borne by retailers. Thus, except for commission agents and wholesalers who handled the crop briefly or not at all, it was the type of commodity rather than the type of marketing agent which determined the amount of physical loss. There seems no general rule that losses uniformly increase or decrease as the crop moves through the marketing channel.

To reduce those losses which are most reflected in consumer utility, it is important to know what indices of quality determine final price. Table 26 shows the characteristics which marketing agents listed for each of the target commodities. For Chinese cabbage, cabbage, and bamboo shoots, sweetness and low cellulose content were the most important characteristics. Outer appearance was moderately important in Chinese cabbage.

Tomato quality, on the other hand, derived from an attractive (thin) skin. Taiwan consumers prefer red color with green shoulders in their fresh-market tomatoes.

For sweet potato, outer appearance was critical because the crop receives a lower price if it is knobbly or scarred. A crisp red interior was also desirable, followed by sweetness, softness, and good keeping quality.

Finally, mungbean must have an attractive light green exterior, good flavor, and thin skin.

THE PROBLEMS AND ASPIRATIONS OF MARKETING AGENTS

We have considered markets on a commodity basis. However, agents handle many commodities and have many concerns related to price fluctuations, goverment policy, an appropriate mix of commodities handled, scale of operation, and so on that influence them as economic decision-makers.

We asked marketing agents to rank major problems and difficulties. Table 27 shows that losses due to overstocking were the single most important problem. But responses varied by type of agent. Because of their

Table 26. Marketing agents preferences in product quality, 1977; AVRDC, 1978.[a]

Item[b]	Outer appearance (size, color, shape)	Inner content and taste								
		Sweet-ness	Low cellulose	Keeping quality	Crisp-ness	Tende-ness	Soft-ness	Color	Thin skin	Fresh-ness
	% responses									
Chinese cabbage	50	64	82		5					
Cabbage	8	72	92		20	4			10	
Tomato	90	10								
Bamboo shoots	17	61	61		6			28		
Sweet potatoes	78	33		11	44		22	44		
Mungbean	50	43							21	7

[a]Total percentage may exceed 100 because of multiple answers. [b]Soybean characteristics are not included because they differed greatly by final use (vegetable oil, soy milk, bean curd, and fresh consumption).

Table 27. Problems and difficulties encountered by marketing agents, 1977-78; AVRDC, 1978.[a]

	Over-stock loss	Price fluctu-ation	Quali-tative hetero-geneity	Perish-ability	Weak power in bargaining	Lack capital	Transport accidents	Lack supply	Insect damage in storage
	%								
Local assemblers (N=14)	21	21		7	29		14	14	7
Jobbers (N=15)	60	13	13	7		7			
Wholesalers (N=11)	27	27	45	9					
Wholesale-retailers (N=9)	44	44	11	33					22
Retailers (N=11)	27	45	18	27					9
Commission agents (N=3)	33		33						
All (N=63)	37	27	17	14	6	2	3	3	6

[a]Total percentages may be less than or exceed 100% because of multiple answers. Excludes soybean marketing agents, who reported no major problems.

different positions in the marketing channel, it is logical that local assemblers should complain most about their weak bargaining power and transport accidents, jobbers should fear most losses due to overstocking, wholesalers should be most apprehensive about variations in quality, wholesale-retailers should be most concerned with perishability, and retailers should most dread price fluctuations.

Since price fluctuations were ranked as the second greatest problem overall, we asked the agents what they would do in the case of a price increase in the buying market or a price decrease in the selling market (Tables 28-29). The marketing agents tended to favor a strategy of either: (1) adjusting purchase quantity only, or (2) combining this strategy with favorable adjustments in transaction price. If price increased, the former was preferred; if price decreased, the latter. Other strategies were less popular than doing nothing at all. But on an individual basis, different strategies tended to reflect the agent's position in the marketing channel. While wholesale-retailers and retailers followed the above patterns, local assemblers, whose main concern is with volume, favored altering purchase quantity as their sole strategy. Half of the commission agents would hedge by increasing purchase quantity if price went up, and vice versa. And, wholesalers tended to adopt the mixed strategy of altering purchase quantity and price at the same time.

Table 28. Marketing agents' response to price increases in the vegetable market, 1977-78; AVRDC, 1978.

	(1) Reduce purchase quantity	(2) Increase purchase quantity	(3) Raise selling price	(1) + (3)	No difference
	%				
Local assemblers (N=47)	47	6		12	35
Jobbers (N=15)	33	7	7	40	13
Assembler/wholesalers[a] (N=1)		100			
Wholesalers (N=83)	23	8	15	46	8
Assembler/retailers[a] (N=3)	33				67
Wholesale-retailers (N=110)	40			30	30
Retailers (N=13)	54		8	30	8
Commission agents (N=3)	33	33			33
All (N=75)	39	7	5	28	21

[a]Only for soybean.

We asked the agents how they thought the marketing of perishable commodities could be improved (Table 30). They suggested: (1) Improve transaction procedures. Wholesale-retailers wanted auctioning, which occurs mostly in wholesale markets, and local assemblers supported improved bargaining. (Commission agents seem to support almost anything: note their responses.) (2) Promote grading and quality standardization (chiefly put forward by local assemblers and commission agents). (3) Promote packaging. This suggestion was strongly backed by local assemblers, where presumably the packing would occur, and commission agents.

Table 29. Marketing agents' response to price decrease in the vegetable market, 1977-78; AVRDC, 1978.

	(1) Increase purchase quantity	(2) Reduce purchase quantity	(3) Reduce selling price	(1) + (3)	No difference
	%				
Local assemblers (N=17)	47	6		12	35
Jobbers (N=15)	20	20	7	40	13
Assembler/wholesalers[a] (N=1)		100			
Wholesalers (N=83)	23	15	15	39	8
Assembler/retailers[a] (N=3)	33				67
Wholesale-retailers (N=110)	30			40	30
Retailers (N=13)	46		8	38	8
Commission agents (N=3)	33	33			33
All (N=75)	34	11	5	29	21

[a]Only for soybean.

And, (4) Expand space and facilities for transaction (though they are delighted with the provisions government has made so far). The chief proponents of this suggestion were wholesalers, who take most advantage of government facilities.

Table 30. Marketing agents' suggestions to further improve the vegetable marketing system, 1977-78; AVRDC, 1978.[a]

	Expand space and facilities for transaction	Improve transaction		Grade and standardize quality	Package	Use telephone to disseminate market information
		Auction	Bargaining			
	%					
Local assemblers (N=14)	29	7	86	71	64	21
Jobbers (N=15)	33	13	80	60	60	
Wholesalers (N=11)	45	9	82	45	18	9
Wholesale-retailers (N=9)	44	44	44	22	22	
Retailers (N=11)	27	27	64	45	18	9
Commission agents (N=2)	100		100	100	100	50
All (N=62)	37	18	74	53	42	10

[a]Total percentage may exceed 100 because of multiple answers. Excludes answers from soybean marketing agents, who reported no suggestions.

Ten percent of all agents suggested using the telephone more widely to disseminate price information. We, therefore, asked marketing agents how they currently received their market information (Table 31). The majority still go to the market themselves; between 8 and 23% use the

Table 31. Market information media used by marketing agents, 1977-78; AVRDC, 1978.[a]

	Telegram	Telephone	Price bulletin board in markets	Radio announcement	Collect in market himself
	%				
Local assemblers (N=17)	53	59			14
Jobbers (N=15)		13	20		73
Assembler/wholesalers (N=1)				100	100
Wholesalers (N=13)		23	8	8	77
Wholesaler/retailers (N=10)			10		80
Assembler/retailers (N=3)		67			100
Retailers (N=13)			8	4	92
Commission agents (N=3)					67
All (N=75)	12	23	8	3	66

[a]Total percentage may exceed 100 because of multiple answers.

telephone, telegram, and price bulletin boards; and, only 3% depend on radio announcements, most of these being wholesalers. Thus, considerable improvements could be made in providing better and faster information to marketing agents in order to help them make their economic decisions.

Finally, we asked the marketing agents which investments they might make in the future (Table 32). Even though we asked them to imagine that capital was unlimited, 45% of all agents claimed they had no specific changes in mind. The other responses pointed to enlarging business size. No one except local assemblers and jobbers mentioned increasing storage and transportation facilities, and no one mentioned expansion of ground space for assembling. These responses suggest that the size and structure of individual market agents' operations are already in tune with their needs. We concluded that competition is brisk, if only 52% of all marketing agents think that increasing their size will help them in any way.

