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IMPROVING THE PERFORMANCE OF PROCUREMENT SYSTEMS FOR FRUIT AND VEGETABLE PROCESSORS IN THAILAND: A CASE STUDY OF UP-COUNTRY PICKLERS AND CANNERIES

By

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A DISSERTATION

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1985

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Dedicated to my parents:

Merle L. and Katherine Menegay

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ABSTRACT

IMPROVING THE PERFORMANCE OF PROCUREMENT SYSTEMS FOR FRUIT AND VEGETABLE PROCESSORS IN THAILAND: A CASE STUDY OF UP-COUNTRY PICKLERS AND CANNERIES

By

Merle R. Menegay

One of Thailand's development strategies for exploiting low cost labor and an abundance of fruits and vegetables is to promote labor intensive, export-oriented, agro-businesses as a source of foreign exchange, rural employment, foreign investment, and advanced technologies. Following the rapid growth of their canned pineapple industry, a series of adverse events led to excess capacity, supply procurement irregularities, weakening demand, and business failure for up-country canneries, thus accenting the need for reassessing their strategy and examining the policy alternatives. The problems underlying the strategy of promoting a large scale fruit and vegetable canning industry and engaging in an "export thrust" for fresh fruits and vegetables are examined in this study.

The goal of this problem-solving study is to determine how to improve the performance of new fruit and vegetable procurement systems and thereby expand employment and income generating activities in rural areas. A systems approach is used to develop a diagnostic framework for identifying the key characteristics, interrelationships, and problems of procurement arrangements in the fruit and vegetable production/distribution/consumption system.

The initial chapters describe the problem area, explain the system's approach, and provide a diagnostic framework which focuses on the

assessment of processor procurement systems both from the processor and fresh food market perspectives.

The following chapters examine two types of processors, traditional picklers and canneries. The analysis of the traditional up-country pickling-preserving firms and one of their established raw materials (garlic) provides an understanding of sources, implications, and adjustments to problems with pickler procurement practices, thereby gaining insights useful to the newer canneries locating up-country. The diagnosis of problems with the up-country canneries and one of their recently introduced raw materials (tomato) provides insights into how the performance of that industry's procurement practices can be improved.

The final chapter synthesizes the findings of the previous chapters and attempts to identify key characteristics and potential problematic relationships within procurement systems. Conclusions include the importance of the "promoter" procurement approach, the importance of careful village selection as a supplier of raw materials, the advantages of using the entrepreneurial talents of middlemen, and the wisdom of a "gradualism" growth strategy. Recommendations were made for improving the performance of processor land public sector operations, as well as for conducting further research.

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CHAPTER I

THE RESEARCH PROBLEM

In Thailand fruit and vegetable canneries have been established in response to the government's Board of Investment (BOI) promotional strategy.

In the North of Thailand the fertile, developed Chiang Mai Valley has been a major production area for fruits and vegetables due to its particularly favorable climate and industrious farmers. For many decades pickling-preserving firms have relied on the abundant fruits and vegetables to support their expansion in concert with the expanding demand from the Thai tourist industry centered in scenic Chiang Mai City. In the late 1960s and early 1970s the government promotion strategy for exporting processed fruits and vegetables resulted in the opening of a cannery in a neighboring area. A few years later the construction of a large scale food processing complex, designed as the largest of its type in Southeast Asia, began in the Chiang Mai Valley itself. By 1977 local fruit and vegetable processing was at its peak with pickling-preserving firms operating side-by-side with medium and large scale fruit and vegetable processing firms.

In the Northeast the supplies of processable fruits and vegetables were very limited, thus very little pickling evolved. Yet, by the late 1970s a meat processing firm expanded its operation into the canning of fruits and vegetables which were shipped in from production areas in

the Northern and Central Plains regions. This firm envisioned an expanded local production of fruits and vegetables based on its promotional efforts. On the northern most fringe of this region, two local middlemen promoted the expansion of local tomato cultivation and built small processing factories which increased in size along with ever-increasing supplies of processing tomatoes.

A. THAILAND'S STRATEGY FOR EXPLOITING LOW COST LABOR AND ABUNDANT RAW MATERIALS

The investment strategy mentioned above focused on promoting labor intensive, export-oriented, agro-businesses as a source of foreign exchange, rural employment, foreign investment, and advanced technologies. The fruit and vegetable canning industry clearly was a strong candidate because of both the perceived abundance of raw materials, and the gradual foreseeable shift of that industry out of Taiwan due to the pressures of increasing labor costs and land usage. Also the attitude of Thai businessmen of Chinese origin is frequently to imitate the industrial successes of Taiwan, as that country outgrows them and moves to higher levels of industrialization. Transfer of technology, production and marketing insights, and even capital have been readily available through joint ventures and the maintenance of historically close working relationships between the two groups of businessmen. It was no accident that in Thailand one of the very first joint ventures for fruit and vegetable processing included Taiwan partners.

Fortunately the initial experience with this strategy for fruit canning appeared extremely successful. Thailand's new exports earned it a position as the second largest supplier of canned pineapple in the

world market within less than twelve years. Exports " . . . rose 16-fold from 10,470 tonnes valued at Baht 14 million (US $1.9 million) in 1971 to a peak of more than 161,000 tonnes worth Baht 2 billion in 1981."[1] In fact, this approach was so successful that large scale fish processing plants were built in the mid-1970s based on perceived abundance of raw materials and a canning technology somewhat similar to that used for pineapple canning. And concurrently, the large scale food processing complex was being constructed in the North based primarily on a wide array of vegetables rather than fruits as raw materials.

B. PROBLEMS WITH THE INVESTMENT STRATEGY

By 1980 the initial enthusiasm and euphoria surrounding this strategy had slackened in the face of the world-wide depressed economic situation and several adverse events within individual industries. Excess capacity, supply procurement irregularities, weakening demand (especially in reaction to the poor quality of several export products), and business failures accented the need for reassessing the strategy and examining the policy alternatives.

The strategy of promoting a large scale fruit and vegetable canning industry, and then more recently also engaging in an "export thrust" for fresh fruits and vegetables had several underlying problems. These center around competing uses for similar commodities and seem to reflect the fact that little was learned from the procurement problems encountered by processors. The collapse of the large food processing complex in North Thailand was attributed, among other things, to major problems

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[1] "The Pineapple Crusher," Far East Economic Review, March 17, 1983, p. 92.

with inconsistent supply of quality raw materials. Competition for highly desirable fruit and vegetable raw materials often stemmed from conflicts between strong domestic fresh market demand and processor requirements. In Thailand, varietal separability, i.e., the exclusive use of a particular variety as raw material in processing or as a commodity in consumption, has not emerged, as witnessed by the large amounts of processing pineapple varieties going into the fresh market. The same is true for processing tomato varieties. Consequently, the competition between fresh market commodity buyers and raw material buyers creates considerable supply uncertainties for processors who need raw material stability in order to efficiently use plant capacity and to maintain a share of the export market.

Seasonality and variability of supply are characteristic of several types of fruits and vegetables. The lack of experience with new technologies, such as agro-chemicals and new varieties (or fruit and vegetable cultivation practices) as well as the higher level of cash inputs to which these types of crops respond, create considerable risk of cash losses and indebtedness not previously encountered by some semi-subsistence farmers. Stories abound regarding the failure of up-country procurement systems and subsequent hardships experienced by the disillusioned farmers.

Although the types and sources of problems emerging from the investment strategy extended from Thai farmer to the consumer in importing countries, the raw material procurement problem is considered central to the collapse of the Chiang Mai Food Complex and is frequently referred to by industry sources as a major source of uncertainty for most exporting firms, especially if a relatively new crop is involved.

Thus, the present study focuses on procurement problems within a broader scope that includes factors needed for understanding raw material procurement systems and prescribing corrective measures.

C. RESEARCH GOAL AND OBJECTIVE

This study's goal is to "determine how to improve the performance of new fruit and vegetable procurement systems and thereby expand employment and income generation activities in rural areas." Specific objectives are the following:

1) To develop a framework identifying the key characteristics of procurement arrangements in the fruit and vegetable production-distribution-consumption system.

2) To describe the grower/processor linkage arrangements and coordination mechanisms for a long established crop (case of garlic) and newly introduced crop (case of tomatoes).

3) To diagnose the sources and implications of procurement problems, and then analyze factors affecting the successful establishment and expansion of procurement arrangements within these grower/processor systems.

4) To suggest public and private sector strategies and policies for developing effective raw material procurement systems that supply fruit and vegetable processing firms.

D. SETTING OF THE STUDY

The study was undertaken under the auspices of the Rural Off-Farm Employment Assessment Project (ROFEAP) based at Kasetsart University and undertaken in collaboration with Michigan State University and Ohio State University (funded by USAID). The ROFEAP was designed to provide information about non-farm employment at rural village and town levels in four provinces of Thailand, with generalizations for the North and Northeast regions.

The author participated in the field research from January 1980 to July 1981, beginning with descriptive assessments of various agro-industries, such as kenaf baling, agricultural tools, and food processing, then engaging in cross-industry marketing studies and interpretations of village marketing patterns for farm products, and finally concentrating on industry studies of food processing firms and case studies of up-country canneries, and their suppliers. The several working papers and a research report completed by the author highlight the wide range of industries, marketing topics, and research approaches used. This dissertation draws upon case study materials obtained from cannery staff, their suppliers, and relevant knowledgable sources; informal interviews with government officials, researchers, and subsector participants; and formal surveys of selected raw material producers.

E. ORGANIZATION OF THE DISSERTATION

Chapter I identifies the problem area in its time and space dimensions, and defines the objectives for the study.

Chapter II explains the overall system's approach for conceptualizing the fruit and vegetable production-distribution-consumption system before presenting an analytical framework which focuses on the assessment of processor procurement systems. This latter framework attempts to integrate the processor and fresh market perspectives so as to determine key characteristics and interaction effects from both perspectives. Finally, the various data collection methods are outlined.

Chapter III provides background information and insights for understanding Thailand and its overall production-distribution-consumption system for fruits and vegetables. This is accomplished by examining

country and regional socio-economic-agroclimatic characteristics, by defining major demand characteristics which set in motion the "demand-pull" forces operating within the system, by identifying vegetable and fruit supply dimensions that are an integral part of the Thai agricultural sector, and by depicting the organization of the marketing system which coordinates and responds to changes in demand and supply conditions. This overview provides a "context" within which fruit and vegetable processors establish their firms and organize their procurement systems.

Chapter IV presents an analysis of traditional up-country pickling-preserving firms and procurement activities for one of their established raw materials--garlic. Characteristics of the raw material system which impinge upon the organization and operation of pickling firms and the pickler's methods of contending with problems and uncertainties arising from the procurement of agricultural raw materials over time are among the key factors and relationships sought from this approach.

Chapter V duplicates the method used above but applies it to up-country canneries and one of their recently introduced raw materials--tomatoes. However, due to the further effort to focus the study, the canneries' external relationships are given more emphasis, especially relative to the various participant groups engaged in growing the raw material.

Chapter VI offers a synthesis of the findings from both previous chapters. This synthesis identifies key characteristics and potentially problematic relationships within procurement systems. Based on that synthesis and insights gained during the research process, recommendations

will be made for improving the performance of procurement systems in particular and the overall fruit and vegetable systems in general.

CHAPTER II

THE RESEARCH APPROACH

A. THE SYSTEMS APPROACH

The systems approach is envisioned as flexible and able to utilize a wide range of data gathering and analytical approaches of both a qualitative and quantitative nature. As applied to a broad problem area it provides what Cox considers, "What's needed . . . is a simplified systems approach that, while less than perfect, would allow the planners to view the whole system so that a large number of variables and their interactions can be considered simultaneously."[1] This systems approach directs attention to economic participants functioning as an interrelated whole within a discernable time-space context. The present study will use a broad systems conceptual framework to provide an "overview" of the total fruit and vegetable system within which a more focused diagnostic framework will be used to examine subsystem components.

The important subsystem to be examined revolves around the processors of fruits and vegetables operating within a network of key relationships: 1) with those who supply raw materials, capital, labor and equipment, 2) with those who purchase the firm's products, and 3) with those of the government and related institutions who set and

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[1]M. L. Cox, "A Simplified Approach to Agricultural Systems," International Agricultural Development Service, New York, New York: 1979.

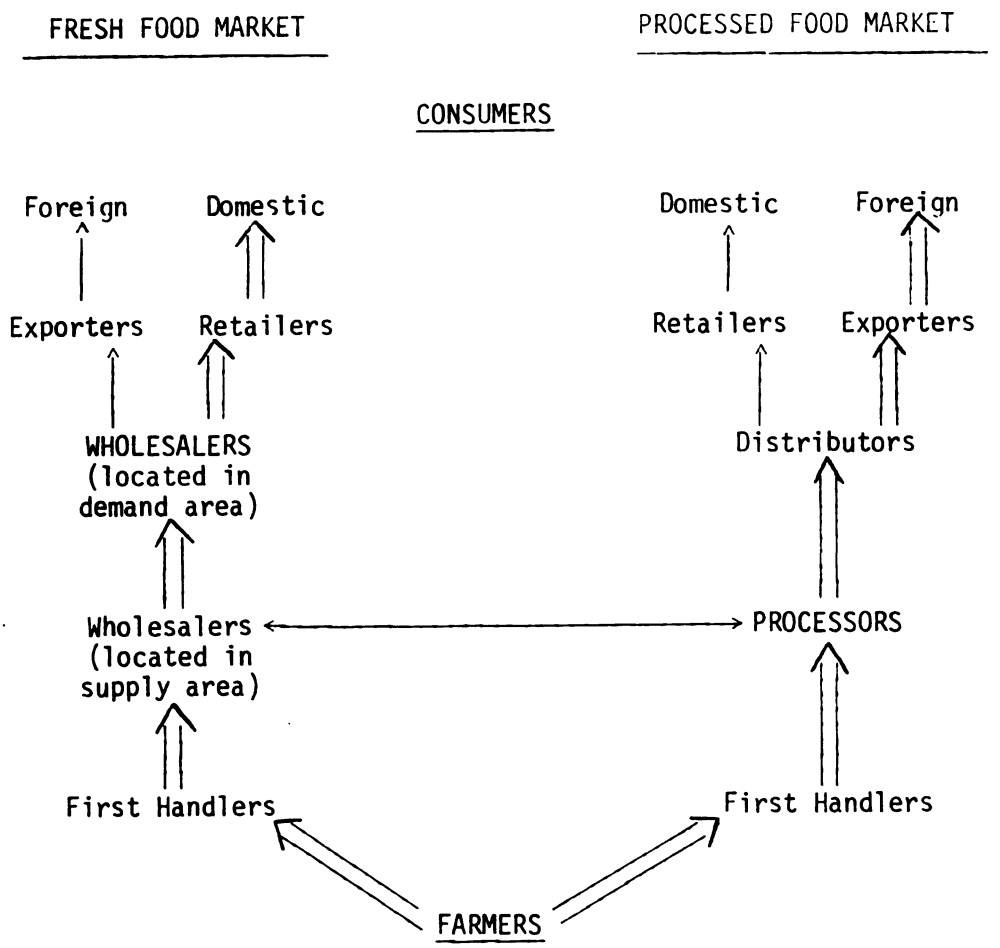
adjust the rules of the game. Development involves changes in each of these classes of participants as well as in the way they relate to one another. A basic argument of the present approach is that policy and project relevant research should examine small firms in the context of a system of participants and activities, rather than as independent autonomous units.

Figure 2-1 illustrates this study's application of the broad system's framework to the economic participants functioning as an interrelated whole, yet being pulled by demand for fruits and vegetables as fresh foods versus processed foods. The flows of fruits and vegetables as agricultural commodities, raw materials, and food products through this system induce changes in flows of capital, services, information, and legal and government policy forces, especially as the volume of processed products continues to increase over time. Although the length, direction, and elements of the vertical chain vary by commodity and product, the basic conceptual focus is on the overall production-distribution system. The external relationships between processing firms, crop buyers, wholesalers, farm households, etc. will receive close examination within this approach.

B. ANALYTICAL METHODS FOR UNDERSTANDING PROCUREMENT SYSTEMS

The "art" of research is the ability to sort out the important from the unimportant elements, especially if cognizant of the need to anticipate potential relationships. Unfortunately guidance for such discriminate selection is often difficult to obtain and even when known, data, time and resources constrain acquisition of many "important" research factors and relationships. However, the concept of a subsector is a

Figure 2-1. Main Participants in the Fruit and Vegetable System



Note: ⟹ = primary flow of goods

⟶ = secondary flow of goods

useful first approximation. It is defined as "a meaningful grouping of economic activities related vertically and horizontally by market relationships . . . The subsector represents a meaningful and manageable division of the economy for comprehensive investigation."[2]

An industry study usually examines a distinct participant grouping, such as food processors or distributors, without explicit consideration of that group's position in or relationships to other participants in the vertical structure. A subsector views the system as a whole while including parts or all of the several industries involved in the vertical value adding process. For instance, farmers growing garlic and picklers of garlic could be treated as two separate industries (in the broad sense of the term), although they are components of the garlic subsector. However, a subsector can be less comprehensive on the horizontal industry level than an industry study because various segments of a particular industry may have little bearing on the overall performance or development of the subsector. For example, only a part of the fruit and vegetable pickling industry is crucial for the analysis of the garlic subsector.

Similarly, it is feasible to restrict a subsector study to various geographical or time dimensions, such as the North Thailand garlic subsector. Although less comprehensive and more limited in explanatory power than a national level subsector study, a restricted subsector analysis may be manageable with time, data, and resource constraints, and provide meaningful results.

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[2]James D. Shaffer, "On the Concept of Subsector Studies," American Journal of Agricultural Economics, Vol. 55, No. 2, May 1973, p. 333.

The subsector approach can be abbreviated or adjusted to focus on various components of a particular system or problem. Thus, it becomes necessary to develop a clear understanding of the problem before designing the approach. In this study, a review of problems encountered during the collapse of the major up-country food processing complex and discussions with knowledgable persons in the industry pointed to the crucial role of the procurement linkage arrangements relative to various raw material supply problems. Particularly important was the failure of firms to obtain acceptable quality of newly introduced crops.

At the same time as these problems occurred in North Thailand (mid-1970s), the author witnessed and examined the success of the rapidly expanding tomato processing industry in Taiwan where an "adapted" Japanese procurement system was used for procuring acceptable quality of similar new crop varieties. Thus, the question arises of why the procurement system succeeded in one country but not in a neighboring country? The Thai farmer's inability to provide the specified raw material quality, plus the periodic fresh market competition for whatever the farmers harvested, indicated possible problems with interpreting technical information (quality specifications) and enforcing contractual agreements. Consequently it seemed logical to trace the quality specification and related procurement aspects through the processor procurement systems to the farmer, and to examine the market forces within the fresh market system from the consumer to the producer.

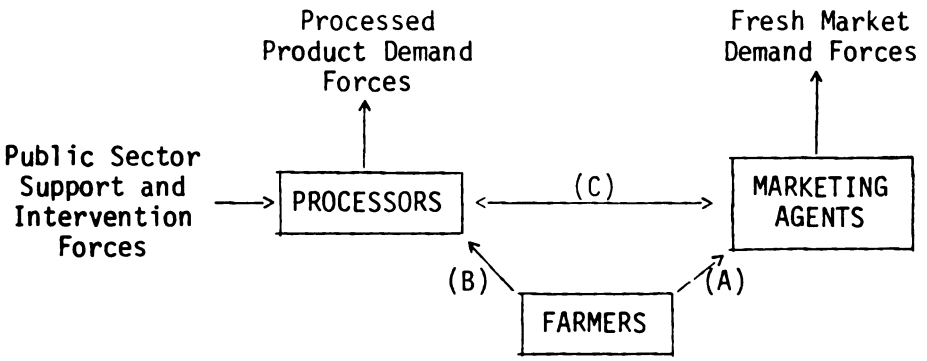
1. Diagnostic Framework

One way to illustrate a diagnostic framework for assessing the array of alternative procurement systems for the farmers' harvests is

depicted in Figure 2-2. The characteristics of the commodity or raw material, (i.e., the main content of any procurement system) directly influence the organization, operation, and comparative advantage of alternative fresh market and processor procurement systems. The information and incentives of the procurement system directly affect farmer crop production and sales decisions while flowing in several, sometimes opposing directions. For instance, farmers' dissatisfaction with a processor's procurement practices can motivate them to offer marketing agents access to a new market opportunity. This diagnostic framework thus stresses the importance of understanding two major perspective, i.e., the processor's and fresh market perspective, and three types of linkages, i.e., processors with farmers, processors with marketing agents, and marketing agents with farmers, within which transactions occur (Figure 2-2).

In the present study, one analysis of these two perspectives will be obtained by examining the northern traditional picklers of local fruits and vegetables in order to learn from their experiences, and to gain insights which might be applicable to the newer canneries locating up-country. The traditional picklers, as processors, have for decades contended with procurement problems and their impacts on internal firm operation and product markets. The understanding of the sources, implications, and adjustments for these procurement and related problems can contribute to the organization and operation of viable procurement systems for canneries. In Figure 2-3 the various interfaces and linkages for pickling firms (which have a reasonable correspondence to those of canning firms) are depicted to illustrate the complexity

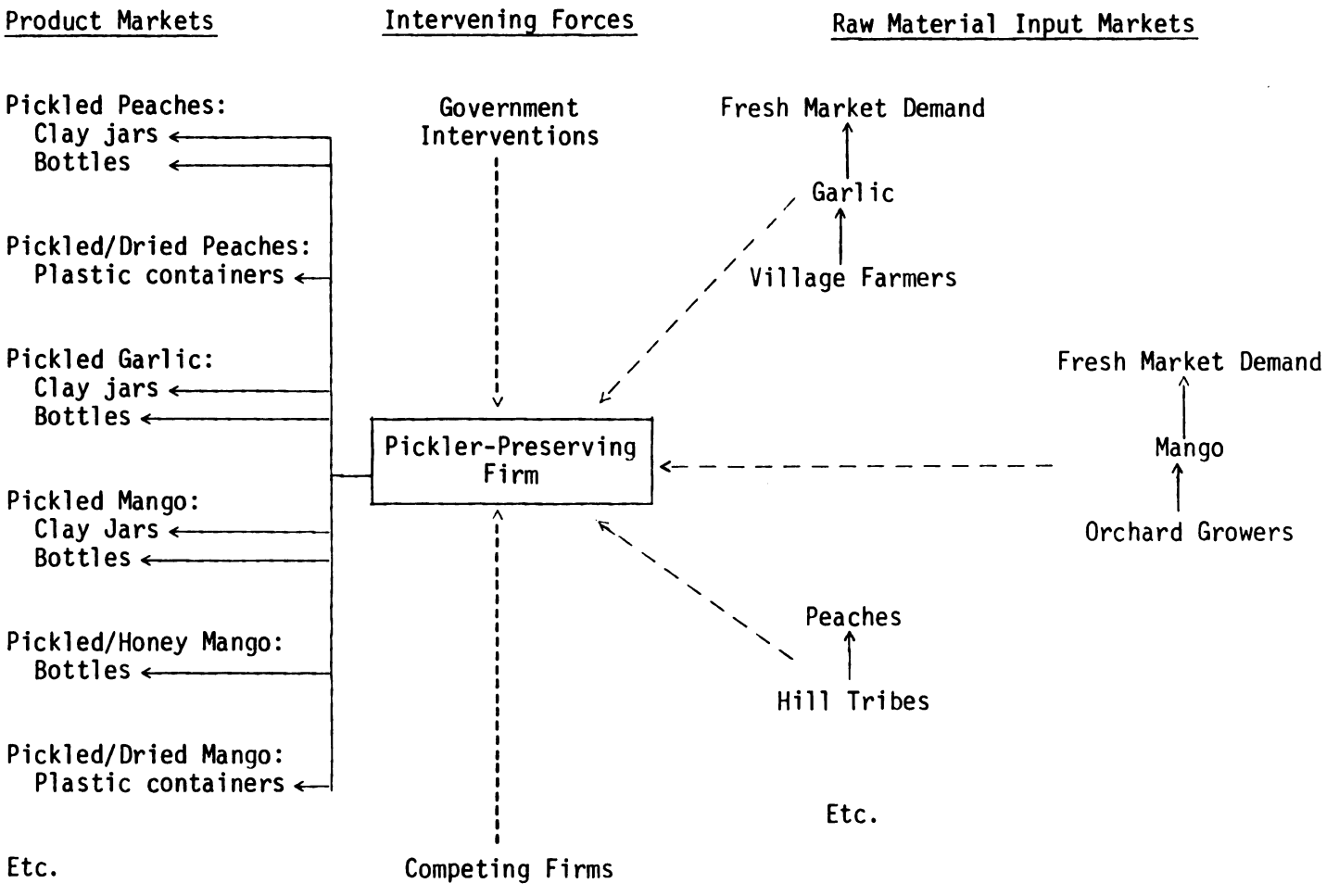
Figure 2-2. A Diagnostic Framework Which Identifies Key Market Participants, Linkages, and Intervening Forces That Affect Alternative Procurement Systems



Linkage Arrangements (Letters Designate Linkages)

1) A = Marketing Agents with Farmers
2) C + A = Processor with Marketing Agents with Farmers
3) B = Processor with Farmers
4) C + B = Marketing Agents with Processor with Farmers

Figure 2-3. Interfaces and Linkages Between Picklers, Their Product and Input Markets, and Outside Forces



involved with the procurement of several entirely different raw materials and the sales of the multiple products in various forms.

The focus on up-country canneries will provide a second analysis of the processor and fresh market perspectives. Canneries are so few in number, heterogeneous in organization and operation, dispersed in location, and divergent in product markets served that inter-firm comparability is minimal. Yet the problems surrounding procurement and methods used to resolve them seemed to be a common area of comparison. Thus, the research on this set of processors (undertaken within the aforementioned diagnostic framework) is largely focused on external relationships, particularly on the procurement system. Since the procurement of new crops like tomatoes is particularly problematic due to farmer adoption processes and risks, the assessment of diverse farmer cultivation conditions required more analysis than for the picklers' procurement systems with established crops.

The fresh market perspective emerges from a commodity approach to procurement in both the pickler and cannery cases. Although marketing agents may handle several commodities, the focus here is on how a particular commodity (which is subject to both processing and fresh market demand) is handled by marketing agents. The identification of key commodity (or raw material) characteristics and their implications for procurement systems receives special emphasis within this framework. The selection of one commodity for each type of processor demand (i.e., pickling and canning) as well as fresh market demand was made according to the following criteria:

1) is used by several of the up-country processors

2) has a variety of uses, i.e., processed and fresh forms for domestic and international markets

3) is amenable to more than one processing technology

4) can contribute to on-farm as well as off-farm employment opportunities

5) exemplifies an "established" and "new" crop/commodity situation for picklers and canneries, respectively.

Given these criteria, it was decided to select garlic as a representative raw material in the pickling industry and tomato for the canning industry.

Besides those two perspectives, three types of linkages are important, i.e., processor with farmers, marketing agent with farmers and processor with marketing agents. The various combinations of such linkages constitute the alternative procurement linkage arrangements currently used within both the fresh market and processor systems. Transaction cost reasoning will be incorporated within this diagnostic framework in order to analyze the tradeoffs between alternative linkage arrangements. Before explaining the role of transaction cost reasoning within this framework, the theory will be briefly reviewed.

2. Transaction Cost Theory

A basic theoretical framework for an examination of transaction cost considerations is still not well developed. Among the first to introduce the concept of transaction cost was Coase (1937) who asked the question of, "why in an enterprise economy resources are sometimes allocated by price (within a market) and sometimes allocated by command (within a firm)."[3] Since many economists argue that the price mechanism

[3]John Staatz, "A Transactions Cost Approach to the Theory of Farmer Cooperatives," Department of Agricultural Economics, Michigan State University, Cooperative Theory Project, 1982, p. 4.

is the most efficient allocator of resources, why would firms continue to internally allocate resources by command rather than buy them in the market place? Coase contended that some firms replaced certain markets with the firm's internal allocation of resources by command because, "There is a cost to using the price mechanism."[4] Components of this cost which Coase noted were:

a) The cost of discovering what relevant prices are;

b) The costs of negotiating and concluding a separate contract for each exchange transaction that takes place on a market;[5]

c) The costs (e.g., risks) of relying on short-term, very specific contracts when a long-term supply of some services or article is desired and all the future contingencies facing buyer and seller are unknown.

Thus, Coase's contention is that entrepreneurs organize firms rather than depend on markets as long as that organizational form reduces the aforementioned costs and thereby cuts their total production costs. In other words, the internalization of market transactions within a firm will continue as long as costs of internal transactions are lower than the costs associated with market procurement. The firm-market dichotomy is Coase's central premise.

Williamson expands upon the basic idea of Coase after contending that there has been limited sensitivity to the explanatory power of transaction cost economizing because, ". . . the origins of transactions costs must often be sought in influences and motives that lie outside

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[4]R. H. Coase, "The Nature of the Firm," Economica N.S., 1937, 4, pp. 386-405; reprinted in Readings in Price Theory, George J. Stigler and Kenneth E. Boulding, Eds., (Homewood, Illinois: Published for the American Economic Association by Richard D. Irwin, Inc., 1952), p. 336.

[5]A firm's integration of a factor of production will not totally eliminate the transaction costs of contracting with that factor, however, a single contract in terms of compliance with management directives (within limits) replaces a series of contracts with that factor.

the normal domain of economics . . . (i.e.) neo-classical theory treats the firm as a production function to which a profit maximization objective has been ascribed."[6] His effort at generalization begins with the contention that for every transaction there exists a governance structure that is most economical. A governance structure refers to " . . . the explicit or implicit contractual framework within which a transaction is located (markets, firms, and mixed modes--e.g., franchising included)."[7] And a transaction occurs when, " . . . a good or service is transferred across a technologically separable interface."[8] For example, when the harvests of the tomato crop in the field are transferred to the processing plant as raw material.

The object of transaction cost economizing becomes one of linking governance structures to the attributes of various transactions in a discriminating way. Various forms of enterprise organization become mechanisms for economizing on total costs which are comprised of production and transaction costs.

The two behavioral assumptions which are crucial for transaction cost analysis are bounded rationality and opportunism. Basically bounded rationality means that human actors, " . . . experience limits in formulating and solving complex problems and in processing (receiving, storing, retrieving, transmitting) information (Simon, 1957, p. 198) . . . . (And) opportunism effectively extends the usual

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[6]Oliver E. Williamson, "The Modern Corporation: Origins, Evolution, Attributes," Journal of Economic Literature, Vol. XIX, (December 1981), pp. 1538-1539.

[7]Ibid., p. 1544.

[8]Ibid.

assumption of self-interest seeking to make allowance for self-interest seeking with guile."[9] Because the assumption of bounded rationality effectively makes it impossible to account for the complexities in all contractually relevant aspects, incomplete contracting is the best that the firms can achieve. The external uncertainties of weather affecting the grower's yields and the risk of processors inaccurately estimating demand for their product are examples of the uncontrollable contingencies, which in addition to the bounded rationality issue, make this assumption especially pertinent. Similarly, incomplete contracting becomes extremely difficult whenever participants in the marketing system are dishonest or, more generally, disguise attributes or preferences, distort information, and otherwise confuse transactions. It can be very costly to distinguish opportunistic from nonopportunistic type of behavior ex ante. Thus, in evaluating the alternative forms of procurement one must take these two behavioral assumptions into account so as to " . . . assess alternative governance structures in terms of their capabilities to economize on bounded rationality while simultaneously safeguarding transactions against opportunism."[10]

The dimensionalization of transactions costs entails identifying the attributes or characteristics of various transactions in order to determine the appropriate governance structure. Williamson specifies relevant attributes and their implications as:

> . . . 1) the frequency with which transactions recur, 2) the uncertainty to which transactions are subject, and 3) the degree to which transactions are supported by

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[9] Ibid., p. 1545.

[10] Ibid., p. 1546.

> durable, transaction-specific investments. (Expanding on the latter point.) . . . Asset specificity can arise in any of three ways: site specificity, as when successive stations are located in check-by-jowl relation to each other so as to economize on inventory and transportation expenses; physical asset specificity, as where specialized dies are required to produce a component; and human asset specificity that arises in a learning-by-doing fashion. (Thus) . . . where asset specificity is great, buyer and seller will make special efforts to design an exchange relation that has good continuity properties.[11]

An additional form of specificity that merits inclusion is time specificity as in the case of highly perishable commodities which must be used quickly before deterioration occurs and whose arrivals should be synchronized for optimal use of plant capacity.

The importance of these specificities becomes crucial because after the investment has been made, the buyer and seller are to some extent operating in a quasi-bilateral exchange relation for a considerable duration thereafter. A pertinent example of such a bilateral exchange relation is that of perennial crops, such as fruit orchards of processing varieties.

In our research approach it is necessary to consider the implication of transaction costs reasoning on the organization of input procurement systems. Williamson acknowledges that for organizing commercial transactions one considers economizing on both production expenses and transactions costs, yet emphasizes the latter and proceeds to develop principles of organizational design. One principle, i.e., the asset-specificity principle, involves the transformation of an exchange relationship from a large-numbers to a small-numbers condition during the period of contract completion. The other principle, i.e., the

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[11] Ibid.

externality principle, generally refers to the "free rider" effects which arise when a non-contributing firm uses a high exclusion cost good such as a new variety. Both principles directly affect the choice of contracting form.

The processor recognizes the inherent production cost advantages of procuring raw materials from the market place to be three " . . . static scale economies can be more fully exhausted by buying rather than making if the firm's needs are small in relation to the market; markets can aggregate uncorrelated demands, to thereby realize risk pooling benefits; and markets may enjoy economies of scope[12] in supplying a related set of activities of which the firm's requirements are only one."[13] However, various unique transaction costs situations can arise and force transactions out of the market place, for instance, the special varietal requirements of the processor and scheduling of factory use. Also, in cases where no market exists for transactions to take place, a special governance structure must be formulated. Williamson's asset specificity principle applies to such a formulation, in that as asset specificity increases the common presumption that recurring transactions for technologically separable goods and services will be efficiently mediated by autonomous market contracting is progressively weakened.

The issue now becomes how can transactions cost reasoning be applied in our proposed diagnostic framework in order to provide insights into

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[12]"Economies of scope are realized" where it is less costly to combine two or more product lines in one firm rather than to produce them separately (John Panzar and Robert Willig, 1981, p. 268). Williamson footnote p. 1547. Example of retail outlet is cited.

[13]Williamson, Ibid., p. 1547

the problems with, and tradeoffs among, alternative procurement linkage arrangements? The procurement of raw materials or commodities by processors and marketing agents from dispersed small scale producers can be a highly complex, costly process. Depending on the system used, the number of individual transactions is very large and somewhat irregular, i.e., peak and slack periods of activity. Each producing area has its unique opportunity set of income generating enterprises, levels of experience and skill, and access to agro-chemicals. Thus, each can respond differently to a buyer's crop promotion incentives. Also the limited understanding of these production area conditions and grower attitudes (bounded rationality) and various competitive buying practices of other buyers (opportunistic behavior) can lead to ill-conceived procurement designs and the inability to insure enforcement of a procurement system. With those factors in mind the transaction cost reasoning identifies appropriate types of information regarding the attributes of transactions, nature of goods and services transferred, presence of bounded rationality and opportunistic behavior, etc., for inclusion within our proposed diagnostic framework.

3. Case Study Approach

An important remaining question is "What method(s) should be used to obtain the data needed to apply the desired diagnostic framework, given the nature of the garlic and tomato subsectors, the sparcity of information available, the small numbers of firms in the population, and the resource-time constraints involved?" Comprehensive information on all the key participants, linkages, and intervening forces was impossible.

It was therefore decided to use a combination of formal survey questionnaires, informal interviews, observations, and consultations with knowledgable persons. Knowledgable informants generally provided information needed for the initial perception of processes involved, organization of participants, and variables worth measuring. Subsequent observations of factory processing, farmer cultivation, and middlemen buying practices, along with informal interviews and cross-check procedures allowed for an iterative process of refining, focusing, or eliminating initial misperceptions. Whenever a larger number of somewhat similar participants were accessible a formal questionnaire was administered, for instance to collect farmer cultivation cost-sales information. However, given prior experience with fruit and vegetable cultivation and procurement processes, field observations and probing questions provided much of the substantive information and insights gained.

The case study method was selected to systematically collect and interpret information. The centrally located, somewhat similar nature of the pickling firms allowed for the collection of time series and cross-section data within a regular, common interview format with different categories of picklers as units of analysis. The purpose of the analysis, the data collection process, and receptivity of these firms facilitated the analysis of internal operating behavior and external relationships.

The dispersed, very unique nature of the canning firms, each responding to different economic opportunities, permitted the collection of only cross-section data within an individualized interview format with

each firm becoming the unit of analysis. The purpose of the analysis (improvement of procurement system performance), the data collection process, and ambivalent receptivity of these firms focused the analysis on external relationships with special attention to factory-farmer concerns.

The underlying study objective was to learn as much as possible from the firms by observing, questioning, and using their real world "trial and error" experiences to suggest reasons for the performance of alternative procurement systems and problems encountered. In order to retain the richness of and insights from the information collected the case study approach became the most logical format for exposition.

> This (case study approach) is often-fallaciously-talked of as if it were a special way of collecting information, but its distinguishing characteristics are simply that each respondent (group or institution, etc.) is looked upon as a unit and that the analysis aims to retain this unitary nature of the individual case and to emphasize the relationship between its various attributes. Generally this is achieved by 'writing-up' the material in mainly non-quantified form.[14]

The need to emphasize certain critical distinctions which emerged from this study resulted in several "operational definitions." These definitions allow the reader to better understand the reasons for and implications of the distinction as they arise in the body of the study (Table 2-1).

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[14]C. A. Moser and G. Kalton, Survey Methods in Social Investigation, 2nd edition, Basic Books, 1972, p. 466.

Table 2-1. Operational Definitions

1) Food Products -- intermediate or final goods formed from agricultural raw materials which have undergone a substantial amount of physical transformation due to further processing in order to be eaten by people.

2) Agricultural Commodities -- agricultural goods produced by crop cultivators and moved through marketing channels with a minimal degree of physical transformation.

3) Raw Materials -- "goods which will become a part of another physical product and which have received no processing at all other than that necessary for economy or protection in physical handling. Raw materials include . . . wheat, corn, cotton, tobacco, fruits, vegetables, livestock, and animal products--eggs and milk."[a]

4) Fabricating Materials -- " . . . are industrial goods which become an actual part of the finished product. They have already been processed to some extent (in contrast to raw materials). Fabricating materials will undergo further processing. Examples include . . . yarn being woven into cloth, and flour becoming a part of bread."[b]

5) Fabricating Parts -- " . . . are industrial goods which become an actual part of the finished product . . . Fabricating parts will be assembled with no further change in form. They include such products as spark plugs and fan belts in an automobile, . . . and the buttons on a dress."[b]

6) Off-Farm Employment -- refers to wage earnings obtained away from the farm premise.[c]

7) Non-Farm Employment -- refers to income generating activities by the household members taking place on the farm premises but not including crop or livestock activities.[c]

8) Crop -- living plants conditioned by environmental factors while being propogated by a cultivator with the intent of obtaining a useful yield (i.e., commodity or raw material).

[a]William J. Stanton, Fundamentals of Marketing, McGraw-Hill Book Company, 4th edition, 1975, p. 139.

[b]Ibid., p. 141.

[c]Somsak Priebprom, "Employment and Income from Farming, Non-farm Enterprises and Rainfed Farms, Khon Kaen, Thailand," Unpublished Ph.D. dissertation, Michigan State University, 1982, p. 3.

C. DATA COLLECTION METHODS

This section will consider the various data collection methods. The initial comprehensive study of the fruit and vegetable system with special emphasis on North and Northeast Thailand was narrowed to a more managable scope by focusing on procurement systems for both up-country pickling-preserving firms and canning firms using fruits and vegetables. However, since certain prominent factors within the larger system directly impinged on the applicability and viability of alternative procurement systems, they also required consideration. Such factors include a) certain characteristics of fruits and vegetables as crops, commodities, and products; b) the competition between the crop buyers who supplied the fresh market versus those supplying processors; c) the contextual issues of varying agricultural and village conditions, and processor competitive position; and d) the rural Thai's way of regarding the organization of economic exchange.

The research environment and basic thrust of the research effort came from the Rural Off-Farm Employment Assessment Project (ROFEAP). Thus, it is important to explain that research environment and orientation by first describing the ROFEAP and then outlining the progression from that origin.

1. The Rural Off-Farm Employment Assessment Project Sample Frame

In 1979 the Rural Off-Farm Employment Assessment Project (ROFEAP) was initiated in response to the Royal Thai Government's (RTG) continuing concern for increasing the role of small scale firms in the development of rural areas. With the financial support of USAID, institutional linkages between Thai and U.S. universities, and coordination of a local

research institute (Center for Applied Economic Research, Kasetsart University) a team of researchers was given the task of providing "data and analysis needed to identify and develop projects and policies to assist in the expansion of non-farm employment and income opportunities in the rural areas and market towns of Thailand."[15] The task of fulfilling this objective evolved into a two-pronged research approach. One approach focused on farm and non-farm enterprises operated at the village level, while the other approach studied town-based, small scale industries. As a subsector study of selected agricultural commodities, i.e., fruits and vegetables, this dissertation draws upon data from both the village and town focuses.

The ROFEAP field research areas were distributed among three regions of Thailand, i.e., the northern region (Chiang Mai Province), the northeastern region (Khon Kaen and Roi Et Provinces), and the central region (Suphan Buri Province) [Figure 2-4]. The former two regions are referred to as "up-country" areas to distinguish them from the central and south regions. Within each province noted above, only a few of the total districts were included, for instance, four of Khon Kaen's nineteen districts. Criteria for regional, provincial, and district selection are explained in Onchan, et al., 1979. Table 2-2 identifies the distribution of the ROFEAP research sites.

Although these sites facilitated the study of several supply area pickling firms, they did not include any of the major demand area picklers (Bangkok) nor most of the wide range of modern canneries.

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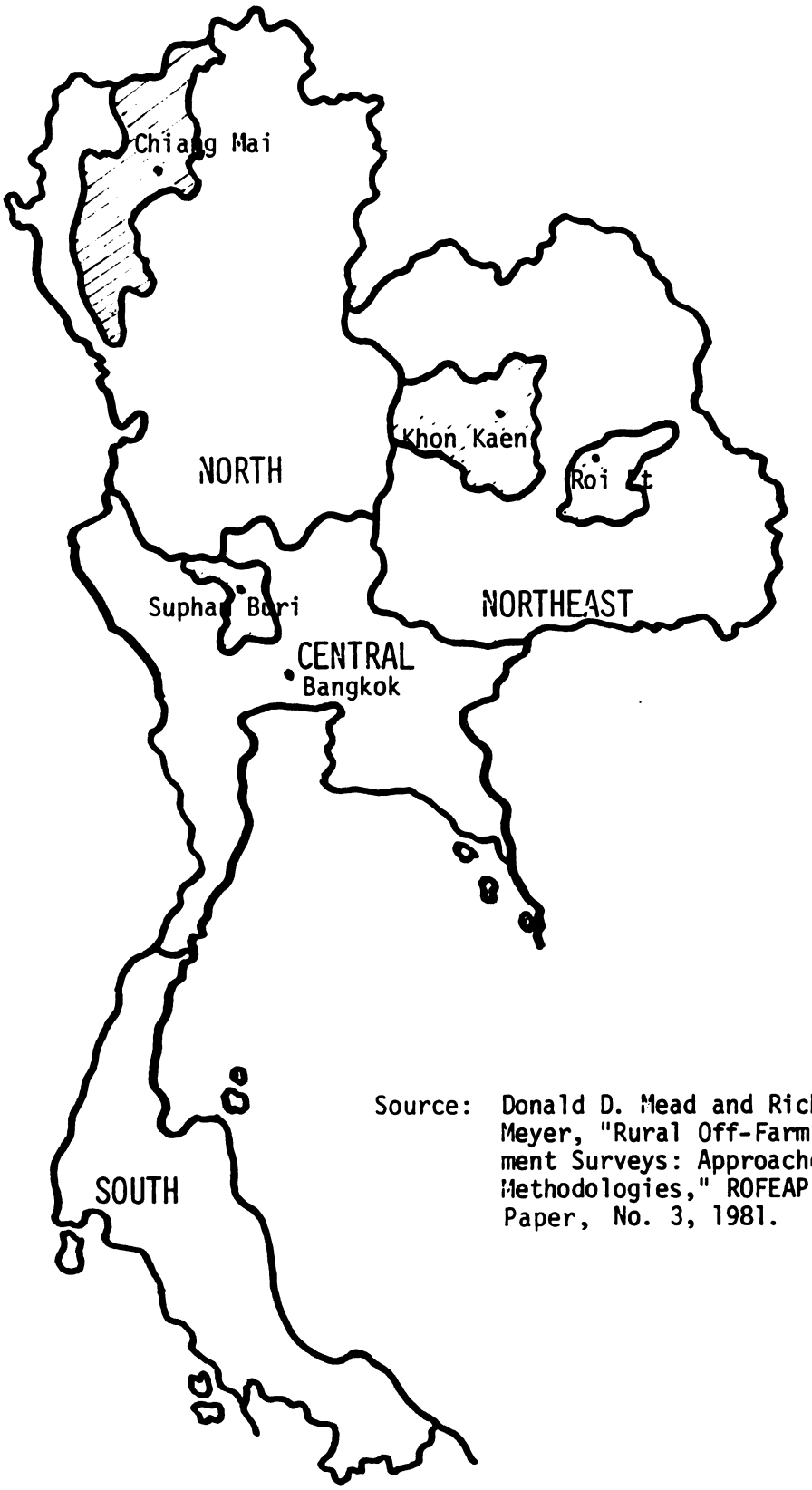
[15]Tongroj Onchan, Pradit Charsombut, Richard L. Meyer, and Donald C. Mead, "Description of the Rural Off-Farm Employment Assessment Project in Thailand," ROFEAP Research Paper, No. 1, 1979, p. 3.

Figure 2-4. Map of Thailand with ROFEAP Areas Identified



Source: Donald D. Mead and Richard Meyer, "Rural Off-Farm Employment Surveys: Approaches and Methodologies," ROFEAP Research Paper, No. 3, 1981.

Table 2-2. Distribution of the ROFEAP Research Sites[a]

Region	Province	Districts	Village
Northeast	Khon Kaen	Khon Kaen Muang*	Kok Nong Takay Ban Ped
		Ban Phai*	Kok Samrann
		Chonnabot*	Don Kar Makmbia
		Nam Phong	Kok Sung Wang Tua Ta Kraserm
	Roi Et	Roi Et Muang*	Ban Pone Nong Bara Tong Pa Perm
		Chaturaphak Phinaan	Suan Mon Ka Yai
North	Chiang Mai	Chiang Mai Muang*	Ban Po
		Sankamphaeng	Roy Prom Rong Waa Dang Sam Ma Hoc Fa
		Sai Pa Tong	Pa Laan Don Keo Ban Kong Hua Kin Kiew Lee Noy
		Hang Dong	Muang Kung
Central	Suphan Buri	Don Chedi	Rai-rot Nong Jikrakas Nong Jaeng

[a]Mead and Meyer, Ibid., p. 20-21.

*Towns in which Phase II survey was conducted.

Therefore, the present study extended into additional study sites, but before explaining these it is useful to examine what the ROFEAP town level and village level focuses encompassed.

a. Town Level ROFEAP Activities

The research design included three stages at the town level, i.e., Phase I, Pre-Town Survey, and Phase II. Phase I was a complete enumeration of manufacturing firms and some commerce firms found within the survey sites. Employment, type of workshop and use of machines were among the types of information collected and used in designing further research efforts.[16] Yet, before defining further research on any industry, the number of industries had to be narrowed to accommodate limited resources and to facilitate the overall organization of the research effort. A "Pre-Town Survey" of approximately 230 businesspersons from several industries produced a thorough enough understanding to select eight industries for the more detailed study in Phase II. Those were the brick, cement products, fruit and vegetable pickling, furniture, ready-made garments, noodles, bean curds, silk, and woodcarving industries.

A senior researcher from the project staff was assigned the responsibility for supervising the data collection and analysis for one or two of these industries. Each researcher's development of a first-hand knowledge of his industry(s) greatly facilitated the collection and interpretation of data, as well as allowed for insightful analysis of the assembled information.

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[16]Donald C. Mead and Pradit Charsombut, "Rural Off-Farm Employment in Thailand: Phase I Survey Results," ROFEAP Research Paper No. 2, 1980.

The Phase II survey encompassed a sample of 150 firms from these eight industries and five towns identified in Table 2-2. It had two major components: 1) monthly collection of information on production, sales, and employment for a nine-month period (the initial interview spanned the prior three months in order to obtain a year's worth of information from March 1980 to February 1981), and 2) five special questionnaires designed to obtain additional information on selected topics of concern (Table 2-3). The findings (preliminary and otherwise) are available in various ROFEAP publication series. Three conferences were held in order to disseminate the findings and their implications to Thai officials, researchers, and donor agencies.

b. Village Level ROFEAP Activities

A village headman (leader) survey was conducted because little detailed information about farm and non-farm activities for individual villages was readily available from published data and government officials. The survey of 74 headmen supplemented existing information and revealed that villages in Thailand can often be very specialized in the type of non-farm production. Thus, 33 villages from that survey were selected for house-by-house enumeration because further information was needed on various village characteristics before investing time and resources on the more complicated research objectives.

The Phase I survey was of over 1,600 households in the 33 villages within the four target provinces.[17] It was designed to obtain sufficient information on which to base the year-long detailed study of village

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[17]Phase I listing of villages and their characteristics can be found in ROFEAP Research Paper No. 2, pp. 37-43.

Table 2-3. Topics for Special Questionnaires Administered to Selected Small Firms

Title	Time Administered	Topic
Entrepreneurship	July 1980	An exploration of the characteristics of the firm; its organizational and ownership structure, and history. Information concerning the entrepreneur; his education, background and experience. Information concerning patterns of management and decisionmaking in the firm. Problems facing the firm.
Marketing	August 1980	Input procurement patterns and problems associated with obtaining needed inputs. Marketing patterns for output; characteristics of sales channels; and marketing problems.
Production Costs	October 1980	Raw material, labor and machinery costs per unit for producing each of up to four products made by the firm. Overhead costs for the month of September.
Labor Force	November 1980	Characteristics of the labor force employed in the firm; age, education, residence, skills, and wage rates. Problems of obtaining workers needed by the firm. Labor force recruitment patterns and procedures.
Finance	February 1981	Constraints to expanded production, whether financial or otherwise. Assets; fixed and working capital at the time of the survey and over the previous year. Credit and loans received by the firm. Barriers to entry and goals of the firm. Government assistance received by the firm and regulations which affect them.

Source: Adapted from James J. Boomgard, "The Economics of Small-Scale Furniture Production and Distribution in Thailand," Unpublished Ph.D. dissertation, Michigan State University, 1983.

households within the Phase II survey. The identification of patterns of agricultural activities and the types of non-agricultural sources of income by household members was of particular interest in this Phase I survey,[18] as was the establishment of criteria for sample village and household selection in Phase II.

The Phase II survey was organized to, " . . . collect detailed information on patterns of production, resource use and finance over a period of a full year for a sample of households representing various combinations of farm and non-farm activities . . . The final sample . . . included 25 villages: 8 in Khon Kaen, 5 in Roi Et, 9 in Chiang Mai, and 3 in Suphan Buri."[19]

2. Subsector Studies Extending Beyond ROFEAP Sample Frame

The management and operation of the village and town level surveys in the ROFEAP's study areas resulted in several diverse research commitments for the author. The responsibility for the fruit and vegetable pickling-preserving industry provided extensive longitudinal and cross-sectional information on the small number of town based picklers in Chiang Mai City and was the basis for the analysis of the up-country pickling industry in Chapter IV of the present study.

Since only a few of the farmers included in ROFEAP's "village level" sample frame produced any crops that could have been used as raw material for fruit and vegetable picklers or canners, a special production cost survey was undertaken in appropriate areas of the North and

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[18]Results of this survey are available in Mead and Charsombut, Ibid., p. 1980.

[19]Mead and Meyer, Ibid., p. 18.

the Northeast regions. Garlic was selected as representative of a long established crop with several commodity uses, one of which was pickling. Tomato (processing varieties) represented a relatively new crop promoted for use in canneries yet with considerable appeal in the fresh food market. The cost-return and market information collected on these crops was used both in the ROFEAP's farm modeling analysis and as an integral component of the subsector studies.

The subsector study of the northern pickling-preserving firms with emphasis on garlic was based on information mentioned above, and was broadened by interviews with firms outside the main ROFEAP sample: these included other picklers, wholesalers, and retailers of pickled products, suppliers of accessory inputs to picklers, trucking companies, crop buyers for the fresh food market, crop and food science researchers, agricultural and industry officials, health officials at regional and national levels, etc. Previous studies about the picklers and related subsectors as well as various sources of secondary data were also incorporated.

The subsector study of the up-country canning firms with emphasis on tomato included intensive interviews with selected firms in the North and Northeast regions as well as some near Bangkok, some of their suppliers and product buyers, and other knowledgable sources and/or previous studies where applicable. Farm level information from farmer and buyer interviews was collected from several dispersed production areas in both regions and supplemented by pertinent research reports. Although an array of interviews similar to that for the pickler-garlic subsector study were conducted, data collection was especially focused on procurement related activities at the firm and farm levels.

The identification of relevant demand and supply characteristics for fruits and vegetables in Thailand required extensive background reading and study, intensive interaction with biological and physical scientists, and discussions with food technologists as well as the organization and display of available secondary data.

CHAPTER III

OVERVIEW OF THE FRUIT AND VEGETABLE PRODUCTION-DISTRIBUTION SYSTEM IN THAILAND

A. COUNTRY SETTING

This section presents an overview of the Thailand economy, reviews key geo-political and regional dimensions, and assesses the contribution of fruits and vegetables to the economy. General recessionary conditions and deteriorating balance of trade have been adversely affecting the Thai processing industry during the past few years. The description of the overall political-economic organization of the country allows for an understanding of the differential impacts of this economic situation. And the assessment of the contribution of fruits and vegetables to the economy emphasizes the importance of resolving problems inhibiting this sector's further contribution to farmer livelihood and industry growth during the coming period.

1. Overview of the Thailand Economy

During the survey period the firms interviewed were responding to prevailing economic conditions. From 1979-81 the economic picture of Thailand reflected some of the volatility of the international financial markets as well as the sluggish economic performance of several of its major trading partners. In general, abundant rainfall and favorable growing conditions contributed to a good showing in agricultural output.

At the same time the international prices for such major exports as feed grains, tapioca, tin, rubber and shrimp were falling, thus holding Thailand export earnings down.

Domestic interest rates increased markedly (Table 3-1) during this period. A projected high deficit in balance of payments in 1981 followed the slight surplus in 1980 (Table 3-1). The government response of increasing the cost of electricity and transportation as well as continued restrictions on the availability and increased costs of fuels, tended to hold down the volume of oil imports even though its overall import costs continued upward. Devaluation of the baht by about 1 percent and again by 8.7 percent in mid-1981 were meant to stimulate exports and decrease demand for imports.[1] Further efforts at tax collection and tighter controls over government spending reduced the government deficit while somewhat easing inflationary pressures. Yet, "the high rates of inflation and the high cost of borrowed funds have made investors more cautious."[2]

One optimistic forecast of the anticipated rate of real economic growth for 1981 (slightly less than 7 percent) was somewhat better than 1980's 6.3 percent growth, yet was lower than the rapid rates of growth during the 1960s and 1970s. Relative to most developing countries this rate of growth is respectable. "In the longer run, Thailand's exceptional resource endowment and abundant labor supplies offer promise of

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[1] 1 Baht = U.S. $0.049 or U.S. $1 = ฿ 20.40 was used as the approximate exchange rate since 1973 according to the IBRD study entitled "Thailand, Toward a Development Strategy of Full Participation," 1980.

[2] Adapted from "Economic Situation and Trends in Thailand," American Embassy Situation Report, September 1981.

Table 3-1. Key Economic Indicators for Thailand, 1979-1981

	1979	1980	Estimate 1981
	----------	US$ Million	----------
INCOME AND PRODUCTION			
GNP-at Current Prices	26,682	32,194e	36,604
-at Constant (1972) Prices	13,179	13,908e	na
Per Capita GNP, Current Prices	578	682e	771
Personal Income	21,208	25,867e	na
	---------	Indices: (1972=100)	--------
Agricultural Production:			
Rice (Paddy)	136.2	135.3	143.4
Maize	251.0	239.5	262.4
Sugarcane	131.0	196.1	262.8
Tapioca	280.3	347.5	415.2
MONEY AND PRICES			
Money Supply (US$ Million)	2,991	3,403	3,924
Interest Rates Commercial Bank Prime (%)	12.8	16.5	17.0
	---------	Indices: (1976=100)	--------
Wholesale Price	128.8	154.7	170.2
Consumer Price	127.6	152.7	173.3
BALANCE OF PAYMENTS AND TRADE	----------	US$ Million	----------
Gold and Foreign Exchange Reserves	1,749	2,154	na
External Public Debt	2,713	4,000	5,376
Annual Debt Service	944	1,255	1,780
Balance of Payments	-387	253	-376
Balance of Trade	-1,855	-2,710	-2,991
Total Exports, FOB	5,282	6,506	7,542
Total Imports, CIF	7,137	9,216	10,533

Note: All values represent period averages unless otherwise indicated; e = estimate

Sources: National Economic and Social Development Board: Bank of Thailand

Business Economic Department: National Statistical Office

Adapted from, "Economic Situation and Trends in Thailand," American Embassy Situation Report, September 1981.

a resumption of the record of impressive growth demonstrated over the last two decades."[3]

2. Geo-Political and Regional Considerations

Thailand is divided into 72 administrative provinces (changwats). These provinces have been grouped in various ways to form either four regions, as depicted in Figure 3-1, or six regions, i.e., northern, northeastern, eastern, western, central, and southern. Each province (changwat) is subdivided into districts (amphurs), town areas (tambons), and villages (mubans). The major amphur in a province is called the amphur muang and contains the capital city for that province. A population center in each amphur houses the district political offices and is called a sanitary district. The subdivision of the amphur, i.e., tambons, are collections of villages (mubans). In most instances villages rather than tambons will be the focus of our research.

For the purposes of this study the more widely used classification of four regions will be used, i.e., the Central Plains, the North, the Northeast, and the South.[4] Since agro-economic characteristics by region are very important for an understanding of the demand and supply conditions facing the fruit and vegetable system, regional differences are summarized here.

The fertile soil and favorable climate conditions of the Central Delta region have been particularly suited for rice cultivation. More than one rice crop per year has been intensely cultivated on the densely

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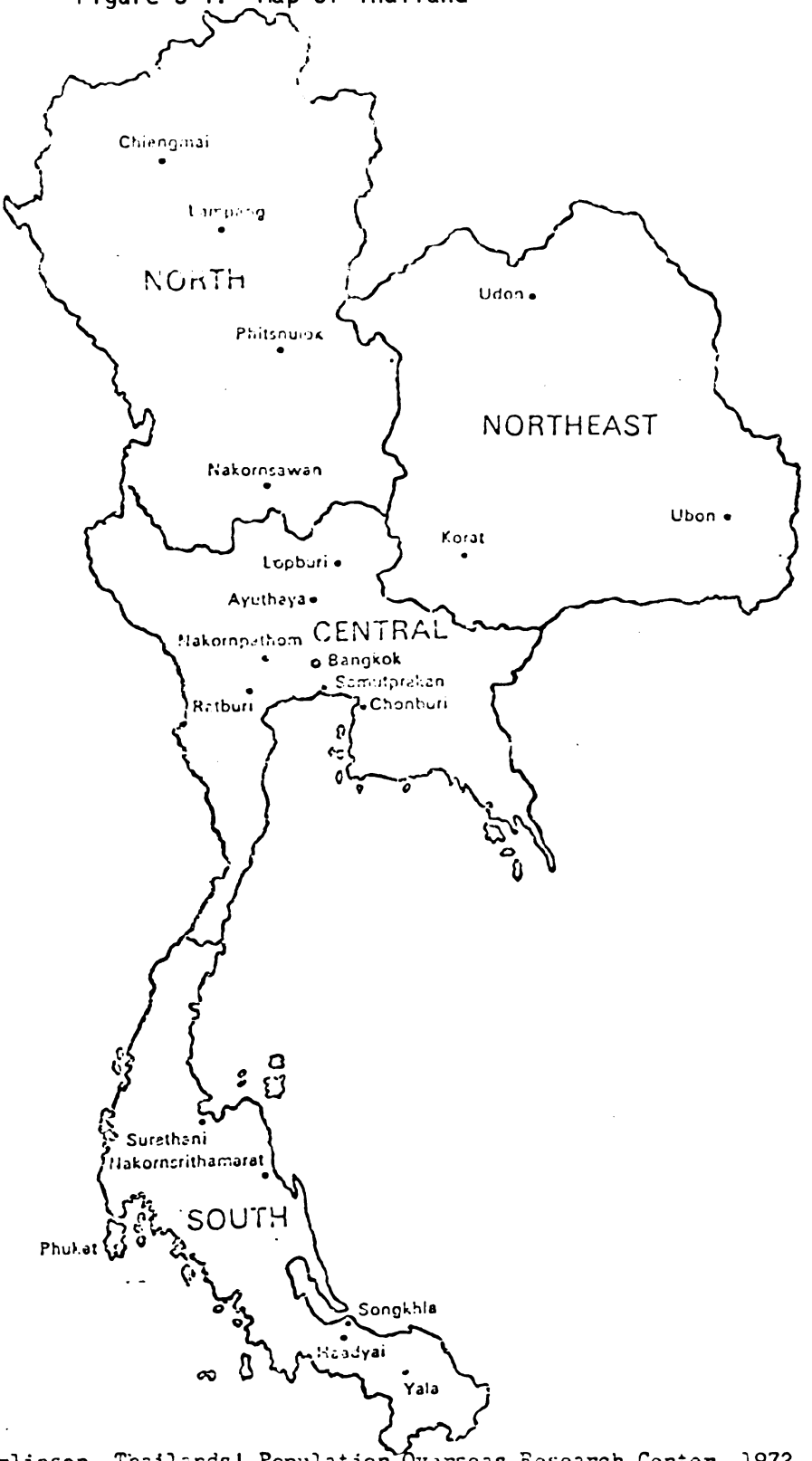
[3] Ibid.

[4] Due to the format of certain secondary data, some tables will present the six region breakdown. Changes in classification systems have caused problems with determining trends over time.

Figure 3-1. Map of Thailand



Source: Ralph Thomlinson, Thailands' Population Overseas Research Center, 1972, based on data from National Statistical Office, Statistical Yearbook: 1967-1969, Bangkok, Thailand, PP. 50-56. The twentieth-largest city contains 30,000 inhabitants.

populated agricultural land surrounding the capital of Thailand, Bangkok. The flat flood plains and the Delta of the Chao Phya River with its tributaries represent the main source of Thailand's rice surplus. The Central Plains' areas to the East and West of the flood plains have been especially productive for a wide range of fruit and vegetable crops. The location of the seat of government and hub of most of Thailand's commercial activities (Bangkok-Tonburi area) within this region both supports and reflects its relative prosperity.

The southern region which extends along the mountainous peninsula contains only 14 percent of the total land area of this country. Rubber cultivation and fishing have become major sources of income for this relatively sparsely populated area.

The sparsely populated northern region mainly consists of mountainous and forested areas. The fertile valleys are the center of most agricultural activities in this region. Labor-intensive cultivation practices are used in the system of small-sized, privately-owned landholdings to achieve higher yields than the other areas.

The largest, yet poorest, region is in the Northeast. Agricultural potential is limited by shallow soils with low moisture-holding capability, poor fertility, limited water supplies, and erosion hazards in most of this region. However, various studies have pointed to the increased migration into this area by Central Plains cultivators searching for land to farm.

In the following considerations of the fruit and vegetable supply system, the implications of the regional differences will be noted even though most of the study will focus on the North and Northeast regions. The potential for major increases in the production of vegetable crops

for processing and fresh market uses within the near future should mainly be in the latter two regions. The strength of that potential is due to the expansion of supplementary irrigation and the suitable climatic conditions for both temperate and tropical crops in both regions as well as the relatively low-earning capacity of competing crops in the Northeast versus labor-intensive cropping systems in the North.

3. Contribution of Fruits and Vegetables to the Economy

One of the measures of the magnitude of this sector is its contribution to the gross domestic product. The value added by fruits and vegetables, including garlic, onion, shallot, and chili, was estimated at about ฿28 billion in 1979 in current prices (Table 3-2). Stated in another way, fruits and vegetables contributed about 26 percent of the gross domestic product originating from crops during 1979.

B. DEMAND AND RELATED CHARACTERISTICS OF FRUITS AND VEGETABLES

In this section selected characteristics of fruit and vegetable use as commodities, raw materials, and products will be discussed prior to an examination of characteristics of consumption, factors determining consumer demand, and government initiatives and interventions. These characteristics of fruits and vegetables influence the system's ability to coordinate demand and supply in the process of handling and distributing the goods grown, produced, and/or desired.

The demand for fruits and vegetables as commodities is different than their demand as raw materials. Likewise, the characteristics of fruits and vegetables used either as commodities or as raw materials influence the marketing system's ability to transmit a wide range of

Table 3-2. Gross Domestic Product Originating From Crops At Current Market Prices

Crops	Year				
	(Units: Millions of Baht)				
	1975	1976	1977	1978	1979[e]
Paddy	28,312	25,650	30,166	37,366	40,635
Rubber	2,282	3,684	4,380	5,554	7,177
Coconut	463	443	448	712	837
Sugarcane	5,144	7,062	4,449	5,072	4,257
Maize and Sorghum	5,981	4,812	2,310	4,571	6,585
Groundnut	1,169	1,376	1,344	1,563	1,992
Mungbean	820	1,053	1,054	1,155	1,206
Castor bean	120	111	90	106	101
Soybean	999	1,266	1,084	1,626	1,724
Cassava	2,735	4,725	5,362	8,033	8,864
Tobacco	3,944	3,182	3,201	4,092	4,336
Cotton	251	299	664	569	603
Kenaf, jute and ramie	722	662	997	1,072	857
Kapok	231	281	310	384	407
Sesame	181	143	282	250	232
Garlic, onion, shallot and chili	5,513	7,480	5,635	5,606	5,957
Vegetables	2,079	3,158	3,510	4,713	5,538
Fruits	8,379	11,673	13,300	14,778	16,955
(Fruits & Vegetables, including garlic, etc.)	(15,971)	(22,311)	(22,446)	(26,132)	(28,450)
Other crops	381	449	503	705	819
Total value added	69,666	77,503	79,069	99,342	109,082
Percentage Contribution of Fruits and Vegetables (%)	23	29	28	26	26

Note: e = estimated

Source: Office of the National Economic and Social Development Board, National Income of Thailand, 1979 Edition.

consumer demands back to the farm level. The perishability, seasonality, variability, and bulkiness of fruits and vegetables affect their marketable area and time, consistency of quality and quantity available, and price range for commodity use. Likewise, such characteristics affect the location of the processing plant relative to potential raw material cultivation, the uniformity and dependability of processed products, and the scheduling of plant deliveries at reasonable costs. Consequently, the processing firm's ability to maintain a consistent market share of raw materials as well as products is impaired.

The consumer demand for commodity use can be directly transmitted by means of prices whereas consumer demand for processed products becomes the processor's demand for raw material which not infrequently requires a set of incentives, besides price, to induce growers to provide raw materials regularly. While variable commodity quality can earn different returns in a fresh market system, the processor system prefers a uniform quality raw material and pays a single price or narrow price range for an "acceptable" quality.

Key characteristics of fruits and vegetables used as commodities with implications for their use as raw materials are explained in Table 3-3. As commodities, the seasonality is adjusted for by higher prices during the "off-season"; quality variablity results in a range of prices according to grades; perishability requires additional care (costs) in handling and display for quick sale; and bulkiness can affect the proximity of cultivation to market place.

For fruit and vegetable use as raw materials those same characteristics result in considerably different patterns. The seasonality constrains raw material use to peak harvest periods; variability increases

Table 3-3. Key Characteristics of Fruit and Vegetables as Commodities With Implications for Their Use as Raw Materials

Characteristic	Explanation	Implication
Seasonality	Harvests (availability) are only during 1 or 2 periods within a year at some stage of plant growth and development[a]	Given a relatively constant demand for the finished product, processors contend with supply and demand imbalance and face problems of production scheduling, product inventory management, and overall coordination. Extreme price fluctuation in the fresh market hampers contract pricing.
Variability	Commodity quality and quantity differ from piece to piece and supply period to supply period due to varying responses to weather changes, crop damage, varietal traits, etc.;[b] heterogeneity of cultivation areas accentuates variability	Considerable pressure is exerted on processor's production scheduling and quality control operations, especially whenever raw materials are a major cost component and the market demands standardized products.
Perishability	As living organisms commodities are not only fragile and perishable but also deteriorate at different rates depending on weather conditions, handling methods, etc.	The more perishable the raw material the more quickly it must be moved from field to processing lines and the greater the care in handling and storage, otherwise losses due to damage or deterioration are excessive
Bulkiness	Commodity price is low relative to weight and volume per unit	Bulkiness affects transportation costs thus favoring production near market places, unless transportation improvements extend areas of profitable production. Likewise changing raw material form can substantially reduce bulkiness and costs of transportation.
Interdependence	Low quality raw material cannot be transformed into high quality products	Recognition of quality correspondence is crucial for adequately fulfilling demand expectations and matching raw material and product markets.

[a]Exceptions include mushroom and papaya

[b]Several varieties of the same crop induce considerable supply variability in terms of time, form, and location. Unfortunately this source of variability is usually overlooked by economists.

quality control costs and decreases the firm's ability to produce consistent products; perishability demands closer coordination between harvesting-handling-processing in order to reduce deterioration and losses; and bulkiness affects the optimal location of the plant. The characteristic of raw material and product interdependence, as noted in Table 3-3, has special significance depending on the processor's marketing strategy. Traditional picklers studied raw material characteristics in order to produce a product acceptable to local consumers (supply-side approach). Modern canneries usually identified various product market demands, then designed a factory and procurement system which could produce competitive products (demand-side approach). In Thailand, canneries currently use both approaches with tropical fruits being canned as available in "spot markets", whereas certain vegetables are contracted in order to meet desired quality specifications.

The listing of characteristics of processed products in Table 3-4 can be compared to the foregoing discussion of commodity and raw material characteristics. The main point is that processing has overcome several of the marketing limitations characteristic of fresh fruits and vegetables used as commodities or raw materials. Processed fruits and vegetables basically combine services with raw materials so as to improve and/or expand consumer acceptance and/or reduce marketing costs. Consequently, the nature of their demand is somewhat different from that of commodities and raw materials.

Demand for processed fruits and vegetables products has generally varied considerably between temperate and tropical countries, as it has between high income and low income countries. The market scope of processors in LDCs is generally "limited by the low share of fruits and vegetables in the average diet and by competition from cheaper fresh

Table 3-4. Relevant Characteristics of Processed Products and Implications for Processors[a]

Characteristics	Explanation	Implication
Extended Shelf-life and Availability	Longer period without substantial deterioration or loss of desirable nutritive or sensorial qualities	Increases market size (time and space terms), especially for the highly perishable fruits and vegetables, and provides convenience
Increased Uniformity	More similar items emerge from standardization of raw material requirements and processing procedures	Wider market appeal (consumption), improved trading arrangements (reduces reliance on inspection), etc.
Multiplicity of Forms	Different processing procedures and ingredients increase the number and variety of end products	Increases the use of the basic raw material, adds variety to diets, etc.
Product Differentiation	Allows for associating the product with the processing firm by use of a brand name	Advertising, promotional activities, etc. to gain consumer acceptance
Reduction in Weight and Volume	Process reduces the weight or volume of the certain raw material	Reduces transportation costs, opens new market areas, and can result in shifting production areas

[a] Basically processed products combine services with raw materials so as to improve consumer acceptance and/or reduce marketing costs, sometimes mitigating limitations inherent in the commodity, such as perishability.

produce in the (local) market at all seasons."[5] Although Thailand is not a particularly "low income" country and fruits and vegetables are a substantial component of the diet, the abundant supply of and competitive demand from fresh fruits and vegetables is very evident. In fact, the demand exerted by the local fresh market systems for certain commodities, especially during the early part of a given harvest season, has exerted such pressure on prices that larger canneries with stringent quality specifications could not economically buy the raw materials and process them.[6]

1. Characteristics of Consumption

Vegetables are consumed in sizable amounts per capita as an integral component of the Thai diet whereas fruits are used more as dessert, on special occasions, as gifts, etc. Regional consumption per capita is quite varied and reflects not only income effects but also abundance or relative scarcity by location (Table 3-5). Generally, the high quality and/or "off-season" fruits which can readily be transported are sent to the high priced areas within or surrounding the Bangkok-Thonburi area. Due to the large population in this area several types of "in-season" vegetables are continually shipped there. In rural areas vegetables grown in small plots and fruits from trees growing near the house are consumed or sold depending on the household's immediate needs and market conditions.

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[5]Eugene Staley and Richard Morse, Modern Small Scale Industry for Developing Countries. (New York: McGraw-Hill Book Company), 1965, p. 151.

[6]According to discussions with knowledgable sources, smaller firms could can raw materials even during years of high raw material prices by disregarding standards, i.e., simply putting fewer fruits in each can, whereas larger firms served markets with more exacting standards. My examination of different brands sold in Bangkok tended to support that claim.

Table 3-5. Estimated Per Capita Food Consumption by Region and Major Food Groups, as Computed from the 1962 Household Expenditure Survey

Item	Region				
	North	Northeast	Central	East	South
	kgs/person consumed per year				
Rice & other Cereals	182.2	185.2	159.7	159.2	155.1
Meat	13.2	8.1	11.0	10.7	10.6
Milk & Eggs	(1)	(1)	0.1	0.1	(1)
Fish	3.9	8.8	11.3	17.4	9.1
Fats & Oils	0.8	0.2	1.7	0.9	1.5
Fruit	9.9	15.4	14.8	13.1	23.5
Vegetables	18.7	17.2	22.2	23.9	12.8
Sugar	1.3	0.7	9.2	5.3	3.8
Salt & Spices	3.2	3.4	1.8	2.5	5.5
Total	233.3	239.0	231.8	232.8	221.9
Total Rice	182.2	185.2	159.7	159.2	155.1
Total Fruit & Veg.	28.6	32.6	37.0	37.0	35.3

Note: (1) = Less than 0.05 kg.

Source: Adapted from; Supanee Milindankura and Melvin M. Wagner, The Demand for Thai Agricultural Products: A Nutritional Approach. Faculty of Economics and Business Administration, Kasetsart University, Kasetsart Economic Report No. 30, 1969.

The changes over time and the proportion of food consumption expenditures by food groups can be noted in Table 3-6. In 1970 estimated national expenditures on various food items, ranked from highest to lowest, were rice and cereals, fruit and vegetables, meat, and fish, respectively. By 1978, meat had displaced fruits and vegetables as the second largest expenditure item.

From a disaggregated viewpoint, the average monthly consumption expenditures per household by community type and region for 1975-76 is provided in Table 3-7. As expected, households in the more densely populated areas (municipal areas) generally spend more than those in villages on fruits and vegetables with households in the Central region spending the most, except for vegetables in municipalities. Since fruits are generally more income elastic than vegetables, that can explain the substantially higher expenditures for fruits in the richer Central Plains communities, i.e., approximately double the other regions, on average. Yet, the composition of fruits and vegetables within those expenditure groups varies considerably according to region and population center. For instance, substantially more per household is spent on tomatoes within the major production regions of the North and Northeast, on pineapple in the Central region area, and on Chinese cabbage in municipal areas (Table 3-8).[7] Expenditures on tinned fruits were extremely small. Preference for fresh versus canned fruits and vegetables is an acknowledged characteristic of Thai consumers.

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[7]The description of the survey design for the seven-day period is inadequate to determine whether seasonal implications could have influenced the results. This type of information should generally be treated with care.

Table 3-6. Private Food Consumption Expenditure
(Unit: Million of Baht)

Item	Year 1970	1971	1972	1973	1974	1975	1976	1977	1978[e]
Rice and Cereals	13,681	12,594	13,868	21,007	27,747	28,914	28,731	29,693	36,106
Meat	7,752	7,582	8,234	9,456	13,603	14,669	16,105	18,692	21,926
Fish	5,075	5,514	6,155	7,388	10,264	11,345	13,452	15,740	18,211
Milk, Cheese and Eggs	2,354	2,435	3,073	4,386	6,202	6,072	6,685	7,202	8,268
Oils and Fats	839	931	1,056	1,415	2,307	2,332	2,343	3,083	3,610
Sugar, Preserves and Confectionery	828	1,123	1,320	1,525	2,109	2,492	2,892	3,148	3,538
Fruits and Vegetables	7,979	8,676	9,817	11,714	13,148	14,706	16,964	17,158	18,550
Coffee, Tea, Cocoa, etc.	474	493	539	636	879	941	963	1,060	1,145
Other Food	3,891	4,448	5,317	6,272	7,304	11,014	12,967	15,192	17,562

Note: e = estimate

Source: Office of the National Economic Development Board, National Income of Thailand, 1978 Edition.

Table 3-7. Average Monthly Consumption Expenditure Per Household by Community Type and Region, 1975-76

Unit: Baht

	North				Central				Northeast			
	Total	M.A.	S.D.	V	Total	M.A.	S.D.	V	Total	M.A.	S.D.	V
Groups and Sub-Groups												
Percent of Households	100.0	7.3	11.8	80.9	100.0	8.2	17.1	74.7	100.0	5.3	10.0	84.7
Average Household Size	5.0	4.8	4.9	5.1	5.2	5.1	5.1	5.3	5.9	5.4	5.6	6.0
Total Monthly Expenditure	1,592	3,144	1,791	1,424	2,375	3,415	2,717	2,182	1,612	3,083	2,309	1,442
Consumption Expenditure	1,545	2,948	1,742	1,390	2,234	3,110	2,516	2,077	1,559	2,889	2,208	1,403
Food and Beverages:	773	1,239	809	723	1,032	1,316	1,117	981	813	1,175	1,019	766
Food prepared at home	733	1,013	758	704	947	1,018	989	929	792	1,040	951	759
Grains & cereal products	290	270	288	292	331	255	311	343	349	270	337	356
Meat & poultry	137	261	162	122	135	226	159	119	112	273	191	93
Fish & seafood	85	90	75	86	145	131	154	145	137	126	140	137
Milk, cheese & eggs	23	57	23	20	37	61	49	32	17	64	40	12
Oils & fats	19	33	18	18	36	38	36	35	10	27	20	8
Fruits & nuts	28	66	28	24	56	85	59	52	27	63	42	24
Vegetables	111	147	117	107	120	119	128	118	104	135	123	100
Sugar & sweets	14	17	11	14	33	20	28	36	9	18	11	8
Spices, coffee, tea, etc.	20	35	24	18	31	33	32	31	21	31	30	19
Non-alcoholic beverages	6	37	9	3	23	50	33	18	6	33	17	2
Prepared foods	40	226	71	19	85	298	128	52	21	135	68	7
Food taken home	14	83	33	5	26	112	41	13	10	68	36	2
Food eaten away from home	26	143	38	14	59	186	87	39	11	67	32	5

Note: M.S. = Municipal Area; S.D. = Sanitary District; V = Village.

Source: National Statistical Office, Report on Socio-Economic Survey, 1975-76, North, Central, Northeast Regions.