Table 32. Possible investments in the future by marketing agents, 1977-78; AVRDC, 1978.[a]

	To enlarge business size	To increase storage facilities	To expand ground space for facilities	To increase transportation facilities	Not yet known	None at all
	%					
Local assemblers (N=17)	77	6		6	12	17
Jobbers (N=15)	53			20	40	
Assembler/wholesalers (N=1)	100					
Wholesalers (N=13)	54				38	8
Wholesaler/retailers (N=10)	20				50	30
Assembler/retailers (N=3)						100
Retailers (N=13)	46					38
Commission agents (N=3)	67					33
All (N=75)	52	1	0	5	24	21

[a]Total percentage may exceed 100 because of multiple answers.

Chapter Five: Evaluating the Efficiency of Various Types of Vegetable Marketing Channels

In order to measure the overall effect of farmer and marketing agent decisions on the welfare of the consumer (and the society as whole), it is important to indentify individual marketing channels and compare their efficiency in delivering high quality goods at low cost to the consumer.

Many writers have addressed the problem of evaluating the efficiency of marketing channels (1, 5, 11, 14, 23, 25, 27, 36, 38, and others). Abbott (1), Von Oppen (36) and Spinks (27) point to the critical relationships between marketing and production, although they do not go so far as Goldberg (14) in describing an agribusiness framework. Von Oppen finds that improvements in marketing are correlated with increased aggregate productivity in India. Spinks shows the contribution of traditional middlemen as suppliers of necessary capital and other production inputs to the farmer. He reports that farmers seem happy with the prices and services which the middlemen provide, that the percentage of the final retail price which the farmers receive in developing countries is significantly higher than in the developed countries, and that the storage of important foodgrains for speculative purposes rarely results in sustained profits for middlemen.

Mellor (23) echoes these conclusions by flatly attesting that much of the folklore about marketing is wrong. He suggests that price differentials from place to place can be explained by differences in transportation costs and that those from season to season can be explained by storage costs. He believes that current sources of inefficiency lie in the infrastructure available rather than the kind of agents involved in marketing. The strengths of the current systems are: (1) they are relatively labor intensive, which allows them to have a positive impact on employment and income distribution. (2) They effectively marshall the savings of small-scale entrepreneurs which would be lost in larger operations. And (3) they provide good incentive for these entrepreneurs to compete with each other in reducing costs. Both he and Bucklin (5) conclude that strengthening traditional markets is more appropriate than the use of supermarkets to achieve horizontal and vertical integration, often at the expense of poor consumers in the low-income Asian nations. Buklin reports that, except for Japan, there is a low incidence of supermarkets in Asia because traditional markets can efficiently sort and turn-over perishable products. The government should improve the efficiency of such food enterprises within the bazaar and make large, clean market places available for small-scale entrepreneurs.

Thus, Asian marketing, according to these authors, is far from the picture which has prevailed until recently: That of the ruthless enslavement of the producer and consumer by traditional middlemen. Rather, what inefficiencies exist are the result of underdeveloped market and transport facilities, and when these inefficiencies are removed, there is a strong impact on agricultural productivity.

Rashid and Chaudhury (25), reviewing various methods to measure

marketing efficiency, determine that structure, conduct, and performance must be considered together before an objective answer is obtained. Single indices are often misapplied, especially in developing countries, when used on a system as a whole. By contrast, Weston (38) points out that efficiency must include both low costs and successful marketing. He divides total efficiency into technical and price efficiency components for determining how much to produce and market of a number of commodities. His primary analytical tool is the production possibility frontier to show that various combinations of price and technical efficiency may exist. However, he makes no empirical application and points out that: (1) price behavior and the very shape of production possibility frontiers may make the rule inapplicable, and (2) it is difficult at best to identify a production possibility frontier. In the absence of knowledge of the product mix which yields the global maximum revenue, the feasible combinations can be surveyed for the one yielding the highest revenue.

None of the above studies have evolved satisfactory indices for comparing the efficiency of marketing systems for delivering individual perishable commodities from the producer to the consumer. It is important that such indices take account of utilities of time, form, and space; quality of the product as it influences price, and distance from market. The following two indices are designed to meet these objectives and provide standard measures to evaluate vegetable marketing efficiency in Taiwan:

1) Technical Efficiency Index, (T)=variable marketing costs per final weight delivered per unit of distance

or, $T_{ij} = V_{ij}/W_{ij}/d_{ij}$

2) Economic Efficiency Index, (E)=Sum of marketing agents' profit/ variable marketing costs

or, $$E_{ij} = \frac{\Sigma_k \{\pi_{ijk}\}}{V_{ij}}$$

Where, i = a given commodity
j = a given marketing channel
k = a single type of marketing agent
for commodity "i" in channel "j",
W = Final weight at delivery
d = total distance commodity traveled
π = A marketing agent's profit
V = Variable marketing costs

The lower the value of T, the greater the technical efficiency of post-harvest handling, transportation, and other aspects of marketing that delivers a given weight of produce to the final buyer as cheaply as possible. This index presupposes freedom of entry and exit, adequate competition in the market, and other aspects of economic efficiency.

The lower E, the greater the economic efficiency. Given an implied high level of technical efficiency as expressed in variable costs, the channel which delivers the produce to the final buyer with the lowest

combined profit to marketing agents is the most efficient. The utilities of time, form, and space are treated as a residual. Combined profit to the marketing agents is the same as marketing agent utility or non-consumer utility. By minimizing non-consumer utility in E we are actually maximizing consumer utility, which automatically takes account of freshness, longer consumption season, better packaging, and other aspects of value to the consumer which manifest themselves in higher price.

The use of either index is insufficient in itself, but together they give a good picture of marketing efficiency. If a given channel for a given commodity enjoys low values for both indices, we have probably discovered a very efficient distribution channel.

The format shown in Table 33 was developed to provide a standard tool for comparing the efficiency of one marketing channel with another. It takes account of the different quantities handled by different agents, different numbers of agents and percentage losses at each stage, percentage of total marketing costs represented by fixed investment, different total distance of each channel, and other problems.

Table 33. Example of marketing channel analysis, (for tomato channel 1), 1977; AVRDC, 1978.

	Producer	Assembler/ Jobber	Wholesaler	Retailer	Consumer
1. Quantity bought (kg)	-	6000	100	85.5	-
2. Quantity delivered (kg)	-	6000	100	83.5	-
3. % loss	-	0	0	2.3	-
4. Adjusted[d] quant. bought (kg)	-	1023	1023	1023	1000
5. Adjusted[d] quant. delivered (kg)	1023	1023	1023	1000	-
6. Buying price (US$/kg)	-	0.63	0.73	0.75	0.93
7. Selling price (US$/kg)	0.63	0.73	0.75	0.93	-
8. Marketing margin (%)	65.7	10.8	2.2	19.3	100
9. Total revenue[a] (US$)	-	108.90	21.57	156.58	-
10. V[b] x (4) (US$)	-	3.01	0	0.09	-
11. F[c] x (4) (US$)	-	0.03	4.91	22.61	-
12. Total cost (10 + 11) (US$)	-	3.04	4.91	22.71	-
13. Profit (9-12) (US$)	-	105.87	16.65	133.88	-
14. Distance (Km)	-	-	-	-	36.8

T, Technical Efficiency Index per ton $= \frac{\Sigma(12)}{(14)} = \frac{30.66}{36.8} = 0.83$ US$/km

E, Economic Efficiency Index per ton $= \frac{\Sigma(13)}{(12)} = \frac{256.40}{30.66} = 8.36$

[a]Total revenue = (5x7) - (4x6)

[b]V = Variable Marketing Cost (US$/kg).
V x (4) = Variable marketing cost of delivering one ton of produce to the consumer.

[c]F = Fixed Marketing Cost (US$/kg).
F x (4) = Fixed Marketing cost of delivering one ton of produce to the consumer.

[d]Volume required to deliver 1000kg of produce to the final consumer.

This format provides two indices of technical efficiency: the percentage of physical loss for each agent individually and for the entire marketing channel (item 3), and T. These two indices should be closely related for the commodities selected, and indicate that, for perishable commodity marketing, measures which can reduce physical weight loss at low cost are a major contributor to technical efficiency.

Similarly, two measures are given for economic efficiency, which refers to the relative competitiveness of a channel and its ability to maximize consumer utility: the marketing margins for each agent (item 8), and E.

Estimates of marketing margins for the target commodities were complicated when most marketing agents could not make a good estimate of average prices, but preferred to report minimum and maximum prices received and paid (see p. 27). We adopted the following procedure to solve this problem: (1) we entered the information on average prices from the farmer, and at the final retail market.[a] As these prices were known to be accurate, subtracting the former from the latter gave us the total marketing margin for a channel. (2) We recorded the marketing agents' reported markups at maximum prices, which were more representative of average markups than those at minimum prices. (3) We multiplied the percentage of this inflated total margin which each agent received by the actual markup from the farmer to the final consumer. This procedure yielded an adjusted estimate of the distribution of marketing margins in each channel.

MUNGBEAN

The domestic marketing channels for mungbean were very simple, in part because speed and efficiency were not critical for reducing product deterioration (Fig. 13). We collected complete information for three channels, all of which carried mungbean from producers to retailers to consumers. Moreover, channels ending at Hsueh-Chia, Chiang-chun, and Shanhua all originated with farmers living at a distance averaging 4 km. Thus, we were in an ideal position to compare their relative technical and economic efficiencies. Table 34 gives T and E of marketing channels for mungbean and other target commodities.

Channel 3 had the best technical efficiency for mungbean. Physical loss (3%) was comparable to the lowest (2% for channel 1). However, the economic efficiency of channel 2, with both the lowest monetary profit to marketing agents and the highest percentage of final price to the producer, was the best. If agents in marketing channel 3 could be forced by increased competition to take lower profits, then channel 3 would be the best system. Alternatively, if the agents in channel 2 adopted cost-saving handling practices and retained their current profit margins, then 2 would be the best.

Analysis of retailer handling procedures shows that the single marketing agent involved in channel 3 deals exclusively in mungbeans among all vegetable commodities, which in turn make up 50% of his total revenue. In contrast, agents in channels 1 and 2 derive only 10% and 16% of their total revenue from vegetables and, therefore, have less time and attention to devote to technical aspects of mungbean handling. The agent in channel 3 handles 432 kg/day at maximum, while those in the other 2 channels handle between 114 and 240; therefore, there may be economies of

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[a]Average prices in the final retail market were those reported in the Commodity Price Statistics Monthly, Taiwan, 1977.

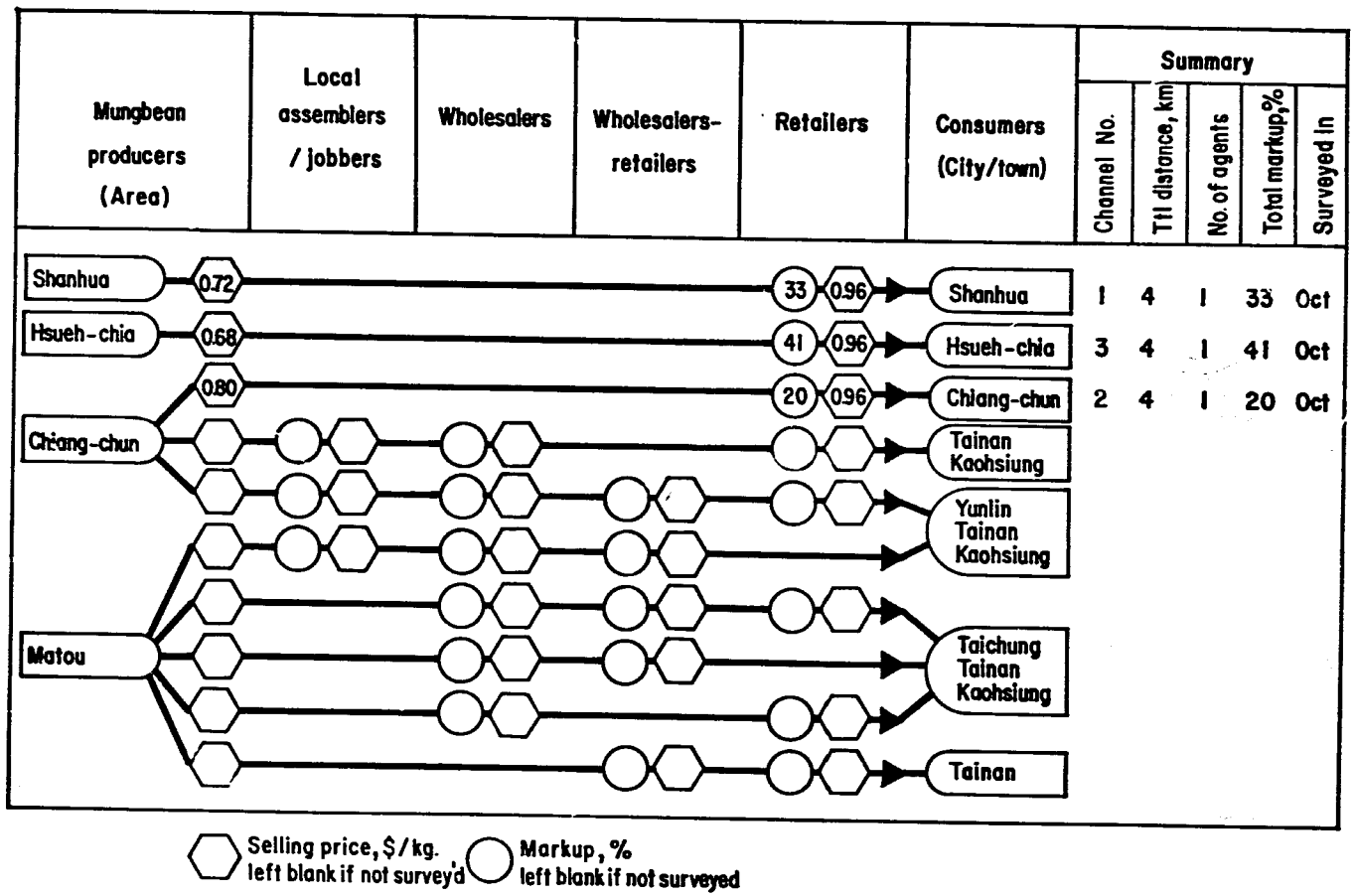

Fig. 13. Marketing channels identified (unnumbered) and analyzed (numbered) for mungbean, 1977; AVRDC, 1978.

Table 34. Summary of efficiency indices for the marketing channels of selected perishable commodities, 1977-78; AVRDC, 1978.

	Channel	Distance	Technical efficiency			Economic efficiency	
			Physical	Loss	T [a]	Farmers' share of Consumer price	E [b]
		-km-	-kg/t-	-kg/t/km-		-%-	
Mungbean	1	4	20.4	5.1	2.17	74	24.60
	2	4	30.9	7.7	14.37	83	1.36
	3	4	30.9	7.7	0.94	71	67.97
Soybean	1	16	180.0	11.3	2.61	69	1.31
	2	18	68.0	3.8	2.22	69	2.34
	3	13	56.0	4.3	1.17	69	8.05
	4	10	91.0	9.1	2.08	71	4.78
	5	16	25.0	1.6	1.69	70	4.46
Sweet potato	1	3	0	0	2.11	50	4.08
	2	57	80.0	1.4	1.33	24	1.01
	3	57	63.0	1.1	1.10	24	0.86
	4	57	53.0	0.9	0.63	24	2.26
	5	175	52.0	0.3	0.16	63	0.26
Bamboo shoots	1	4	49.3	12.3	7.43	52	5.54
	2	4	111.1	27.8	9.33	58	3.06
	3	4	0	0	6.12	57	6.54
	4	4	169.6	42.4	11.46	66	1.11
Tomato	1	37	23.0	0.6	0.83	68	8.36
	2	21	60.1	2.9	3.03	65	3.63
	3	180	231.0	1.3	0.90	46	0.98
	4	142	182.0	1.3	0.74	46	0.22
Cabbage	1	111	372.8	3.4	1.37	68	-0.64
	2	111	417.4	3.8	1.15	68	-0.75
	3	34	372.8	11.0	2.66	44	2.20
	4	34	431.8	12.7	3.00	44	1.65
	5	33	264.2	8.0	2.22	51	2.63
	6	33	318.5	9.7	2.54	51	2.02
Chinese cabbage	1	79	458.6	5.8	1.44	43	0.68
	2	79	500.6	6.3	1.82	43	0.24
	3	79	436.3	5.5	1.58	43	0.59
	4	60	50.2	0.8	1.60	44	2.21
	5	60	333.9	5.6	2.25	44	0.59
	6	60	276.7	4.6	1.96	44	0.99
	7	34	268.4	7.9	3.46	57	0.01
	8	34	304.9	9.0	4.19	57	-0.27
	9	34	248.9	7.3	3.80	57	-0.01

[a]Technical Efficiency Index ($/t/km). [b]Economic Efficiency Index ($profit/$variable costs).

scale in channel 3. The agent is able to handle about 22 kgs/min versus 24 for the agent in channel 1, and 5 for channel 2. The channel 3 agent only culls, and does not sort, wash, package, or perform other services. His only material inputs are cloth bags, which he purchases at $0.05 each and which hold 108 kg. One of the greatest advantages of channel 3 is that the farmers bring the produce directly to him to sell and consumers come to his shopfront to buy.