Table 3-8. Average Household Expenditures in a 7-Day Period for Items of Food, Especially Fresh and Preserved Fruits and Vegetables by Region, 1975-76

	North			Central				Northeast			
	M.A.	S.D.	V	Total	M.A.	S.D.	V	Total	M.A.	S.D.	V
Fruits and Vegetables:											
Fresh:											
Mangoes	1.21	0.31	0.69	0.92	2.40	1.08	0.72	0.66	0.77	1.02	0.61
Oranges	3.07	0.69	0.39	1.42	3.99	1.67	1.08	0.47	3.22	1.32	0.20
Papaya	0.33	0.13	0.23	0.24	0.25	0.21	0.25	2.16	1.57	1.46	2.28
Pineapple	0.66	0.43	0.37	0.54	1.04	0.79	0.43	0.07	0.43	0.16	0.04
Bamboo Shoots	1.75	2.29*	2.21*	0.94	0.93	1.20	0.88	2.31	1.47	1.78	2.42*
Chilies	1.96	1.93	1.85	1.56	1.32	1.46	1.61	2.39*	2.56	2.84	2.31
Chinese Cabbage	2.75*	1.99	1.01	1.68	2.51*	2.20*	1.47	1.92	3.84*	3.09*	1.66
Cucumbers	1.51	1.09	0.99	1.42	1.47	1.64	1.37	0.94	2.27	2.04	0.73
Egg Plant	1.37	1.13	1.45	1.72*	1.45	1.74	1.74*	1.30	0.96	1.40	1.31
Green Onions	0.83	0.24	0.19	0.46	0.64	0.56	0.43	2.58	1.54	1.87	0.91
Mustard Greens	0.83	1.77	1.20	0.12	0.28	0.26	0.07	0.48	0.64	0.28	0.50
Tomatoes	0.78	0.33	0.21	0.14	0.25	0.15	0.13	0.21	0.66	0.43	0.15
Preserved:											
Pickled Fruits	0.10	0.07	0.01	0.51	0.09	0.03	0.66	----	0.01	----	0.01
Tinned Fruits	0.06	0.04	----	0.02	0.13	0.05	0.01	----	----	0.35	----
Pickled Mustard	2.46	2.75	2.75	1.69	1.95	1.89	1.62	2.94	1.16	1.21	3.26
Other Pickled Vegetables	1.03	0.64	0.49	1.07	1.42	1.69	0.89	0.56	1.09	0.85	0.48
Dried:											
Chilies	3.37	4.55	4.53	4.60	2.15	4.48	4.89	4.30	2.87	4.33	4.40
Garlic	2.97	2.30	2.18	3.20	2.47	2.88	3.35	1.25	2.02	1.90	1.12
Onion	2.41	1.21	1.55	2.57	1.93	2.06	2.76	1.14	1.64	1.38	1.08
Food Prepared at Home:											
Rice	35.48	18.61	28.96	62.04	44.62	55.82	65.37	31.11	35.44	33.54	30.55
Glutinous Rice	16.02	38.93	33.81	4.41	1.50	5.61	4.45	47.81	21.65	38.39	50.56
Noodles	1.64	0.67	0.41	1.25	1.53	1.26	1.22	0.20	0.67	0.43	0.14
Prepared Meals Taken Home:											
Rice and Curry	0.88	0.32	0.03	0.25	0.97	0.53	0.11	0.07	0.33	0.52	----
Noodles	5.90	1.67	0.45	1.81	4.83	3.24	1.15	0.81	5.29	2.82	0.29
Snacks	0.75	0.15	0.02	0.84	3.57	0.86	0.53	0.09	0.86	0.27	0.02
Other Prepared Foods	3.23	1.93	0.38	1.16	6.11	1.77	0.48	0.42	2.59	1.99	0.10

* Means the major expenditure item of vegetables in that area.

[ ] Means incorrect number published.

Note: M.A. = Municipal Area; S.D. - Sanitary District; V = Village.

Source: Adapted from National Statistical Office, Report on Socio-Economic Survey, 1975-76, North, Central, and Northeast Regions.

The most recent information available concerning price and income elasticities is from the study of 18 major food items in Thailand at the retail level.[8] Unfortunately data limitations confined their selection of vegetable commodities to storable, less perishable commodities, i.e., potatoes, chili, garlic, and onion. The selection of fruits more closely reflected the diversity within that category, i.e., watermelon, coconut, pineapple, and bananas.

Results of this study for their vegetable group of commodities included:[9]

1) Price elasticities of demand ranked from highest to lowest are -.53, -.48, -.35, and -.35 for potatoes, garlic, onion, and chili, respectively.

2) In general, commodities in this vegetable group are not very competitive, so changes in the price of one do not seem to change the consumption of others in this group. The only competitive commodities in this group appear to be chili and onions . . . although onions and potatoes seem to be complementary goods.

3) Regarding income elasticities, changes of 1 percent in disposable personal income appeared to change the quantity demanded of garlic by .45, potatoes by .38, chili by .36, and onions by .31 percent.

However, for other vegetables one would not expect such strong effects from changes in income, rather as income increased the consumer would change the composition of purchases from more abundant, lower priced vegetables to less plentiful, higher priced kinds.

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[8]The study was the result of a cooperative research effort between the Division of Agricultural Economics (DAE) of the Ministry of Agriculture and Cooperatives (RTG) and the Center for Agricultural and Rural Development of Iowa State University.

[9]Bahram Dagostar, Wayne D. Ellingson, Earl O. Heady, Randall A. Hoffman, Consumer Demand for Food Commodities in Thailand, DAE-CARD Sector Analysis Series: No. 10, March, 1978, p. 36.

For fruits the findings of this study were:[10]

1) Price elasticities of demand ranked from highest to lowest are -.77, -.68, -.59, and -.54 for pineapple, watermelon, bananas, and coconuts.

2) There seems to be little substitution of one fruit for another in this group. One reason for this situation is that they are not supplied to the market in the same seasons, and no storage facilities for such perishable products are available to supply them to the market gradually over a period of months.

3) Regarding income elasticities, changes of 1 percent in disposable personal income appeared to change the quantity demanded of coconuts by .56, watermelon by .53, bananas by .53, and pineapple by .50 percent.

The traditional consumption patterns for coconuts and bananas, their exceptional abundance throughout much of the year, wide price range with considerable amounts sold at lower prices, and the nature of consumption raise questions regarding the reliability of such high demand and income elasticities for these commodities. Otherwise, as a group the fruits display elasticities higher than those for vegetables, as expected. Yet, one must recognize that different commodities within these groups, especially for vegetables, could have given substantially different results.

2. Factors Determining Consumer Demand

Among the several factors determining consumer demand for fruits and vegetables, population and income growth and distribution merit attention. The distribution of population by region and changes from 1960 to 1976 (Table 3-9) identify the Northeast as having the largest population as well as one of the highest annual growth rates in Thailand. The annual growth rate of over 4 percent for Bangkok reflects the large in-migration

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[10] Ibid., pp. 36-37.

Table 3-9. Thailand's Population by Region (000's)

				Annual Growth Rate (%)	
	1960	1970	1976	1960-70	1970-76
Bangkok	2,136	3,253	4,343	4.3	4.9
Central	6,135	7,966	8,948	2.6	2.0
North	5,723	7,919	9,174	3.3	2.5
Northeast	8,992	12,715	15,169	3.5	3.0
South	3,272	4,517	5,323	3.3	2.8
Whole Kingdom	26,258	36,370	42,957	3.3	2.8

Source: Adapted from, The International Bank for Reconstruction and Development, "Thailand, Toward a Development Strategy of Full Participation," (Baltimore: John Hopkins University Press), A World Bank Country Study, 1980, p. 217.

of people from other provinces in their search for work and a higher standard of living. Droughts or political unrest in various parts of Thailand usually increase this rate of migration.

The World Bank's projection of population by region for 1990 emphasizes the high annual growth rate of 3 percent for the Northeast yet considers out-migration likely (Table 3-10). On the other hand the projection for Bangkok was based on a modest 1.7 percent annual growth rate as a natural increase but adjusts that figure upwards to over 4 percent given in-migration. Regional distribution of household income and its change over time are identified in Table 3-11. Although the regional averages per household indicated substantial increases in the standard

Table 3-10. Projected Population by Region (000's)

Region	Actual 1975	Projected 1990		1975 to 1990 Annual Growth Rate (%)	
		Natural Increase Only	With Migration	Natural Increase Only	With Migration
Bangkok	4,200	5,400	7,700	1.7	4.1
Northeast	14,800	22,900	19,800	3.0	2.0
North	8,900	10,800	10,900	1.3	1.4
Central	8,800	11,900	11,800	2.0	2.0
South	5,200	7,800	8,600	2.7	3.4
Whole Kingdom	41,900	58,800	58,800	2.3	2.3

Source: Adapted from The International Bank for Reconstruction and Development, Ibid., p. 114.

Table 3-11. Household Total Income by Region, Thailand, 1962-63 to 1975-76

Region	Household total income (in Baht)			Household total income as % of level for Central Region		
	1962-63	1968-69	1975-76	1962-63	1968-69	1975-76
Northeast	5,915	9,481	16,572	60.8	60.7	66.7
North	5,987	10,253	16,644	61.5	65.6	67.0
South	9,411	10,893	19,920	96.7	69.7	80.2
Center[a]	9,731	15,630	24,852	100.0	100.0	100.0
Bangkok[b]	18,690	32,432	37,848	192.0	207.5	152.3
Whole Kingdom	8,232	13,074	21,240	84.6	83.6	85.5

[a]Excludes changwats Samut Prakan, Nonthaburi and Pathum Thani in 1975-76.

[b]Includes changwats Bangkok and Thonburi in all years and, in addition, changwats Samut Prakan, Nonthaburi and Pathum Thani in 1975-76.

Source: Oey Astra Meesook, "Income, Consumption, and Poverty in Thailand, 1962/63 to 1975/76," World Bank, Staff Working Paper No. 364, 1979, p. 20.

of living, the distribution was uneven. The higher income position of households in the Central Plains relative to other regions showed minimal to moderate change from 1962/63 to 1975/76. Yet, "the disparity between urban and rural areas in household incomes has been declining over this time in all regions."[11] Although average household income in the North and Northeast appeared to be at similar levels, a much larger percentage of "poor population" in the Northeast indicates the extent of differences in income distribution within regions.

This information on income distribution (and the income effect on selected fruits and vegetables noted in the previous section) suggests the possibility of expanding demand for selected fruit and vegetables in the Northeast and North.

3. Government Initiatives and Interventions

Since 1979 the Thai Government has increased pressure to expand foreign trade to offset balance of trade deficits. In fact,

> The Board of Investment (BOI) and the Government are again working hand in hand to improve exports. All the promotional privileges are already in place, and now the Government wants to say to the private sector, 'all right, we will even help you to find markets and the finance for your business! Surely this is the right time to invest in Thailand, preferably in a labor-intensive, export-oriented, agro-business!'[12]

The prime example illustrating the wisdom of this agro-business approach was the canned pineapple industry in which Thailand had rapidly become the second largest supplier to the world of canned pineapple.

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[11] Oey Astra Meesook, Ibid., p. 68.

[12] "BOI's Strategies and National Government Policy," Bangkok Post, Supplement, August, 1980.

The current trade situation for fruits and vegetables is favorable with total exports amounting to over ฿2 billion and imports of about ฿126 million in 1979. The export value of canned pineapple was over ฿1.2 billion in that year, indicating considerable dependence on one product.

In step with this policy position, the government of Thailand through the Ministry of Commerce, began encouraging the establishment of "general trading companies designed to promote the development of Thailand's industries through export . . . The Board of Investment . . . was going to provide investment privileges and other incentives to international trading companies."[13] By February, 1980, 11 companies were granted investment incentives but only five had been set up. Their export products were to include processed and fresh fruits and vegetables. In fact, these trading companies were to serve a new role in the trade arena for Thailand, such as providing consultative services, market research, finance, etc., for small and medium sized manufacturers. It was planned that the trading companies would be in a better position than current distributors to insist on the production of what is acceptable in foreign markets rather than accepting whatever quality is produced for export.

13"How S. M. International Trading Started," Bangkok Post, Supplement, February 27, 1980.

Other signs of the export thrust for the fruits and vegetables sector include: 1) the agreement between the state enterprise, Cold Storage Organization (CSO) and the Singapore-based Fook Huat Tong Kee Pte Ltd., for, "year-round exports of Thai fruit and vegetables to Singapore as part of efforts to diversify operations to meet rising costs of cold storage operations;"[14] 2) the heralded "large scale export promotion campaign for Thai fruits and vegetables[15] by the Commercial Relations Department of the Ministry of Commerce including exhibitions in Bangkok, distribution of high quality posters in major trade centers overseas, and increased media coverage of various events related to the campaign; 3) the BOI commissioned sector surveys which identified possible investment projects with a good chance of success of which "tropical fruit exports" was the most promising;[16] and 4) formation of the Ministry of Commerce-approved Association of Vegetable and Fruit Exporters.[17]

This strategy with its export endeavors was continually plagued by such problems as unstable supply, arrival in the foreign market of damaged produce, preferential treatment of competitors, cut throat competition within the country which often led to cost cutting techniques (consequently poor quality, inconsistent supply, and a "bad reputation" for this country's exports) and stifling government controls. Reference to such problems included Japan's refusal to import Thai mangoes because

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[14]"Singapore to Buy More Fruit and Vegetables," Bangkok Post, August 29, 1980.

[15]"Fruit, Vegetable Export Drive Begins," Bangkok Post, July 2, 1980.

[16]"Directing Investor Interest Towards Suitable Projects," Bangkok Post, Supplement, August 4, 1980.

[17]Ibid.

of their substandard condition,[18] U.S. ban on over 14 processed fruit and vegetable imports due to a wide array of defects,[19] government intervention on the behalf of longan (Lamyai) producers,[20] and several lingering supply problems adversely influencing the pineapple industry.[21]

C. SUPPLY AND RELATED CHARACTERISTICS OF FRUITS AND VEGETABLES

The basic theme of this section is that the characteristics of the fruits and vegetables as crops (plants) not only influence a new grower's ability and willingness to cultivate them, but also affect the stability and costs of a procurement system. The understanding of such characteristics and their implications for farmer cultivation and sales practices, as well as buyer promotion practices, is of central importance to processors.

The crop characteristics and related management considerations which deserve attention by the processors are listed in Table 3-12. An understanding of those characteristics and considerations allow processors to carefully select locations and seasons to promote production, the level of input support and extension services to provide as promotion incentives, the types of cultivation problems to anticipate, and sources of yield and quality variations. For instance, the buyer who promotes a vegetable variety which a) has a relatively low yield, b) is tolerant of drought conditions, c) is very susceptible to insect attack, d) responds

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[18]"Japan: Thai Mangoes are Sub-Standard," Bangkok Post, June 10, 1980.

[19]"U.S. Bans 55 Thai Exports," Bangkok Post, February 16, 1981.

[20]"Lamyai Exporters Get Ministry's Stern Warning," Bangkok Post, July 16, 1980.

[21]"Pineapple Woes to be Discussed," Bangkok Post, November 12, 1980.

Table 3-12. Crop Characteristics and Grower Management Considerations

Characteristics	Management Considerations
Yield Range	Seed availability, viability, costs and varietal options
Hardiness[a]	Extent of cash inputs needed and available
Susceptibility[b]	Level of management and crop care[g]
Responsiveness[c]	Water availability, costs and regularity
Growth Period[d]	Level, distribution and costs of labor
Season Adaptability[e]	Terms of exchange risk (buyer availability and price fluctuation)
Number of Harvests[f]	Extent of tradeoffs with existing resource uses

Note: Possibility of a cash loss, reliability of yield expectations, percent of yield that is nonsaleable, etc. tend to be more crucial considerations for new crops, especially fruits and vegetables, than established, familiar crops.

[a]Hardiness in respect to tolerance to drought, heavy rainfall, waterlogging, etc.

[b]Susceptability in respect to resistance to insect infestation, diseases, etc.

[c]Responsiveness to the application of fertilizers, soil conditions, etc.

[d]Growth period in terms of months in the soil as expressed in period from planting to harvest.

[e]Season adaptability in terms of specific planting and harvesting months.

[f]For each harvest only a certain proportion is marketable (termed "marketable yield") although all ripe material, even damaged pieces, must be removed to minimize disease problems.

[g]Management includes both field inspections and coordination (execution) of field operations.

slightly to fertilizer applications, and e) grows best in the cool season should anticipate the following: 1) paying a relatively higher per unit price, 2) locating rainfed area producers so that such a crop can effectively compete within their usually lower opportunity cost conditions, and 3) recommending minimal application of fertilizer and considerable vigilance and care in pesticide applications.

A common form of interdependence between crops and their commodities is "yield" and "quality" as affected by both agro-climatic conditions and crop care. This is particularly pertinent for fruits and vegetables. "The quality of food products is subject to many conditioning factors, the weather again being not the least among them. Good quality and large yields go hand in hand. When yields are poor, quality is frequently poor. Wide variations in quality tend to disorganize the market, cause wide price fluctuations, add to the costs of storage, complicate grading, and make transportation difficult."[22] Now for a closer examination of the two major groups of crops, i.e. vegetables and fruits, in Thailand.

1. Selected Characteristics of Vegetables

In Thailand, as elsewhere in Asia, there are two main types of farmers growing vegetables, i.e., vegetable gardeners and vegetable growers. "In Thailand, home vegetable gardening is found all over the country and is of greater importance than we generally appreciate. The surplus from home gardens often becomes an important factor in the

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22 L. B. Darrah, Food Marketing, The Ronald Press, 1971, p. 15.

markets of smaller cities."[23] Yet, this is not what is meant by "vegetable gardeners" who are specialized, usually full-time, producers of vegetables. Their cultivation location is often but not necessarily near population centers, even though,

> Commercial vegetable production in Thailand concentrates in areas surrounding big cities. An exception to this is the intensive vegetable production found in some distant areas with certain favorable conditions such as advantages from producing exceptionally well formed and bright root crops, or some other crops of more than average perfection, at an earlier or later date, or at a lower cost. Such advantage often offsets the disadvantage of greater distance to market.[24]

In one Asian country the public sector recognized the strong natural comparative advantages resulting from the historical vegetable cultivation in such favorable agro-climatic conditions and instituted a "Specialized Vegetable Production Area" program. The objectives of improving market coordination and progressiveness as well as effectively introducing improved technologies were accomplished by concentration of research and extension efforts in those production areas and the direct linkage arrangement between them and the large public-private market place in the major demand area.[25]

This study is not as concerned with vegetable gardners as with "vegetable growers" who are crop farmers who rely on rice or other staple crops for their livelihood, yet they grow one or two "in-season"

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[23]Chamnien Booma, Apisith Issariyanukula, and Somkit Tugsinavisuitte, "Vegetable Production in Amphoe Damnoen Saduak, Changwat Ratchaburi, 1972-73," Kasetsart University, Faculty of Economics and Business Administration, Research Report No. 7,1974, p. 1.

[24]Ibid., p. 2.

[25]See Merle R. Menegay, "Taiwan's Specialized Vegetable Production Areas: An Integrated Approach," Asian Vegetable Research and Development Center, Technical Bulletin No. 1, 1976.

vegetable crops as a source of cash during the "off-season" period for their main crop or on land not suitable for those staples. Vegetable growers become more numerous and dispersed as a country's transportation system improves. Generally these growers select hardier vegetable crops, grow them on relatively large plots of land (compared to gardeners), and plant during the "in-season" for that particular crop. Since they tend to be more dispersed and further from markets (fresh market or processor), the crop buyer becomes especially important for decisions about crop selection and level of inputs used. Likewise the perishable nature of most vegetables, the distance involved, and the economies of scale in assembly and transportation which buyers encounter encourage several neighboring vegetable growers to cultivate the same type of crop during the same season.

The seasonality of vegetable crops is usually a source of cultivation and marketing risk and uncertainty, especially for the more perishable harvested commodities. Each crop has its own most favorable agro-climatic growth and harvest periods called its "in-season." The healthy crop generally requires less care (lower production costs), produces its highest yields, and reaches its peak supply with subsequent downward pressures on prices. During the months of less favorable agro-climatic conditions, e.g., "off-season," the less healthy crop generally requires more care (higher production costs), produces lower yields, and results in lower supply with likely upward pressures on prices. Some crops have several varieties which allow for year-round cultivation with a different variety for each season or can alternate locations on a seasonal basis, i.e., highland and lowland areas. In Thailand, the cool

dry season is generally the peak season for most vegetables yet several tropical vegetables are also available during the hot rainy season.

Main characteristics of several vegetable crops include, a) much crop care from planting to final harvest, b) intensive labor use in bed formation as well as during harvest, c) disease and insect damage to the plants and harvests may reduce market acceptance rather than physical yield, and d) considerable cash expenditures are common. Application of inappropriate or adulterated pesticides have been especially problematic for Thai vegetable gardeners. Also the build up of insect pests and disease organisms in the soil or on plants outside the field not only result in increased production costs over time but also may necessitate a farm reorganization and shift to other types of crops, such as fruit trees.

a. Trends in Production and Planted Area

A ranking of the major vegetables from largest to smallest amounts of planted area for 1979 shows garlic, bird pepper, chili, and shallot with over 100,000 rai,[26] and cabbage, Chinese radish, ginger, tomato, sugar pea, and potato with under 100,000 rai respectively (Table 3-13). Garlic, chili, and ginger have a generally increasing trend in planted area while shallot and potato planted area declined and bird pepper, Chinese radish, tomato, and sugar pea peaked then declined over the 1975-79 period. Production figures displayed fairly similar patterns but in a more erratic fashion due to weather and estimation problems.

For the ten vegetables of concern the Central area, Eastern area, and South did not have a dominant production or planted area position

[26] 1 rai = 1,600 m^2 = .16 ha = .395 acres and 1 ha = 6.25 rai.

Table 3-13. Production and Planted Area of Selected Vegetable Commodities, 1974-1979

Commodities	Total Production (1,000 M/T)						Planted Area (1,000 rai)					
	1974	1975	1976	1977	1978	1979	1974	1975	1976	1977	1978	1979
Garlic	150	169	162	186	309	305	210	193	199	184	251	244
Bird Pepper	65	68	75	81	66	55	270	278	284	321	218	231
Chilli	60	76	61	70	61	67	205	218	218	235	236	222
Shallot	177	243	164	120	137	106	197	212	167	125	140	112
Cabbage	101	65	118	92	88	88	71	62	80	68	64	75
Chinese Radish	90	85	122	119	105	98	56	59	79	78	63	61
Ginger	27	32	53	38	74	98	30	29	38	30	37	43
Tomato	34	31	61	31	29	29	41	49	52	47	40	38
Sugar Pea	5	5	11	7	4	4	14	16	21	17	16	14
Potato	7	5	8	3	6	4	7	4	4	3	3	2
TOTAL	716	779 +9	835 +7	747 -10	879 +18	854 -3	1,101	1,120 +2	1,142 +2	1,108 -3	1,068 -4	1,042 -2

Source: Data from Ministry of Agriculture and Cooperatives.

in 1979 (Table 3-14). Garlic, potato, chili, and sugar pea were dominant in the North; shallot, bird pepper, cabbage, and tomato in the Northeast; and Chinese radish and ginger in the Western area. Ranked in terms of aggregate planted area and production the North, Northeast, and Western area were the largest, respectively.

2. Selected Characteristics of Fruits

In Thailand there are three main types of fruit growers, i.e., household growers, farmer-tree crop growers, and orchardmen. The most numerous and widely dispersed are the household growers. "Thailand is a nation of fruit-loving people, and dooryards, ditch banks, and similar odd corners are planted to fruit trees throughout the length and breadth of the land. Such small plantings supply the family with fruit but the surplus is sold contributing significantly to the supply available for consumption in towns and cities."[27]

Next there are the farmer-fruit tree growers in various parts of Thailand who grow fruit trees along with other agricultural commodities. And finally there are the orchardmen who plant and cultivate fairly large areas of fruit trees, as noted by the mango orchards in the North and Northeast.

A suscinct overview of Thailand's fruit cultivation in the early 1970s provides a useful benchmark perspective for this set of crops.

> Although no accurate statistics exist, rough estimates suggest there are currently about 400,000 hectares (2,500,000 rais) of organized fruit orchards in Thailand, with a rapid yearly rate of expansion. About two-thirds of the total area planted is devoted to bananas, pineapples and citrus, while the remaining one-third is devoted to a large number of tree and vine fruits.

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[27] W. Reuther, "Report to the Government of Thailand on Fruit Culture Development in Thailand," Food and Agriculture Organization of the United Nations, FAO Regular Programme No. RAFE 2,1971, p. 5.

Table 3-14. Production and Planted Area of Selected Vegetable Commodities by Region, 1979
(Area: 1,000 rai; Units: Production M/T)

Commodities	Regions													
	Central		Northern		Northeastern		Eastern		Western		Southern		Whole Country	
	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area
Garlic	197	.5	283,060	196.4	20,757	44.5	279	.7	625	1.3	271	.6	305,190	244.0
Shallot	1,434	2.8	42,542	39.1	50,003	59.4	2,878	3.1	7,662	6.4	1,104	1.6	105,623	112.4
Chinese Radish	6,284	5.0	13,943	11.5	13,861	11.2	8,021	5.1	51,174	25.2	5,253	3.3	98,537	61.3
Ginger	1,455	1.6	10,377	10.0	3,069	3.8	2,332	2.6	57,108	15.3	23,312	9.6	97,653	42.8
Potato	---	---	3,306	1.9	627	.4	107	.1	---	---	32	.1	4,072	2.5
Bird Pepper	1,707	7.4	13,305	52.2	15,900	78.2	11,027	43.8	11,027	43.8	7,740	31.7	55,254	231.4
Chilli	2,676	11.1	37,034	99.2	12,495	56.7	5,067	17.8	6,429	24.9	2,864	11.9	66,564	221.9
Cabbage	3,634	2.8	22,092	19.2	50,751	45.0	1,779	1.5	6,936	4.6	2,703	2.0	87,896	75.0
Tomato	1,972	3.5	6,816	8.8	13,241	16.6	983	1.6	4,682	4.1	1,450	3.9	29,144	38.5
Sugar Pea	109	.5	1,927	6.1	1,368	4.0	517	1.3	418	1.5	121	.6	4,461	14.0
TOTAL	19,468	35.2	434,402	444.4	182,072	319.8	32,990	77.6	146,061	127.1	44,850	65.3	854,394	1043.8

"_____" means largest number per commodity.

Source: Data from Ministry of Agriculture and Cooperatives.

> Most orchards are owner-operated. Current land tenure patterns and capacity of growers present no serious obstacles to the expansion and improvement of fruit culture in Thailand.
>
> The tropical climate of Thailand is, in the main, quite favorable for the culture of a wide variety of tropical and subtropical fruits. Currently about two-thirds of the total area devoted to fruit culture is found in the drier monsoon areas, and is planted on raised beds separated by drainage ditches on wet, lowland paddy soils high in clay content. Because of poor drainage, yields on such soils are low and production costs per unit are high. Most of the other third of fruits are grown on upland soils in high rainfall areas where seasonal distribution is adequate or nearly so, but the kinds of fruit well adapted to high rainfall conditions are limited. A small production of very drought resistant fruits (mangos, anonas, guavas, etc.) is found in monsoon areas on unirrigated upland soils, but production per unit is quite low. There are virtually no irrigated orchards on upland soils in areas of monsoon rainfall distribution.
>
> Deep, well drained upland soils well adapted to fruit culture are plentiful in most of the drier four-fifth of Thailand, but the water resources and the technology necessary for exploiting such soils are as yet largely undeveloped. However, these soils, when irrigated, will have the greatest potential for the future development of volume production of high quality fruits at low unit costs.[28]

Since the time of this report some things have changed. The statistical base was expanded from planted area and production for only banana and pineapple to include over 20 fruits. More financial and manpower resources have been directed toward horticultural crop concerns. The canned pineapply industry has expanded as anticipated, and currently the export potential has received considerable fanfare. Yet, the systematic organization and coordination of the fruit production-distribution system is still not within sight.

Because this set of crops is not as crucial as vegetables for this study, its main characteristics will be briefly summarized. The long period of tree growth before bearing fruit, the limited crop care before

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[28]Ibid., p. i.

relative to after fruit initiation, the labor intensity during the harvest period, and the yield vulnerability to weather conditions characterize many of these crops. When adverse weather conditions prevail the whole year's harvest can be lost regardless of the grower's efforts. For some promising tropical fruits of Thailand, supply variability has been very extreme, thus inhibiting efforts at developing consistent overseas markets.

a. Trends in Production and Planted Area

The major commercial fruit crops[29] with their recent production and planted area trends are identified in Table 3-15. Ranked according to the most recent data available for planted area, three groups of fruits can be formed by these crops recently planted on a) more than 500,000 rai, b) between 100,000-500,000 rai, and c) less than 100,000 rai.[30] Of those occupying the largest land area, coconut and mango have maintained a fairly stable position, while tamarind area has rapidly shrunk, rambutan substantially expanded, and pineapply steadily increased. The middle range group has been more moderate in the degree of change over the six-year period.

For a regional perspective the production and planted area of the major fruits during 1977 by six regions are presented in Table 3-16. The Southern region has the largest area with fruit crops with coconut area representing 54 percent of its total area in fruit crops while

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[29]Papaya is widely grown, harvested throughout most of the year, and commonly sold, yet production statistics were not published with other fruits.

[30]There has been some concern regarding the accuracy of these statistics so the following observations are based on the assumption that accuracy is at least consistent over time.

Table 3-15. Production and Planted Area Trends for Selected Fruit Commodities for the Whole Kingdom, 1973-1978/79

Commodity	Total Production (M/T)						Planted Area (1,000 Rai)					
	1973	1974	1975	1976	1977	1978/79[a]	1973	1974	1975	1976	1977	1978/79
Coconut	1,944	2,024	3,783	2,544	1,674	-----	2,567	2,334	2,867	2,806	2,540	-----
Mango	516	463	914	704	2,893	640	1,143	1,095	1,201	1,197	1,247	1,355
Rambutan	377	551	575	340	403	1,122	456	645	532	429	506	1,188
Tamarind	629	588	981	404	270	272	2,584	2,630	2,173	687	561	608
Pineapple	860	1,112	1,354	2,245	2,141	-----	330	373	403	485	551	-----
Banana (Nam Wa)	373	283	295	542	434	-----	400	305	394	633	467	-----
Durian	313	609	469	486	441	266	277	301	341	370	439	389
Jack Fruit	263	288	514	357	51	61	301	304	469	417	322	323
Tangerine	355	273	372	517	435	332	223	257	221	382	278	319
Watermelon	487	485	589	654	445	477	275	297	329	324	229	251
Longan	140	120	145	178	136	114	168	165	199	216	202	200
Sapodilla	68	63	87	100	82	76	144	137	167	233	194	183
Guava	65	85	80	89	82	114	81	88	84	94	92	132
Lime	90	48	122	107	2,002[b]	75	103	87	117	186	95	106
Banana (Hom-Thong)	34	51	50	54	59	60	47	50	74	95	73	80
Mangosteen	52	37	41	46	37	32	47	32	49	40	41	77
Pomelo	94	81	97	98	49	46	62	59	68	65	62	61
Langsat	91	91	106	69	60	53	76	75	93	71	67	60
Custard-Apple	63	85	82	72	70	97	36	42	42	40	54	50
Sweet Orange	17	2	34	27	10	12	18	26	26	29	22	32
Lychee	8	6	14	22	14	8	12	12	16	38	28	31
Grape	29	21	37	34	17	40	20	12	24	9	7	14
Totals	6,868	7,366	10,741	9,689	11,804	3,897	9,370	9,326	9,889	8,846	8,077	5,520
Percent Change (%)		+ 7	+ 46	- 10	+ 22			- .4	+ 6	- 10	- 7	

[a]Incomplete data for this year.

[b]Probable error, should be between 50 and 100.

Source: Data from Ministry of Agriculture and Cooperatives.

Table 3-16 Production and Planted Areas of Selected Fruit Commodities by Region, 1977[a]

Unit: Area - 1,000 rai
Production - M/T

Commodities	Central		Northern		Northeastern		Eastern		Western		Southern		Whole Country	
	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area	Production	Area
Coconut	81,483	111.8	145,259	187.1	169,169	237.2	173,009	361.0	164,996	273.8	939,920	1,370.4	1,673,835	2,540.5
Mango	297,590	127.3	590,684	299.6	1,167,602	426.3	508,707	212.4	204,473	125.3	124,370	55.6	2,893,427	1,246.6
Tamarind	15,176	134.9	80,752	134.9	117,430	338.0	13,256	17.8	31,085	29.3	11,892	26.1	269,591	560.9
Pineapple	22	.05	47,778	28.0	38,899	16.3	258,348	67.4	1,427,019	301.1	369,291	138.1	2,141,356	551.1
Rambutan	149	1.6	612	2.4	5	.2	200,539	228.0	1,480	3.6	200,454	270.6	403,270	506.3
Banana (Nam Wa)	34,572	27.7	99,744	127.8	70,690	71.0	71,665	83.8	63,736	55.0	93,835	101.4	434,244	466.6
Durian	6,557	20.0	3,493	9.0	---	.1	73,235	173.2	75	.3	350,019	236.3	441,379	438.9
Jack fruit	924	9.1	17,134	94.0	15,322	87.8	5,751	39.8	4,534	39.0	7,596	52.6	51,262	322.3
Tangerine	181,223	88.4	44,087	30.7	1,428	1.5	102,511	82.7	7,598	16.8	97,520	58.4	434,666	277.7
Watermelon	7,169	5.0	60,277	42.3	164,093	82.2	20,703	11.2	37,413	17.8	155,075	71.3	445,230	229.1
Longan	172	.5	121,040	174.9	13,105	26.1	94	.7	1,106	2.1	---	---	135,516	202.4
Sapodilla	12,167	24.5	18,506	62.6	2,750	10.2	14,212	33.9	21,197	36.8	13,545	26.9	82,377	194.0
Lime[b]	79,284	7.2	149,489	14.8	105,739	10.8	176,756	11.5	881,402	30.8	608,998	20.6	2,001,668	94.8
Guava	13,162	13.6	17,994	16.5	22,774	35.8	7,578	7.7	10,415	8.1	9,629	10.0	81,552	91.6
Banana (Hom Thong)	8,106	11.1	4,217	6.7	5,031	5.7	8,741	10.4	4,040	6.7	29,217	32.7	59,352	73.2
Longsat	---	---	5,792	14.1	---	---	10,604	13.7	5	---[c]	43,726	36.9	60,207	66.6
Pomelo	2,527	3.8	14,625	18.0	4,795	6.7	6,446	8.5	7,561	3.2	13,433	15.5	49,393	61.7
Custard-Apple	5,348	4.6	8,168	6.6	36,504	26.3	10,192	12.3	7,318	2.7	1,821	1.3	69,551	53.8
Mangosteen	142	.7	192	.4	7	.01	23,435	22.3	10	.04	13,448	17.5	37,234	41.0
Lichee	105,434	.4	10,571	19.0	86	.3	2,516	6.2	822	2.7	---	---	14,101	28.3
Sweet Orange	714	1.3	4,007	14.7	161	.9	73	.5	1,981	1.1	3,033	3.3	9,970	21.9
Grape	17	---[d]	---	---	---	---	2	2	17,134	6.8	103	.07	17,255	7.2
TOTAL	851,930	593.6	1,444,471	1,144.1	1,935,590	1,381.4	1,688,653	1,405.2	2,895,400	965.0	3,094,931	2,547.6	11,806,416	8,076.4

[a] Due to the suspect nature of 1978/79 data, the data for 1977 was used.

[b] Likely error in production statistics, should range between 50,000 - 100,000 M/T total production.

[c] .005

[d] .007

"____" means largest number per category.

Source: Data from the Ministry of Agriculture and Cooperatives

only durian, Hom-Thong banana, and langsat areas have their largest regional planted area in the South. The Eastern region has the next largest total area in fruit crops, a fairly wide range of crops (i.e., over 10) with sizeable planted areas of each, and with only mangosteens having the largest planted area among all the regions. The Northeastern region presents a considerably different perspective in that it displays comparative advantage in the planted area of a certain set of fruits, such as mango, tamarind, watermelon, guava, and custard apple, with only two other fruit crop areas of any size. The Northern region combines the breadth of the Eastern region with the depth of the Northeastern region in that several fruits have sizeable areas in that region besides Nam-wa banana, jack fruit, longan, sapodilla, pomelo, lichee, and sweet orange have their largest planted areas in the North. The Western region has been the home of the processed pineapple industry for obvious reasons with sizeable areas in five or six other fruits plus the major area for lime and grape. The Central region's area in fruit crops is considerably less than any of the other regions with tangerine area only slightly more than in the Eastern region and with moderate areas in tamarind, mango and coconuts.

Transition is the word for the future as fruit cultivation moves from supplying only the domestic market to expanding into export markets for both fresh and processed fruits. Production stability, considerable support services, and infrastructure improvement will have to accompany various elements of this export strategy. Yet, the lack of locally adapted technology, acute shortage of well-trained fruit culture specialists and limited public sector resource investment in research and education in horticultural crops still remain.

> The potentials in Thailand for development of a sizeable export trade in fresh and/or processed fruit are good. That no significant export industry has developed so far is due largely to three factors;
>
> 1) lack of locally adapted and well integrated variety, production, handling, shipping, processing and marketing technology;
>
> 2) low yields and high production costs on poorly drained paddy soils;
>
> 3) lack of appropriate co-operatives or other mechanisms to enable a large number of small growers to supply processors and/or exporters with a disciplined flow of fruit meeting required standards.
>
> However, developments during the last several years, with the production of canned pineapples for export, give promise that some of these restraints can be overcome fairly rapidly.[31]

D. PARTICIPANTS WITHIN THE MARKETING SYSTEM

A generalized framework depicting the main participants in the fruit and vegetable system (Figure 3-2) identifies the two major markets for study, i.e., the fresh food market and the processed food market. Indirect participants within the private sector, i.e., transporters, credit agencies, storage firms, etc., are not examined because few signs of problems were noted in the initial discussions with knowledgable persons and research resources were limited. However, indirect participants within the public sector, i.e., various government agencies and research institutions, received attention as "intervening forces" because of several signs of problems throughout the research process. Yet, the central focus was on the direct participants within both markets.

The participants in the fresh food marketing system from the first handler to consumer are far too large, complex, and diverse a group to

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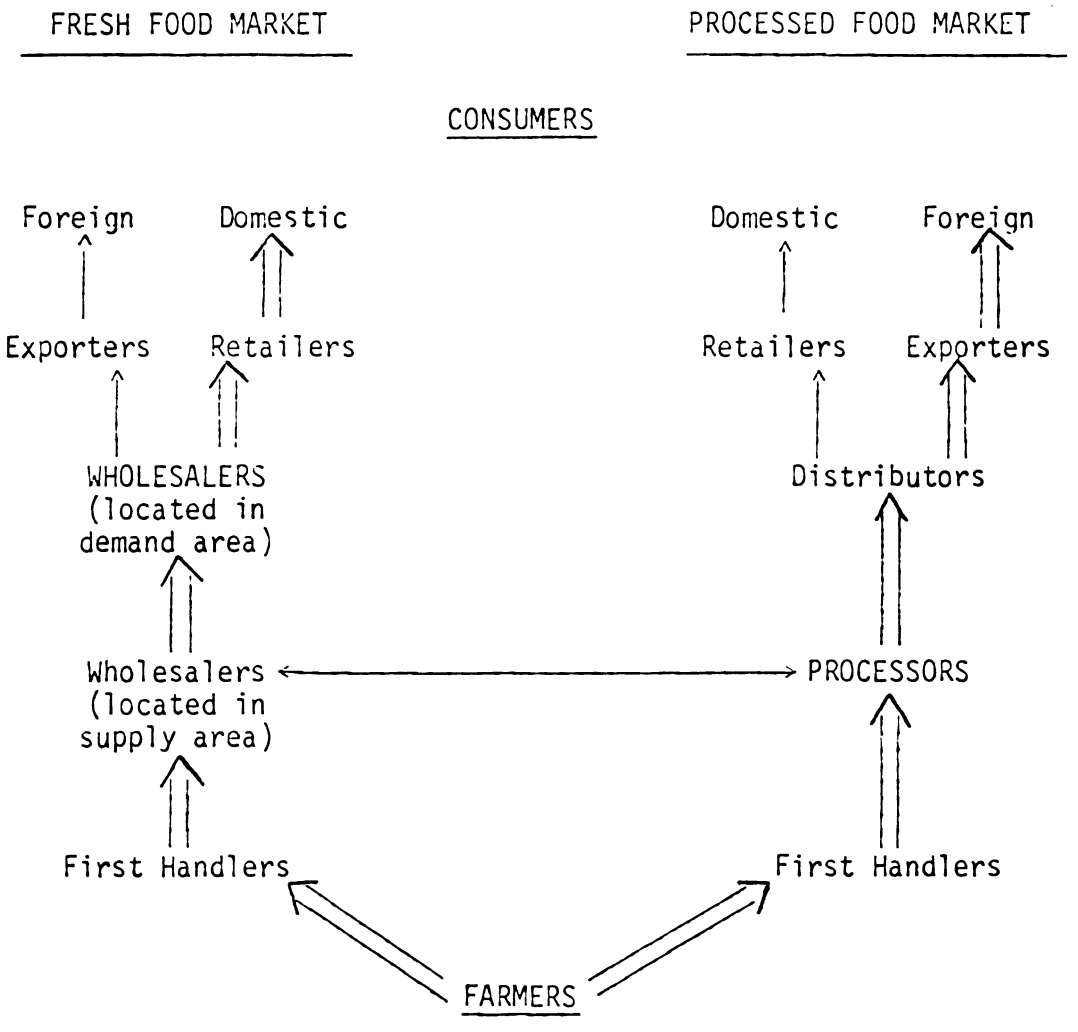
[31] W. Reuther, Ibid., p. ii.

Figure 3-2. Main Participants in the Fruit and Vegetable System



Note: ⟹ = primary flow of goods

⟶ = secondary flow of goods

allow for anything but a brief overview of their basic structure and behavior. Observations in several market places and discussions with key informants suggest that the participants are very active in searching for new economic opportunities and that this system works well except for periodic shortages due to acts of nature, i.e., floods and droughts.

The participants in the processed food market system are also quite a large, complex, and diverse group; therefore the discussion here will center on describing the universe of processing firms within the pickling-preserving industry and canning industry.

1. Fresh Food Marketing System

Several previous studies have looked at the agricultural marketing system in Thailand. The current understanding of the main system roughly corresponds to the analogy of the wooden wheel with the Bangkok wholesale market at the center (hub), local traders as the spokes, and vegetable growers around the rim. The number of buyers and sellers is unknown, however, each Bangkok wholesaler has a network of suppliers (local traders) with their set of regular or independent vegetable gardeners and growers. The larger wholesalers in the Pak Klong Talad (the main wholesale market) generally specialize in and organize their trade around two or three commodities although they also trade in several others.

Previously, this system not only spread outwards from the Bangkok Wholesale Market but also served as a transhipment point via which commodities moved from surplus areas to deficit areas, for instance Northern garlic came to Bangkok then was sent to the Northeast. Today there are

signs that more direct interregional trade is evolving, however, the pricing function of the Bangkok Market remains evident. According to a recent study, as the first deliveries arrive the daily vegetable prices are determined (discovered in the Bangkok Wholesale Market) in the following way:

1) the supply of each type of vegetable in the preceeding week is considered
2) information on production is obtained from local traders and vegetable farmers who are dependent on the wholesalers
3) vegetable prices on the previous day recalled and
4) the experience and wholesaler's estimate of the market situation invoked.[32]

After the day's price is arrived at in the early morning that day's activities will move it up (strong demand) or down (large supply). Since each wholesaler is attentive to the prices of the other wholesalers, the daily price difference between wholesalers is reportedly very small. The narrow difference is ascribed to the degree of mutual interdependence which inhibited cut-throat competition in buying and selling.

The considerable interaction between wholesalers and the local traders not only generates supply information but also effectively disseminates the price information with special efforts to contact local traders whenever substantial price changes occur. Since the daily turnover of these large wholesalers is reportedly at least ฿100,000, their expertise, information system, and experience has to be considerable to avoid major losses in dealing with such variable commodities as vegetables. And during the peak season when volume sufficiently lowers prices

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[32]Ruangrai Tokrisna and Somporn Isvilanondha, "Economics of Production and Marketing of Selected Vegetables for Processing," Kasetsart University, Faculty of Economics and Business Administration, Research Report No. 45, 1981, p. 28.

various fruit and vegetable processors in the Central Plains area buy raw materials from these large wholesalers. Thus, for certain commodities, these wholesalers coordinate both fresh market and processed market forms of demand.

Within this marketing system there are three levels, i.e., the retailers in rural and urban areas, the wholesaler level usually located in larger population centers, and the local crop buyer or trader near the growers. The Chinese merchants control the wholesale level of the marketing channels while Thai's are dominant at both the farm-crop buyer and retailer-consumer ends of the channel. Consequently, insights into the modus operandi of Chinese businessmen can be extremely helpful in understanding the behavior of the system itself.

Although various studies have tried to understand the success of the Chinese businessman in Thailand, a study of the Chinese businessman's strategies and methods of doing business in Vietnam was especially insightful and well explained. Reasons for the Chinese merchant's success in competing with merchants of other ethnic groups included,

> . . . they worked harder, because they were willing to 'hak foo noi lo' (overcome bittnerness and endure drudgery), because they operated on a longer time perspective and were willing to take small gains over a long time rather than to make quick killings, and because they were more willing to save and postpone consumption.
>
> However, by far the most frequent explanation . . . was couched in terms of . . . 'sun yung.' In its most general sense it conveys the meaning of interpersonal 'trust' or 'confidence.' When a person is said to have sun yung, the meaning conveyed is that he has a reputation for trustworthiness, his word is his bond.[33]

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[33]Cliff Barton,"Trust and Credit: Some Observations Regarding Business Strategies of Overseas Chinese Traders in South Vietnam," unpublished paper, 1976, pp. 6-7.

The Vietnamese merchants interviewed in that study generally agreed that the interpersonal trust was a major factor for the Chinese businessman's success. This finding adds credence to that commonly recognized practice of Chinese in Asia. Others, such as Alice Dewey, expressed the existence of the trust element in these terms;

> Especially in a society that lacks a well-developed and well-enforced civil code, trust, based on non-legal sanctions, is important in trade. If capital is to flow freely, if long range planning is to be possible, and if merchants are to know what they have bought without constantly supervising others and inspecting goods, there must be mutual assurance that contracts will be fulfilled.[34]

For Thailand, the abstract of Lengel's study on the markets of Thailand concluded that,

> Quantitative analysis of data on profits shows the advantage given to ethnic Chinese merchants due to assistance from their families that is both more effective and more readily available than that for ethnic Thai merchants. It is concluded that this advantage, together with the strong emphasis on contractual obligations among Chinese helps to account for their greater success in the market.[35]

In concert with this behavior is the use of credit to regularize business relationships with suppliers and buyers, participation in "share or rotating credit groups" as an important source of working capital, and a set of social-business relationships to further one's business and social position in society. This behavior also facilitates the flow of information regarding economic conditions and opportunities. Consequently each businessman had to ". . . conduct himself in his financial affairs as to build and preserve a reputation for trustworthy, reliable and

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[34]Alice Dewey, Peasant Marketing in Java, (Glencoe, Illinois: The Free Press), 1962, p. 43.

[35]Francis Kenneth Lengel, "Markets in Thailand: An Analysis of the Interrelationship Between Sociocultural and Economic Factors," Unpublished Ph.D. dissertation, Columbia University, 1976, abstract.

astute behavior.[36] But if one failed to conform to the approved business behavior, then sanctions were directed at the source of the businessman's success. "The threat of shame or the loss of reputation or sun yung among one's network of friends and associates were compelling incentives for a Chinese businessman to conform to the approved standards of ethical business behavior."[37]

Although several other behavioral considerations are relevant for a comprehensive exposition of middleman behavior, especially beyond the crop buyer level, the points emphasized above embody the key elements.

The government role in the vegetable marketing system is typical of other Asian countries. Schemes to reduce the cost-of-living include the fire-fighting techniques of "controlled prices" for fruits and vegetables as well as the establishment of public markets wherein only producers are permitted to sell. For instance, in May 1980, the Bangkok governor (Mr. Chaowas) issued directives to set up "farmer markets" with no rental payments for the farmers to sell there. "Mr. Chaowas said this type of market can enormously reduce the retail prices of food stuffs, especially vegetables, because of the absence of middlemen."[38] Yet, such markets subsequently went unused or were populated by "middlemen" farmers.

The remainder of that article fairly well summarizes the perceptions of the urban consumer and various public officials regarding wholesalers (middlemen) by stating that:

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[36]Cliff Barton, Ibid., p. 27.

[37]Ibid.

[38]"More Markets to Ease Food Prices," Bangkok Post, May 20, 1980.

> As vegetables for consumption of city dwellers are sold at Pak Klong Talad where middlemen control the quantity and prices of vegetables, observers said that the new markets will be ineffective because of the longstanding monopoly of the food market. In a Bangkok Post survey yesterday, vegetable retailers complained that the prices of all kinds of vegetables at Pak Klong Talad were very high, making it impossible for them to sell at old prices . . . . The vendors said they used to sell for instance, Chinese lettuce at about 8 or 10 baht a kilogramme (about 25-26 baht/kg during the survey period) and string beans at 6-8 baht a kilogramme (about 25 baht/kg during the survey) around the end of last year.
>
> A well-informed source attributed the rocketing prices of vegetables to low supply resulting from the drought.[39]

The most interesting aspect of that article is not that the prices during a drought period were compared to the peak period, i.e., end of last year, but that a small, practially obscure article followed within two days and explained that, "Prices of most vegetables in the country have been unusually high this year not because of high exports but rather because of the shortage of supply, Mr. Ananda (Director-General of the Business Economics Department) said."[40] Thus the shortage-induced price increase was clearly recognized by various informed persons, yet the political pressure exerted by such prices required a scape-goat and bandaid approach to show that action was being taken.

A flood in October of 1980 reinforces the illustration of the vulnerability of Thailand's vegetable system to weather problems, "Heavy rainfall and floods during the early part of October have caused a wide fluctuation in prices of fresh vegetables in the market due to the interruption of supply and damages to vegetable plantations, the Business Economics Department reported."[41] Many vegetable growers who anticipated

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[39] Bangkok Post, Ibid., May 20, 1980.

[40] "Local Vegetable Prices Shoot Up," Bangkok Post, May 22, 1980.

[41] "Vegetable Prices Up," Bangkok Post, October 24, 1980.

the flood hurriedly harvested their crops, glutted the market, and received less favorable prices, while those who couldn't get their crops out of the field suffered serious losses. It was further noted that, ". . . a large volume of vegetables was damaged during the transportation process from the provinces to Bangkok."[42] Meanwhile various government agencies, such as the Interior Ministry, were attempting to quell fears of improper practices by asking ". . . authorities involved to keep a close watch on unscrupulous merchants or vendors who tried to exploit the flood situation by hiking vegetable and other commodities' prices unreasonably."[43] Such patterns of disruption of supply and/or the distribution system should alert prospective large scale processors of potential supply side uncertainties and potential government interventions given the resultant public reactions.

2. Processed Food Marketing System

The focus of this section is on the products, number, and distribution of all processing firms in both the pickling-preserving industry and canning industry. This description and analysis of the universe of processing firms will position the up-country firms within their respective industries as well as provide background information for the following chapters.

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[42]Ibid.

[43]"Bid to Hold Down Vegetable Prices," Bangkok Post, October 29, 1980.

a. Characteristics of the Pickling-Preserving Industry

The pickling-preserving industry has been a productive, albeit small, component of Thailand's agro-industrial sector. As one of the country's oldest agro-industries, its basic technology continues the methods practiced for centuries throughout Asia.

(1) Types of Products

Pickled products can add spice to meals and snacks. The blending of sugar and vinegar with a wide variety of fruits and vegetables gives a crisp, firm texture, and pungent, sweet-sour flavor.[44] Probably, the original pickling process evolved from the effort to preserve various fruits and vegetables which were in abundant supply for short periods then not available during the rest of the year. Later pickled products earned their own distinctive place in the diets of several peoples, such that today the process of extending the shelf life of seasonally surplus agricultural products by a pickling or preserving process can be observed in most countries of the world.

In Thailand there are two distinctive, yet overlapping types of pickled products: 1) "food pickles," i.e., the pickled garlic, Chinese mustand, and bamboo shoots which are a part of or accessory to several food dishes, and 2) "snack pickles," i.e., mostly fruit products, especially from mango and peach, yet also including olive, sandoria, star gooseberry, tamarind, ginger, tomato, palm, jujube, and many other fruits.

The "food pickles" of Chinese mustard (salty and sour forms) and bamboo shoots are sold in the morning food markets or most urban areas

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[44]USDA, "Making Pickles and Relishes at Home," Home and Garden Bulletin, No. 192, 1970.

of Thailand since the raw materials are often locally grown or accessible most of the year for the small household picklers to process and bring to their morning market stand. Yet, in areas where bamboo shoots grow especially well, as in Prachin Buri Province, large quantities are pickled and distributed throughout the country.

Pickled garlic depends on fresh garlic which is mostly a one season crop with large scale production confined to the northern and some parts of the eastern regions of Thailand. Picklers located in both major supply and demand areas, distribute clay jars with 12 kgs. of the final processed product to retailers around the country. In the morning markets the sellers take the pickled product from the solution in a large basin or clay jar, put it in plastic bags, weigh it, and sell the desired amount to the consumer. The major exceptions to this selling and buying pattern are the bottled pickled garlic and canned pickled Chinese mustard. The former are sold in tourist areas of the North, at eating and fueling areas along the major highways to the North, and in large food or department stores in the Bangkok area. The canned Chinese mustard is available throughout the country wherever a large variety of canned products are sold.

"Snack pickles" are quite different in nature. They are processed into many forms by widely dispersed factories. Stores and market stands in tourist areas and large food stores elsewhere sell the following forms; 1) small to large bottles or plastic boxes of mangoes and peaches in salty and/or sweet solutions, 2) smaller quantity containers of a wide variety of fruits, such as palm, lemon, star gooseberries, and tamarind, and 3) a wide variety of other snack products, including sweet and sour pickles sold on a quantity basis from large glass display bowls.

Sweet vendors and refreshment stands at movie theaters or other entertainment areas also sell a wide variety of sweet-sour pickled or sweetened fruits in dry and wet forms.

(2) Number and Distribution of Processing Firms

In Thailand, pickling-preserving firms were established in locations where favorable agro-climatic conditions induced especially large, seasonal production of particular fruits and/or vegetables. They were also located in the vicinity of growing population centers where demand for such products was particularly strong. The former condition will be termed "supply areas" of raw materials and the latter "demand areas" for pickled products. The Chiang Mai Valley (garlic and peach), Prachin Buri (bamboo shoots), Petchaburi (star gooseberry), and Nakhon Pathom (jujube) are a few examples of locations with "supply area picklers" of specific products. In the major demand area (Bangkok-Thonburi) the pickler-preserving firms most commonly pickled Chinese mustard, garlic and/or a variety of fruits.

An overall understanding of the structure of this industry has been very elusive due to the limited data available, to the behavior of the firms, and to the changing composition of firms. A study in the early 1970s used a survey, and the 1963 Census of Industry, to estimate that in 1964 there were 83 fruit and vegetable preserving firms in Thailand with estimated peak employment of 500 employees and an estimated wholesale value of production of ฿553.3 million.[45] Since many of these were small scale processing firms, the author acknowledged serious difficulties in formulating sales estimates.

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[45]Anonymous, "Food Canning and Preserving," Mimeographed report, 1972 or 1973.

Let us first identify the difficulties in making such an estimate before proceeding to up-date this benchmark estimate and elaborating on the industry's structural characteristics. Firms can be categorized into household (i.e., using only family labor) and manufacturing (i.e., using hired and family labor) firms. Likewise an understanding of the industry and the technology involved would suggest that firms producing less than 10,000 kg. of raw material are small scale whereas those operating at levels beyond this amount are medium or large scale firms depending on the raw materials involved. Observations and interviews conducted with processors indicate that household firms are usually small scale, single product firms which pickle in their backyard or under their house only during the peak harvest period for a local raw material. Because of limited working capital, cash flow problems, and other enterprise commitments these household firms enter the market at the retail level as soon as the pickled product is ready, in order to gain the widest margin and quickly dispose of their products. One knowledgeable entrepreneur estimated that several hundred such firms pickled garlic in the North but did not have any idea of the number pickling in other areas or for other raw materials. These household firms provide an additional form of employment and income during the period when field work and other opportunities are relatively few, especially for the older women of the households.

The manufacturing type pickling firms consist of various sized processing firms of single or multiple products with varying degrees of forward integration. For certain products, such as pickled garlic, the single product firms (regardless of size) actively pickle during the 2-3 month harvest period for the raw material then distribute their

product for a few more months until their inventory is depleted. In the meantime they are engaged in other businesses such as commodity wholesaling, metal fabrication, etc. Consequently, they are seldom registered as picklers and are especially difficult to identify. For other products, such as pickled Chinese mustard, the single product firms pickle during the periodic harvests of raw materials. The larger firms of this type are more conspicuous and likely to be registered, while the smaller firms are quite difficult to identify. Multiple product firms display a pattern somewhat similar to the former group and likewise become more prominent or visible as their size increases. Thai factory registration laws stipulate that firms with 2 hp. engines and/or 7 workers must be registered with the Ministry of Industry while all food processors are required to register with the Ministry of Public Health. The larger and more active firms are more conspicuous, thus their ability to avoid compliance is reduced and avoidance costs are higher. Consequently, these manufacturing firms are more likely to be registered whereas the smaller or less active firms have been able to remain anonymous, as have the household firms.

In an attempt to quantify the structural dimensions of this industry, study experiences in the ROFEAP areas and opinions of knowledgeable sources will be used. In the entire Chiang Mai Province, four firms were officially registered with the Government as picklers, but in the ROFEAP's Phase I enumeration and subsequent interviews, eight manufacturing firms were identified.[46] After a year of observations, interviews, and further searching a total of 21 manufacturing firms were

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[46]The ROFEAP enumeration areas included only three of the 19 amphurs in the Chiang Mai Province.

found to be operating in the Province with still others mentioned but not yet located! In terms of production volume, sales value, and number of employees, it was found that the unregistered manufacturing firms in total exceeded the importance of the registered firms. And this does not include an estimate of the importance of the hundreds of household firms previously referred to above.

During this research a large reputable pickling firm which sells to wholesalers and retailers of pickled products estimated that over 1,000 firms pickled garlic (including household firms) in Thailand. This source provided estimates of manufacturing firms by location to support that estimate. The limited opportunity to substantiate this specific estimate resulted in locating several large unregistered firms of the single product type but not as many as conjectured. Consequently, we estimate that at least four out of five manufacturing type pickling firms were not registered, but on an aggregate volume basis the registered factories may account for as much as 50-60 percent of all pickled products because they are generally the larger firms. This estimate is more an indication of relative weights of the various structural dimensions considered rather than an accurate statement of the present status.

Having outlined the limitations of the information on the number of registered firms relative to the population of all picklers, it is useful to examine the characteristics of the officially registered firms as indicative of industry characteristics for larger firms. The Ministry of Industry requests the following information from each firm which complies with the registration requirement; 1) licensed level of paid-up capital, 2) anticipated employment, 3) anticipated level of output for products processed, and 4) year registered. The year registered can

reflect either the date the business was established or the year the firm evaluated the costs associated with compliance as less than those for further avoidance and thus registered. Since much of this information is not checked against the actual status of the firm nor is the firm's current status updated, one must use considerable caution in using it. Also, due to various standard operating procedures within the concerned agencies, the list of registered firms in the Central Office in Bangkok sometimes does not include all the firms listed in the provincial offices. Whenever the insights provided by this information conflicted with other sources of information, they have been clarified.[47]

The total number of firms registered are classified by employment class and differentiated by region (Table 3-17). As can be observed the size distribution of firms according to employment class is skewed toward the smaller firms with one to ten employees, regardless of region. The Central Plains and Bangkok areas are the dominant locations of registered picklers with very few in the Northeast and South regions. The firms with the largest number of employees are located in the Central Plains, particularly Chonburi, Pathum Thani, Samut Prakan, and Nontaburi Provinces.

The size distribution of firms based on registered capital stock (in 1976 prices) is shown in Table 3-18 and indicates a fairly normal distribution in the aggregate with the ฿100,000-250,000 category containing the largest percentage of firms (29%). Capital stock distribution

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[47]The list of registered fruit and vegetable processing firms included firms that use canning technology for both pickled and non-pickled products. Those firms were classified as canneries and not included here. In Bangkok several original picklers evolved into canneries for a wide range of pickled and non-pickled products.

Table 3-17. Size Distribution (Employment Based) of Registered Pickling and Preserving Firms by Region

Employment Class (Number of Employees)	Bangkok		Central Plains		North		Northeast		South		Whole Kingdom	
	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)
1-10	9	47	9	41	5	62	1	100			24	47
11-25	8	42	6	27	2	25			1	100	17	33
26-50	2	11	2	9	1	13					5	10
51-100	--	--	2	9							2	4
101-200	--	--	3	14							3	6
201+	--	--	--	--								
Total	19	100	22	100	8	100	1	100	1	100	51	100

Source: Computed from the Ministry of Industry data, Bangkok.

Table 3-18. Size Distribution (Capital Stock Based) of Registered Pickling-Preserving Firms by Region

Registered Capital Stock in 1976 Prices	Bangkok		Central Plains		North		Northeast		South		Whole Kingdom	
	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)
0-50,000	1	5							1	100	2	4
50,001-100,000	4	21	3	14	1	12					8	16
100,001-250,000	7	36	6	27	2	25					15	29
251,001-500,000	2	11	3	14	2	25	1	100			8	16
500,001-1,000,000	2	11	4	18	2	25					8	16
1,000,001-5,000,000	2	11	5	23	1	12					8	16
5,000,001+	1	5	1	4							2	4
Total	19	100	22	100	8	99	1	100	1	100	51	101

Source: Computed from Ministry of Industry data, Bangkok.

for Bangkok firms is skewed to the smaller amounts, Central Plains firms skewed to larger amounts and the Northern firms centered at the ฿250,000-500,000 level.

As indicated by the information in Table 3-19, the capital stock distribution reflected the larger, more recently registered firms in the Central Plains (average 3.6 years by 1981). It also reflects the smaller and earlier firms in Bangkok, and the medium sized, earlier firms in the North. Except for the firm in the South, a range of capital/labor ratios of 32.5 to 55.9 conformed to the industry's reputation for labor intensity with a single basic technology.

In summary, the Central Plains-Bangkok area contains the most registered firms (80%); recently registered, more capitalized firms have also entered the industry in the Central Plains area, perhaps indicating a shift out of the heavily metropolitan area of Bangkok; relatively few manufacturing type pickling firms in the North, Northeast, and South have been registered; and the industry is basically labor intensive, especially the smaller firms.

b. Characteristics of the Canning Industry

As a newly developed industry with its first major plant beginning operation in 1967, this industry was organized around pineapple canning. Since that time the industry's explosive rate of growth has ebbed while it has diversified into an array of seasonally available fruits and vegetables. The Central Plains firms processed mostly fruit whereas the Northern firms have attempted to incorporate several vegetables into their product lines. The firms along the seacoast included various seafoods in their product lines. This overview will highlight the

Table 3-19. Selected Characteristics of Registered Pickling-Preserving Firms by Region

Region	Number of Firms (#)	Relative Frequency (%)	Average Age in 1981 (Years)	Average Number of Employees (#)	Average Registered Capital Stock (฿1,000)[a]	Average Registered Capital to Labor Ratio (฿1,000)
Bangkok	19	37	6.0	12.9	2,160.0	167.5[b]
Central Plains	22	43	3.6	31.0	1,734.8	55.9
North	8	16	6.8	14.5	500.1	34.5
Northeast	1	2	3.0	7.0	267.0	38.1
South	1	2	1.0	11.0	42.6	3.9
Whole Kingdom	51	100	5.0	20.8	1,637.6	78.641

Source: Computed from Ministry of Industry data, Bangkok.

Note: [a]Adjusted to 1976 prices.

[b]One firm had an exceptionally large amount of registered capital stock and, if deleted, the capital stock and capital/labor ratio for the remaining 18 firms were ฿393.6 and ฿32.5, respectively.

historical-locational dimensions as well as the basic characteristics of this industry in Thailand.

(1) Intermediate and Final Products

One can classify canned fruit and vegetable products into four groups: 1) whole or sliced fruits and vegetables, 2) juices, 3) prepared or preserved fruits and vegetables, and 4) miscellaneous products. Examples of whole or sliced products included longan, lichee, rambutan, mango, bamboo shoot, pineapple, baby corn, and peas; juices included orange, tomato, pineapple, mango, and vegetable; prepared or preserved included salted cucumbers and Chinese mustard; and miscellaneous included pastes and puree products from a variety of raw materials.

The initial common criteria for canning various raw materials centered around the perceived abundance of tropical fruits which had seasonally low prices and strong foreign demand. Later two main strategies emerged; 1) canning promising tropical fruits during their peak harvest season when prices were lowest, such as rambutan, pineapple and lichee, and 2) having identified a product with a strong demand, introduce and promote production of the relevant crop among Thai farmers, such as baby corn and tomato.

(2) Number and Distribution of Processing Firms

This relatively new industry was begun with, then dominated by the processing of pineapple for export. Thus historically and locationally the industry started and expanded from the pineapple cultivation areas in the Central Plains. The first large scale fruit and vegetable cannery was a joint venture with Taiwan and Japan begun in 1967. In the late

1960s and early 1970s the industry expanded to include six major firms, four plants in Prachuap-Khiri Khan Province, one in Petchaburi Province, and one in Lampang Province.[48] The addition of the Chiang Mai Complex in 1974 added considerable capacity for various vegetable products besides the prevalent fruit products. By 1977 it was estimated that in addition to the large firms, there were "Some 16 small plants and over 200 cottage industries which can produce about 250,000 tons per year or 38.9 percent of the total production which was 642,200 metric tons."[49]

The registration of factories was begun in the late 1960s and provides a useful source of information on the structure of this industry, however, several of the data qualifications mentioned above for the pickling industry also apply here. The number of firms registered each year since 1967 indicated two major periods of firm entry, cir. 1972-73 and 1980 (Table 3-20). That time frame generally corresponded to the initial build-up period within the Central Plains area and recent start-ups of large firms in the Central Plains along the seacoasts (several firms processed both fruit and fish products).[50] The size distribution of firms based on the number of employees was skewed toward the smaller firms with one to ten employees (Table 3-21). The Central Plains and Bangkok areas were the dominant locations of registered canneries with very few in the Northeast and South. The firms with the largest number of employees were located in Prachuap Khiri Khan, Nakhon Pathom, Rayong,

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[48]Supanee Artachinda, "Food Processing Industry in Thailand," Kasetsart University, Center for Applied Research, Research Report No. 4, 1978, p. 11.

[49]Ibid.

[50]According to the size and product mix of several firms in Petchaburi registered in 1981 one could conjecture that recent enforcement of registration regulations rather than new entry occurred in that Province.

Table 3-20. Number of Fruit and Vegetable Cannery Firms Newly Registered by Year, 1967-1981

Year	Number of Firms
1981	1
1980	11
1979	4
1978	6
1977	5
1976	4
1975	3
1974	3
1973	9
1972	5
1971	3
1970	3
1969	2
1968	-
1967	1

Source: Computed from Ministry of Industry data, Bangkok.

Table 3-21. Size Distribution (Employment Based) of Fruit and Vegetable Cannery Firms by Region

Employment Class (Number of Employees)	Bangkok		Central Plains		North		Northeast		South		Whole Kingdom	
	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)
1-10	8	40	11	33	1	20					20	33
11-25	7	35	6	18	2	40					15	25
26-50	4	20	3	9					1	100	8	13
51-100	1	5	3	9	1	20					5	9
101-200			4	13							4	7
201+			6	18	1	20	1	100			8	13
Total	20	100	33	100	5	100	1	100	1	100	60	100

Source: Computed from the Ministry of Industry data, Bangkok.

Ratchaburi, and Petchaburi Provinces. The size distribution of firms based on registered capital stock (in 1976 prices) was skewed toward the highest category of over 5 million baht (29% of the firms) (Table 3-22). Capital stock distribution for Bangkok firms was widely dispersed with 40 percent of the firms registered with over 1 million baht, Central Plains firms were also widely distributed with 42 percent of the firms with over 5 million baht similar to the Northern firms. Each firm in the Northeast and South was also heavily capitalized. That capital stock distribution reflected the two basic types of canneries most frequently found, i.e., the small-medium sized firms (often family firms) processing and canning a variety of pickled, sweetened, or whole products based on local seasonal availability of raw materials, and the medium-large firms (often corporate businesses, several as joint ventures) which concentrate on canning whole products from raw materials shipped in from near and far.

The combination of those two types of firms and the non-registration of firms in some regions somewhat disguise the regional characteristics of the canneries (Table 3-23). Clearly the Bangkok-based firms are the oldest firms and are relatively small in terms of average number of employees and average registered capital. Although the Central Plains firms have also been in business for several years, they are much larger both in terms of employees (one firm with over 2,000 employees) and average registered capital stock (12 firms with over 10 million baht in registered capital). The information for the Northern firms is somewhat misleading because the largest registered firm collapsed in 1978/79 but it was still registered, consequently today's situation actually reflects a combination of small and medium-sized firms both in terms of employees

Table 3-22. Size Distribution (Capital Stock Based) of Fruit and Vegetable Canneries by Region

Registered Capital Stock in 1976 Prices	Bangkok		Central Plains		North		Northeast		South		Whole Kingdom	
	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)	Number of Firms (#)	Relative Frequency (%)
0-50,000	2	10									2	3
50,001-100,000			3	9							3	5
100,001-250,000	4	20	5	15							9	15
250,001-500,000	2	10	2	6	1	20					5	8
500,001-1,000,000	4	20	3	9	1	20					8	13
1,000,001-5,000,000	8	40	6	18	1	20			1	100	16	27
5,000,000+			14	42	2	40	1	100			17	29
Total	20	100	33	99	5	100	1	100	1	100	60	100

Source: Computed from the Ministry of Industry data, Bangkok.

Table 3-23. Selected Characteristics of Fruit and Vegetable Canneries by Region, 1967-1981

Region	Number of Firms (#)	Relative Frequency (%)	Average Age in 1981 (Years)	Average Number of Employees (#)	Average[a] Registered Capital Stock (฿1,000)	Average Registered Capital to Labor Ratio (฿1,000)
Bangkok	20	33	6.5	21	1,189.4	56.6
Central Plains	33	55	5.2	180	14,069.6	78.2
North	5	8	3.6	104	16,815.1	161.7
Northeast	1	2	2.0	385	19,396.6	50.4
South	1	2	3.0	40	1,831.2	45.8
Whole Kingdom	60	100	5.4	122	9,893.6	81.1

Source: Computed from the Ministry of Industry data, Bangkok.

[a]Adjusted to 1976 prices by using a CPI.

and registered capital rather than as indicated. The adjusted capital labor ratio is 82.1 rather than 161.7.

The number and sizes of the Northeast and South firms were as displayed except that the employment anticipated for the Northeast firm was not realized. The capital labor ratio ranged from 45.8 to 82.1 (see footnote to Table 3-23) and generally conformed to the industry reputation of being somewhat more capital intensive than the non-canning fruit and vegetable processors. However, a word of clarification is needed, namely, 1) several pickling-preserving firms in the Bangkok and Central Plains areas added canning to their previous packaging activities thus became classified as "canneries" and 2) some larger old fruit canneries in those same areas added fish products to their product lines thus may now be listed as fish canneries, and vice versa for large fish canneries that added fruits to their processing lines during slack seasons for the fish industry.

A reason for these canneries not having much higher capital labor ratios can be explained by their use of labor-intensive technologies,

> A large factory does not necessarily need to be capital intensive. At the present level of wages in Thailand, a labor-intensive operation would appear most desirable. Several large factories in Thailand are intentionally using labor-intensive equipment. SAFCOL, the Australian-owned seafood cannery pastes labels manually, citing the fact that the cost of an automatic labeling machine would be equivalent to the cost of 20 years of manual labor. Thai Seri Cold Storage Company (seafood freezing), and Dole Thailand Co. Ltd. (canned pineapple), use manual labor in preference to automatic processing machinery. As labor rates increase in the future, the factory could consider a more highly mechanized operation.[51]

Another crucial dimension of this industry has been the extent of foreign firm involvement. Most of the largest firms were joint ventures,

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[51] Chemonics Consulting Company, "An Agro-Industrial Prefeasibility Study on the Mushroom Industry," prepared for Board of Investment, Government of Thailand, 1979, pp. 37-38.

including two firms developed in collaboration with firms from the United States, two from Taiwan, two from Japan, and one from Israel. Although the available information on foreign capital is limited, it illustrates the magnitude of capital involved, i.e., three joint ventures formed between 1972-74 involved approximately 51 million baht for canned pineapple manufacturing.[52] Thailand also benefited from the imported technologies and market access coming from the joint venture with the Dole (Thailand) Limited Company. This provided especially good marketing expertise and access to the United States markets.

Various attempts by the Ministry of Industry to up-date production and employment figures for the larger firms found that six of these firms recently employed an average of 1,300 employees, thus indicating an employment situation far larger than that found in the official information of registered factories.

An additional dimension to the structure and characteristics of this industry is the presence of public sector firms, i.e., the large capacity of the Processed Food Organization that is owned and operated by the Ministry of Defense, and the two small canneries (one in Chiang Mai and the other in Chiang Rai Provinces) associated with the Government Hill Tribes Programme. Over the years there has also been an expansion of the capacity of the Chiang Mai University's processing facilities in addition to those already in operation by the Institute of Food Research and Product Development (Kasetsart University), and Thailand Institute of Scientific and Technical Research in Bangkok. These additions have further enabled public sector support for and involvement in the expanding canning and processing industry.

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[52]Supanee Artachinda, Ibid., p. 36.

Government efforts to promote the rapid expansion of the food processing industry has been especially evident for a select group of canning firms. From information on the firms granted promotion certificates between 1960-1978, a clear pattern of large scale, mostly joint venture firms can be discerned. The total employment generated by the 11 certified firms identified as processing or preserving fruits and vegetables amounted to over 11,000 persons, with an average of slightly over 1,000 employees per firm and a range from 333 to 3,087 persons. All but two of these firms are largely pineapple canneries. Four are also certified to operate large scale farms (plantations) as a source of raw materials. All had their main offices in Bangkok even though their processing plants were dispersed over several provinces, mostly in the Central Plains area. Obviously the Government promotional schemes were directed at and accepted by large firms. They seemed especially interested if access to foreign technology, capital and markets were a component of the investment package.

CHAPTER IV

NORTHERN PICKLING-PRESERVING FIRMS WITH EMPHASIS ON GARLIC

A. INTRODUCTION

The main objective of this chapter is to examine in detail one set of traditional pickling-preserving firms, i.e., those picklers located in North Thailand. Emphasis is given to understanding how these firms have organized and operated so as to contend with the seasonality of and competition for major raw materials supplied by the fruit and vegetable system. Selected case studies of traditional firms will provide insights for achieving better performance in the industry. The first section of the chapter uses longitudinal and cross-sectional information to describe the general characteristics of the traditional pickling-preserving firms in North Thailand and to analyze key characteristics and practices by firm type. The next section uses an abbreviated subsector approach in which to analyze market behavior and the demand-supply conditions for a major raw material (garlic) used by these pickling-preserving firms. The final sections examine how crop buyers manage garlic procurement for fresh market sale versus pickling firm uses and then diagnose problems encountered by pickling firms.

B. DESCRIPTION OF PICKLING-PRESERVING FIRMS

The pickling-preserving firms interviewed during the research project in Chiang Mai City exemplify the heterogeneity that exists in this

industry. A description of the sample firms relative to their products requires a preliminary distinction between firms serving the "food pickles" market and those providing primarily "snack pickles." The former type of firm will be termed "vegetable dominant picklers" while the latter type is called "fruit dominant picklers."

1. Products and Their Markets

The vegetable dominant picklers were either single product firms specializing in garlic pickling or multiple product firms processing garlic, chinese mustard (varieties for either salty or sour forms), and/or bamboo shoots. The single product firms pickle garlic during the 2-3 months harvest period and ship most of the large clay jars of pickled garlic to urban centers outside of Chiang Mai City, even to exporters near the Thai-Malaysian border. The multiple product firms generally produce two or more types of the aforementioned pickles, sell them in the various local food markets at the retail and/or wholesale levels, and sometimes supply the four moderately large, food market places. Those market places include, 1)two morning markets for the more price conscious consumers, 2) one morning market for the less price conscious, and 3) one evening market. Retailers from outlying areas or small suburban markets generally buy from these picklers if they do not pickle their own products.

The fruit dominant picklers were also either single product firms specializing in mango pickling or multiple product firms processing mainly peaches, mango, olive, and garlic. The single product firms pickle mango during its peak harvest season and ship most of the large clay jars of pickled mango to picklers or wholesalers in urban areas throughout Thailand. The multiple product firms produce several types of pickled and

preserved products in various packaged forms for local and nearby retailers (including their own outlets) and for wholesalers from various parts of Thailand. The bottles or plastic boxes of pickled products usually reflect tourist demand and thus are sold in tourist stores, market place stands, hotels, stands in the "Night Bazaar," near train and bus depots or at the airport, and various entertainment places. Some clay jars or pickled products, especially garlic, are also sold to retailers as "food pickles." Some of these fruit dominant picklers canvassed nearby provinces in the effort to expand their markets, others filled special orders for distant wholesalers, and still others exerted considerable effort at developing new products or alternative packaging forms.

The sales options for food pickles are relatively straightforward and passive, that is, daily sales in most food markets, whereas the sales practices for "snack pickles" are more intricate and active, that is, using every conceivable sales approach related to tourism. Sales near major hotels where the tourists stayed, near or in restaurants frequented, near or in modes of transportation (including roadside stands at bus and car rest stops between Chiang Mai City and Bangkok), and even commissioning tourist agencies to bring busloads of tourists to a pickling factory before departing for their trip south.

Although competition over the full range of traditional bottled, pickled products remained very strong, there was a trend away from traditional pickles and toward producing more dried and sweetened pickled products packed in a variety of plastic containers and testing new sweetened products. Opportunities to expand one's pickling business were in sweetened not traditional pickled products. Several retailers and some

picklers contended that most pickled fruit products, regardless of the raw material, taste somewhat similar. On the other hand, fruits that were pickled then sweetened have a wider range of sweet and sour tastes which more consumers seemed to prefer.

2. Facilities, Processing Technology, and Employment

The distinction between vegetable and fruit dominant firms is not as important for the consideration of facilities, processing technologies, and employment as it was for products and markets served. The basic pickling process itself is surprisingly similar among all firms whereas facilities and employment dimensions are usually unique for each firm, except that single product firms require less permanent structures since they are active for a few months a year while multiple product firms are year-round enterprises. The reprocessing or preserving technology was only used for fruit products.

Facilities include buildings, land, large mixing containers, and thousands of clay jars repeatedly used for pickling. All the firms in the ROFEAP's sample repeatedly used most of their clay jars as processing containers only. Several large single product firms interviewed outside our sample area also sold their product in clay jars. Broken clay jars are replaced by purchasing used clay jars brought to the factory by peddlars or ordering new clay jars directly from factories in their major production area. No machinery is used, except for small electrical water pumps.

Working capital is a major concern for the factories, especially for pickler/wholesalers who not only had money tied up in the large inventories of final products but also in accounts receivable from the

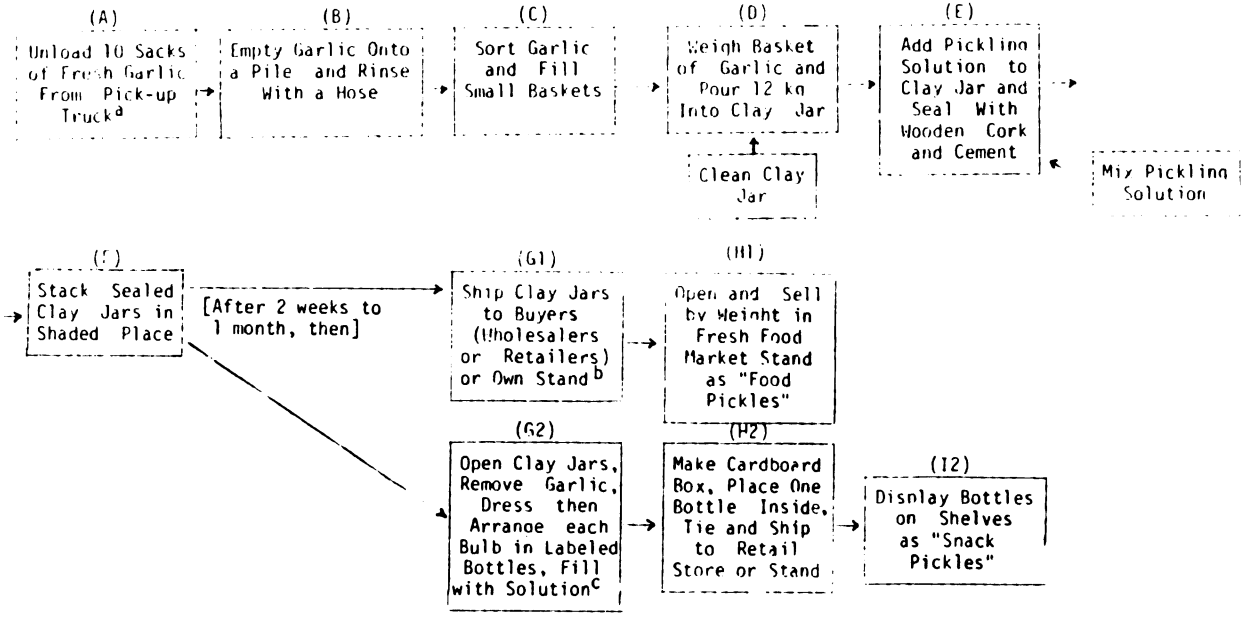
retailers they supplied. The basic need for working capital is dependent on the season of the major raw materials to be pickled, thus for factories with mostly peach and mango products, May and June are very difficult periods to finance.