Why do the marketing agents in channel 2 have the highest economic efficiency? Excessive costs make the benefit/cost ratio low. Furthermore, the agents in channel 2 also provide space utility by transporting the produce at a cost of $13/t without passing this charge on to the consumer. At the same time, they offer the highest price of all three channels to the producer.

SOYBEAN

Figure 14 shows five marketing channels identified for soybean. Ease in handling makes soybean the only commodity with such marketing agent designations as assembler/jobber/retailer and assembler/wholesaler. Therefore, many channels are very short in number of agents involved. All channels chosen for study were in the Pingtung area for winter soybean, with 18 km the maximum distance from farmers and 10 km the minimum. Channels 1-4 took the soybean to ultimate consumers, while channel 5 ended at a processing factory.

Channel 3 had a technical efficiency of US$1.17/t delivered per km. Values for other channels ranged from $1.69-$2.61. The superiority of channel 3 seemed at first surprising because 56 extra kg had to be purchased from the farmer to deliver one ton to the consumer because of losses at the retail level. However, this was still the second lowest loss among all five channels.

Channel 1 was most efficient economically. It was similar in structure to channel 3, except that assembler/jobbers sold to wholesale retailers instead of retailers. Thus, the two most efficient channels for soybean avoided agents who combined too many operations (e.g. assembler/jobber/retailers).

Analysis of the handling procedures of the marketing agents showed that although the assembler/jobbers were the same for channels 1-3, the channel 3 retailer had virtually no variable marketing costs and handled almost three times as much volume per season (10,000 kg), and 8 times as much per day as the only other retailer (channel 2). Thus, as in mungbean, economies of scale were present. By buying in small quantities and selling in large, this retailer distributed his sales to achieve a high selling price.

Economically, channel 1 was superior because its agents took the lowest overall profit per kilometer of all channels. The technical efficiency of channel 1 was, however, the lowest because there was a 15% loss at the wholesale/retail level and a 18% loss overall.

Thus improvements in soybean marketing efficiency could be made by combining the low profit margins of channel 1 with the better handling procedures of channel 3.

SWEET POTATO

Five marketing channels were identified for sweet potato (Fig. 15). Channel 1 took the product directly from the producer through a jobber to the starch factory, while the others involved several combinations of jobbers, wholesale-retailers, and retailers. The first 4 channels covered August data, while the fifth was recorded in December to gauge the effect of different seasons on marketing efficiency.

T of channel 5 was lowest, $0.16/t/km. It also had the second lowest volume of farmgate purchases (1052 kg) required to deliver one ton to the final consumer (channel 1 required only 1000 kg). The agents in channel 5 had to ship the commodity the greatest distance (175 km) while those in channel 1 had to ship it only 3.3 km.

Channel 5 had the lowest E. Producers received the highest percentage of final consumer price (63%) versus only 24% for all other channels. Thus, neither index of economic efficiency points to excess profits going to marketing agents. As both technical and economic efficiency were higher than for mungbean and soybean, we concluded that sweet potato is an efficient crop to distribute.

Analysis of their handling procedures showed that the jobbers in channel 5 had a larger percentage of vegetables in their total revenues (40%) than those from other channels (25-30%). This gave them an edge in handling expertise and economies of scale. Channel 5 jobbers handled about 19 t/wk and 6 t/day, higher than in any other channel except channel 1, where distances were so short (3.3 km) that the jobber could handle 342 t/week and 21 t/day. As a result of economies of scale, he was able to handle 12.5 kg/min., versus about 3 kg/min in other channels (statistics for channel 1 are not available). He used inexpensive plastic bags, which cost $0.11 and had a capacity of 60 kgs, versus jobbers in other channels who used cloth bags ($0.34 with a capacity of 72 kg). The plastic bags could be discarded after a single use.

Wholesale-retailers in channel 5 specialized in sweet potatoes. Moreover, they had the highest transaction volume per week (4,200 kg) and per day (1,200 kg). They used trucks for transportation, while the retailer of channel 2, for example, had excessively high transportation costs because he transported his sweet potato by motorcycle. Wholesale-retailers in channel 5 used plastic bags, while those in other channels sometimes also used cloth.

In channel 5, the number of kilograms lost in handling and shipping (52 kg/t) was the lowest except for that of channel 1, where short distances meant no losses. Channel 5 was a winter channel, in which all varieties of sweet potato were relatively free from rotting. In summer, varieties like Early-70 spoil very quickly if exposed to rain; therefore, special varieties, such as Tainan 31 and Tainan 57, must be grown before transport losses may be reduced.

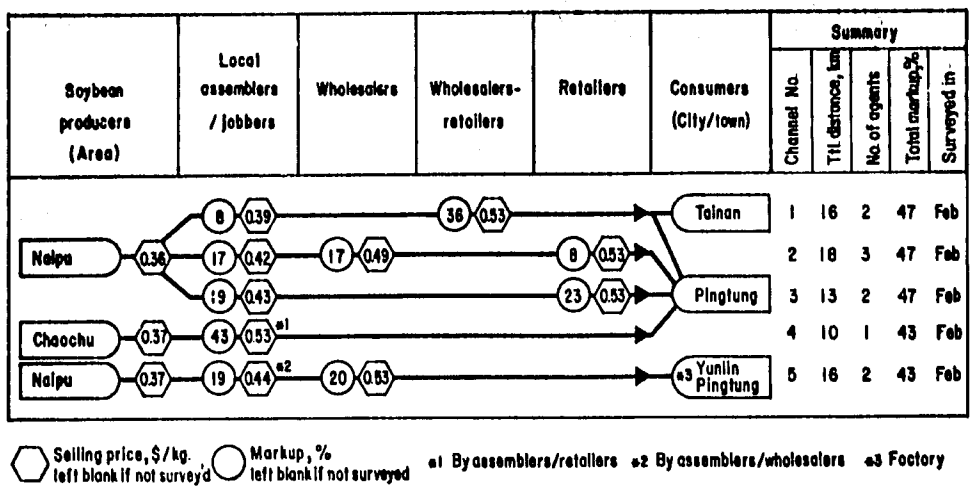

Fig. 14. Marketing channels analyzed for soybean, 1978; AVRDC, 1978.