The processing technology used by the picklers extends back for several generations and has basically remained the same. The absence of machinery or even much large equipment is one of the most striking features of these traditional processors. Equipment is mostly comprised of the large glazed jars for cleaning the raw materials and the medium sized clay jars into which the raw material is packed. A simple brick stove is used for boiling mango and peaches during the reprocessing procedure. The factories within which the processing is usually done ranged from a simple pole barn type of structure to a two-story, reinforced concrete building complete with living accommodations. Shaded storage rooms or pole barns are commonly used to store the glazed clay jars filled with the pickled products. The empty clay jars are usually stacked outside. Since thousands of empty and full clay jars are used, considerable land area is needed as the firm grows in volume of operations.

The pickling process for fruits and vegetables is considered a "trade secret" and varies somewhat from firm to firm. Figure 4-1 depicts the process used for pickling garlic and identifies the extent of labor use in stage I (pickling) and stage II (packaging) for "snack pickles."

Some processors add a preservative during step E, others in step G2, and a few not at all depending on the amount of salt used in the solution as well as the ripeness of the raw material. The pickling solution usually includes varying amounts of salt, acetic acid, and saccharin.

Figure 4-1. Flow Chart of Garlic Pickling and Packing Process



[a] 1 sack = 100 kg of fresh garlic.

[b] This use required more labor in "C" because the garlic was dressed (i.e., some skin removed) then rather than in G2.

[c] One variation for G2 is to break the bulbs into corms, thus forming a different, higher priced product. Also for G2, small, medium or large bottles can be used.

For Stage I (A to F) an average of 1.5 mandays and 6 womandays were used by sample firms and for Stage II (G2) 31 womandays were used based on the original 1,000 kg of fresh garlic.

Source: Interview information

Reprocessing for preserved, sweet-dried peaches is done for pickled peaches that are not as firm as required for a good pickled product. If the peaches are too ripe when pickled, the final product is not firm thus the need for careful selection of the raw material. The sweetening/ reprocessing procedure includes:

1) rinse the pickled peaches, cut out damaged spots, and make three or four cuts along the length of the peach stone which remains within the final product (another form requires removing the stone);

2) put those peaches, together with the sugar-preservative solution into a large metal pot and boil over a charcoal or wood fire;

3) boil until they turn a dark brown color and pour these shriveled peaches into a basket to cool;

4) discard undesirable pieces while spreading the preserved peaches in a single layer on a round, shallow bamboo container for drying in the sun; and

5) after drying, pack the product into an assortment of plastic bags or small boxes.

The amount of sugar basically determines the degree of sweetness or sourness. This basic set of steps is used for sliced, moist mango and sliced and whole peaches. However, these steps are varied in several ways in order to produce new sweetened products with a wider market appeal among women and children. Also additional steps are needed for a dried-sweetened product.

Shelflife of the pickled product depends on the pickling process, ripeness of the raw material, amounts of additives, and the types of container used. If kept in a clay jar and original solution, product spoilage is minimal but once packed in bottles it can spoil within a few months.

Employment patterns reflect the "family firm" nature of all the firms, thus an understanding of the role of the family is essential. The family generally consists of the core management element (husband, wife,

and sometimes an elder child), the other immediate members and relatives. Work that can not be handled by this "family" is done by hired laborers under the supervision of family members. Family members participate directly in the business on a full-time or part-time basis, or broaden the firm's information base or market links by indirect means. The primary activities undertaken by full-time family members included, a) marketing, i.e., both raw material procurement and product sales, b) management of the production process, i.e., mixing the "secret" solutions and supervising hired labor, c) basic recordkeeping, and d) participation in the production and packaging process. Family members with part-time participation may have other employment or study obligations, such as a husband who returned from his government clerical position and helped his wife pickle in the evenings or the daughter who packed pickled products after school and on weekends. Indirect participation included relatives who establish their own stand in the morning market and sell the firm's products, or who work in a food research institute and provide the firm pertinent technical information regarding new products.

Children undertake a wide range of tasks, generally according to their age, time available, and the time frame of the firm in the stuffing, packing, and sales cycle. Young school children spend considerable time after school and on weekends filling the various types of containers with the pickled products. Older children are given practical experience in operating various aspects of the business. For several firms the children have been a major consideration for a firm's longevity and a key factor in the owner-operator's decision to expand the business, maintain it at the current level, or go out-of-business. For instance, one firm credited its strong position to the increasing help of the owner's son while another

firm mentioned that if the owner had more family members, he could contact more customers, i.e., sell more.

Temporary laborers, who are the bulk of the hired labor force, are generally hired during the clay jar stuffing periods, such as February, March, May, June and July. Since the technology used in the pickling process is relatively simple and required no special skill, most picklers considered their hired workers, whether permanent or temporary, as non-skilled or at best semi-skilled laborers. Methods used to supervise their hired labor seemed to vary from firm to firm. Some firms closely supervise and set the pace for each type of work undertaken. Others give general directions and let the workers set their own pace. Permanent workers are few but are given responsibility for important steps within the production process, like teaching and supervising temporary laborers and sometimes participating in product sales activities.

Labor use patterns generally reflect two conditions, 1) all factory's periodic need for causal labor, i.e., the high demand for labor during the short harvest periods of the perishable raw materials, yet a limited need for hired labor during the balance of the year, and 2) some factory's need for continuous labor to handle a multiplicity of products and/or forms in which the products could be packaged. In other words, not only processing related activities but also marketing related activities influence the labor use patterns. The distribution of work between males and females is usually relative to physical strength. The male workers carry raw materials, stack clay jars, and load or unlead trucks while the female workers stuff clay jars, and dress and pack final products. The pay differential by the sex of the laborer ranged from ฿5-10/day with male workers receiving ฿30-40/day and the female workers earning ฿25-30/day.

Workers who had previously worked for a particular factory received at least a few baht per day more than new employees for the same type of work.

3. Raw Materials and Fabricating Materials and Parts

The role of raw materials and fabricating materials and parts varies substantially among pickling firms. By raw materials is meant agricultural ". . . goods which will become a part of another physical product and which have received no processing at all other than that necessary for economy or protection in physical handling."[1] Whereas fabricating materials and parts, ". . . are industrial goods which become an actual part of the finished product. They have already been processed to some extent (in contrast to raw materials). Fabricating materials will undergo further processing . . . . Fabricating parts will be assembled with no further change in form."[2]

The major raw materials for the Chiang Mai pickling-preserving firms included garlic, peaches, mango, and chinese mustard. Figure 4-2 shows their typical acquisition periods. During those periods a few provincial wholesalers, many village farmer-merchants (acting as commission agents), and several town buyers are contacted by or contact the picklers before delivering the agreed upon pick-up truck loads of raw materials to the local pickling factories. The very large wholesalers usually ship a large portion of their commodities to distant picklers, such as Bangkok pickling factories, during the latter part of the harvest season when prices were lowest.

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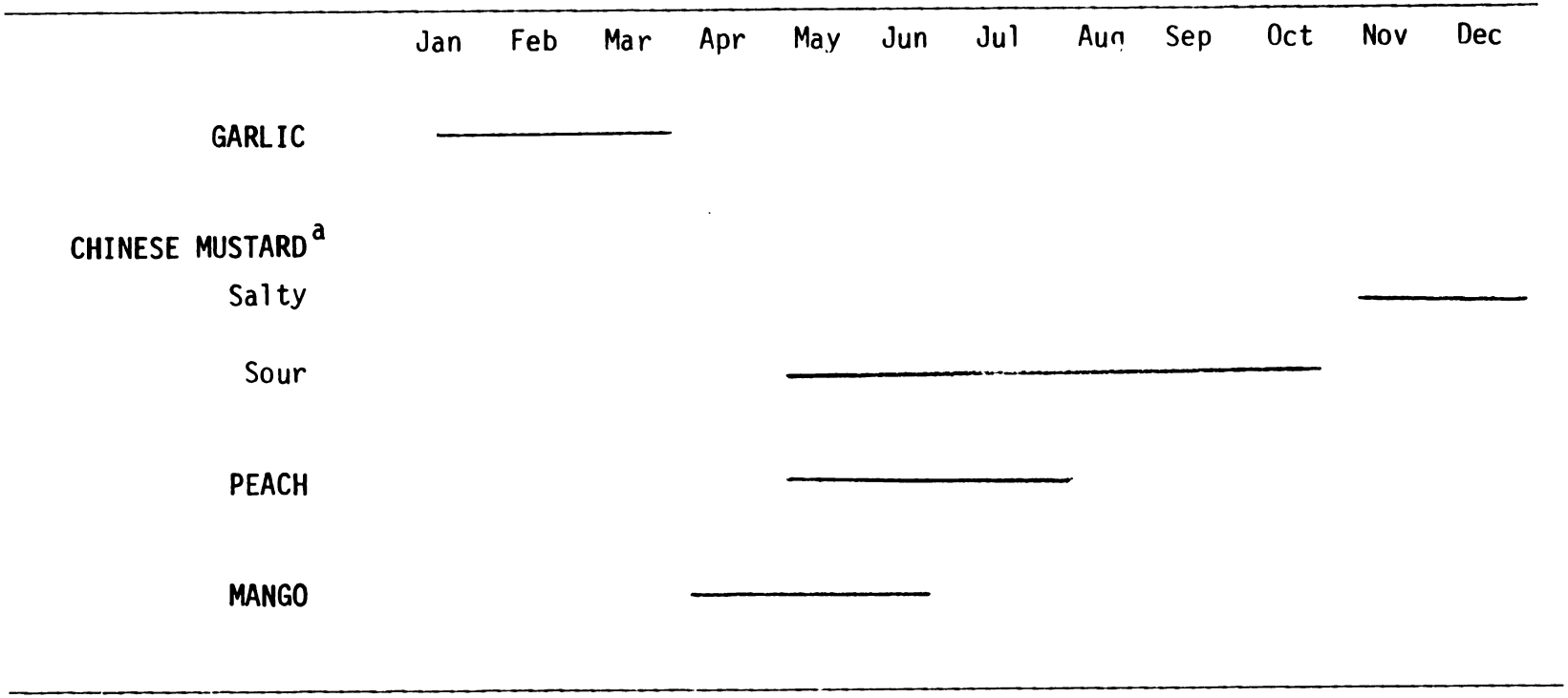
[1] Stanton, Ibid., p. 147

[2] Ibid., p. 149.

Figure 4-2. Primary Harvest Months for Garlic, Chinese Mustard, Peaches, and Mango in the Chiang Mai Valley



[a]Designates the harvest periods for the different varieties used in producing sour or salty pickles.

Source: Interview information

Since each raw material usually has its own distinctive set of suppliers who operate out of different locations, the pickler's input procurement process is a very time consuming and demanding activity. The pickler has to accurately assess the supply condition for each raw material every year. This reinforces the need to establish long term relationships with a particular set of commission agents and/or wholesalers for the bulk of their needs while responding to new potential suppliers for the remaining amounts. This arrangement reduces transactions costs and risks of inadequate and/or untimely supply.

Initial raw material prices seem to originate from the interaction between the supplier and the pickler with the latter in a somewhat stronger position. From the price information obtained and related observations it seems that information on current raw material prices is informally exchanged among the older factories, although they would not admit this. Likewise, individual suppliers deal with more than one factory, thereby facilitating the exchange of information and the formation of acceptable prices. Quality, type of supplier, time of purchase, and the limited use of credit affect the individual factory's raw material price which varies within the usual 2-3 months of procurement. The raw material suppliers whom we interviewed indicated wider price differences than the factories mentioned.

The raw material characteristics as determined from pickling firms and suppliers sampled are given in Table 4-1. Since the differences in raw material characteristics exceed their similarities, each will be considered briefly. Pickling garlic grown in the two major low-land production areas, i.e., one north of the Chiang Mai Valley (Fang area) and the other in the middle and lower portions of the Chiang Mai Valley (Lamphun

Table 4-1. Characteristics of Major Raw Materials

Characteristic	Raw Material			
	Garlic	Chinese Mustard	Peach	Mango
1) Major Production Locations	Lowland, paddy fields in the Chiang Mai Valley and other northern provinces	Upland and lowland fields around the country	Mountainous areas near the Chiang Mai Valley	Upland and lowland orchards around the country
2) Main Procurement Season for Pickling	January to March	November to early January (Salty form)	June to July	May to June
3) Prices during 1979/80 Season	฿5-7/kg	฿2-3/kg	฿6-7/kg - local ฿10-14/kg - improved	฿3-4/kg
4) Alternative Uses	Fresh garlic for pickling; semi-dry and dry for consumption	Mostly for pickling but some for consumption	Mostly pickling	Some for pickling but most for consumption
5) Varietal Diversity for Pickling	Single major variety in northern region	A few varieties	A wild and cultivated, traditional variety; improved varieties	Few for pickling; many for consumption
6) Cultivation Period	90 days	45 days	3-5 years before a yearly harvest	Several years depending on variety
7) Problems Encountered	Inconsistent quality and recent high price	Immature crop sometimes sold to the factory, thus spoilage rate was high	High price and resistance of hilltribes to reducing the price	Inconsistent quality from year to year

Source: Interview information.

area), is locally obtained through many local farmer-merchants and crop buyers in or near those production areas. The hill tribes people (Hmong) carry the peaches down the mountains to the highland towns and either sell most of them to a few crop buyers, who assemble and buy the peaches to sell at the factories, or bring their peaches directly to the factory. Mangoes were received from different types of small and large scale fruit wholesalers who handled several varieties of mangoes, besides those suitable for pickling. Chinese mustard suppliers seemed to include a larger proportion of producers than other types of raw material suppliers, in fact, pickling factories said that so many farmers came to sell their harvests that the picklers could exert considerable pressure on prices, yet get good quality for the cool "in-season" crops. Yet, for the "off-season" crops they usually had to arrange contacts with specialized vegetable gardeners and pay higher prices.

Another pertinent characteristic is the country-wide availability of certain raw materials, such as Chinese mustard and mango, which helps explain why most of our sample firms generally processed only enough for local or nearby consumer demand with limited processing to meet demand from tourists. On the other hand, garlic and peaches as primarily northern crops were emphasized by our firms.

A pivotal point frequently mentioned by sampled firms as directly affecting the firm's performance is the quality of the raw material. The ability of the manager to identify and receive the raw material at just the right stage of ripening is critical for the production of a high quality final product. Thus, the selection skill and the communication of that quality specification to suppliers is one of the underlying factors differentiating firm performance.

Table 4-2 identifies several of the basic characteristics of the important fabricating materials and parts used by the sample firms. Besides the sample firms, several wholesalers and retailers, both in Chiang Mai and Bangkok, were interviewed for this information which exhibited considerable variation by type of good and sales outlet. Since most of these industrial goods come from the Central Plains area or abroad, the Bangkok picklers have a clear comparative advantage in their procurement and prices paid. Yet from an accessibility standpoint, the lead time in procuring these goods (as required by the Chiang Mai picklers) seems relatively short regardless of the source or type of input. Credit was usually available in some form but it depended on the type of supplier and the creditworthiness of the particular firm. The use of fabricating materials, such as preservative, acetic acid, and saccharin, was common among most pickling firms; however, sugar and bottles were mostly used by fruit dominant picklers and accounted for a substantial part of their production costs. All firms questioned said that any additional working capital would be spent on raw material rather than cash or large volume purchases of fabricating materials or parts.

C. ANALYSIS OF CHARACTERISTICS AND PRACTICES OF PROCESSORS BY FIRM TYPE

The following analysis of this set of firms will compare and contrast key factors, focus on the extent and implications of raw material-final product interdependence, and develop inferences from the case study observations and interview data. Because most firms provided misleading information on one occasion or another, especially regarding "sensitive issues," the researcher had to use his judgment regarding information reliability based on 1) an evolving understanding of the industry,

Table 4-2. Characteristics of Important Fabricating Materials and Parts

Characteristic	Bottles		Acetic Acid	Salt	Saccharin	Sugar	Preservative
	Glass	Plastic					
1) Major Sources of Supply	Factory near Bangkok	Factory near Bangkok	Importer in Bangkok or Chiang Mai Wholesaler	Chiang Mai Suppliers	Importer and Local Factory	Bangkok or Chiang Mai Wholesaler or Retailer	Importer or Bangkok or Chiang Mai Supplier
2) Prices During 1980/81 Season	฿7-15*	฿10	฿430-450/ container	฿0.8-1/kg	฿85-95/lb	฿8.50/kg	฿1,400/50 kgs
3) Lead Time for Delivery	3-7 days	3-7 days	2-3 days	few days	few hours to few days	2-3 days	few days
4) Maximum Inventories	100-10,000 units		10-100 containers	20-250 sacks	few pounds	100 sacks	1 drum
5) Observations	Trend away from glass and toward plastic containers Credit available		Trend away from Japanese and toward Chinese brand Credit from importer	Credit available	Credit available		Credit available
6) Problems Encountered	Breakage and heavy weight	Limited transparency gave contents a poor appearance	Rapid rise in price	Some difficulty of obtaining in the rainy season	Uncertainty about government policy Poor quality of local product	Rising price	

* Includes transportation and breakage for medium sized bottles

Note: 1) If the product is sold in clay jars, new clay jars are ordered from the Ratburi factories for ฿26+ or used ones are purchased for ฿18-20 each.

2) Single price figures represent the most frequently mentioned value whereas price ranges indicate wide variations in values due to considerable variations in quality or outlet used.

Source: Interview information.

2) observations of the firms' facilities and operations, 3) cross-checks between different questionnaires, and 4) discussions with other informants. Consequently, the distinction between observation and inference occasionally blurs the origin of the insights gained. Likewise, the effort to relate internal and external factors and relationships to raw material procurement processes, sometimes results in suggestive cause-effects rather than entirely verifiable insights. The unique nature of each firm adjusting its operations to complex and ever changing product and raw material market conditions may also make duplication of some insights difficult.

After an overview of the firm analysis, the analysis of each firm type will be presented according to its market segmentation, internal organization and operation, and raw material procurement practices. Multiple product firms will be considered before the single product firms.

1. Overview of the Firm Analysis

The heterogeneity of the firms interviewed required a classification scheme designed to stratify firms into meaningful units of analysis. The initial distinctions according to dominant product types, i.e., fruit versus vegetable dominant firms, and number of products processed, i.e., single versus multiple product firms, are retained because of their explanatory power. An additional criterion for classification purposes is the extent of forward integration, i.e., pickling plus wholesaling or wholesaling and retailing as major activities. Other criteria, such as volume of output, number of employees, managerial characteristics, etc., were not as useful in analyzing differences in input procurement practices, processing technology, and product sales patterns.

To focus and integrate the analysis of the procurement-processing-distribution dimensions a commodity subsector framework was organized around a primary raw material/product used by the majority of sample firms. In other words, a "pickled garlic subsector" allows the researcher to position the analysis of picklers within the continuum of garlic production-processing-distribution for both fresh and pickled forms of garlic.

The positions of the various types of firms within the pickled garlic subsector in relation to their alternative sources of raw material and primary markets is depicted in Figure 4-3. Each type of firm depicted has different product specialities as well as primary and secondary marketing channels with different product prices and some differences in product form. Table 4-3 presents the distribution of firms within the pickled garlic subsector as found in the Chiang Mai Valley during the study period. The initial sample of eight firms represented the universe of firms located in the early survey period and those from whom extensive cross-sectional and longitudinal information was gathered. As more was learned about the industry, many additional firms were discovered, often in the most unlikely places.

A brief description of each type of firm will provide the background for additional analysis. The "Vegetable Dominant" Multiple Product Integrated Pickler/Wholesaler/Retailers (VDR I) usually sell most of their pickled products (primarily vegetables) in morning fresh food markets on a daily basis. Of the four firms actually identified in the ROFEAP's area three firms were in our sample (Table 4-3).[3]

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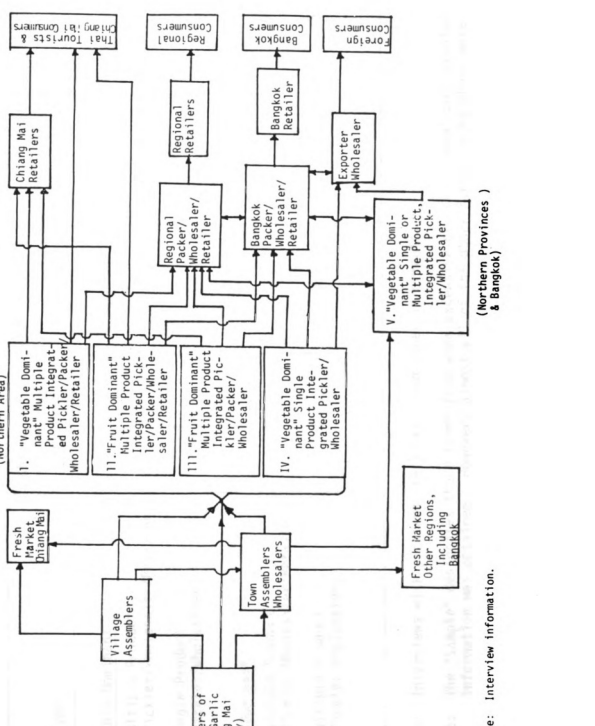
[3]Besides the manufacturing firms classified above there were household picklers/retailers who pickled 10-100 clay jars of vegetables per season besides purchasing from larger pickling firms to sell in small local markets dispersed throughout the Valley. Although we occasionally observed these very small enterprises, they were not included in this study because they are primarily sales oriented and are part-time enterprises.

Figure 4-3. The Chiang Mai Valley Pickled Garlic Subsector



Source: Interview information.

Table 4-3. Number of Firms Within the Pickled Garlic Subsector as Found in the Chiang Mai Valley

Firm Type	Chiang Mai City (ROFEAP area)		Other Firms in the Valley	All Areas
	Universe	Sample		
Vegetable Dominant				
VDR I Multiple Product (Pickler/Wholesaler/Retailer)	4	3	na	4+
VDW IV Single Product (Pickler/Wholesaler)	4	0	4+	8+
Fruit Dominant				
FDR II Multiple Product (Pickler/Wholesaler/Retailer)	5	2	1	6
FDR III Multiple Product (Pickler/Wholesaler)	3	3	0	3

Source: Interviews with picklers, retailers, and other informants.

Note: The "sample" designates those firms from whom extensive cross-sectional and longitudinal information was obtained. However, almost all of the other firms listed above were interviewed at least once.

The "Fruit Dominant" Multiple Product Integrated Pickler/Wholesaler/Retailers (FDR II) set of firms included five firms operating out of large retail stores or market place stands on a daily basis. Of these five firms, two were included in our sample.

The "Fruit Dominant" Multiple Product Integrated Picklers/Wholesalers (FDW III) were found to include only three firms, all of which were in our sample. One firm was quite large while the other two were of moderate size.

The "Vegetable Dominant" Single Product Integrated Pickler/Wholesalers (VDW IV) included an uncertain number of firms, four of which we finally located and briefly interviewed. They ranged in size from medium to very large, multiple enterprise firms. The difficulty of finding and interviewing this type of elusive firm arose because of their brief period in operation (only 2-3 months in business), pickling was often a sideline business along with year-round trading in other commodities (such as grains) or other business (such as welding), and the shipment of their products to markets outside the Chiang Mai area. Within a couple of months the larger firms pickled garlic in thousands of large clay jars for special orders from various regions of Thailand, then shipped truck and railroad carloads of the fragile clay jars of pickled garlic out of this area rather than compete in the local markets. Figure 4-3 distinguished between this type of firm operating in the Chiang Mai Valley (IV) and those firms operating outside this area (V) because the latter firms have become a major source of competition within recent years and thereby influencing the growth of the former set of firms.

2. Fruit Dominant Pickler/Wholesaler/Retailers (FDR II)

a. Market Segmentation

The larger firms in this FDR II category relied heavily on their retail stores and product reputation as they competed for shares of the "Thai tourist trade," especially for the less price conscious tourists. Thai tourists coming to Chiang Mai City were primarily interested in "snack pickles" as gifts. Quality was of paramount concern, whether in terms of product appearance, taste, or extended shelf-life.

The firms in this sample averaged over 20 years in business which is far more than any of the other types of picklers. This experience and apparent prosperity suggests success in adjusting to the variability inherent in this type of business. The oldest firm relied on the good product reputation earned by the founder of the firm. The owner of the next oldest firm continually stressed his ability to select quality raw materials as the key to his acknowledged good quality, final product. A more recent firm procurred the endorsement and seal of approval from a national organization that judges quality for a wide range of consumer products in Thailand.[4] All these firms had their brand symbols on their pickled-preserved products. Some firms remarked that processing techniques (ingredients) influenced the quality of their products but without selecting raw material at the proper stage of ripening, high quality could not be achieved regardless of processing technique.

Retail store inventories included not only the firm's own brand of pickled products but also products of other types of local food products,

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[4]This firm was interviewed outside of our basic sample.

such as dried strawberries, unsalted potato slices, dried longan and bananas, and a wide array of jams, jellies, and canned fruits and vegetables. The stores located within the "Night Bazaar" area (i.e., a colorful market place where Thai handicrafts and related articles can be purchased every evening) stocked some non-food items of interest to tourists, such as beverages and film. The family members manning the stores were especially alert to help customers, in contrast to the disinterested attitude of hired clerks observed in other stores.

Firms in this category did not rely just on their retail outlets to move products. The largest and most popular firm was very selective in responding to other retailers' requests to handle his "snack pickles." His wife also sold clay jars of pickled garlic in the morning wholesale market as "food pickles." Occasionally this firm sold special orders to wholesalers. Whereas the next largest firm recruited and stocked several newly established retailers with its "snack pickles," developed new product lines for new "snack pickle" markets, and actively sought opportunities to sell to wholesalers. In other words, apparently similar firms used substantially different product marketing strategies, i.e., the former concentrated on a narrow array of quality products channeled into both "snack and food pickle" markets while the latter firm broadened the array of quality products and competed in several "snack pickles" markets locally and in distant areas.

For a perspective on future marketing patterns it is important to note the trend away from glass bottles (easily broken in transit) to lighter weight, durable plastic bottles. The more widely recognized and prominent brands can now reach distant markets which were previously inaccessible because of high breakage rates. And in distant markets the

preferences of Thai consumers, outside of Bangkok,[5] for recognized versus no-name brands could indicate a future economic opportunity for these firms.

Due to the interdependence of procurement, processing, and distribution the implications of these alternative marketing approaches should directly impinge on internal firm organization and operation as well as procurement patterns. The implicit question of why the largest firm continually referred to "quality" issues during various discussions while the other firm asked about new product ideas or sales opportunities seems to be answered by an understanding of their somewhat diverse, yet overlapping markets.

The seasonality of FDR II sales of major products was considerable as average gross sales during the peak sales month exceeded the slack sales month by 4½ times. During the peak tourist season which corresponded to the first few months of the year, near Chinese New Year (January or February) and Thai New Year (April) Festivals, sales were highest. For their medium sized bottles of pickled garlic their average retail price was ฿33.50/bottle and ฿28/bottle an average wholesale price. Since their variable costs were computed at ฿19.89/bottle in the 1979/80 season, their margin was ฿13.61 or ฿8.11/bottle for retail or wholesale purchases, respectively.[6] A 10-15 percent discount was given large buyers. These margins enabled FDR II to actively bid for fresh garlic in the early part of its harvest season.

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[5]Consumer preference for branded products was noted in Hans Thorelli and Gerald Sentell, Consumer Emancipation and Economic Development: The Case of Thailand, JAI Press, 1982.

[6]Fixed costs were difficult to distribute over all products due to limited information.

Since these firms also sold other tourist-related products to attract a larger clientele, they not only earned the retail margin on their own but also a margin on products usually obtained from manufacturers on credit. These firms seldom complained about cash flow problems, unlike the FDW III firms. Also since most of their own products were sold at the retail level in their own outlets, they could carefully monitor the amounts of products bottled and exhibited on their shelves, thus reducing the possibility of spoilage.

b. Internal Organization and Operation

Unlike the other types of picklers, these firms had their households occupying the rooms above or behind their retail store, instead of adjacent to or above their pickling factory. This arrangement enabled them to operate their retail stores 12 hours or more everyday of the year and reduced the commuting costs incurred by the VDR I retailers.

A major distinguishing feature between the two sample firms in this category is the difference in factory location. The factory of the larger firm was located near Chiang Mai City's downtown area, thus workers were usually recruited from the urban labor pool. Due to a number of factors the firm experienced difficulty hiring sufficient numbers of industrious laborers. Consequently, laborers from nearby villages were transported as needed to the factory in the firm's vehicles. This practice cost the firm ฿5 per worker per day for transporation in addition to ฿30-40/day for male and ฿25/day for female employees. One way the firm seemed to have adjusted its operations to contend with this condition of paying the highest wages paid by any firm was to use labor less frequently, i.e., use laborers at 2-3 week intervals during the slack season rather than on

a daily basis as done by other large firms. Such periodic use of labor could support the processing of large quantities of a few basic products but would be untenable if a wider range of products were involved.

When asked why labor time and costs were especially high for bottling garlic, the response was that the appearance of garlic in the bottle was a "quality" feature which required more labor. Bottling labor time (costs) for the two firms with reputations for "quality" bottled garlic were indeed substantially higher than those of the other firms.

The other firm of this type located its factory in a rural area and recruited local villagers as a core group of 10 to 15 "temporary laborers"[7] who worked 28 days every month with additional laborers hired during the peak raw material periods. Unlike the firm above, this firm's labor costs were relatively low at ฿20-25/day for the female laborers[8] who were motivated to work well and were readily available. This firm processed a medium amount of the basic products plus small amounts of several other products in a wide variety of forms. Whether the different labor conditions and costs directly influenced the scope and depth of product lines or vice versa is inferable rather than a testable relationship.[9] What is clear is that the broad product scope would have been extremely expensive and perhaps unmanagable within the downtown area given that large firm's family labor and business structure.

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[7]Because there was considerable turnover in personnel, the firm considered them "temporary."

[8]The male family members handled the heavy lifting so that only female workers were hired.

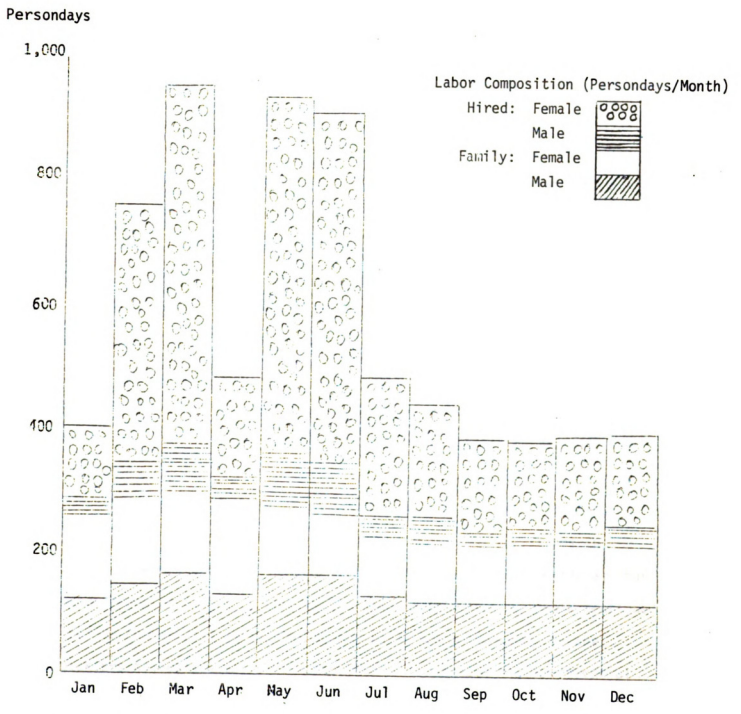
[9]It is interesting to note that when labor figures are aggregated on a monthly basis these very different labor use patterns are not evident.

The distribution of family labor by gender for the FDR II firms was consistent across firms. Women family members generally handled product sales whereas men were usually responsible for the raw material procurement and production management. This division of labor allowed women to come in direct contact with consumers, a popular method of retailing food products. As will be seen, this pattern is substantially different for that of the FDW III firms.

The seasonality of labor use and relationship between family versus hired labor for the FDR II firms can be seen in Figure 4-4. Family labor time equaled or surpassed hired labor time during the months outside the peak months of labor use. The magnitude and seasonality of labor use for these firms reflected their heavy involvement in both retailing and processing operations as well as the mix and forms of products pickled.

Due to the fluidity of family labor use in retailing and processing, it is extremely difficult, if not impossible, to clearly identify the time spent in each. Likewise, separating out labor used in retailing products purchased from other processors versus those pickled by these firms is not possible, given the information available. It cannot be verified whether the large family sizes (considering children or relatives actively involved in the business) significantly contributed to firm growth or just benefitted from that growth in terms of employment opportunities. Even though these firms had larger numbers of active family members than the other types of firms and frequent mention was made of the benefits from their involvement, these impacts seemed to be more supporting than motivating firm growth.

Figure 4-4. Seasonality and Composition of the Labor Force for an Average FDR II Pickling Firm, 1980-81



Source: Survey information

c. Raw Material Procurement Patterns

The FDR II firms had fairly similar procurement patterns for the major raw materials that they had in common. Each firm dealt with about ten commission agents for garlic, paid cash for the delivered raw materials and quickly stuffed the jars with the fresh garlic. For peaches both dealt with commission agents but the larger firm also bought directly from several hill tribe growers. Again they both paid cash and quickly stuffed the pickling jars. For mangoes a few wholesalers provided their needs for which they paid cash.

The manager of the larger firm was very vocal in explaining what constituted a quality versus less preferred raw material for each product. The young person responsible for the other firm's procurement had more difficulty explaining the intricacies involved in selecting quality raw materials and seemed to depend more heavily on the commission agents' judgment. Outside firms had occasionally commented on the general lack of interest in the pickling business by this young man as a reason for that firm's decreasing quality since the founder of the firm retired. The gist of this observation is that procuring raw materials does require some skill and interest, without which it is difficult to maintain the reputation for quality products.

If raw material price, type of supplier and the terms of exchange (cash versus credit) were somewhat indicative of quality, firms in the FDR II category could be said to have a higher quality raw material than other types of firms. A commission agent interviewed at length mentioned that he coordinates deliveries according to the prices paid by the picklers he deals with. The largest FDR II firm received preferential treatment.

3. Fruit Dominant Pickler/Wholesalers (FDW III)

a. Market Segmentation

The three sample firms in this group had substantially different marketing strategies for their "snack pickles." Although all have been in business over ten years, only one was begun by a local entrepreneur. According to retailers and other picklers, the largest pickler of this type produced very good quality pickles whereas the two medium sized firms sold moderate and sometimes poor quality products.

The largest firm was extremely active, not only in supplying local retailers with its higher priced products, but also in canvassing retailers in surrounding provinces with truckloads of bottled pickled products and paying commissions to tourist organizations or agencies to bring busloads of tourists to his factory. The next largest firm actively supplied several local retailers with its moderately priced products and passively responded to wholesaler orders for various sized batches of products. The smallest firm reported only filling orders from a regular group of wholesalers with occasional outside orders. The latter two firms reprocessed a considerable amount of pickled peach and mango but it remained unclear whether market demand or inferior raw materials caused that practice.[10] The largest firm produced mostly pickled products.

These pickler/wholesalers contended that the costs of establishing their own retail outlets were beyond their financial means. It was also observed that none of these firms had large enough families to manage a

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[10]Recall that peaches and mango which were too ripe when picked, produced an unacceptably soft pickled product, consequently they were reprocessed into wet or dry, salty or sweet products and packed in plastic boxes.

retail outlet. One firm complained that it could not even expand sales as a wholesaler because there were no other family members to help out.

An important point to note is that the profit from wholesaling pickled products was handicapped by several factors, 1) the common practice of not receiving payment for the products until delivering the next order (usually about 30 days later) which meant large accounts receivable at various times of the year, 2) damaged containers or spoiled products were returned to the pickler at no charge to the wholesaler or retailer,[11] 3) much time and expense was incurred by regularly delivering the products to the retail stands, and 4) considerable competition from firms attempting to expand their volume of business kept product prices from increasing or terms of trade from improving for these firms. The 10-20 percent discounts offered by these wholesalers further depressed their earnings when compared to the FDR II picklers who sold a majority of their products at retail prices. Only the largest wholesaler had a volume of business approximating that of the FDR II firms.

The seasonality of product sales for the FDW III major products was particularly extreme. The sales pattern reflected the tourist demand (which was the same for the FDR II firms except that variations by month exceeded those of the FDR II firms, i.e., over 7 times the lowest sales period for the peak month relative to 4½ times for FDR II firms).

The medium sized bottles of pickled garlic for this type of firm sold at an average wholesale price of ฿28.33/bottle. Since their variable costs averaged ฿19.96/bottle in the 1979/80 season, their wholesale

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[11]Since considerable spoilage arose if the products were improperly displayed or the amount supplied exceeded that retailer's ability to sell it, much time and effort was used to teach and monitor retailers, especially its new customers.

margin[12] was ฿8.37/bottle for most wholesale outlets. A 15-20 percent discount was given larger buyers. In various retail outlets their brands cost from ฿30-34/bottle before haggling over the price.

Unlike the FDR II firms which earned returns on other product sales, these pickled products represented the only known source of business income. And as previously noted, the purchasing periods for peach and mango raw materials were more than five months in advance of the peak sales period; consequently the working capital constraint not only included costs of raw materials, labor, and fabricating materials and parts, but also costs associated with storing huge product inventories for extended periods. In summary, the combination of all those factors required astute businessmen to manage and balance such a complex set of interrelationships, especially if spoilage becomes a problem.

b. Internal Organization and Operation

As mentioned for the FDR II firms, the location of the factory and types of products affected the internal organization of the individual firm. The largest firm in this group was located near a major highway on the outskirts of Chiang Mai City. Unlike all others in the sample, this firm had built living accommodations for a few permanent employees. They paid their permanent staff relatively well at ฿35-50/day (3 males) and ฿30-32/day (6 females) while temporary labor was periodically hired at ฿25-27/day (females). The land area available to the firm was adequate to substantially expand the processing facilities.

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[12]Overhead costs were not distributed among their various products due to the lack of information available. Estimates of spoilage were not obtained.

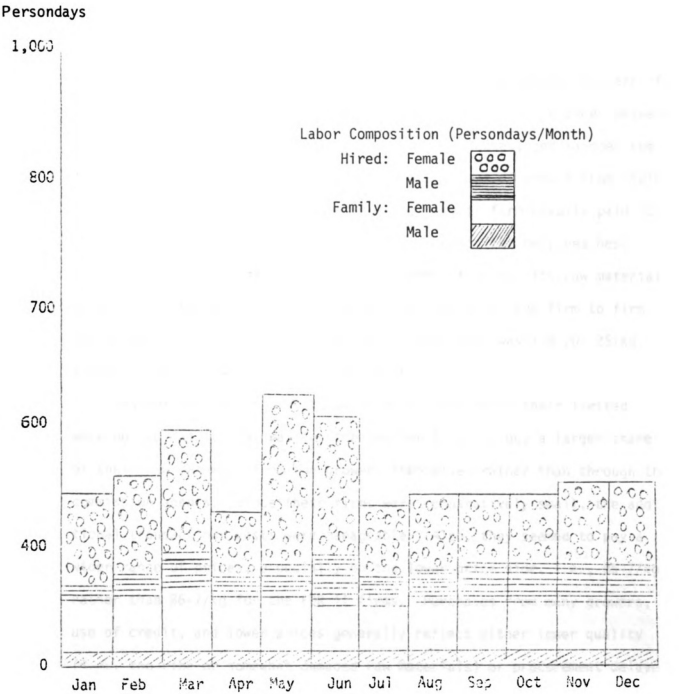
The next larger firm in the group was located in rented buildings in a suburb of Chiang Mai City. Its permanent laborers consisted of 2 males (฿30/day) and 8 females (฿25-30/day) from the surrounding area. The temporary female employees were often very young and reportedly earned ฿20-25/day. The rooms for the family were on the floor above the crowded factory which could not be expanded beyond its current boundaries.