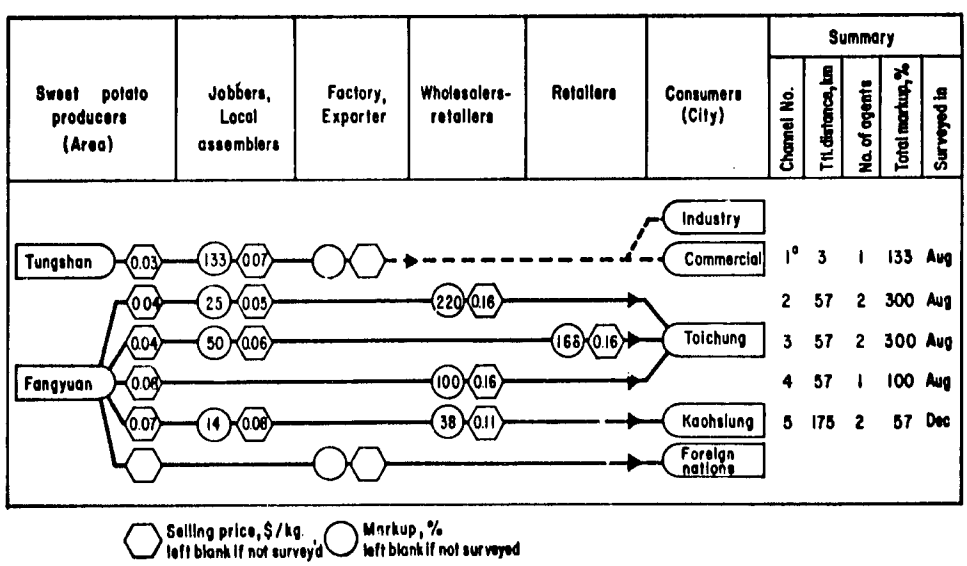

Fig. 15. Marketing channels identified (unnumbered) and analyzed (numbered) for sweet potato, 1977; AVRDC, 1978.

[a]No attempt was made to trace sweet potato starch after it left the factory.

Channel 5 was economically efficient because: (1) it involved only two marketing intermediaries, and (2) they prefered to take a smaller profit in the interest of handling larger volumes.

BAMBOO SHOOTS

Marketing channels identified for bamboo shoots are shown in Figure 16. The distance covered in all cases was 4 km, which permitted a standard basis for analysis.

Channel 3 had the lowest T (US$6.12/km). Percentage physical loss was the lowest of any channel: 0%. Consumer and producer benefits, however, were maximized under channel 4 (producers received 66% of final price). The economic efficiency of channel 3, and the technical efficiency of channel 4, could be improved by combining their best aspects. Note that the two best channels involve transactions made in wholesalers market by wholesalers-retailers. Furthermore, producers received the highest price for their produce in the wholesalers market (i.e. channels 2, 3 only). This illustrates the benefit to producers of carrying out their transactions in the wholesalers market.

In channel 3 large buyers, such as institutions, were the end consumers. Again, economy of scale played an important role. Thus, channel 3's lowest marketing costs were not only attributed to the high business volume handled (135 kg/day), but also to the high volume transacted each day with large buyers. Through such large scale operations, agents in this channel could more than cover the cost of delivering produce to customers, a unique service of this channel.

Channel 4 was economically efficient because the profit earned at each marketing stage was significantly lower than in other channels. Relatively high marketing costs with high prices paid to producers resulted in low and sometimes even negative profits.

Bamboo shoot producers receive the least through channel 1, which bypassed wholesale markets in its marketing route. By selling their produce in a wholesale market, farmers could raise their revenue 10% or more. Therefore, encouraging farmers to deal with merchants in the public wholesale market is one way to increase farmers' incomes.

The shortest channel may not always be the most efficient channel, economically and technically. The technical efficiency of channel 2 was 52% lower than that for channel 3 even though its economic efficiency was 47% higher.

TOMATO

Four marketing channels were identified for tomatoes, two in the summer (Aug) and two in the winter (Nov-Dec). Fig. 17 shows that channels 1 and 3 involved wholesalers as a link between jobbers and retailers, and that channels 2 and 4, which originated in the same area, differed by season.

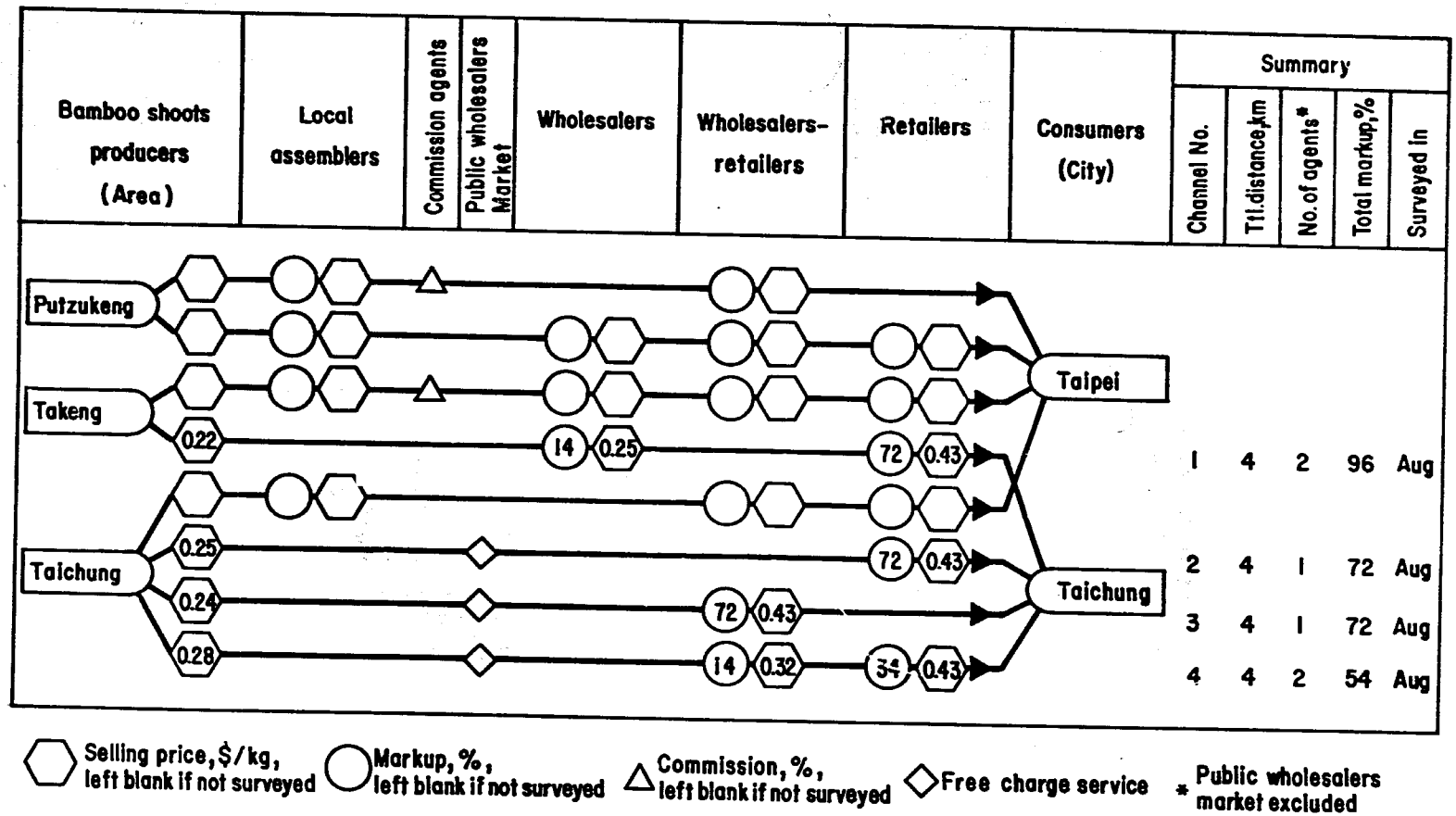

Fig. 16. Marketing channels identified (unnumbered) and analyzed (numbered) for bamboo shoots, 1977; AVRDC, 1978.

Channel 4 was technically superior because the commodity was carried over a long distance (142 km) without corresponding increases in cost per km. Therefore T was only US$0.74, a figure lower than for the less perishable bamboo shoots. Thus, agents in channel 4 were able to transport tomatoes through a long channel from the producer to the consumer with acceptably low costs even though local jobbers had to start with the second highest amount of produce at the farmgate (1182 kg) to deliver one ton to the final consumer.

Channel 4 was economically superior. Even though the producer received a lower percentage of the final consumer price (46 % vs 68% for channel 1), E was only 0.22, a figure less than a quarter that of any other channel. In both the winter and the summer, the channels which bypassed wholesalers as a link between jobbers and retailers had the lowest E, showing that these intermediaries are superfluous to providing utilities to the consumer.

Specialization helped achieve high technical and economic efficiency. Jobbers in channel 4 specialized 100% in vegetable marketing, versus 72 and 64% for other channels. One-fifth of all their income came from tomatoes. The jobbers used cardboard boxes which cost $0.53 and could be used twice. These were less expensive than the average of $0.74 paid for similar boxes in channel 3. However, channel 2 agents, operating in the summer, seemed to get by with cheaper ($0.12) boxes and additions of newspaper($0.002 per box).

Channel 3 and 4 wholesale and retailer agents always used bamboo baskets and cardboard containers, while these were mentioned only occasionally by retailers in channels 1 and 2. Their use presumably added to the technical efficiency of channels 3 and 4.

The major reason for low E in channel 4 was the small number of agents. Additionally, volume handled was less per week and per day than in other channels, so that when tomatoes are a smaller part of an exclusively vegetable operation, agents may find smaller returns acceptable.

COMMON CABBAGE

Marketing channels are identified for common cabbage in Figure 18. Of these, we obtained complete data on six channels, all of which ended with the final consumer in Taichung. The first two channels originated in Li Shan (total distance to Taichung 111 km) the next two began in Yungching (34 km), and the final two started in Hsihu (33 km). Heavy rains and great fluctuations in prices resulted in negative average returns to the marketing agents in channels 1 and 2. Rather than attempt to adjust these figures, we assumed that intended cost expenditures were the same, but that the agents' unexpected reversal gave a momentary boon to the consumer. Thus, these channels may have the greatest economic efficiency but not necessarily the greatest technical efficiency.

Technical efficiency seems to bear an inverse relationship to distance from market. Channels 1 and 2 averaged only US$1.26/t/km versus

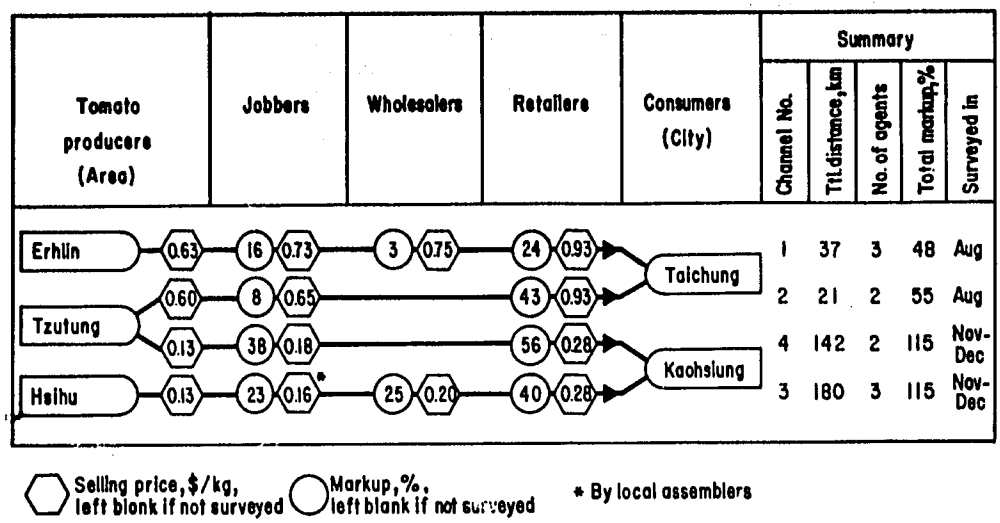

Fig. 17. Marketing channels analyzed for fresh market tomato, 1977; AVRDC, 1978.

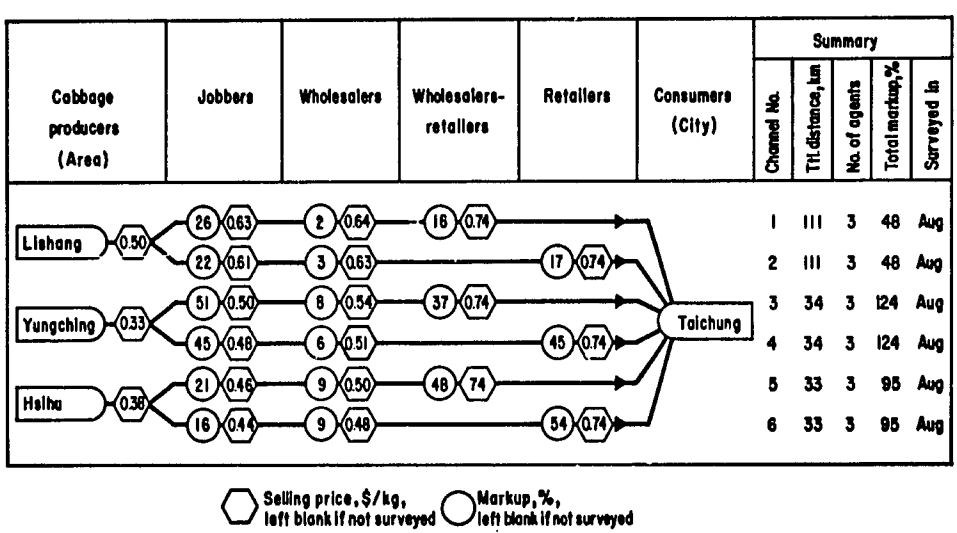

Fig. 18. Marketing channels analyzed for common cabbage, 1977; AVRDC, 1978.

averages for Hsihu ($2.36) and Yungching ($2.83); channel 1 also had the lowest physical loss, especially if considering per kilometer costs. These figures are generally higher than those for the less perishable commodities mungbean, soybean, sweet potato, and tomato, but lower than those for bamboo shoots. The explanation lies partly in the great efficiency of cabbage marketing and partly in the effect of distance from market.

Economic efficiency is the highest in channels originating in Li Shan, though we cannot be certain that this situation prevails in the long run. Channel 2 was technically and economically the best channel.

The assembler/jobbers in Li Shan derived over 80% their total revenue from vegetables, versus an average of 38% for other channels. However, as with tomatoes, they handled fewer cabbages - 700 kg/wk and 150 kg/day - than in the other channels, suggesting that, with highly perishable commodities, agents take more care and require less profit if they handle relatively smaller shipments. Assemblers and jobbers in channels 1 and 2 also handled up to 7.5 kg/min versus an average of 2.5 for the other channels, showing the greater skill of the former. They also were always careful to put the cabbages in bamboo baskets (holding 70 kgs, costing US$3.95, and usable 60-90 times), while agents from other channels sometimes just piled them onto a truck.

Wholesalers in all channels performed essentially the same operations (stripping off the outer green leaves to reveal the whiter leaves underneath). Channel 2 is slightly more efficient than channel 1 because its last market agents are retailers rather than wholesale-retailers; but we were able to find no technical reason why this should be so.

CHINESE CABBAGE

Marketing channels for the most perishable commodity, Chinese cabbage, are shown in Figure 19. The first three channels originated in T'u-ku (79 km from Taichung). Channels 4-6 and 7-9 are comparable, except that points of origin were Erh-lin (60 km from Taichung) and Yungching (34 km from Taichung), respectively. Variation in T showed that as distance from market increased, the average cost per kilometer decreased. The costs of transportation for Chinese cabbage from Yungching were higher than those for the less perishable common cabbage. The effect of distance from market in determining market efficiency seems greater than the influence of commodity perishability.

The most technically efficient channels were 1, 4, and 7. These all involved jobbers selling directly to retailers in the Taichung Fruit and Vegetable Market. The least technically efficient channels in all cases involved assemblers selling to wholesale retailers. Channels featuring both wholesalers and retailers were intermediate.