The smallest factory was found closer to the downtown area occupying the compound and first floor of a two-story building. It employed a sales agent, 3 male relatives (฿35/day), and 2 female relatives (฿25/day) on a steady basis with periodic use of temporary labor at ฿25/day (female); however, seasonal availability of additional labor was a concern. This firm's factory had become very crowded until recently when construction was completed on a new factory outside of the city.

Figure 4-5 illustrates the seasonality of labor use which was somewhat less than for FDR II firms because of the extensive reprocessing activities by this group of firms. Female and hired labor were clearly dominant although family labor supplied a large component of the labor used. Most firms acknowledged that the reprocessing was quite expensive and not as profitable as selling the bottled pickled products. However, since the reprocessed products had their own market demand and it was difficult competing against the strong market position of the FDR II firms for bottled products, these firms emphasized reprocessing of peaches and mango.

For the FDW III firms the male family members were responsible for procuring the raw materials, delivering a fresh supply of products, receiving the payment due from the prior delivery, and overall recordkeeping. The women usually managed the production process and supervision of

Figure 4-5. Seasonality and Composition of the Labor Force for an Average FDW III Pickling Firm, 1980-81



Source: Survey information

factory labor. A likely reason for this distribution of labor is that it can be hazardous for the women to travel alone while carrying money from the sales. The women managers usually preferred hiring female laborers because Thai male laborers found it difficult to take orders from female bosses, and female wage rates were lower. One female manager was especially vocal about tensions between a female boss and male laborers.

c. Raw Material Procurement Patterns

All FDW III firms had substantially the same procurement patterns for their major raw materials, yet there were significant differences between these firms and the FDR II firms. For garlic, peaches, and mangoes the two smaller FDW III firms obtained a certain amount of credit from their larger suppliers (commission agents). The largest firm usually paid 90 percent or more in cash and the balance in credit (for only peaches). The smallest firm obtained as much as 25 percent of all its raw materials on credit. The terms of credit varied substantially from firm to firm and commodity to commodity but the most common form was a ฿.20-.25/kg higher price paid within one to two months.

Besides the use of credit, another way to stretch their limited working capital further was for the smaller firms to buy a larger share of their raw material from the growers themselves rather than through the commission agents. Since these firms were comparatively small, the additional transactions costs were manageable. Also, they seemed to pay a wider range of prices, especially on the lower price side, i.e., ฿5-7/kg rather than ฿6-7/kg for the FDR II firms. Purchases from many growers, use of credit, and lower prices generally reflect either lower quality (i.e., too ripe or somewhat damaged raw materials) or procurement delayed

until later in the season. The large amounts of reprocessing undertaken by these two firms would support the lower quality explanation (as would the assertion of retailers interviewed) but the firm's unwillingness to discuss this quality issue did not allow us to resolve it.

4. Vegetable Dominant Pickler/Wholesalers/Retailers (VDR I)

a. Market Segmentation

The three firms in this group were quite different from each other in terms of size, variety of products, years in business, and extent of pickling versus sales activities. They were similar in market outlet and basic product lines. The largest and oldest firm has been in business 14 years whereas the other two firms averaged 3 years. The operators of two of the three firms mentioned that their fathers were originally vegetable gardeners who began pickling and retailing chinese mustard only in its peak harvest season before expanding to year-round pickling/retailing (VDR I). Such a link between a household at first cultivating mustard, then pickling and selling it in small stands, and finally becoming a pickling firm (VDR I) seems to be a common pattern in this type of business.

Early every morning a family member or two commuted from the factory in order to set up the firm's market stand in the morning food market; filled customer orders by taking the pickled products ("food pickles") out of basins or open clay jars and putting the desired amounts in plastic bags on a weight basis; and by late afternoon returned home (factory) with the unsold stock. These firms primarily supplied the "food pickles" market thus their sales pattern reflected the daily diets of local consumers.

The larger firm operated a large stand in a newer market of less price conscious consumers, thus it could sell a wider variety of pickled fruit products in bottles and plastic boxes besides the basic four pickled vegetables of garlic, chinese mustard in salty and sour forms, and bamboo shoots in plastic bags. The other two firms had small stands in the older market where consumers were supposedly more price conscious, thus they only sold the basic four pickled products placed in plastic bags according to the amounts that consumers wanted or in standard sized ฿1, ฿2, or ฿5 bags. Interestingly this latter market place has an area set aside for a wide array of tourist items which not only included handicraft sellers but also retailers of bottled pickled fruits, whereas the other market sold bottled snack pickles along with food pickles. The main point is that even for retailing "food pickles" a wide variety of sales approaches (standardized versus individualized amounts) or marketing options (separation or combination of bottled and bagged products) directly affected firm size and growth opportunities. These firms were clever at seeing new opportunities.

During the survey period the largest firm attempted to develop a branded product for fruit pickles similar to those of the FDR II and FDW III firms because the basic pickling process was similar for vegetables and fruits and she considered her customers were quite well off. However, according to the operator, her regular customers in the morning food market did not seem to respond as anticipated. And efforts to develop new outlets, such as restaurants near the train station, did not work out well, consequently the activity was curtailed. Her sales of clay jars of pickled vegetables to wholesalers were reportedly quite minor. Meanwhile the larger of the other two small firms used its large family

to diversify business into trading certain pickled products shipped in from other regions and retailing other non-pickled food commodities. This was undertaken because the firm considered the market for food pickles too tight for further expansion without substantially more working capital. The smallest firm with few family members continued business at about the same level year after year.

Although these firms considered their profit margins to be better than wholesalers, they acknowledged that there were constraints on sales volume due to the numerous competitors in the retail market places. Likewise efforts to compete with branded snack pickles from a food pickles stand was very difficult, again due to intense competition in a saturated market.

In general the market outlets for this type of firm were not nearly as diversified as for the FDR II and FDW III firms. On the other hand the seasonality of their sales was not nearly as extreme nor were cash flow (working capital) constraints as problematic since daily earnings could pay labor wages, etc. without further loans. Likewise, the fairly continuous turnover of certain products, such as chinese mustard, meant less capital was tied up in unsold inventories. Although several of these features made it easier to do business, its adverse effect was that so many persons were in this business that retail competition was extremely fierce. That intense competition was particularly acute for a couple of months after the peak harvest season for chinese mustard when many household picklers set up retail stands around food markets.

These firms sold pickled garlic by weight at ฿18-20/kg and put it in plastic bags. This method of packaging pickled products in plastic bags rather than bottles (FDR II case) or clay jars (FDW III and VDW IV cases)

meant substantially lower cost associated with fabricating parts. Although they were not as cooperative as the other types of firms regarding costs of pickling garlic, the information obtained indicated that their costs were less than ฿10/kg during the 1979/80 season. Without the costs of bottles and bottling labor (i.e., as much as 50 percent of the FDR II and FDW III costs), pickling garlic is not a very expensive proposition.

b. Internal Organization and Operation

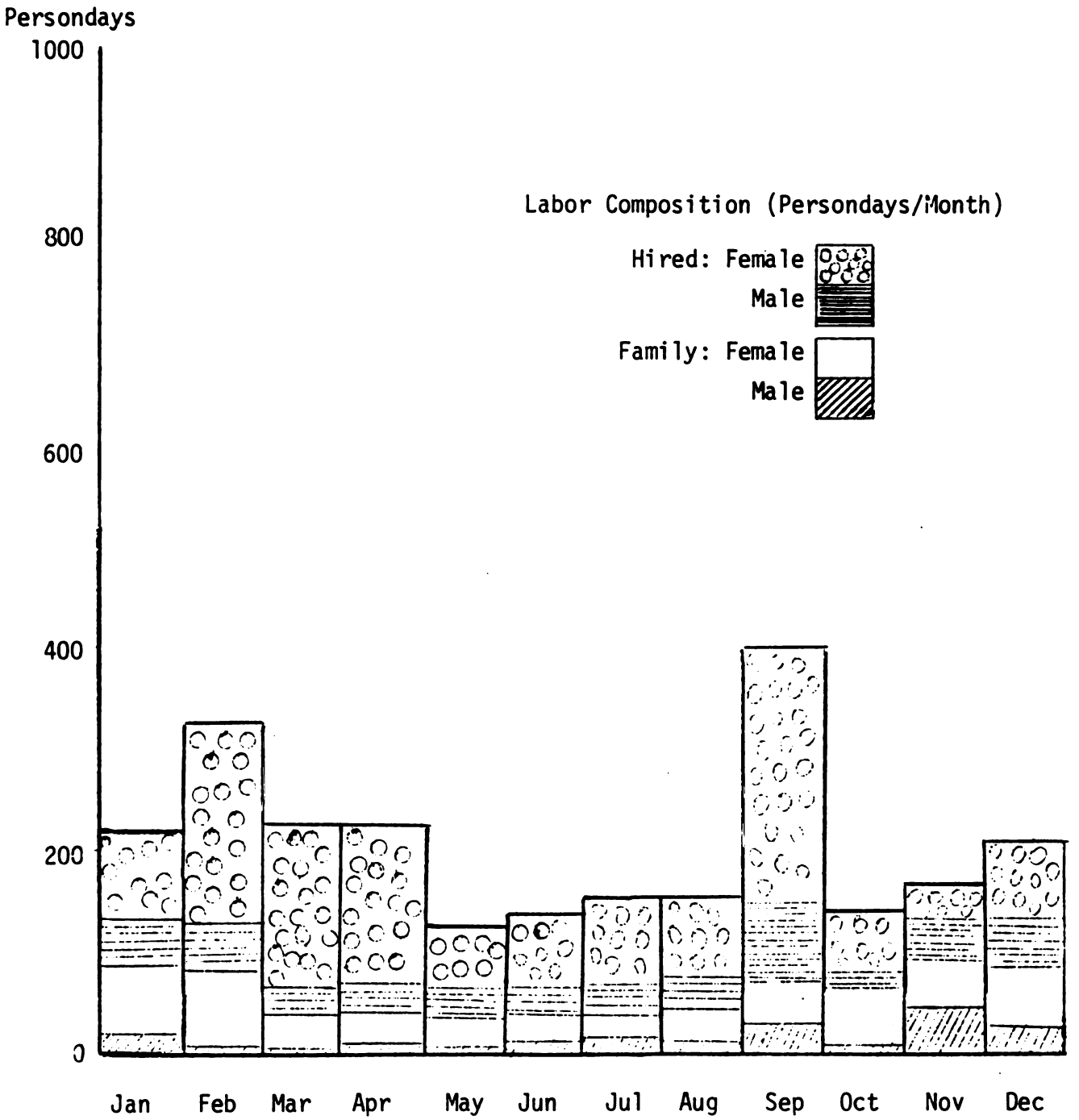
These firm owners lived and pickled raw materials on the same premises. Two of the three firms were located on the outskirts of Chiang Mai City within large compounds with considerable land area on which to expand their business. The third and smallest firm pickled its products in the cramped area underneath its house near the downtown area of the city.

The relatively limited seasonality of labor use in Figure 4-6 reflects the size of the two small firms and their extended periods of pickling chinese mustard rather than the extreme fluctuations noted for the other types of firms. Also their especially small size resulted in limited amounts of labor use per month. Likewise, no reprocessing or bottling activities were practiced by these firms, except for the largest as it was attempting to enter the market for "snack pickles." Women family members sold the products and in two out of three cases also managed the pickling operations.

c. Raw Material Procurement Patterns

The VDR I firms pickled substantially different raw materials than the FDR II and FDW III firms, except for garlic which two firms pickled

Figure 4-6. Seasonality and Composition of the Labor Force for an Average VDR I Pickling Firm, 1980-81



Source: Survey information

and the third bought its supply from another pickler. Generally these firms paid cash for their raw materials, bought later in the harvest season when prices were lower, and used a few commission agents as well as producers "off the street." An example of the lower price for garlic was ฿4-5.50/kg compared to the FDW III firm ฿5-7/kg.

Their number one product was pickled chinese mustard that was sold in two forms, i.e., the salty form made from a variety of chinese mustard which is most popular with vegetable growers during the cool season and the sour form which is made from another variety grown by vegetable gardeners in various seasons throughout the year. Consequently, during the cool season many growers and some commission agents came to the factories peddling chinese mustard at fairly low prices, whereas during the rest of the year the other variety of chinese mustard had to be obtained at higher prices from vegetable wholesalers or certain vegetable gardeners. Likewise bamboo shoots had more extended periods of availability with one processed form shipped in from another region.

5. Single Product, Vegetable Dominant Pickler/Wholesalers (VDW IV)

Since this type of firm was located several months after the initial selection of the sample firms for the pickling industry study, these firms were interviewed in a one-shot survey approach. Although the largest firm was registered and freely discussed this type of business, all the other smaller firms expressed surprise at being located due to the sideline nature of their business and their strong preference for anonymity. Since combined with other businesses, the pickling enterprise is usually not visible to outsiders. Consequently the reliability and extent of information accessible from these firms was limited but sufficient for

distinguishing the single product vegetable dominant type of firm from the others.

a. Market Segmentation

The large and medium sized firms shipped truck and train carloads of clay jars filled with 12 kgs of pickled garlic to cities and regions to the south and east of Chiang Mai. The very small firms just processed enough to supply to local retailers in small markets or to sell along with other retail items on a seasonal basis. The larger firms usually supplied wholesalers who in turn stored and distributed these pickles to fresh market retailers within their area. One large firm speculated that the volume he shipped to Yala City, near the Malaysian border, suggested sizeable exports. The medium sized firms said they usually disposed of their product inventories as quickly as possible whereas the larger maintained inventories up to November. Frequently mentioned prices soon after the pickling period in 1980 were ฿120-130/12 kg jar with interest added for every month in storage. The products of the larger firms had brands attached to their clay jars whereas the others said they had a "no-name" brand, i.e., unbranded products.

b. Internal Organization and Operation

Unlike the multiple product firms these businesses were sideline due to the seasonal availability of the raw material which was prominent for this region of the country. The largest and oldest firm encountered was a second generation business with over 20 years of experience and considerable knowledge about this aspect of the pickling industry. Of the firms located only this one contended that its output was increasing over

time whereas the others of this type said that firms in provinces south of this area had entered this business thus retarding their growth.

All firms operated out of large, enclosed structures, purchased the clay jars and pickling ingredients just prior to the pickling season, and frantically pickled large amounts during the main months of February and March. That purchase of fabricating materials and parts just prior to use and relatively quick disposition of products indicates limited expense for any type of inventories. Previous orders from regular customers and telephone contacts with potential buyers allowed for a fairly quick disposition of their products. The pickling process was substantially the same as for the multiple product picklers except that more time and attention was given to cleaning and dressing the garlic before stuffing it into the clay jars and the cost of the clay jar was part of the final product price. Permanent laborers were transferred from their work in other lines of business to supervise and participate in pickling along with several temporary laborers. The types of labor hired and wages paid seemed to reflect the labor pool near the factory, thus downtown picklers paid laborers more than picklers on the outskirts of Chiang Mai City, i.e., ฿40-60/day relative to ฿35-45/day for males and ฿27-30/day relative to ฿25/day for females.

6. Fruit Dominant Wholesalers

While completing the field work for this study we happened across a small mountain of clay pickling jars far outside of Chiang Mai City. From discussions with local residents it was learned that two large scale firms in this part of the Chiang Mai Valley pickled mangoes only on a seasonal

basis and shipped them out by the truckload. The owner and/or operator was not available since it was not the mango season.

The reason for identifying this case is to call attention to the magnitude of and reasons for the considerable amount of seasonal employment opportunities and grower income opportunities existent but unreported. This example among others was the reason for the considerable caution in the attempt to estimate the structure of this type of industry in Chapter Three.

7. Insights Gained

The detailed examination of picklers' market segmentation, internal organization and operation, and raw material procurement patterns by type of firm provides insights relevant to the fruit and vegetable canning industry. Such insights can be arranged according to their economic value added dimensions: space; time; form; and possession.

Within the space dimension two insights are particularly relevant, the location of the factory and size of the business. Recognized trade-offs of location nearer sources of raw materials or final product markets usually overlooks implications for accessible pools of labor. From firms located within urban areas we noted that worker absenteeism, distaste for this type of fast paced, repetitive work, and high turnover rates were as problematic as higher wages and seasonal scarcity. Consequently cannery feasibility analysis should recognize factors beyond wage rates and aggregate unemployment statistics in estimating labor availability and costs. Likewise larger multiple product firms preferred procurement arrangements with a relatively small group of trusted commission agents in order to facilitate tighter scheduling and to lessen adverse effects

of opportunistic behavior by various suppliers (unable to inspect each sack due to large volume).

The time dimension includes, 1) the importance of obtaining raw materials in the proper stage of ripening, otherwise an inferior product is likely, 2) whenever tight scheduling is required for procuring and quickly processing perishable raw materials, coordination via a smaller number of suppliers is preferable, 3) long storage periods between processing and final product sales cause special cash flow problems for firms primarily dependent on wholesale markets, and 4) firms using the strategy of starting relatively small and gradually expanding over time seemed more successful in adjusting to the risks and uncertainties inherent in this type of agribusiness.

The form dimension concerns firm organization and the interrelatedness of raw materials and their products. The degree of vertical integration, i.e., processing to wholesaling or processing to retailing, has substantial implications not only for profit margins but also working capital constraints on internal firm operation, business vulnerability to "poor crop years" for raw materials, and distribution of family labor by sex between processing and sales management. Technical interrelatedness between raw materials purchased and final products sold is sometimes so strong that processing technologies cannot produce high quality products from inappropriate raw materials. This fact has been overlooked or inadequately accounted for in numerous instances of processing industries in developing countries.

The possession dimension emphasizes the value of information and skill within a highly competitive environment. The more successful, quality product firms depended on their skill in selecting quality raw

materials, guarding their "secret formula" ingredients, and knowing who would supply quality raw materials. The implications for new entrants into this business and researchers attempting to understand it are evident.

With these insights in mind, the role of the pickling firms in the garlic subsector will be examined.

D. GARLIC AS A RAW MATERIAL VIEWED IN A MARKETING SYSTEMS CONTEXT

Garlic for use as a raw material for picklers competes with other uses of garlic in the fresh food market system. The following analysis attempts to identify the distinctive characteristics of garlic both as a raw material and commodity from a demand perspective. The structure and behavior of the marketing system as it responds to both demands and to other characteristics of garlic will be described with emphasis on the high degree of uncertainty that it has had to cope with over time. Finally, the sources of changes in supply will be assessed in the effort to identify the causes of variability that are so problematic from a processor's perspective.

As a prelude to this commodity analysis it is useful to provide the general dimensions of this crop/commodity relative to Thailand's agricultural sector. Today in Thailand garlic is classified along with onion, shallot, and chili as a special set of crops which generate a substantial part of the gross domestic product originating from crops. In fact, the estimated value added from this set of crops was approximately ฿5,960 million in 1979 at current prices, i.e., about 5.5 percent of the gross domestic product originating from crops.[13] The Office of Agriculture

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[13]Office of the National Economic and Social Development Board, 1979, Ibid.

Economics, Ministry of Agriculture and Cooperatives, estimated that 1978/79 farm value of garlic, chili, and onions-shallot at ฿2,001 million, ฿1,917 million, and ฿1,625 million, respectively.[14] And from a dietary perspective, this set of commodities has been such an integral part of the diet that nutrition and household expenditure surveys identify them as separate categories within the category of "vegetables," i.e., leafy greens, dried onion, dried garlic, chilies and peppers, and others. Yet, unlike major food or other cash crops, relatively little economic research has been done on these important commodities.

1. Uses of Garlic

Garlic has several uses in Thailand as well as uses in other countries which can become a market opportunity for Thai garlic. As a commodity in the fresh food market both semi-dry and dry garlic forms (bulbs and corms) are popular as ingredients to a very wide range of Thai dishes including rice, noodle, and soup dishes. The semi-dry form is most prevalent from February to a few months after the final harvests in April-May. Dry garlic (which comes from a more mature crop that is harvested and thoroughly dried in the sun) is steadily released from storage onto the food market over a ten-month period beginning around the April-May period.

Pickled garlic (bulbs and corms) has earned a place for itself in the Thai diet as a product in the fresh food market and the tourist market. Traditionally it had been particularly favored by the Chinese community in Thailand but over time it has become a side dish and type of snack food for many Thai households, especially for the older generation.

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[14] Office of Agriculture Economics, Agricultural Statistics of Thailand, Crop Year 1978/79, Ministry of Agriculture and Cooperatives, 1979.

Besides culinary use, garlic's reputation as a natural remedy that is effective against a wide variety of diseases and illness merits attention as a potential market opportunity for Thailand. "Indeed, so great is the current scientific interest in plant-based medicines that 'new' discoveries are being made, founded on hard medical facts . . . Laboratories throughout the world are working to unlock the secrets held within the simple garlic corm."[15] Processing of Thai garlic for the health food industry warrants consideration for future entrepreneurs.

Another form of culinary use is the popular powdered garlic found in Western countries. According to an official in the Ministry of Interior, a factory to produce powdered garlic has already filed for a processing license. Due to the volume requirements of such an enterprise, this form of use will create a substantial impact on Thailand's garlic industry.

2. Demand Dimensions

In an analysis of demand it would be particularly useful to estimate a demand equation which incorporated the relevant determinants of demand so as to determine the effect of different prices on the quantity purchased and to identify the impact of additional sources of demand. For garlic there already is a complex set of interrelationships between quantity and price as established by various groups of consumers for the fresh, semi-dry, and dry forms of garlic. Basically picklers for the "food pickles" and "snack pickles" markets compete for fresh garlic while a wide array of wholesalers compete for semi-dry and dry garlic. Imports and exports of dry garlic and exports of pickled garlic add further to

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[15]Paul Simmons, Garlic the Powerful Panacea (Thorsoon Publishers Ltd.) 1980, p. 8.

the complexity of the relationships involved. Also, the speculative behavior of various marketing agents in the dry and pickled garlic markets during certain years and periodic government interventions tend to introduce unpredictability into the consistency of the relationships.

The limited and, sometimes contradictory, information available does not allow the author to answer the pertinent demand question of "How much will be bought at a price?" However, available information on various characteristics of the garlic commodities and pickled products, consumption patterns, and related considerations will be presented in the effort to better understand the competing demand forces that affect picklers procurement patterns and problems. Since fresh, semi-dry and dry forms of garlic basically represent different harvesting times for the same crop, the importance of understanding the competing demand forces is evident.

a. Characteristics of Demand

There are several factors influencing the sales of garlic in its dry, semi-dry, and pickled forms, such as, the price of the garlic commodity/product in each form, consumer income levels, the population and its consumption, and the general economic condition of the country. In Thailand, garlic has a basic position in the diet as an ingredient (dry garlic) in cooking and as a snack or side dish (pickled garlic). The former dominant use suggests a more stable consumption pattern while the latter use indicates a somewhat more variable pattern of consumption. The types of factors affecting consumption patterns generally include employment opportunities, season, geographic region, educational or occupational levels of the household, ethnic groups, etc.

The basic situation with the various forms is as follows; fresh garlic is available from January to April and is used exclusively for pickling; semi-dry garlic becomes available soon after fresh garlic and is only used for a couple of months beyond the April-May termination of the northern garlic crop because its moisture content does not allow for extended storage; new dry garlic usually comes onto the market around April and is stored for steady distribution over the following ten-month period until the new semi-dry garlic enters the market; and pickled garlic is available year-round with the bulk processed in February and March then stored for later sales. Because dry garlic and pickled garlic are storable and vary markedly in production from year to year, speculation in purchases and resale are observed in years of large production. A different type of dry garlic has been imported from Taiwan, supposedly for the food establishments, in varied amounts over time while local dry and pickled garlic are exported in irregular amounts from year to year. Reported imports have not amounted to more than 5 percent of production for any year.

A key characteristic of garlic demand is its income and demand elasticities. A recent study estimated the matrix of demand elasticities for 18 major food items in Thailand at retail prices.[16] Dry garlic as one of those major food items, had an own price elasticity of -.485 and an income elasticity of .451, both of which were larger than those of the other "vegetables," i.e., chili and onion. Although the cross price elasticity of chili for onion (.37) suggested a certain degree of substitution between those commodities, there was no indication of competition between them and garlic, i.e., relative to garlic changes in the price of one

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[16]Bahram Dagostar, et al., Ibid.

did not change the consumption of the others. Since the income elasticity for garlic meant that a change of 1 percent in disposable personal income changed the quantity demanded of garlic by .45 percent, it is useful to examine income and population changes (Table 4-4). For the 1971-78 period population increased by about 21 percent while disposable personal income increased by 38 percent in real terms, thus exerting considerable demand pull for dry garlic.

Table 4-4. Disposable Personal Income (Per Capita) and Population of Thailand, 1971-78

Year	Deflated DPI (฿)	Growth Rate (%)	Population (millions)	Growth Rate (%)
1978	3,599	+7.72	45.08	+2.32
1977	3,341	+4.97	44.06	+3.02
1976	3,183	+3.48	42.77	+2.81
1975	3,076	+2.26	41.60	+2.92
1974	3,008	-4.75	40.42	+2.72
1973	3,158	+13.64	39.35	+2.50
1972	2,779	+6.80	38.39	+2.78
1971	2,609		37.35	
	+37.95 (1971-78)		+20.70 (1971-78)	

Source: Office of Agriculture Economics, Ministry of Agriculture and Cooperatives, "Selected Economic Indicators Relating to Agriculture," 1979.

b. Consumption Patterns

In Asia garlic has been consumed as a spice or ingredient in several food dishes for centuries. In Thailand the consumer purchases very small but consistent quantities of dry garlic as needed whereas food stands and restaurants regularly purchase larger amounts as a necessary ingredient for their various food dishes. The number of dry garlic consumers, either at home or in eating establishments, is estimated to be very large. On the other hand, pickled garlic sold in the food markets as a "food pickle" has a less broad consumer appeal and is used more as a side dish along with certain main courses in households and in a few types of eating establishments. The bottled form of pickled garlic as sold in department stores or retail outlets in Chiang Mai serves as a gift or souvenir from a tourist area. According to retailers and picklers interviewed, the older generation represents the major source of demand for pickled garlic, consequently they anticipate a gradual decline in its domestic market over time.

The amounts of dry[17] and pickled garlic consumed per person in Thailand are somewhat difficult to accurately assess because as a non-staple, purchased in very small amounts, and included in such a wide range of foods (dry garlic) or along with certain regionally preferred dishes (pickled garlic) measurement can be extremely misleading. For instance, a recent article in the Wall Street Journal claimed, "Nobody here says much about any towns in South Korea or Thailand, where per capita consumption of garlic is about 20 pounds a year, compared with 1.1 pounds

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[17]In consumption surveys and various statistics the term dry garlic is used; however, it appears that both semi-dry and dry forms were actually combined.

in the U.S."[18] Yet, a recent nutrition survey in Thailand asserted that less than 2.2 pounds of dry garlic were consumed per person. The vast difference between those estimates merits consideration in light of their implications for the strength of demand.

In Thailand dry garlic consumption has been so important that various nutrition surveys, expenditure surveys, and food demand studies have included it. However, pickled garlic consumption is less well documented. An assessment of the magnitude of and differences in consumption patterns would facilitate an understanding of the relative sources and strengths of demand. A nutrition study based on the 1962 Household Expenditure Survey identifies the substantial regional variations in per capita dry garlic consumption (Table 4-5) and, if computed on a yearly basis, the regional variations would amount to, Central Plains (759 gm), South (286 gm), North (660 gm), Northeast (130 gm), East (718 gm), Bangkok-Thonburi (593 gm), and the Whole Kingdom average of 452 gm. An increase in consumption since the early 1960s can be noted by a comparison with data from a 1970-71 study[19] which found that farmer's consumption per consumer unit for garlic by region was; Central Plains (969.1 gm), South (953.63 gm), North (805.90 gm), Northeast (286.89 gm), and average for the whole kingdom of 554.56 gm. The disparity between the survey results centers on the estimates for the South while the increases in the other regions appear very probable while perhaps underestimating regional consumption somewhat because the 1970-71 study only considered farmers and not urban households. The diagnosis of reasons for the particularly low

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[18]Ray Vicker, Wall Street Journal, "Take a Deep Breath and Read All About the Big Garlic Trend," July 1, 1981.

[19]"Selected Economic Indicators Relating to Agriculture," Ibid., p. 33.

Table 4-5. Regional Variations in Estimated Per Capita Consumption of Dried Garlic as Computed from the 1962 Household Expenditure Survey of National Statistical Office.

Region	Grams Consumed Per Week	Calories Consumed Per Day	Kilograms Consumed Per Year	Percent of Total Consumption	
				By Weight	By Calories
North	12.7	2	0.7	0.3	0.1
Northeast	2.5	< 0.5	0.1	0.1	< 0.05
Central	14.6	3	0.8	0.3	0.1
East	13.8	2	0.7	0.3	0.1
South	5.5	1	0.3	0.1	0.1
(Bangkok-Thonburi)	11.4	2	0.6	0.3	0.1
Whole Kingdom	8.7	2	0.4	0.2	0.1

Source: Adapted from Supanee Milindankura and Melvin Wagner, Ibid.

level of consumption in the Northeast region would be valuable in anticipating changes in demand over time. Information on expenditures for dry garlic would facilitate that diagnosis.

A National Statistical Office expenditure survey[20] conducted in 1975-76 found that average household expenditures for dry garlic in a seven-day period varied by region (Table 4-6). A comparison of the degree of regional differences in average expenditures and in average consumption from previous periods (assuming relative consumption differences between

[20]This same type of survey conducted in 1962 was the origin of the aforementioned regional consumption figures.

Table 4-6. Average Household Expenditure on Dry Garlic in a 7-Day Period, by Region, 1975-76

Region	Population Centers		
	Municipal Areas	Sanitary Districts	Villages
	---------- Baht Per Household ----------		
North	2.97	2.30	2.18
Central	2.47	2.88	3.35
Northeast	2.02	1.90	1.12

Source: National Statistical Office, Report Socio-Economic Survey 1975-76: North, Central, and Northeast Regions.

regions did not change substantially) indicates that consumer costs per kg were much higher in the Northeast as wholesale price comparisons would suggest. Consequently, the evolving shifts in the market system away from transshipment of dry garlic to the Northeast via Bangkok to direct trade between wholesalers in the North and Northeast would suggest future increases in effective demand[21] from that region through cost reduction beyond income and population effects as that region's economy improves.

The question of the rate of increase in dry garlic consumption warrants further examination. If one compared the consumption averages for the whole kingdom from the 1962 to 1970-71 studies, a 23 percent increase

[21] "Effective Demand Is the Desire of the Consumer for the Commodity Backed Up by Purchasing Power," R. L. Kohl and J. N. Uhl, Marketing of Agricultural Products, New York, Macmillan Publishing Company, 1980, p. 135.

would be indicated yet total production of garlic for that period increased by 47 percent. Questions of comparability of samples, major changes in uses of garlic, or inherent data problems are apparent. Average consumption of .56 kg per person times 1971 population resulted in 20.7 million kgs compared to 1970/71 production figures of 88.5 million kgs, thus indicating a substantial discrepancy between the dominant source of use and production estimates which no adjustments for imports, exports, and pickled garlic uses can explain. Perhaps for a commodity purchased in such small amounts with such a wide range of uses for a very large segment of the population per capita by standard consumption survey methods and/or sampling procedures. Also the production data does not seem to be standardized according to a single form with applicable conversion ratios from the other forms, consequently yields of fresh, semi-dry, and dry forms are merged thereby inflating supply figures. It is very clear that supply per capita, meaning production minus exports plus imports and inventories divided by population has no correspondence to consumption estimates, consequently using either one to determine the rate of increase in consumption must be qualified.

Another source of consumption data indicated a much sharper increase in the amount of dry garlic consumed since the 1960s, yet it has the similar problem of reflecting somewhat different samples. The dry garlic consumption figures by source of information are; 1) 0.47 kg/person (1970-71) survey average for all regions, 2) 0.64 kg/person (1976) average a DAE official estimate, and 3) 0.96 kg/person (1978) survey average of North, Central, and Northeast regions for 1978.[22] If these figures were

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[22]"Selected Economic Indicators Relating to Agriculture," Ibid., p. 32.

at all comparable, the 104 percent increase (i.e., 0.47 kg/person to 0.96 kg/person from 1970-71 to 1978) would be substantially beyond the 23 percent increase for the 1962 to 1970-71 period. Production had increased by 245 percent over the period from 1970/71 to 1977/78. In other words, the increase in dry garlic consumption during the 1970s was several times that of the 1960s.

Information on pickled garlic consumption could not be found. However, based on the study of the pickling industry approximately a million kgs of pickled garlic can be accounted for, and industry estimates are that no more than 4-5 percent of garlic production is pickled. The National Statistical Office estimates of average household expenditures in a seven-day period for "other pickled vegetables" (primarily pickled garlic and bamboo shoots) by region (Table 4-7) indicates a regional pattern somewhat similar to that for dry garlic except that households in the Northeast spend slightly more on average than those in the North. On average, households were found to spend less than half as much on pickles as for dry garlic.

In summary, consumption of dry garlic seems to have increased very markedly during the 1970s, however, the magnitude of that increase cannot be accurately determined from available information. Industry sources considered that domestic consumption of pickled garlic would gradually decline but that purchases by accessible foreign markets would increase. With an estimated income elasticity of .45, the increases in disposable income and population will exert strong pull on dry garlic for the foreseeable future. With the relatively low level of consumption in the Northeast and the nature of the garlic commodities/products, improvements in the trade between the North and the Northeast could substantially increase their aggregate consumption.

Table 4-7. Average Household Expenditures for Other Pickled Vegetables in a 7-Day Period, by Region, 1975-76[a]

Region	Population Centers		
	Municipal Areas	Sanitary Districts	Villages
	---------- Baht Per Household ----------		
North	1.03	0.64	0.49
Central	1.42	1.69	0.89
Northeast	1.09	0.85	0.48

[a] This category includes vegetable pickles other than pickled mustard.

Source: Adapted from; National Statistical Office, Report on Socio-Economic Survey 1975-76, North, Central, and Northeast Regions.

3. Selected Characteristics of the Garlic Marketing System

The demand pull forces originating from the consumer of fresh market commodities or processed products are recognized by and expressed through the marketing agents in the marketing system. Yet the methods in which these agents operate, the options available for sales, the need for storage or special handling arrangements, etc. are often conditioned by the characteristics of the commodities traded. Similarly, competition for varied amounts and qualities of the commodity sought may come from sources outside the channel in which the marketing agent operates. Consequently procurement strategies of marketing agents may change over time and

space, depending on the commodity characteristics and alternative sources of competition.

The following sections include a description of the marketing system's organization and operation, analysis of what prices have to tell us about the commodity characteristics, and a description of the sources and nature of competition within the system. The pivotal role of large demand area wholesalers in coordinating the system is emphasized, but attention is called to the changing nature of that role as the supply area wholesalers grow over time. Signs of extreme risk and uncertainties will be flagged as they arise.

a. Organization and Operation

Market organization and operation are influenced by the characteristics of the different forms of garlic, but once fresh garlic is pickled, both pickled and dry forms had some similar characteristics, i.e., sold in food markets, purchased in very small quantities, and stored until the new garlic crop. Likewise firms processing both forms indicated a potential for speculative behavior in anticipation of future price changes. Distinct characteristics included, dry competes with imports, has only limited export potential, and is very "transportable" due to its light weight, whereas pickled garlic does not have serious import competition, has overland export potential, and is expensive to transport due to jar breakage and weight of the accompanying liquid solution.

Information and data from two previous studies[23] will be combined with the author's field observations and interviews in order to present

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[23]Alan Thodey and Aree Wiboonpongse, The Chiang Mai Central Crop Market: Structure, Conduct, and Performance, Chiang Mai University, Faculty of Agriculture, Agricultural Economics Report No. 2, 1974; Aree Wiboonpongse and Earl Kellogg, Study of Farm to Wholesale Marketing in the Chiang Mai Valley, Chiang Mai University, Faculty of Agriculture, Multiple Cropping Project, Agricultural Economics Report, No. 7, 1979.

a concise, coherent assessment of the dry and semi-dry garlic marketing system that can be used for later analysis. No information other than the author's interviews was found for the fresh garlic marketing system.

There are two major channels within the garlic marketing system as shown in Figure 4-7, i.e., the fresh food marketing channel for garlic commodities (semi-dry and dry forms) and the pickled products marketing channel. As depicted, both channels compete for the harvests of the same sets of farmers, in fact crop buyers and wholesalers located in the supply areas respond to both types of demand. Wholesalers, distributors, and retailers in demand areas tend to handle separate items. An understanding of the similarities and distinguishing features of these two markets, both in terms of their organization and operation, will facilitate the interpretation of why different types of processors organize and operate their procurement systems in various ways.

The common hour glass analogy describes the relative number and size distribution of participants in the fresh market channel for semi-dry and dry garlic. Tens of tousands of farmers cultivate small (2-3 rai) plots of garlic which is bought mostly by hundreds of local crop buyers who then assemble and sell it to larger buyers (wholesalers) in nearby towns or cities. Wholesalers in the supply areas in turn sell to larger local wholesalers or to distant demand area wholesalers of various size. The dozen or so large wholesalers in the Songwad area of Bangkok receive a large portion of garlic flowing from the supply areas and distribute it to smaller demand area wholesalers in surrounding areas. Finally, thousands of retailers buy from the wholesaler-retailers in nearby market places and sell very small portions to the individual consumers. Since semi-dry garlic is less storable it moves through the market in the

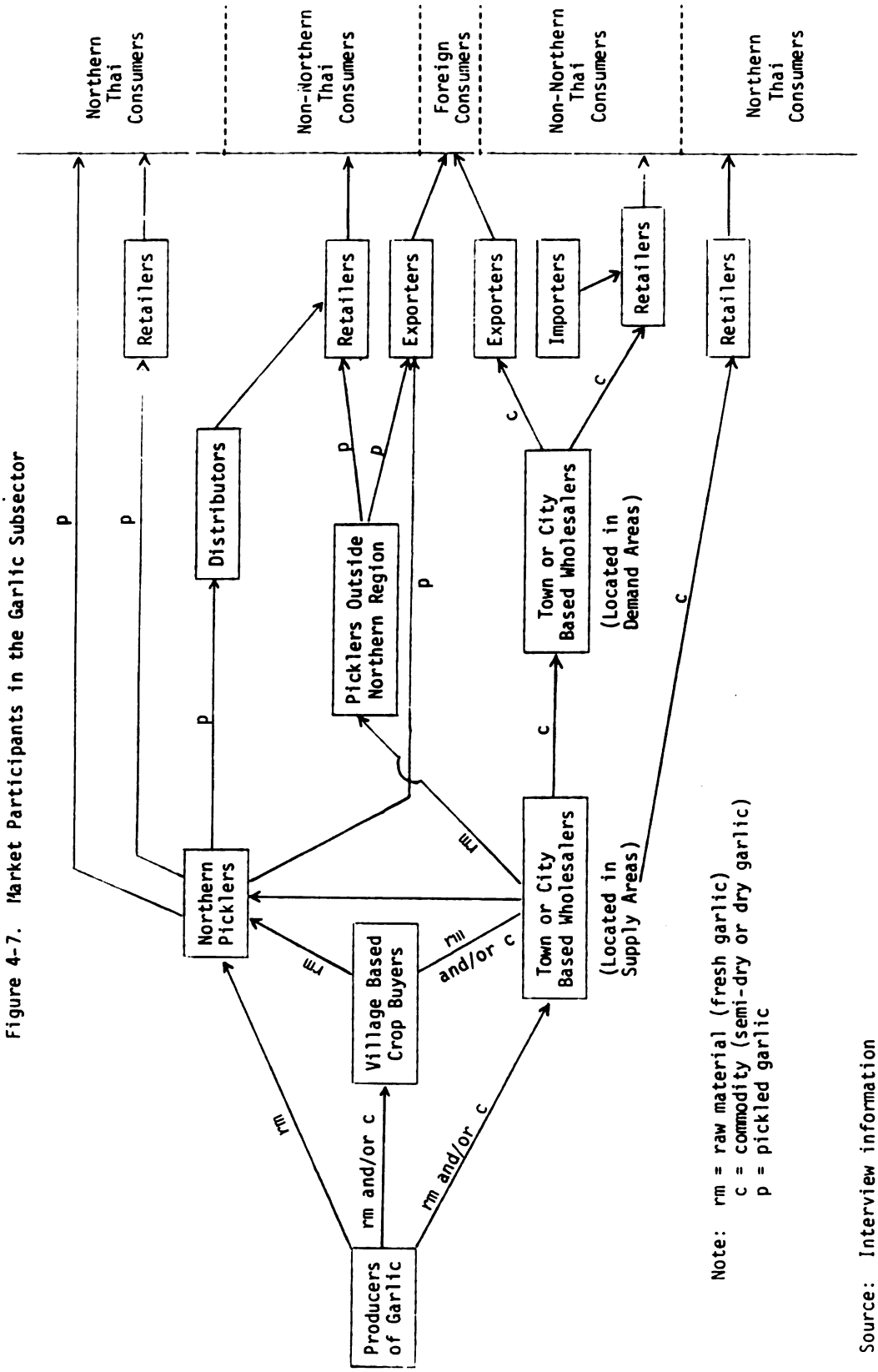

Figure 4-7. Market Participants in the Garlic Subsector

Note: rm = raw material (fresh garlic)
c = commodity (semi-dry or dry garlic)
p = pickled garlic

Source: Interview information

peak season followed by dry garlic which is stored at various junctures within the channels, mostly by larger wholesalers.