We hypothesize that simpler channels had greater economic efficiency. For all points of origin, the assembler to wholesale-retailer channel had lowest E because their absolute level of cumulative profits was

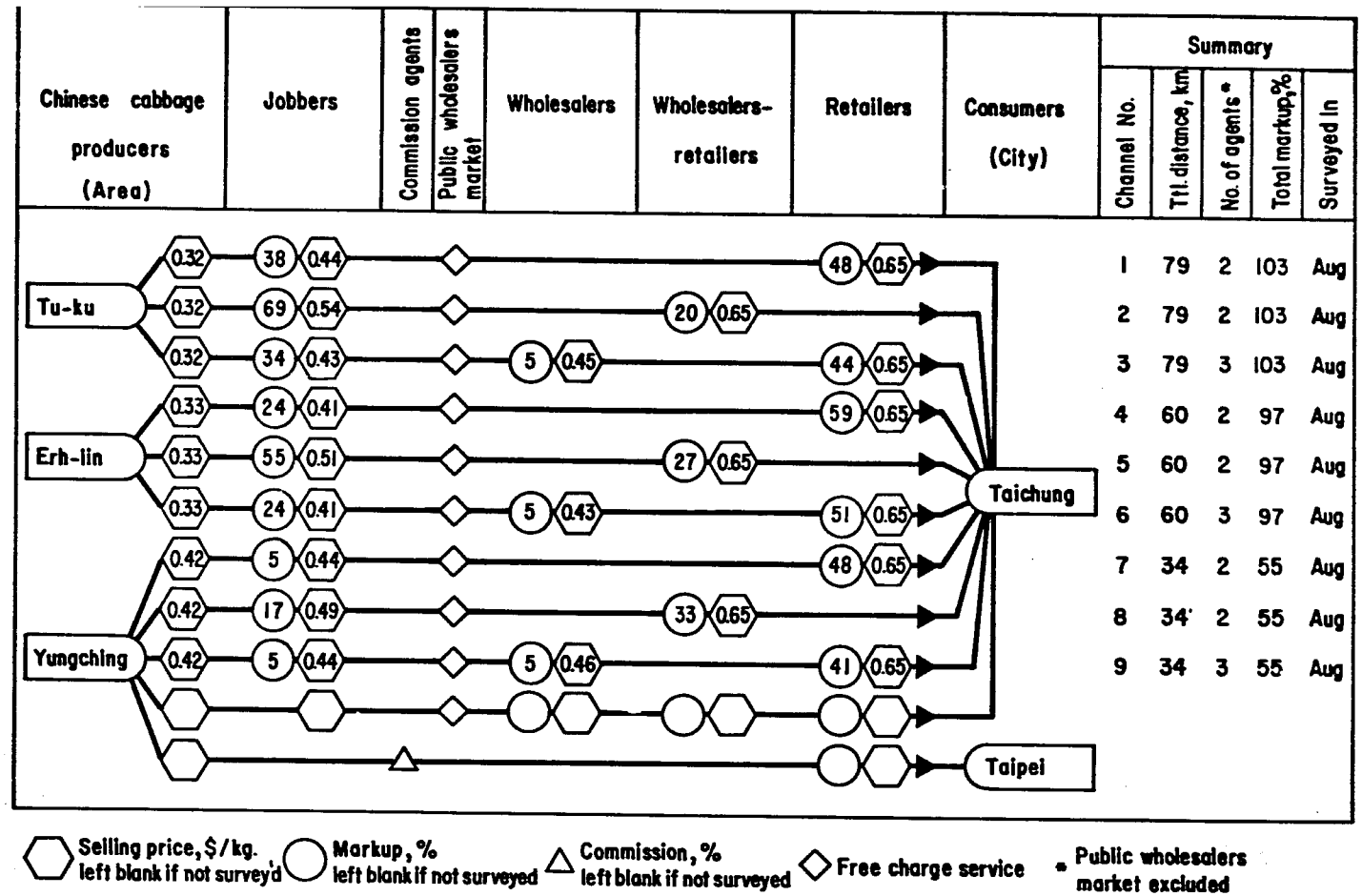

Fig. 19. Marketing channels identified (unnumbered) and analyzed (numbered) for Chinese cabbage, 1977; AVRDC, 1978.

lowest in all three cases. When wholesale-retailers take over the responsibilities of both wholesalers and retailers, they shorten the channel and increase the economic efficiency.

The technical efficiency of channel 1 was the highest. The jobbers in this channel dealt 55% in vegetables, of which 45% was in Chinese cabbage. By contrast agents in channels 7-9 dealt only 1.5% in vegetables, with 0.5% in Chinese cabbage. Volumes handled per week and per day (4 t, 2 t) were also much greater than the next nearest jobbers in channels 4-6 (1 t, 0.4 t). Jobbers were able to handle 6 kg/min in channels 1-3 versus 3.3 for channels 7-9. Transport costs were also the lowest of all channels because the jobbers used their own trucks. They placed the produce directly on their vehicles and took it to the market, where they transferred it to bamboo baskets holding about 60 kgs which may be used 60-90 times and cost US$1.32 apiece. Jobbers from other channels refrained from special handling and, instead, gave a service person at the market a fee of 2% for performing these operations. Retailers in channel 1, like those in other channels, transferred the goods from bamboo baskets to plastic bags. The less efficient wholesale-retailers simply used bamboo baskets.

Economic efficiency was highest in channel 8, mainly because of the negative returns to marketing agents because of problems in summer transport. Thus, programs to improve the marketing of Chinese cabbage should aim at retaining the technical operations of channel 1 while stabilizing the profit to agents.

Table 35. The relationship among physical and economic characteristics in the marketing of selected commodities; AVRDC, 1978.

Commodity	Water content[a]	Physical loss	T[c]	E[d]	Farmers' share of consumer price
	-%-	-%-			-%-
Chinese cabbage	95.7	32.0	2.46	0.56	48
Cabbage	94.2	36.3	2.16	1.19	54
Tomato	95.0	12.4	1.38	3.28	56
Bamboo shoots	82.7	8.3	8.59	4.06	58
Sweet potato	75.3	5.0	1.07	1.69	37
Soybean	9.3[b]	8.4	1.95	4.19	70
Mungbean	11.8	2.7	5.82	31.31	76

[a]Adapted from ref. 12. All other data are averages of the channels studied in this report. [b]When purchased from the farmer, the moisture content is considerably higher; therefore, soybean is ranked more perishable than mungbean. [c]Technical Efficiency Index. [d]Economic Efficiency Index.

CONCLUSIONS

Table 35 shows the relationships among selected physical and economic characteristics for the target commodities under study. The commodities are listed in descending order of perishability, as ranked by marketing agents, which closely follows their percentage water content and average percentage physical loss in handling, as measured from the marketing channels described in this chapter. The last three columns show that, in general, decreasing perishability also results in lower T values, higher E values, and a higher percentage of final consumer price received by the farmer.

There are two exceptions to the above trends: (1) sweet potato is so easily handled that it has uncharacteristically low values for Economic Efficiency Index and the percentage of consumer price to the farmer, and (2) bamboo shoots and mungbean have excessively high values for T given their relative water content and physical losses. This is partly because of the short distances over which they are transported in the channels under study. Technical improvements could be made in reducing their handling costs per ton per kilometer.

In general, however, the statistics show remarkably consistent trends, the most surprising of which is that marketing agents take less profit from both the consumer and producer in the case of the most perishable commodities. The trends also suggest that one may consult physiological tables on water content to estimate for a given commodity its relative physical and economic marketing parameters. Thus, government planners do not necessarily have to perform pilot studies in order to estimate the effects of introducing the marketing of a given crop.

Such products as sweet potato and mungbean which are considered low-input crops by farmers have low water content and low physical losses. In contrast, Chinese cabbage, cabbage, and tomato are considered by farmers to be high input crops, have high water content, and suffer high losses in marketing. Since both in their production and marketing, Chinese cabbage, cabbage, and tomato are relatively sensitive to water stress, a strong relationship exists between investments in irrigation in the production stage and investments in retarding moisture loss in the post-harvest and marketing stages.

Chapter Six: Summary and Conclusions

The Asian Vegetable Research and Development Center (AVRDC) conducted surveys of 312 producers and 75 marketing agents of perishable commodities during 1977-78 in Taiwan. The commodities, in descending order of perishability, were Chinese cabbage, common cabbage, tomato, bamboo shoots, sweet potato, soybean, and mungbean. Chosen in part because they exhibit a wide range of production and handling problems, they are also crops on which improvements in pre harvest technology are being developed at AVRDC.

Forty-five producers for each crop were interviewed regarding pre- and post-harvest budgets, disposal of product, investments in marketing, and attitudes toward current marketing policies. Marketing agents were asked about their scale of operation, investments, post-harvest handling and marketing procedures, physical losses, economic margins, and attitudes toward current policies.

From the two interview samples, complete marketing channels were constructed for each commodity, differing in both distance covered and the number of marketing intermediaries between the producer and consumer. Gross margins, physical losses, profits, shipping and handling procedures, and benefits to consumers and producers were determined for each channel. In addition, we developed the Economic Efficiency Index to gauge the extent to which a given channel maximized consumer utility and the Technical Efficiency Index to measure the least-cost way to transport and handle goods. These indices allowed us to determine the most efficient channel for each of the seven commodities.

CONCLUSIONS

On the basis of production, consumption, and export trends in Taiwan, we classified the seven target commodities into three groups: (1) bamboo shoots, tomato, and Chinese cabbage, which are increasing in importance; (2) mungbean and common cabbage, which are remaining stable; and, (3) soybean and sweet potato, which are declining. Planted area, marketing structure, and exports, particularly of canned tomato and bamboo shoots, have responded to dynamic changes in domestic and foreign demand.

Farmer interviews revealed satisfaction with the specialized vegetable production area program. Farmers also favored expansion of government marketing facilities, guaranteed prices, and a teletypewriter network to disseminate prices. The farmers who were most eager to see such government improvements in marketing largely produced groups 2 and 3 crops above.

Although marketing agents favored an expansion of space and facilities for marketing and the increased availability of telecommunications, they were even more interested in improved transaction practices, grading and quality standardization, and packaging. However, distinct preferences were shown by different types of marketing agents, depending on their position in the marketing chain.

Price information was gathered by both marketing agents and farmers

in the central region. Although bulletin boards, broadcasts of prices, and other programs have been initiated by the government, these have not been widely used. Farmers in the south, who sold most of their products at home or at the farm gate, were dependent mostly on other farmers and the marketing agents themselves for price information. They, therefore, had a weaker bargaining position than farmers in the central region.

Marketing agents, particularly those close to the farmer, also cited weak bargaining power and price fluctuations as significant problems. The latter was also a main factor in how farmers chose which crop to grow, along with yield fluctuation, ease in transport, and labor shortage. Both farmers and marketing agents were concerned with perishability and variability in product quality. Marketing agents alone listed overstocking, transport accidents, lack of supply, and insufficient marketing capital as major problems.

Marketing agents have generally achieved an appropriate scale of operations: more than half contemplated no major investments in the near future. Most marketing investments by farmers have been for improved transport, which is highly correlated with bargaining power and the major post-harvest handling activity. More farmers in the central region than in the south make such investments.

Farmers listed the type of agent to whom they would prefer to sell their produce. For tomato, Chinese cabbage, common cabbage, soybean, and sweet potato, they indicated non-retailing shippers and local assemblers. All channels identified in the analysis of these products started with jobbers or local assemblers. For bamboo shoots, however, farmers preferred to sell to processors; and for mungbean, general consumers. None of the channels identified had direct access to these outlets. Therefore, farmers did not always find the type of marketing agent they wanted.

For sweet potato, tomato, and common cabbage, a single channel was found most technically and economically efficient. For sweet potato, this involved local assemblers and wholesale-retailers; for tomato, jobbers and retailers; and for cabbage, jobbers, wholesalers, and retailers. For all other commodities, combining the best attributes of two different channels could result in improved efficiency. The above channels were the most efficient because of their lower percentage loss of the product, use of low-cost but adequate packaging, high speed in handling, and specialization. For tomato and cabbage, very perishable crops, efficiency seemed related to low volumes of the target crop within a high percentage of vegetables in the entire enterprise. For sweet potato and tomato, channels measured in the winter months were more efficient than those in the summer.

Tomato had the highest farm income through harvest and the highest farm and net income from post-harvest handling and marketing. Therefore, it pays farmers to take on some of tomato's post-harvest operations. To a lesser extent, cabbage and sweet potato also had favorable farm and net incomes after harvest. Farms with under-utilized labor could also benefit from post-harvest handling of Chinese cabbage, bamboo shoots, and mungbean, in declining order. The profitability of these operations to farmers would depend on the returns from alternative uses of family

labor. In general, it is in farmers' interests to deliver their produce to a wholesale market if at all possible.

Because the weighted average of actual prices received by marketing agents was difficult to determine, it was impossible to develop marketing budgets for the target crops. However, marketing agents must pay higher costs for marketing commodities of increasing perishability. They also must accept lower percentage markups in the interest of moving perishable commodities as quickly as possible. Still, because the unit prices for such commodities are much higher than those of relatively non-perishable crops, Chinese cabbage, tomato, and common cabbage may well be the most profitable to handle, if the most risky. For this reason, most marketing agents prefer to diversify their portfolio of perishable commodities.

Increasing perishability was related to a high percentage water content, low percentage of final consumer price received by the farmer, high physical loss in handling, low technical efficiency index, low percentage markups, high marketing costs, and high economic efficiency index. Given their relative water content, sweet potato seemed unusually efficient and bamboo shoots unusually inefficient, but general trends suggested that water content may be used to assess the potential marketing efficiency of a wide range of commodities.

The more marketing intermediaries who separate a given agent from the producer, the higher that agent's markup is likely to be.

The results of this study add to the knowledge about the marketing of specific perishable commodities in the Republic of China. They also help to set out a format for the analysis of marketing channels which may be used by research workers with limited resources in other countries of Asia and the tropics.

Copies of the questionnaire and data analysis forms are available upon request from the AVRDC Office of Information Services.

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APPENDIX: VARIABLE MARKETING COSTS FOR SELECTED COMMODITIES

Variable marketing costs by marketing agents, soybean, 1978; AVRDC, 1978.

	Variable marketing costs					
	Labor[a]	Material	Transport-ation	Commission		Total
				Market	Other agents	
	US$/t					
Assemblers/jobbers	3.16	0	2.31	0	0	5.47
Assemblers/wholesalers	12.82	0	2.56	0	0	15.38
Wholesalers	1.15	0	0	0	0	1.15
Assemblers/retailers	6.67	0	2.31	0	0	8.97
Wholesalers/retailers	15.38	0	2.56	0	0	17.95
Retailers	0	0	0	0	0	0

[a]Imputed values included for own labor.

Variable marketing costs by marketing agent, cabbage, 1977; AVRDC, 1978.

	Variable marketing costs					
	Labor[a]	Materials	Transpor-tation	Commission		Total
				Market	Other agents	
	US$/t					
Local assemblers	1.03	13.11	12.82	23.54	0	50.49
Jobbers	7.10	0.28	8.82	26.35	0	42.54
Wholesalers	0	0	0	0	0	0
Wholesale-retailers	2.55	2.19	1.94	0.94	0	7.61
Retailers	5.90	1.10	0.66	0	0	7.65
Commission agents	1.71	2.67	2.56	0	0	6.95

[a]Imputed values included for own labor.

Variable marketing costs by marketing agent, bamboo shoots, 1977; AVRDC, 1978.

	Variable marketing costs					
	Labor[a]	Materials	Transpor-tation	Commission		Total
				Market	Other agents	
	US$/t					
Local assemblers	2.23	4.99	11.91	15.74	0	34.86
Jobbers	-	-	-	-	-	-
Wholesalers	0	0	0	0	0	0
Wholesale-retailers	2.06	0.93	1.97	6.37	0	11.34
Retailers	7.52	1.18	1.92	0	0	10.61
Commission agents	-	-	-	-	-	-

[a]Imputed value included for own labor.

Variable marketing costs by marketing agent, mungbean, 1977; AVRDC, 1978.

	Variable marketing costs					
	Labor[a]	Materials	Transportation	Commission		Total
				Market	Other agents	
	US$/t					
Local assemblers	14.73	0.22	3.21	0	0	18.16
Jobbers	21.37	1.05	12.57	0	0	34.98
Wholesalers	1.61	0.28	0	0	0	1.89
Wholesale-retailers	2.45	0.31	0	0	0	2.76
Retailers	1.14	0.13	4.81	0	0	6.08
Commission agents	-	-	-	-	-	-

[a]Imputed values included for own labor.

Variable marketing costs by marketing agent, tomato, 1977; AVRDC, 1978.

	Variable marketing costs					
	Labor[a]	Material	Transportation	Commission		Total
				Market	Other agents	
	US$/t					
Local assemblers	4.06	18.24	14.96	7.32	0	44.57
Jobbers	2.86	8.82	10.26	16.01	0	37.95
Wholesalers	8.55	4.92	8.55	3.21	0	25.22
Wholesale-retailers	-	-	-	-	-	-
Retailers	0	0.12	1.05	2.33	0	3.05
Commission agents	-	-	-	-	-	-

[a]Imputed values included for own labor.

Published by the Office of Information Services,
Asian Vegetable Research and Development Center,
P.O. Box 42, Shanhua, Tainan 741, Taiwan, R.O.C.