That simplified description of the system becomes more complex once fresh garlic is added. Often during the early part of the harvest season the local crop buyers for semi-dry and dry garlic also purchase fresh garlic for picklers located in or near the supply area. But as the harvest season progresses and supply increases rapidly, the local crop buyers respond to the bids made by larger wholesalers. Those larger wholesaler (i.e., purchasers of ten tons or more per day) receive orders from distant picklers as the peak season price decreases. Up until the last few years the Songwad wholesalers also purchased fresh garlic on behalf of Bangkok picklers. However, these picklers now order directly from the large wholesalers in the supply area.

The system for dry and semi-dry garlic operates at two levels, i.e., at the wholesale level and village level. The formation of a reference or base price, and various coordination activities originate from the wholesale level while most farmer-first handler transactions occur at the village level. The large Songwad wholesalers and large wholesalers in neighboring market places perform the role of channel captains as they buy on their own account or engage in some brokerage activities. Price information[24] is mailed to supply area wholesalers, specifying the buying price for each grade of the commodities that they want to buy as well as some information about supply and demand changes which influence anticipated prices according to the sender's knowledge

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[24]Price lists called "Hang Cheng" in Chinese, included the prices of various commodities as prevailing in the Bangkok Wholesale Market on the day that the letter is issued.

and judgment. This information is sent on a bi-weekly basis or perhaps more frequently during periods of considerable fluctuations in prices. It's augmented by telephone contact when particularly wide deviations from the mailed information occur.

The wholesalers in the main supply areas who receive these letters are usually of Chinese origin with medium to large scale operations. Their basic role is to use price and market information within their fairly stable linkage system to orchestrate deliveries to their stores in the wholesale markets. The larger wholesalers who buy from several dispersed locations begin serious buying later in the season as the volume begins to peak. Some wholesalers mentioned having a few buying agents operating in rural areas. The buying agent is frequently related to and dependent on these wholesalers for price information and commodity purchases. However, wholesalers usually buy from independent village level buyers on a regular basis. The crop buyers without continuous dealings with any particular wholesaler conferred with several before deciding to whom to sell. Often prices are quoted according to the samples of garlic brought by the village level buyers. Most of the village level buyers are Thais, whether farmer-merchant, commission agent, or buying agent.

The Chiang Mai wholesalers generally deal in cash, i.e., their suppliers are usually paid cash on delivery (occasionally delayed on week-ends when the banks are closed) and they usually receive payment from the Bangkok wholesalers within three days through a bank draft either sent by mail or by the truck which delivers the goods. To handle their cash flow the Chiang Mai wholesalers depend more on commercial banks than on the Bangkok wholesalers, even though more than 30 percent of the Chiang Mai wholesalers mentioned receiving between ฿10,000 and ฿100,000

(interest free) advances that often extend for one to two week periods.[25] Yet, even with those two options, most merchants consider insufficient working capital to be a constraint to their business, especially during the peak buying season when the particularly "unfavorable" Bangkok prices make storage more desirable.

Some Chiang Mai wholesalers mentioned occasionally advancing about ฿1,000 per certain regular supplier (a few as high as ฿10,000) for a one or two month period, usually without charging interest. Yet the practice of advancing money varies considerably among the wholesalers, especially since several mentioned previously losing substantial amounts due to supplier default. When a village level buyer goes bankrupt, the wholesalers generally does not harass him but waits for repayment once he is back on his feet.

All the Chiang Mai wholesalers reported some long term storage in order to earn money from anticipated price increases after the main harvest period for garlic. This distribution of stored garlic among many wholesalers in Chiang Mai facilitates the orderly marketing of garlic since it takes about six to eight months for the garlic to come out of this major supply area and be absorbed into the market system. Since most merchants said they preferred to sell garlic in smaller and more even shipments, rather than large, sudden shipments to Bangkok, sharp supply fluctuations would be lessened. Analysis of the parallel movements of prices (Bangkok and Chiang Mai Wholesale Prices) indicates a considerable degree of pricing efficiency in this system as will be noted in the following section.

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[25]The Chinese business practice of extending credit within a system of mutual trust is very common in Asia as documented in Vietnam by Barton and mentioned by Lengel in Thailand.

The system for fresh garlic used by picklers is less transparent due to the limited information available. At the beginning of the garlic harvest season local multiple product picklers negotiate with their regular commission agents for the delivery of the early harvests. As the season progresses and volume increases the village level buyers continue to deliver to local or nearby single and multiple product picklers. However, near the peak harvest period when the price has fallen somewhat and local demand nears saturation, the large wholesalers enter the market in response to bids placed by distant picklers.

The greater distances, larger volumes and larger number of middlemen in the marketing chain require different handling procedures and additional coordination. Because fresh garlic is very perishable and deteriorates rapidly whenever not handled properly, i.e., salt application,[26] the assembly and shipment of large volumes must be done quickly. This quality and time constraint enforces a greater degree of system coordination for which the more experienced, larger wholesaler is particularly suited. Thus it was observed that larger picklers generally rely more heavily on larger wholesalers.

Although some wholesalers of dry and semi-dry garlic also handled fresh garlic and fresh garlic prices were recorded on some of the Chiang Mai Wholesale Price sheets, it is not known whether each day's fresh garlic price is discovered independently of the Bangkok wholesalers or not. Previously when Bangkok wholesalers handled a major share of the Bangkok picklers fresh garlic orders, their price discovery role probably corresponded to that for dry garlic. Now that most Bangkok picklers deal

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[26]Salt must be mixed with the fresh garlic in order to inhibit rapid spoilage due to the extended time since harvest and tight packing conditions.

directly with Chiang Mai wholesalers, their role is less clear. And since this author's research was focused on the North, this question was less relevant.

b. Price Trends, Seasonality, and Variability

What can the analysis of prices tell us about the characteristics of the commodities/products and the marketing system which evolved to enable those commodities/products to reach the different types of consumers in the most appropriate form, time and place? The role of price will be summarized before considering its various dimensions and implications.

The Bangkok wholesalers in the major garlic market places regularly send price and marketing information on semi-dry and dry garlic to the medium and large supply area wholesalers who use this reference price in their bids for local garlic brought to them by village level buyers. The judgment and experience of both groups of wholesalers, together with their capacity and working capital constraints, affect the various bids and offers made. The market study by Thodey and Wiboonpongse found that dry garlic prices in Chiang Mai (the major crop market in Northern Thailand) closely followed Bangkok terminal market prices, ". . . indicating that the Chiang Mai Market is performing its pricing function reasonably effectively."[27]

At the other end of the spectrum the garlic grower had three distinct sales options, 1) pull his garlic from 85 to 90 days after planting and sell this "fresh" garlic either directly to local picklers or through a

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[27]Thodey and Wiboonpongse, Ibid., p. 52.

variety of channels that linked the grower and pickler, 2) harvest his garlic at about 100 days after planting, briefly sun-dry before bundling and selling this "semi-dry" garlic to local buyers, or 3) pull the fully matured garlic after about 110 days of growth, sun-dry, bundle and hang for further drying under his house for later consumption or sale to local buyers. The factors influencing his decision of form and buyer will be discussed within the supply section. The main point here is that three substantially different prices and costs were involved for the same crop.

A related point which definitely confuses price comparisons between and within studies is weight loss and price differentials by trimming or not trimming the commodity. For instance, survey information on price differentials for forms of garlic which are trimmed or non-trimmed resulted in the following magnitude of differences for the 1980-81 crop; ฿2-2.10/kg for untrimmed fresh, ฿4-4.25/kg for trimmed fresh, ฿2.50-2.75/kg untrimmed semi-dry, ฿4.75-5.15/kg for trimmed semi-dry, ฿7.50-9.00/kg untrimmed dry and ฿10.40+/kg for trimmed dry. Not infrequently when the author examined statistical data and cost of production studies conducted by government agencies and universities, internal inconsistencies were found because the analyst and/or his enumerator probably was not aware of the aforementioned differences in form. For instance, in one study the price for dry garlic was associated with fresh garlic yields, in another trimmed, dry garlic was quoted as a "farm price" yet many farmers in that area sold mostly semi-dry garlic, and one attempt to calculate price margins seemed to have overlooked the necessary conversions. The prevalence of multiple commodity forms in the marketing system necessitates special care in price analysis, especially when one is aware of the varied methods in which price data are collected and processed.

The final aspect worth noting is that most crop buyers and wholesalers (86%)[28] indicated that their primary source of price information was higher level merchants rather than radio, newspaper, or buyers at the same market level. This vertical price searching process is qualified somewhat in that the wholesalers who receive the price letters contend they are not secret and are freely shown to farmers or others who request to see them. Thus, village level buyers are in a position to compare prices even if they normally dealt with a regular buyer. The proximity of market centers to major production areas, the good transportation system with a large number of vehicles in operation, the varied types and locations of buyers accessible to farmers, farmer visits to buyers and vice versa, and the number of alternative crops cultivated during the cool season argue for a fairly efficient flow of market information to the farm level with farmer response according to his perceived opportunity sets.

The relationship between price and planted area usually reflects the lagged area response to changes in price. Yearly planted area and the Bangkok wholesale price for grade 1 dry garlic (nominal and real terms) were plotted on Figure 4-8 to determine relative trends and possible relationships. Planted area and nominal wholesale prices displayed clear upward trends with a lagged reaction of planted area to price changes as would be expected. Nominal prices displayed a cyclical behavior, which can be explained by planting decisions in response to the previous year's prices. This phenomenon is described by the cobweb model wherein, ". . . high price leads to large production; the large supply results in low

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[28]Wiboonpongse and Kellogg, Ibid., p. 92.

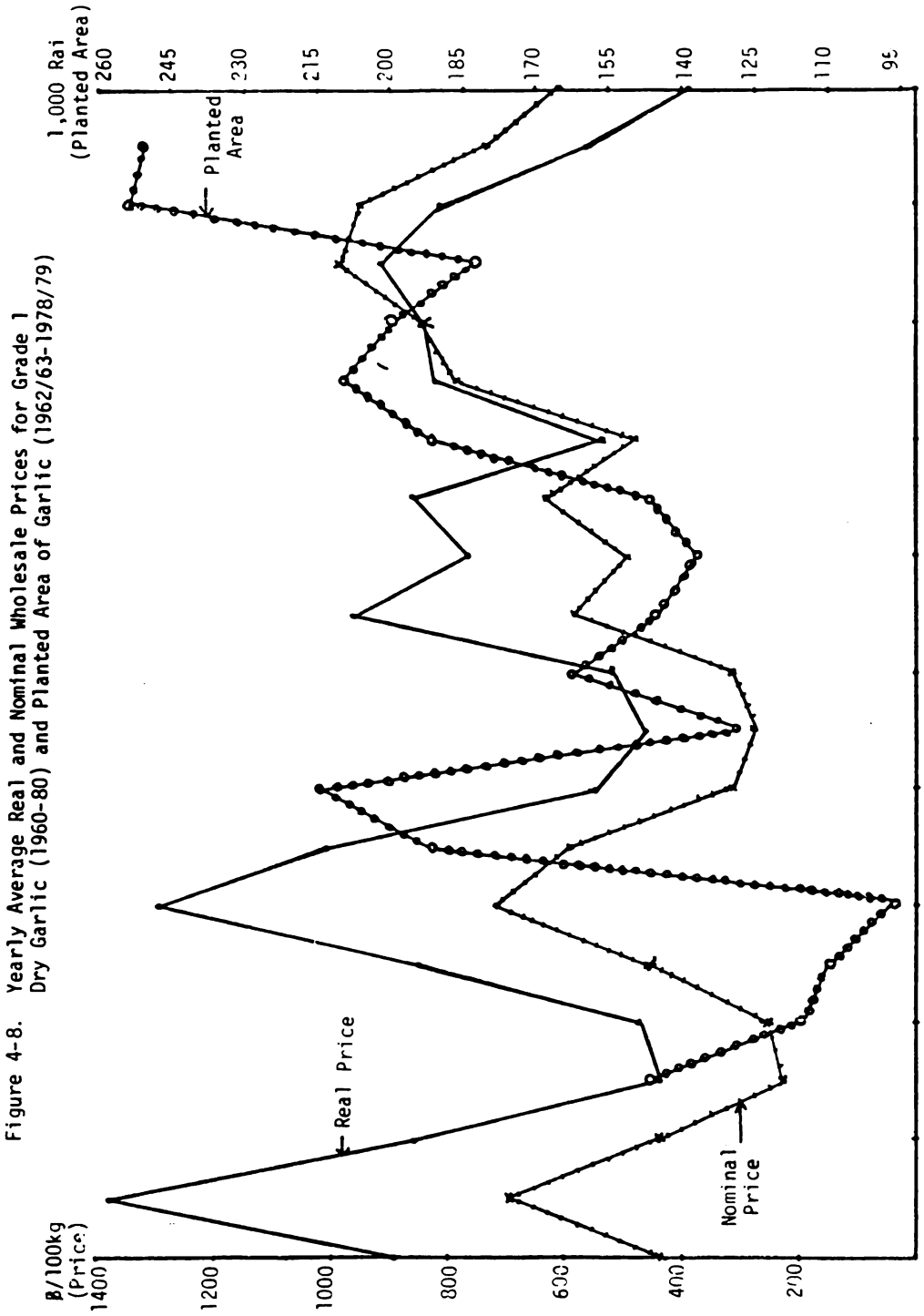

Figure 4-8. Yearly Average Real and Nominal Wholesale Prices for Grade 1 Dry Garlic (1960-80) and Planted Area of Garlic (1962/63-1978/79)

Source: Planted area data from Ministry of Agriculture and Cooperatives. Price data from Ministry of Interior.

prices, which in turn result in smaller production, and so forth."[29] This lagged response to past prices is one of the major factors influencing yearly supply.

A problematic point is that the yearly real prices for dry garlic varied considerable from year to year, and although recently swinging less drastically are moving in a slightly downward direction. As a crop using considerably cash inputs and competing with other crops within the expanding cropping systems in the North, this downward trend in real prices could forebode an impending turn-around in the upward trend in planted area as other commodity prices look more favorable. On the consumer side, the favorable decreasing real costs of dry garlic can induce further increases in consumption beyond what nominal prices might indicate, if more is produced.

The seasonal pattern of Northern (i.e., Chiang Mai Valley) Grade 1 and Grade 2 Dry Garlic price in the Bangkok Wholesale Market during the 1965-69 and 1975-79 periods are depicted in terms of indices in Figure 4-9. The seasonal pattern of prices generally reflects the major production and marketing periods for semi-dry and dry garlic. The distribution of the garlic crop plantings from October to December are influenced by the weather conditions and harvests of the prior crops in those fields. Although February and March are the primary harvest periods the dominance of either month varies from year to year. The indices show the average value for each month during the respective five-year periods as a percentage of the average for all months.[30] As anticipated, the seasonality has

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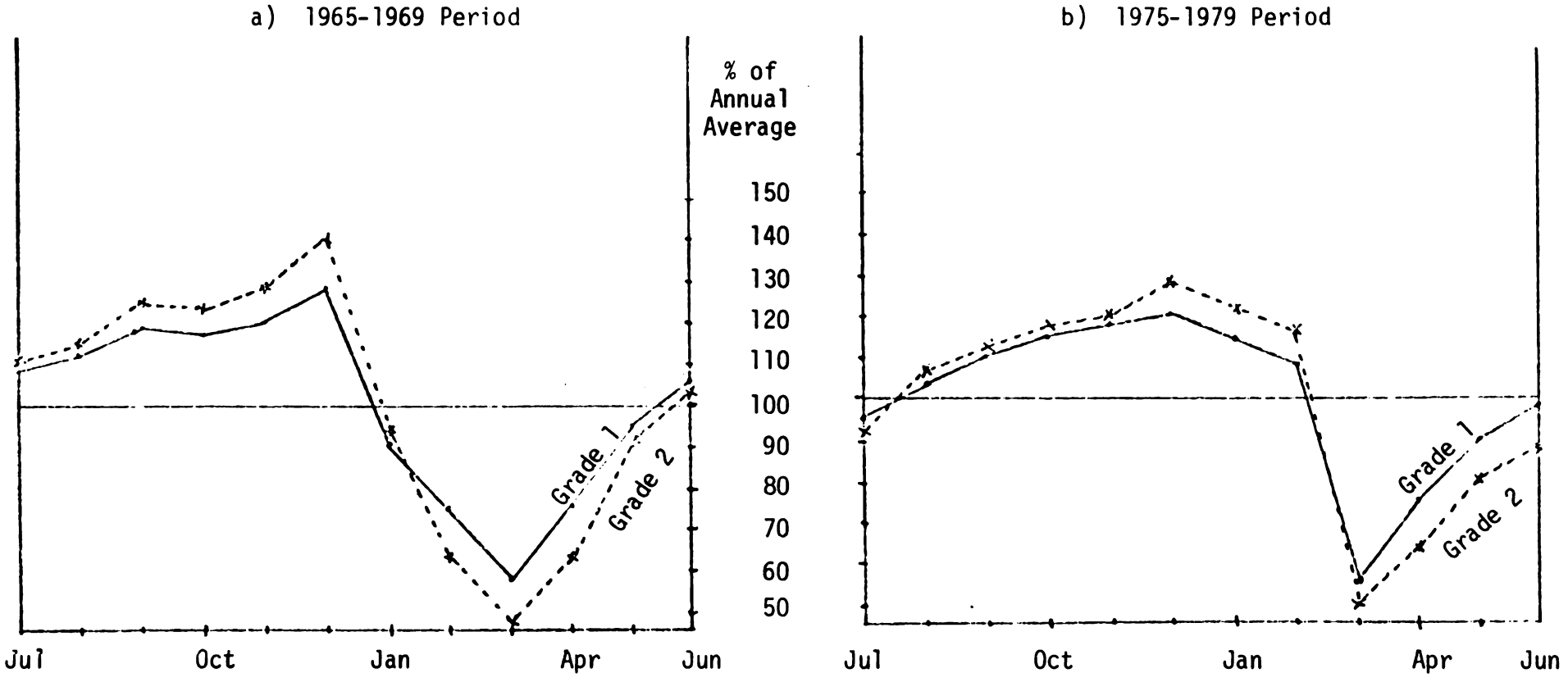
[29]William G. Tomek and Kenneth L. Robinson, Agricultural Product Prices, Cornell University Press, 1972, p. 176.

[30]Harold Breimyer and Charlotte Kanse, "Charting the Seasonal Market for Meat Animals," Agricultural Handbook No. 83, USDA, AMS, 1955.

Figure 4-9. Seasonality of Northern Grade 1 and Grade 2 Dry Garlic Wholesale Prices, Bangkok



Source: Data from Ministry of Interior

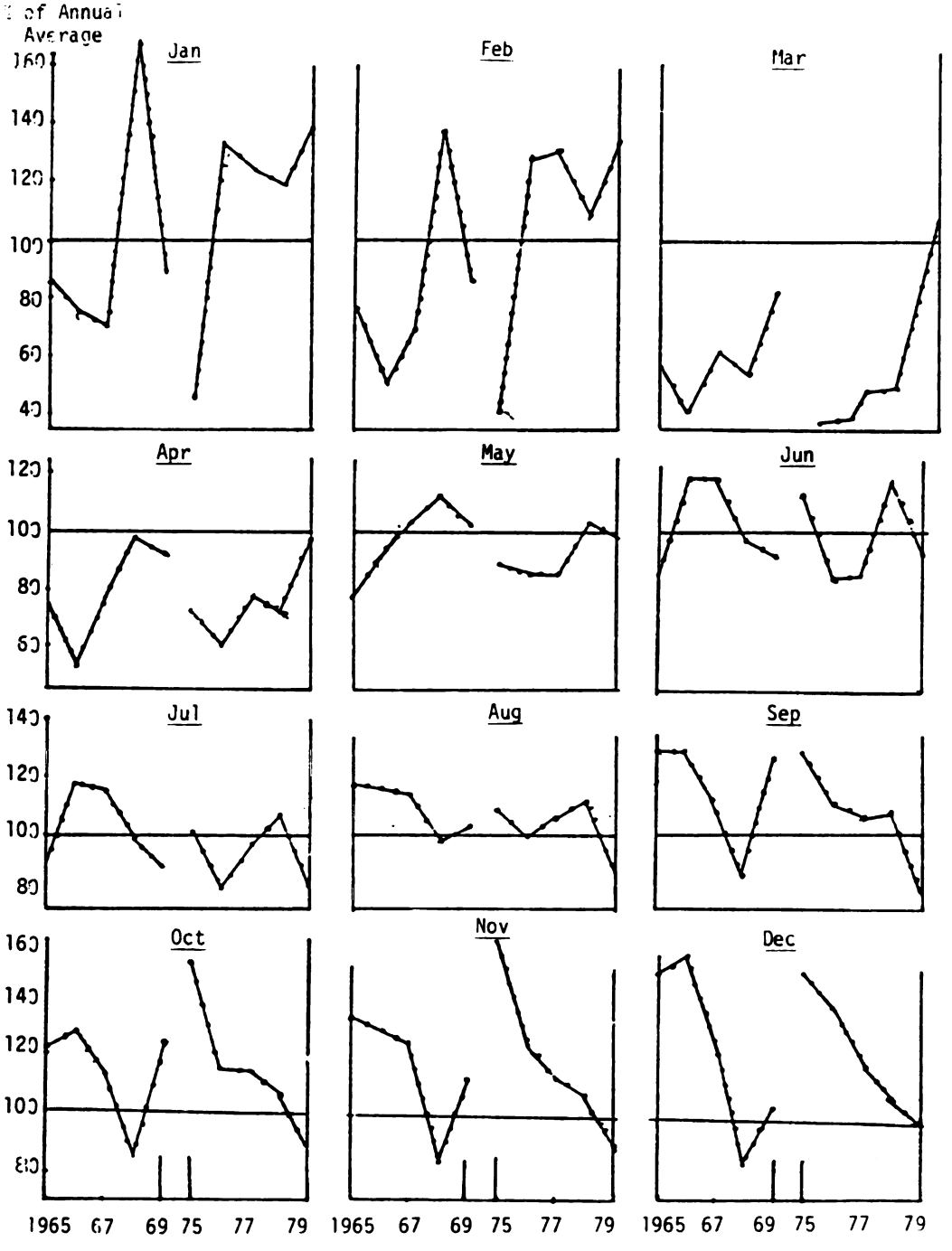
remained substantially the same with apparently more concentration of harvests during March in the 1975-79 period.

As a storable commodity the influence of inventories on the wholesale price during the peak harvest month is also crucial but data limitations do not allow for an accurate assessment of that influence. According to interviews conducted during this study and the Thodey-Wiboonpongse study, the large wholesalers contended that their inventories are usually exhausted just prior to the new harvest season.

The degree of seasonal variability and changes in variability over time can be shown by plotting each month's price as a percent of its annual average price. According to Figure 4-10 for four of the five years in the earlier period (1965-69), January and February indices reflected percentages of annual averages below 100 percent whereas the inverse was true for the more recent period (1975-79). Price patterns for those two months have changed substantially between those two periods. Possible explanations for such a shift would be that evolving concentration of production in one area means larger volumes enter the market in late February and March rather than distributed over January to March or in relative terms less imports occurred in January and February. However, insufficient information is available to determine the exact cause of this change.

Extreme variability of prices from year to year and month to month indicate a high degree of risk and uncertainty in growing and handling this garlic crop. Is this a characteristic of just this commodity of Chiang Mai commodities in general? A comparison of supply area (Chiang Mai) wholesale buying and demand area (Bangkok) wholesale prices for dry garlic, soybean, and peanuts (Tables 4-8 and 4-9) indicated similar price variability traits by location for each commodity but substantially less

Figure 4-10. Changes in Seasonality of Grade 1 Dry Garlic Wholesale Prices in Bangkok, 1965-69 and 1975-79



Source: Data from Ministry of Interior.

Table 4-8. Month to Month Price Variations for Garlic, Soybean, and Peanuts in Chiang Mai and Bangkok Markets

Chiang Mai Buying Price Variability

	Garlic				Peanuts	
	Large	Medium	Small	Soybeans	Shelled	Unshelled
C.V.	.29	.35	.37	.08	.04	.04
Years	65-73	65-73	65-73	65-73	65-73	65-73

Bangkok Wholesale Price Variability

	Garlic		Soybeans		Peanuts	
	Grade 1	Grade 2	Grade 1	Grade 2	Grade 1	Grade 2
C.V.	.18	.24	.06	.07	.04	.05
Years	51-73	51-73	52-73	56-73	57-73	56-73

Source: Adapted from Thodey and Wiboonpongse Study, Ibid., p. 69-80.

Note: C.V.= coefficient of variation

Table 4-9. Yearly Price Variations Within the Same Month for Garlic, Soybean, and Peanuts in Chiang Mai and Bangkok Markets

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Average	Period
Chiang Mai Buying Price Variability (C.V.)														
Garlic														
Large	.41	.27	.32	.27	.41	.43	.41	.42	.41	.40	.42	.45	.33	65-73
Medium	.49	.29	.36	.30	.53	.54	.49	.49	.47	.47	.48	.50	.40	65-73
Small	.52	.37	.44	.38	.60	.59	.52	.56	.53	.50	.50	.53	.43	65-73
Soybean	.19	.26	.33	.29	.33	.43	.45	.32	.26	.23	.21	.15	.29	65-73
Peanuts														
Shelled	.15	.18	.21	.18	.20	.25	.29	.27	.25	.25	.23	.22	.21	65-73
Unshelled	.17	.20	.23	.19	.24	.29	.33	.22	.19	.22	.22	.21	.21	65-73
Bangkok Wholesale Price Variability (C.V.)														
Garlic														
Grade 1	.40	.37	.31	.36	.44	.45	.45	.42	.44	.43	.42	.50	.37	51-73
Grade 2	.48	.46	.30	.38	.51	.56	.53	.51	.53	.51	.51	.58	.45	51-73
Soybean														
Grade 1	.22	.24	.25	.23	.26	.33	.37	.33	.31	.28	.23	.28	.26	52-73
Grade 2	.25	.27	.30	.28	.30	.37	.41	.35	.28	.30	.25	.32	.30	56-73
Peanuts														
Grade 1	.13	.15	.16	.18	.17	.17	.22	.22	.21	.20	.20	.21	.17	52-73
Grade 2	.15	.16	.18	.20	.17	.18	.25	.24	.20	.20	.20	.22	.18	56-73

Source: Thodey and Wiboonpongse, Ibid., pp. 69-80.

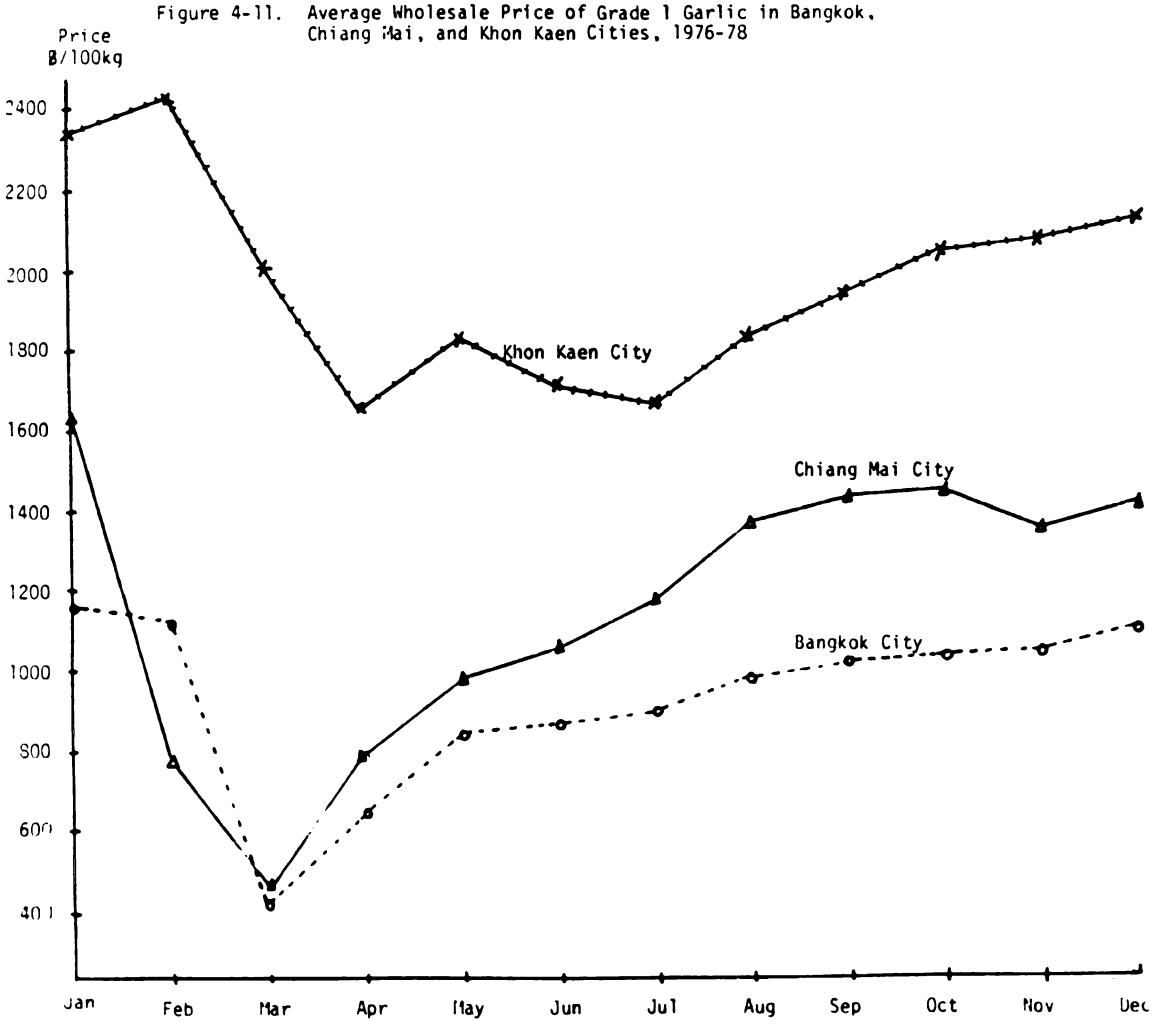
Note: C.V. = coefficient of variation

variability for soybean and peanut prices compared to dry garlic prices. Thus, commodity characteristics rather than type of market place were probably the origin of the variability. The lower grades of dry garlic exhibited the greatest degree of price variability.

A comparison of the average wholesale prices (1976-1981) of first grade garlic by location provides useful insights about the price seasonality and differential between a major supply area (Chiang Mai), major demand area (Bangkok), and a smaller deficit area (Khon Kaen) (Figure 4-11). Khon Kaen City consumers pay a relatively high price for their first grade garlic in comparison to Chiang Mai and Bangkok consumers. The seasonal fluctuations in prices were much less severe and the low priced months were April to July rather than the usual February to April period for Chiang Mai and Bangkok. First grade for Chiang Mai and Bangkok do not seem to be comparable grades because garlic shipped from Chiang Mai to Bangkok should have a price differential that at least covers the ฿.50/kg transportation costs. The important point is that the latter two cities have almost parallel patterns of high and low priced months. Previous comments regarding the potential for increased consumption of dry garlic in the Northeast region through lower garlic prices seems to be supported by these data.

The concerns expressed by farmers regarding wide price fluctuations from year to year are substantiated by this information as are wholesalers' observations about the considerable risks associated with storing dry garlic for later sale. Although one might expect that few risk averse farmers would be willing to plant garlic, field interviews indicated that expectations of very large returns during a high price year often induced farmers to take a chance to cultivate garlic on some portion of their land.

Figure 4-11. Average Wholesale Price of Grade 1 Garlic in Bangkok, Chiang Mai, and Khon Kaen Cities, 1976-78



Source: Bangkok data from Ministry of Interior; Chiang Mai data from Multiple Cropping Project, Chiang Mai University; Khon Kaen data from Northeast Office of Agriculture.

c. Competitive Conditions

The issue of competition and the competitive nature of the garlic marketing system is very pertinent for the understanding of processor procurement systems. The structure of the market, the conditions facilitating competition, the storage dimension, and various signs of competition will be briefly discussed.

The structure of the Chiang Mai Wholesale Market was found to include at least 30 crop wholesalers who handled garlic and onion with less than 25 being important crop traders.[31] Nearby markets also had one or two large wholesalers and several small wholesalers in each market place. Since most of these wholesalers handled more than one commodity they were not entirely dependent on or limited to garlic for their income, thus they had more latitude for adjusting to major changes in garlic marketing from year to year.

The conditions which facilitate a competitive dry garlic marketing system in the supply area include, "1) small traders efforts to expand their business, thus price competition with the larger wholesalers, 2) rural crop buyers obtain price quotes from several wholesalers before selling their produce, and 3) unlike Bangkok wholesalers, Chiang Mai wholesalers had no crop association and limited direct relationship between large wholesalers."[32] At the village level, the several current and potential garlic buyers recognized by both farmers and local crop buyers, the ease of buyer entry at the village level, the several references to defaults by the village level buyers, and the multiplicity of types of

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[31] Thodey and Wiboonpongse, Ibid., p. 36.

[32] Ibid.

local buyers, such as farmer-merchant, agent, and independent crop buyer, all argued for considerable active competition (Wiboonpongse and Kellogg). Competition was said to be so stiff that new buyers had to use risky practices such as advancing credit to growers or buying the crop as it stood in the field in order to win growers from other buyers. Opportunistic behavior was said to cause losses from such practices (Wiboonpongse and Kellogg). And finally the very proximity of the market places to the production areas, vehicles operating from the village level and itinerant buyers coming into the production area from outside provinces argue for a high degree of competition during the main harvest period.

Competitive forces facing Bangkok wholesalers appear quite strong not only because this storable commodity could be held in various amounts by wholesalers within the supply area as well as within other demand areas but also there was always the potential for imports during the storage period. In the Bangkok area, interviews with4-5 garlic wholesalers indicated that there were over ten large garlic wholesalers in the Songwad area plus others dispersed among other major market places. Although each had regular up-country suppliers, they also dealt with some other suppliers, in other words, overlaps of suppliers were evident.

One competitive behavioral trait of large wholesalers provides insights into the difficulties exporters encounter in developing and expanding a consistent, viable export market for garlic. As mentioned during two interviews, the practice of undercutting any wholesaler who received a big order from overseas discouraged market development efforts. As soon as other wholesalers heard of such an order they purchased as much of that particular type of garlic as available, then began negotiating a higher price from the firm with the contract. Asked why the larger wholesalers

did not purchase such types of garlic in anticipation of such a future order, they responded that it was too risky since orders from overseas were too irregular and the practice mentioned above often led to shipments of underspecified garlic (original contract price untenable for specified quality) with little likelihood of follow-up orders. Such a course of behavior suggests several similar sized firms rather than a few very large ones and limited control of the market.

An example of the common speculative mentality among wholesalers was noted from those Bangkok interviews. When the government banned imported garlic in October, 1980, many large wholesalers assumed that regulation would create a shortage and high prices near the end of the season. Thus many wholesalers reduced their sales until just before the new crop. At that time the market was flooded with hoarded old garlic, the price severely depressed, and wholesaler losses in the millions of baht. Prevailing depressed prices and wholesaler losses suggest low farm prices for the next harvest season. Yet, when interviewing those large wholesalers in Bangkok and Chiang Mai, they emphasized the losses experienced by many others but none acknowledged they had any loss. To acknowledge such a loss to an outsider would be to lose face and business credibility according to the knowledgeable source.

For the pickled garlic marketing system many of the same marketing forces and participants are present with a somewhat different twist. Since fresh garlic is highly perishable, the coordination mechanisms have to be more closely sychronized. In other words, negotiation for next day delivery between crop buyers and local picklers is usually necessary or orders from distant picklers must clearly state scheduling in advance.

4. Supply Dimensions

The supply of garlic has several dimensions at both the macro and micro levels. The issue of Thailand's relative position as a world class producer of garlic merits attention because it both reflects a production environment acclimatized to the unique requirements of garlic as a crop as well as a potential source of raw material for new uses of garlic. Trends and changes in garlic production, characteristics of garlic cultivation and growers, and an assessment of supply factors will be the main focus of this section in the effort to understand supply side forces influencing the pickler's procurement system.

From the previous sections we know that there is considerable production seasonality, extreme price fluctuations, three distinct forms for the garlic harvest, prevalence of semi-dry and dry garlic compared to fresh garlic, strong and consistent demand for dry garlic which varies by region, much competition within the garlic procurement system at the village level and indications of a cyclical production pattern. Reasons for and costs of grower sales of one form rather than another, forms of opportunistic behavior noted at the farm level, probable causes of cyclical price patterns, etc. still remain to be understood so that the relevant trade-offs in procurement practices can be identified.

a. Thailand's Position Among World Producers

Thailand is a world class producer of garlic (Table 4-10). In 1980 only two other countries had more harvested area in garlic and three had higher total production, with Asia being the largest garlic producing region. And of the major producing nations, only Korea reportedly had

Table 4-10. Recent Trends in Harvested Area, Yields, and Production of Garlic by Regions and Major Producing Countries

	Harvested Area (1,000 ha)			Yield (kg/ha)			Production (1,000 MT)		
	1969-71	1979	1980	1969-71	1979	1980	1969-71	1979	1980
Asia	152	220	229	5,199	6,365	5,983	791	1,401	1,368
(China)	41F	54F	56F	8,698	9,588	9,286	354F	518F	520F
(India)	28	42F	50F	3,690	3,571	3,300	103	150F	165F
(Thailand)	24	32*	40*	2,936	4,219	4,375	70	135*	175*
(Korea Republic)	15	41	30*	5,333	8,605	8,433	80	350	253*
(Turkey)	11	13	13	4,618	5,600	5,600	50	70	70
(Bangladesh)	14	13F	13F	3,782	3,200	3,228	53	40F	41F
Europe	69	87	82	5,282	5,134	5,574	365	445	454
(Spain)	19	40	34	6,917	5,304	6,412	131	211	218
(Yugoslavia)	16	17	17F	3,242	3,419	3,376	53	57	57F
South America	30	32	39	3,764	4,700	4,685	113	152	181
(Argentina)	10	17	19	4,783	4,816	5,080	48	81	95
(Brazil)	14	8	12	2,563	3,769	4,054	36	31	48
USSR	8	12*	17*	1,714	1,667	1,294	14	20*	22*
N.C. America	9	15	13	7,238	10,186	10,905	66	150	143
Africa	5	8	9	25,423	22,158	23,001	130	172	210
Oceania				1,000	7,295	7,308	-	1	2
World	274	374	388	5,405	6,264	6,130	1,479	2,341	2,380

Source: Food and Agriculture Organization of the United Nations, 1980 FAO Production Yearbook, FAO Statistics Series, Volume 34, Rome, 1981.

F = FAO Estimate

* = Unofficial Figure

higher production per capita. This position may imply a potential for production expansion beyond local consumption requirements, given sufficient foreign demand. Yet, do the presence of experienced garlic cultivators and marketing system for handling increased volumes of supply really indicate the ability to respond to increased foreign demand? Perhaps a better understanding of the garlic supply conditions would help answer that question.

b. Trends and Changes in Garlic Production

Trends in harvested area and production over the ten-year period from 1969/70 to 1978/79 indicate a general growth trend which may have peaked in the 1976/77 season (Table 4-11). Garlic production has been concentrated in the northern region with further concentration there over time (Table 4-12). At the northern provincial level, the Chiang Mai Valley (consisting of Chiang Mai and Lamphun Provinces) has become the primary production location accounting for 41.6 percent of production in 1969/70 and 77.7 percent by 1978/79 (Tables 4-13 and 4-14). Such a trend toward concentration could facilitate less costly and more timely assembly of large shipments of garlic to areas outside of the garlic production area.

The region with the next largest amount of garlic production was the eastern region. Total production by the end of that ten-year period was 253 percent higher while harvested area increased by 40 percent, thus suggesting substantial increases in yields over this period.[33]

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[33]Close examination of the production data by province suggests differences in the form of the yield recorded by province, i.e., dry or semi-dry yield. Because semi-dry garlic is much heavier than dry garlic there is a production bias toward provinces which report the semi-dry form, as the northern provinces do.

Table 4-11. Regional Shifts in the Production and Harvested Area of Garlic, 1969/70 - 1978/79

Region	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	Average 69/70-78/79
	Production										
	Ton										
North	49,925	76,515	43,012	149,429	131,401	135,031	162,808	285,021	283,061	206,832	152,004
Northeast	9,498	9,355	14,733	18,500	12,928	17,899	21,431	17,201	20,758	17,097	15,940
Central	4,396	2,636	5,774	3,870	5,759	9,169	1,366	6,858	1,103	1,142	4,207
South	2	5	74	31	32	95	28	18	271	272	83
Whole Kingdom	63,821	88,511	63,593	171,830	150,120	162,194	185,633	309,098	305,193	225,343	172,534
Percent Change (%)	---	+ 39	- 28	+ 170	- 13	+ 8	+ 14	+ 66	- 1	- 26	+ 253
	Harvested Area										
	Rai										
North	105,846	105,160	97,731	146,301	163,694	144,504	130,260	206,790	195,505	170,242	145,603
Northeast	28,845	23,155	32,971	35,224	32,957	44,368	48,988	38,491	43,724	30,034	35,876
Central	11,198	8,536	15,417	9,927	10,068	8,954	3,617	4,814	2,501	2,928	7,796
South	7	16	216	67	104	322	88	61	611	381	188
Whole Kingdom	145,896	136,867	146,335	191,519	206,823	198,148	182,953	250,156	242,341	203,585	190,463
Percent Change (%)	---	- 6	+ 7	+ 31	+ 8	- 4	- 8	+ 37	- 3	- 16	+ 40

Source: Ministry of Agriculture and Cooperatives

Table 4-12. Harvested Area and Production of Garlic for Northern Thailand Relative to the Whole Kingdom, 1969-79

Year	Harvested Area			Production		
	North (A)	Whole Kingdom (B)	A/B	North (C)	Whole Kingdom (D)	C/D
	'000 rai		%	MT		%
1978-79	170	204	83	206,832	225,344	92
1977-78	196	242	81	283,060	305,190	93
1976-77	207	250	83	285,021	309,098	92
1975-76	130	183	71	162,808	185,633	88
1974-75	134	198	68	135,028	162,090	83
1973-74	164	207	80	131,401	150,120	88
1972-73	146	192	76	149,429	171,830	87
1971-72	98	146	67	43,012	63,593	68
1970-71	105	137	77	76,515	88,511	86
1969-70	106	146	73	49,925	63,821	78
1969-79	146	190	77	152,303	172,523	88

Source: Ministry of Agriculture and Cooperatives.

Table 4-13. Harvested Area and Production of Garlic for the Five Major Producing Provinces, 1969/70

Province	Harvested Area		Production	
	(Rai)	(%)	(M/T)	(%)
Chiang Mai	46,808	32.1	23,404	36.7
Chiang Rai	15,849	10.9	8,509	13.5
Lampang	9,275	6.4	2,968	4.6
Lamphun	9,008	6.2	3,153	4.9
Nan	6,771	4.6	2,573	4.0
Whole Kingdom	145,896		63,821	

Source: Ministry of Agriculture and Cooperatives.

Table 4-14. Harvested Area and Production of Garlic for the Five Major Producing Provinces, 1978/79

Province	Harvested Area		Production	
	(Rai)	(%)	(M/T)	(%)
Chiang Mai	57,611	28.3	83,506	37.1
Lamphun	41,774	20.5	91,610	40.6
Lampang	19,408	9.5	4,852	2.1
Mae Hong Son	12,888	6.3	9,666	4.3
Nan	8,178	4.0	3,680	1.6
Whole Kingdom	203,585		225,343	

Source: Ministry of Agriculture and Cooperatives

Note: The data for Chiang Rai during 1978/79 was very inconsistent with all prior years, suggesting some data collection problem. It consistently was second or third in area and production for all other years from 1969/70-1977/78.

Characteristics of the crop itself could have accelerated the rate of production concentration. There are two major varieties of garlic in Thailand. The less erect variety grows better in the cooler climate of the North while the erect variety grows in the other areas, according to a local garlic breeder. This plant scientist contends that no new variety has been developed and promoted over the past two decades, thus production of the two popular varieties should be gravitating toward their most favorable climates and/or ecological conditions where improved cultural practices and/or cultivation on better soils have contributed to the fairly steady increase in average yields from about 300 kg/rai during the 1962/63 crop year to over 1,000 kg/rai in recent years.

The seasonality of the main production during the cool dry season in the North is facilitated by the "seed material" crop whose harvest corresponds to the planting time (late October to January) of the main crop. Concern over the increasing costs of good seed material and local practices to insure seed material viability were mentioned by farmers interviewed. Sampled farmers discounted the conventional wisdom of most farmers holding their own seed material. Unfortunately no further information was available concerning this vital link in the production, harvest, and replanting cycle.

Sensitivity of the main garlic crop to humidity and temperature conditions was mentioned as cultivation problems both by the plant scientist and farmers. For instance, rains in January occasionally caused "environmental shock" damage to crop yield and sharp temperature increases in April terminated the growth of any of the crop still in the field. These environmental factors could be a major factor affecting yields and quality, thus contributing to the extreme price variability and cyclical price

movements observed. Besides the weather and environmental factors, the farmer can increase or decrease acreage and/or yield through his decisions, consequently it is important to develop a clear picture of the grower and his cultivation of garlic.

c. Characteristics of Garlic Cultivation and Growers

Production of garlic in almost every province underscores the certain degree of versatility exhibited by this crop. However, one must recall that garlic outside of the main production areas was mostly for household consumption or local market sale. Of the two main locations of garlic growers in the Chiang Mai Valley, i.e., Fang and Rimping, the latter area was surveyed. The farmers within this major garlic production area near Lamphun City represented a broad cross-section of rice farmers who cultivated garlic during the dry season. Some of these farmers grow other crops on the large raised garlic beds during the rainy season while most leveled the beds for rice cultivation then make them again after the rainy season's rice crop.

Major competing crops during the dry season included tobacco, soybean, peanut, and sometimes tomato. According to MCP[34] research, common cropping patterns which included garlic were rice-garlic and rice-garlic-mung beans. Due to the wide area involved and limited information available it is not possible to associate garlic cultivation with any particular group or subgroup of producers. However, from interviews with farmers on the fringes of the garlic production areas it was noted that the soil properties of certain fields prohibited the expansion of economic production of garlic into those areas. Some farmers who ceased production

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[34]MCP = Multiple Cropping Project based at Chiang Mai University.

remarked that past losses in garlic production prohibited further cultivation because of the high cash costs for good seed material and chemical inputs. Other common problems mentioned included periodic incidences of disease, and widely fluctuating prices.

The understanding of the grower's decision of which form to harvest, i.e., fresh, semi-dry, or dry garlic, is very pertinent to the processor. Although some farmers sell more than one form, they usually sell only one form. Besides the comparison of value by form, there is the factor of crop interrelatedness as explained by the sample of farmers in Rimping. For instance, during the 1980/81 cultivation season an unseasonal rain had damaged the previous rice crop which was lying in the fields of several farmers ready for threshing. That loss caused them an unanticipated shortfall in cash which in turn lowered the level of inputs used in this year's garlic and forced them to harvest their garlic as "fresh garlic" even though the price was unfavorable. Otherwise the cash flow problem for their following main rice crop would have been unmanagable. Thus the farmer's bargaining position can be compromised by weather related factors in both indirect and direct ways, especially whenever sizable amounts of cash inputs are involved.

A profile of the production practices provides a means of identifying pertinent field operations or cost components which would either, 1) prohibit the rapid expansion of this particular crop, 2) cause shifts away from this crop if a substitute crop became available, or 3) reduce yields or areas planted due to the unavailability or increased costs of certain materials or labor costs in the near future. Such a profile of garlic production would include:

A) Preparation of the seed material, i.e., break the bulb into its numerous parts. (Female and/or children's work).

B) Plow the field so as to break up the soil into clumps. (Male with an animal or machine).

C) Break the clumps and form the beds with hoes (Male or female work at a ratio of 1 hour male = 2 hours female work).

D) Plant, fertilize (some farmers use compost while others favor chemical fertilizers), mulch (straw cover), and water as one set of activities. (Female and male work).

E) Periodic watering every 10-15 days by splashing water from the channel between beds onto the beds with small scoops on the end of long handles. (Male and female work at a ratio of 1 hour male = 2-3 hours female work).

F) One or two weedings dependent on the field condition one or two months after planting. (Female work with more time spent on the first weeding).

G) One or two top dressings of chemical fertilizer (broadcast method) beginning 15 to 20 days after planting. (Male or female work).

H) Two or more applications of insecticides-fungicides as needed (a male uses a sprayer, sometimes with a female preparing the spraying materials).

I) Harvesting activities include pulling, bundling and tying, and carrying home. (Female and male work).

J) Miscellaneous activities include preparation and sales activities. The former are those associated with trimming and bagging if sold fresh or arranging in open areas then hanging under the house for further drying and trimming before selling. Those activities vary widely from household to household and are generally done by the female members of the household. Sales activities are usually undertaken by the head of the household, vary widely, yet generally include checking on prices by taking samples to buyers who later come to collect the harvests, pay the farmer in cash, and transport the bagged garlic in their trucks.

This profile of the production practices suggests periodic use of groups of laborers (hired labor even for smaller plots), less frequent repetition of crop care operations (slack periods for other uses of family labor) and

limited field inspection needed, i.e., can be grown in fields somewhat further from the house.

Water requirements confine its cultivation to irrigated areas and the types of field operations suggest considerable labor requirements. It is useful to compare this crop's labor use to that of other types of crops cultivated in that region. From Table 4-15 a comparison of the labor use by various crops illustrates the magnitude of the labor time difference. From a comparative labor cost perspective Table 4-16 indicates the sizable difference between vegetables, such as garlic and tomato, and field crops such as mung bean, soybean, rice and peanuts.

Table 4-15. Man-hours of Labor Per Rai by Type of Field Operation in Ban Pa Mark,[a] Northern Thailand, 1973/74

Field Operation	Rainy Season	Dry Season			
	Rice	Rice	Soybean	Peanut	Garlic
	Man-hours/Rai				
Nursery	3	2	---	---	---
Land Preparation	19	19	20	36	190
Plant or Transplant	25	33	40	62	251
Care of Crop	8	12	12	16	205
Harvest	41	43	46	154	184
Total	96	109	118	268	830

[a] Located in the Chiang Mai Valley.

Source: Adapted from: Alan Thodey and Peter LaRamee, "Ban Pa Mark, Northern Thailand: Results of a Daily Record-keeping Study 1973-74," Agricultural Economics Report, No. 1, Faculty of Agriculture, Chiang Mai University, 1974.

Table 4-16. Labor Costs Per Rai for Selected Crops in the Chiang Mai Valley, 1975/76

Type of Labor	Field Crops				Vegetable Crops			
	Mung-bean	Soybean	Rice	Peanut	Chinese Cabbage	Local Sweet-corn	Tomato	Garlic
	Baht/Rai							
Family	124	121	206	403	390	490	651	502
Hired	41	123	122	105	3	13		238
Total	165	244	328	508	393	503	651	740

Source: Adapted from: Wiboonpongse and Thodey, Ibid.

Perhaps returns to this crop warrant the considerably higher labor costs. The average variable production costs for a sample of 1980/81 garlic producers in the Rimping area of Lamphun Province (Chiang Mai Valley) are provided in Table 4-17. The major cost component was the seed material which cost as much as ฿12/kg. That cost was 31 percent of total cost, 42 percent of cash costs, and as much as 57 percent of the costs of supplies. Fertilizer costs which were reportedly high amounted to 13 percent of total costs, 18 percent of cash costs and 25 percent of costs of supplies. Although returns were about ฿200/rai below the expenses which included family labor costs (inputed according to local hired wage rates), the households earned about ฿1,000 per rai beyond cash expenses. Due to the extreme variability in costs and yields mentioned in the previous studies, three additional production cost studies will be cited.

Table 4-17. Average Variable Production Costs per Rai of Garlic in the Rimping Area of Lamphun Province, 1980/81 Season

Cost Item			Costs (฿)
Supplies			
Seed Material (cir. 100-120 kg/rai)			1,445
Straw			454
Fertilizer			628
Pesticides			20
Subtotal			2,547
Equipment (with Labor)			
Land Preparation			193
Labor[a]			
	Family	Hired	Total
Preparing the bulbs	250		250
Bed Formation	250	240	490
Plant	50	200	250
Fertilize	25		25
Crop Care: Irrigate	450		450
Weed	150		150
Chemical Spray	20		20
Harvest		300	300
Subtotal	1,195	740	1,935

Total Cost = ฿ 4,675/rai

Cash Cost = ฿ 3,480/rai

Yield (fresh form) = 2,088 kg (untrimmed) x ฿ 2.14/kg = ฿ 4,468.32/rai

[a] Imputed family member time at ฿ 25/day for males and females and ฿ 10/day for children.

Source: Survey of seven garlic growers.

Two production cost surveys conducted by the Multiple Cropping Project (MCP) of Chiang Mai University are illustrated by Cases A and B of Table 4-18. In Case A, a sample of garlic growers was found to spend 64 percent of total costs on supplies (i.e., over 80 percent of cash costs) and earned ฿436 above all costs or ฿997 beyond cash costs. In Case B, a sample of six garlic growers spent 74 percent of the total costs on supplies and earned ฿648 above all costs. In another part of that study observations of over 30 producers' yields and costs over an extended period led to the conclusion that the garlic crop was very risky as judged by the standard deviation of net returns, coefficient of variation of no returns, and observed probability of not covering labor, supply, and equipment costs. It is interesting to note the extreme riskiness, yet on average, returns above all costs.

Another study which included costs for two time periods, Cases C and D, was undertaken by the Office of Agricultural Economics (Table 4-18). These costs were much closer to this author's cost distribution between supplies and labor with supplies being the larger component. In those studies seed material costs were 39 percent (Case C) and 35 percent (Case D) of total variable costs and 65 percent (Case C) and 67 percent (Case D) of supply costs whereas fertilizer costs only accounted for 12 percent (Case C) and 11 percent (Case D) of supply costs. Normally vegetable seed material is very crucial for a healthy crop but in this case where seed material is such a large cost component, the viability of the seed material makes a crucial difference between cash loss or profit. Further research on this seed material factor is extremely pertinent because cash requirements near planting time, germination problems, farmer planting decision relative to seed material costs rather than mainly the price of harvested commodity, etc. could be at the crux of variability problems.

Table 4-18. Average Costs of Production Per Rai of Garlic

Cost Item	Costs			
	Case A 1975/76	Case B 1976/77	Case C 1977/78	Case D 1978/79
	Baht			
Supplies	1,712	2,216	1,763	2,604
Equipment	59	308		
Labor-Total	740	486	1,154	1,276
Family	502			
Hired	238			
Others	176		92	104
Total Cost	2,687	3,010	3,009	3,984
Cash Costs	2,126			
Cost per kg.	2.18/kg	2.19/kg	4.71/kg	5.53/kg
Yield	1,229.45 kg x ฿2.54/kg	1,375 kg x ฿2.66/kg	639 kg	720 kg
Return	฿3,123/rai	฿3,658/rai		
Net return:				
All costs	฿436	฿648		
Cash costs	฿997			

Adapted from: Case A - Wiboonpongse and Kellogg, "Study of Farm to Wholesale Marketing in the Chiang Mai Valley," Ibid., p. 34.

Case B - MCP cost estimates.

Case C and D - Office of Agricultural Economics, "Problems in Selling Onion, Garlic and Ways to Solve," Ministry of Agriculture and Cooperatives (Estimated for Area 10 consisting of Chiang Mai, Chiang Rai, Mae Hong Son, and Lamphun Provinces) (in Thai), 1979.

Further comparisons between the four cases in Table 4-18 are tenuous due to limited information on data collection methods, different survey sites, and substantial differences in cost estimating procedures and in breakdown of costs.

E. GARLIC PROCUREMENT PRACTICES

This section focuses on garlic buyer procurement practices, primarily as they respond to the demands of the fresh market and pickling market channels. Yet, before examining the variations in buying practices by type of channel it is important to understand grower sales behavior. From the Wiboonpongse-Kellogg study 94 percent of the 35 garlic growers interviewed in the Chiang Mai Valley (1975-76) sold their garlic to one buyer, often the first one contacted. The distribution of types and location of buyers, i.e., merchant in own village, in city, in own tambon, in own amphur, in nearby tambon, farmer-merchant, and others, suggest proximity to the garlic grower in most cases. Also when that study compared its findings with an earlier survey, i.e., Paiboon and Thodey, 1971, a larger percentage of farmers went to the merchants for price information and to sell their product rather than await the buyers arrival. This change implies an active and more assertive group of producers trying to get a better price while engaging in a competitive system, otherwise why exert such sales effort if only one price is applied. Best price, most convenient, and long standing contact were the main reasons for selling to their buyers.

The usual method of payment is cash at the time of sale, although a few growers received delayed payments ranging from three days to two months. When growers insist on their exclusive measurement of the commodity there is the implication of mistrust in the buyer but for garlic only 37 percent

of the garlic growers measured their product before sale, unlike the 85 percent of the soybean producers surveyed by Wiboonpongse and Kellogg. Most sample farmers expressed satisfaction with the sales arrangements.

A crucial element in the grower's sales decision is what form to sell, i.e., fresh garlic versus semi-dry or dry garlic. Fresh garlic must be sold within a couple of days to avoid spoilage, consequently the grower has to have a sales agreement before or at the harvest time. Semi-dry garlic sales can be delayed a couple weeks during which time price comparisons will be made. Dry garlic sales theoretically could be delayed for as long as storage is feasible but most information suggests farmers sell the vast majority of this commodity before the end of May. Now let us consider the procurement practices by the different types of buyers.

1. Fresh Market Buyers (Semi-Dry and Dry Forms)

The analysis of the marketing system participants identified two levels of participants, i.e., village level buyers and wholesalers within the fresh market channel. The analysis of grower sales practices and the nature of the commodities themselves indicate that the first handler is usually located at or near the village level, offers convenience and/or best price to the grower, and, not infrequently, operates within a long term contact basis. Here the issue is to understand the garlic grower-first handler relationships which arise during the garlic harvest season, especially as those relationships may influence the picklers procurement system. Although the information available is limited, certain relevant patterns can be discerned.

From the Wiboonpongse-Kellogg study and this author's interviews no definite procurement boundaries seemed to exist for village level buyers,

however farmers generally put more trust in buyers whom they recognized and with whom they had previous dealings. Thus outside buyers would have to offer very favorable prices or special convenience during the harvest period in order to compete in new areas. One buyer illustrated the benefits of farmer recognition by noting that new buyers or buyers who wanted to become more "popular" with growers usually had to provide some input credit or buy the crop "green," i.e., unharvested in the field. The first option requires considerable working capital and the second is very risky because farmers in that area had devised such practices as spraying the crop with a weed killer to give the appearance of maturity (dry stems). Such examples of opportunistic behavior on the part of farmers increased buyer risk and inhibited market entry by additional village buyers.

Canvassing familiar or new garlic growers just at the right time seemed crucial for these buyers since sample farmers said they often sold to the first one contacted at harvest time. This reinforces the necessity of proximity and intimate awareness of crop scheduling and likely harvest periods. Likewise, the commission approach was common in some areas wherein a local buyer assembled growers' harvests, sold them for the growers, and retained a prearranged margin. Trust and accountability are important for this approach, thus again favoring local rather than outside buyers. The reasons for some farmers accepting this first bid at the farm level while others took their harvest directly to the higher level buyers in the cities remain unclear, except for the anticipation of receiving a higher price.

The hierarchical structure of this market system requires village level buyers to rely on higher level buyers both for price information and purchases of commodity already procured from farmers. As the market

becomes very active during the peak harvest period, prices changed considerably from day to day. The village buyer with a long-standing relationship to a higher level buyer seemed to have several advantages over newcomers in terms of experience in identifying and evaluating quality differences, possible working capital advances, and an assured buyer. Yet, from interviews and field observations the degree of regularized interaction between higher level and village buyer seemed to be decreasing in favor of the attitude that each person was on his own. However, the extent of that breakdown or reasons for it remain uncertain.

2. Pickling Market Buyers (Fresh Forms)

A major distinction between the procurement practices for this raw material and the other commodity forms is not that different individuals are involved, but the degree of market coordination activities necessary for the pickling versus fresh market channel. Since fresh garlic is so perishable, the inspection process and delivery arrangements require more time, oversight, and attention. Both the growers and village buyers of fresh garlic need some assurance of quick sales because quality deterioration is so rapid.

The fresh garlic represents the first of three sales options, thus its returns are compared to the anticipated returns of the other forms. Consequently, the village buyer of fresh garlic must clearly understand and be able to explain to farmers the tradeoffs between forms in order to persuade the grower to harvest fresh. Buyer and pickler contentions that the fresh garlic price is much more stable than that for dry garlic probably is a strong argument for harvesting fresh.

The prices that village buyers of fresh garlic can offer growers seemed to vary by their pickler clientele and the time purchased. The

pickler clientele consists of local picklers within the village buyers sales area (i.e., near or in the production areas) or distant picklers, usually via a large local wholesaler. Since village buyers who are recognized as commission agents for the larger multiple product picklers were said to also have the advantage of having more favorable terms of trade, it is useful to consider village buyer-pickler relationships by type of pickler.

The FDR II firms dealt with ten regular commission agents from whom they bought all of their garlic on a cash basis. Since the sales peak for their bottled garlic corresponds to the Chiang Mai tourist season, i.e., early part of the year and these firms were aware of the higher quality garlic in the early season, they are among the earliest to enter the market for fresh garlic; and their bidding activities probably set the tone for prices during the early harvests of fresh garlic. These firm owners visit their commission agents in the production area or are visited by them in order to exchange information on anticipated supply, to discuss the factory's perceived requirements, and to negotiate for an adequate quantity of acceptable quality at an appropriate time within reasonable costs and delivery schedules. With the village buyer's first delivery in the morning, cash is paid and newly agreed upon terms of trade are negotiated. Then the process of searching for growers, loading the pick-up with fresh garlic and storing it overnight, and next day delivery to the factory is repeated. One of these commission agents stated that the pickler generally has the stronger influence on price determination but that since he deals with several picklers he compares bids and prioritizes delivery of raw material according to the best price.

Other important points include, 1) the experience of the commission agent as a garlic grower which enables him to select better crops on the pickler's behalf, 2) the recognized relationship with such reputable picklers improves the commission agent's status among competing village buyers, and 3) the long term relationship should give the pickler a more accurate assessment of supply conditions over the whole season. For whichever or all these reasons, the FDR II firms did not accept much, if any, garlic outside these arrangements, i.e., "off the street."

Both the FDW III and VDR I firms seem to have a somewhat similar arrangement but with half as many commission agents. They sometimes accepted fresh garlic "off the street." Since the FDW III firms competed in a similar product market, their procurement arrangement almost paralleled the FDR II system; however, their prices had a wider range, ฿5-7/kg versus ฿6-7/kg (1979/80 season), and one firm mentioned that some credit was obtained from a large supplier. Due to the strong demand during the early market period it is likely that credit was given only later in the season when prices had decreased somewhat. The VDR I firms were not very active in the early tourist market, invested heavily in the procurement of chinese mustard just prior to the garlic season and were smaller in size, consequently working capital constraints were cited, among other reasons, for minimal involvement in the fresh garlic market compared to FDR II and FDW III firms.

The medium and large scale, single product firms (VDW IV) have major markets outside of the North, thus their procurement was not so strongly influenced by the tourist season demand during the early part of the year. Although most firms procured from several regular commission agents, some bought as much as 50 percent of their supply "off the street" fresh garlic sellers, especially during the peak season.

The procurement practices of distant picklers include different standard operating procedures because daily shipments of 6-10 ton trucks of fresh garlic require more assembly activities and more time, thereby increasing the chances of spoilage. Salt must be mixed in with the fresh garlic to inhibit deterioration during the delayed assembly, shipment, and preparation period. Since the pickling process does not result in weight reduction, transportation costs for distant picklers do not put them at a cost disadvantage as long as raw material quality deterioration and shipment losses are controlled.

Thw two main ways for distant picklers to procure directly from the Chiang Mai Valley are to place orders with local medium sized or large wholesalers. If with medium sized wholesalers, an advance to cover procurement and shipment costs is negotiated along with "at factory" price. After the initial deliveries, the "at factory" price is renegotiated (usually decreased) as the initial advance is discounted on the basis of each delivery. The large wholesalers usually did not receive an advance but negotiated for a higher "at factory" price.

For village level buyers a major tradeoff between dealing with local picklers and distant picklers is that in the latter situation the village buyer became a link in the supply chain rather than a direct supplier. Thus it seems reasonable that local picklers receive priority treatment whenever possible. Since distant picklers directly competed with the VDW IV firms for the same product markets, they could not afford to pay too much more for the raw material of less favorable quality. Unfortunately, the scope of research did not allow a comprehensive investigation of this aspect.

Behavioral practices of suppliers and picklers created risks and uncertainties within various procurement systems. For instance, the price that VDW IV firms offered seemed to vary by the type of suppliers. During the 1980/81 season a price of ฿4.50-4.75/kg for fresh garlic (trimmed) was offered by this factory but whenever a regular village level buyer arrived this pickler said he paid ฿.20-.30/kg above that rate, i.e., ฿4.70-5.05/kg. If a trucker brought a farmer and his harvest and helped persuade the farmer to sell, the pickler paid ฿4/kg to the farmer and ฿.50/kg as a commission to the trucker (collected at a later time as an "introduction commission").

Another type of trade practice which illustrates opportunistic behavior within the fresh garlic market is the village level buyer's practice of soaking the burlap bags full of fresh garlic in water overnight to add weight. The next morning the 10-14 percent heavier bags of fresh garlic are delivered to the nearby pickler (or large wholesaler) and sold on a kilogram basis. However, the pickler or wholesaler had a countermeasure whereby he already adjusted his scales to under weigh the bags and thereby offset the overweight. Consequently one could infer that each practice offset the other. Yet several questions arise. "Was the soaking designed to counter the fixed scales or vice versa?" In other words, since the large cement containers used to soak the sacks full of garlic were not accessible to farmers, "Is the individual small farmer who circumvents the village level buyer (i.e., delivers his harvest directly to picklers or wholesalers) likely to gain better returns?" Probably not, given the transportation cost, truckers' "introduction commission" from those buyers, and the "fixed scales" that are under weighing the farmer's sacks of garlic!

As noted for dry garlic procurement, village level buyers engaged in such a high degree of competition that new entrants often had to provide input credit to growers or purchase the crop "green" in the field. Unfortunately another form of opportunistic behavior occurred whereby some farmers sprayed an 80-day-old crop with a hormone solution which gave the stems a thick healthy appearance of a 90-day-old crop. When the new buyer went to harvest the immature crop he was unable to fill his agreed delivery to picklers. Thus buying "green" was a very risky option and credit an expensive way to gain farmer clients.

In summary, the marketing systems of wholesalers and village buyers simultaneously handles various types of demand in terms of different forms, types of buyer, and services required. The system adjusts to the commodity characteristics of both perishable and storable commodity. The need for better quality raw material is fulfilled by close contact with and a long term business relationship with those most knowledgeable about cultivation and grower skill, i.e., the village buyer who has been a cultivator himself. Local picklers who can identify production areas with reputations for especially high quality harvests are in a unique position to establish a working relationship with a village buyer from that area. Whereas other picklers are forced to accept ungraded lots. Distant picklers have to rely on wholesaler's ability to judge quality, and obtain it, rather than be directly involved.

F. DIAGNOSIS OF PROBLEMS ENCOUNTERED

The diagnosis of problems entailed two approaches. First, questions regarding perceived problems were part of the subject matter questionnaires administered to the sample firms. Second, cross comparisons between

questionnaires and follow-up discussions with individual firms were used to identify sources and implications of the problems mentioned. This process helped explain why the same respondent answered similar questions differently at different points in time. For instance, during the period following an especially high increase in the price of one raw material and one fabricating material, all firms emphasized the serious problem of rapid price increases for inputs. However, when that previously high price fell to an anticipated level during the following procurement season, and product prices had increased in the meantime, several firms began emphasizing "working capital" as a major problem. The following diagnosis of various types of problems mentioned will attempt to relate problems to their sources as much as possible.

Working capital is used primarily for purchasing raw materials but also for covering fabricating materials and parts needs as well as operating expense requirements, such as hired labor expenses. Due to the long lag periods between periodic purchases of raw materials and the sales of final products, there are considerable costs associated with carrying large inventories of final or intermediate products. For the three FDW III firms, working capital was cited as their number one problem because the burden of large accounts receivable from their buyers enforced additional constraints for financing firm operations, supporting the large inventories of products, and expanding their markets. Narrow margins and returns of spoiled products further exacerbated their interrelated set of working capital problems. The other types of firms acknowledged that working capital constraints hampered firm output expansion primarily because it limited the amount of raw material that a firm could purchase. However, their daily sales provided sufficient working capital to cover operating

costs. From a somewhat broader perspective working capital was mentioned by four of seven pickling firms as a potential barrier for firms attempting to enter this industry.

One way to assess the extent of this working capital problem is to compare the seasonality of average raw material purchases and sales value for the main products according to firm type (Table 4-19). This comparison shows the higher degree of seasonal variability for FDR II and FDW III firms relative to VDR I firms. Likewise, the relative magnitude of working capital requirements for raw material purchases during June and July for the fruit dominant firms is emphasized by contrasting it to the gross sales value for those two months. Unlike the fairly consistent raw material purchases and sales pattern for the VDR I firms, the mismatched procurement and sales periods of fruit dominant firms impose considerable costs and risks in carrying inventories of final products over extended periods.

The rapidly increasing price of raw materials was of primary importance to six of the eight pickling firms. All three FDW III firms ranked this as the second or third most important problem whereas one FDR II and one VDR I firm did not mention this problem. Further discussions revealed the cost-price squeeze implications of this particular problem (i.e., the depressed economy weakened product demand thus requiring several months delay before increasing product prices). The source of this perceived problem, i.e., rapidly increasing raw material prices, was the unanticipated price fluctuation around a generally upward price trend for fresh garlic. Picklers illustrated the degree of price fluctuation by providing their average prices for fresh garlic as, ฿4-5/kg (1978/79), ฿6-7/kg (1979/80), and ฿4.50-5.50/kg (1980/81). When first interviewed they had paid the 1979/80 raw material price while anticipating about ฿5/kg in what

Table 4-19: Comparison of Seasonality of Average Raw Material Purchases and Sales Value for Main Products According to Firm Type

Type of Firm	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	X	C.V.
							Baht							
FDR II:														
Sales	917,190	857,877	802,070	712,485	240,836	182,656	145,778	144,390	162,148	251,106	255,150	843,964	457,638	.72
Raw Material Purchases		108,000	180,000		46,800	240,100	363,000						78,150	1.55
FDW III:														
Sales	566,134	685,864	247,044	709,949	107,068	104,854	136,782	135,579	91,081	138,195	172,041	453,693	295,690	.81
Raw Material Purchases		104,000	128,040	---	86,500	227,000	136,780						56,860	1.36
VDRI														
Sales	145,887	173,344	171,521	171,675	137,311	128,353	111,890	109,795	109,587	116,797	116,873	110,753	133,649	.19
Raw Material Purchases	17,500	92,023	102,480	2,200	2,200	69,667	97,667	25,750	25,750		31,900	32,440	41,632	.92

Source: Survey of Chiang Mai picklers

they described as a comparatively stable fresh garlic market (i.e., stable relative to the instability for dry garlic).[35] During interviews in the 1980/81 period, raw material prices were as anticipated, so firms began emphasizing problems of working capital and too much competition.

The related issue of variable raw material quality was often brought up by the firms. Their observations agreed with the natural phenomenon of law quality raw materials during a poor crop year and higher quality during good crop years. Consequently they paid more for a poorer quality and less for the good quality which translates into selling a less flavorful product (or of poorer appearance) at the same or higher price than the good product due to raw material and final product interdependence. Since pickled products packed in bottles are much more observable than reprocessed products, picklers who favored bottled products seemd most concerned.

Labor related problems were most frequently discussed by three of the four firms with a factory near downtown Chiang Mai City. The limited skill of the laborers, absenteeism, poor work habits, and periodic shortage of personnel were mentioned by these firms. Each firm owner seemed to have his own distinctive way of managing employees. Management practices included, 1) designating specific repetitive jobs for certain persons or general work for everyone, 2) hiring a group of especially young local workers on a regular basis or periodically transporting in adult laborers from outside villages or employing mostly relatives on a regular basis, and 3) paying an absolute minimum or moderate wage. For the remaining four firms located on the periphery of the city or in a village area, only one mentioned a lack of labor for certain periods of

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[35]The analysis of the garlic subsector confirmed that dry garlic prices, displayed an increasing trend in nominal terms, exhibited considerable cyclical fluctuations, and were extremely variable over time.

time as a problem, i.e., primarily during the rice planting season. Again labor management practices and organization varied widely, but labor wages were more similar and discontent with labor performance was minor.

Technical processing problems were only mentioned by two VDR I firms in reference to the recent substantial rotting of stored pickled chinese mustard. Normally the pickling solution that fills the sealed pickling jar induces the pickling process and protects the resultant pickled products. However, in the case of pickled chinese mustard the solution level in several sealed clay jars recedes over time thus exposing more and more pickled mustard which then rots. The pickler attributed the evaporation of solution to a chemical reaction in the clay jars due to the over application of nitrogen fertilizer which somehow contaminated the chinese mustard. Another possible explanation was that heavy fertilization quickened plant growth so that it appeared mature and could be harvested earlier. Then the pickling of immature mustard could have caused the adverse chemical reaction. Although they recognized that it is important to resolve this problem so as to reduce picklers' costs and thereby consumer price, they did not know how to solve the problem nor who to contact about it. If an immature or contaminated commodity is being sold to picklers, that coordination problem will require public sector attention.

Government interventions seemed to be a fact of life which each firm attempted to deal with as it arose as a part of the costs of "doing business" unless it affected the industry as a whole. On these occasions all the larger "unprotected firms"[36] held a meeting to discuss their

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[36]Two firms were said to have paid for and received special protection from certain local influential persons or contacts in Bangkok.

strategy for dealing with it. At the onset of this study few firms acknowledged any form of government intervention as problematic. Perhaps because they were not so serious or more likely because most of the firms chose avoidance measures versus compliance, thus compromising their ability to discuss their course of action with outsiders. However, near the completion of the fieldwork several interesting problems were discussed with confidentiality of the sources assured. A few problems of the major industry wide interventions need an explanation.

Health regulations were more problematic in their interpretation by local implementing authorities than in their actual statement or intent. An excellent example was the concern that too much artificial acetic acid used in the pickling process would be harmful to the consumers of pickled products. A local health official suggested that a large pickler had included too much acetic acid in his products, when the pickler refuted that accusation the case was taken to the court. The author's attempts to clarify the regulation on the behalf of some concerned pickling firms produced no clear answer regarding what was "too much" acetic acid, even after visits to health department officials in Bangkok. The regulation seemed to be a statement of concern for the consumer rather than an enforceable regulation with implementable specifications. The bottom line is that local health officials were put in a position to influence a firm's reputation or impose extra market costs to firms who were unwilling to enhance their earnings, i.e., make payoffs.

Consultations with food technologists regarding the effects of acetic acid on consumers brought out the point that the inclusion of even moderate amounts of acetic acid would adversely affect the taste of the pickles, consequently, it would be illogical for the firm to use anything

but minimal amounts. Also the point was made that natural acetic acid in the form of vinegars from agricultural by-products would solve any potential health problem while making more efficient use of Thailand's agricultural products. Followup on that point led to the finding that natural vinegars were not readily available at comparable prices due to certain regulations and/or bureaucratic concerns in the government's Tobacco and Alcohol Monopoly.[37]

While looking into those alleged concerns, one firm alerted us to a new regulation by the Health Department in which the pickling plant layout was to follow certain general guidelines. This instance brought to light the informal association of the larger pickling firms. They held meetings in an effort to determine the implications of and avoidance costs of the new regulation. The possible implementation of this regulation was creating havoc for several firms because plant closure was threatened rather than a fine for non-compliance. Yet, the costs of compliance would also force closure for some firms. Discussions with knowledgeable health officials explained the origin of the regulation as a need to have separate processing areas for fish and for fruits and vegetables in order to avoid contamination problems. However, the wording was vague enough that one could interpret it to mean that <u>every</u> processed food should have its own processing area. In that case, a firm processing five or six fruits needed five to six entirely different processing areas regardless of whether using the same process. Such an interpretation could be fatal to many multiple product picklers.

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[37]Because the process of converting by-products into vinegar include an alcohol formation step, the Tobacco and Alcohol Monopoly had special jurisdiction over vinegar production. As a consequence of that jurisdiction, Thailand wastes by-products and imports and consumes millions of dollars worth of acetic acid.

Yet another source of concern and uncertainty is the proposed regulation banning the use of saccharin which is a commonly used ingredient in the sweetening process. According to a sample of wholesalers and retailers of saccharin in Bangkok, the rumor of the possible sanction had already affected their sales of saccharin to some Bangkok picklers. The Chiang Mai picklers mentioned learning of such a rumor but did not know much about it.

These examples and several others, point out the problematic relationship between the firms and various government agencies. Although intended to protect consumers, labor, and existing firms as well as to obtain government revenue, the gap between intent and actual implementation seemed to be considerable.

A final consideration regarding government intervention is the uneven impact of such intervention on firms of different sizes. The term "firm visibility" basically means that the larger the firm the more easily it is detected (visible), its income estimated, and the more regulations that become applicable. Consequently the costs of evasion or quasi-compliance increase disproportionately to firm size. Examples of regulations with size implications were, 1) factory registration requirements stated a minimum of a 2 h.p. engine or seven employees before being obligated to register; 2) labor laws for employee insurance payments specified a minimum of 20 employees; and 3) a tax of 7 percent of gross income was based on the tax assessor's visual "estimate" of gross income. Some firms also mentioned cases of junior officials visiting the factory and asking for "contributions" for their boss' birthday; dinners following group meetings with officials were paid for by the largest firm owner present, etc. as additional costs.

Whereas the smaller firm, especially with a small retail stand, was said to pay fees for retailing and disguise the extent of its pickling enterprise. As was learned the hard way, it is very difficult to find small firms under family houses or down dark alleys and harder to get reliable information from them. A comment relevant to the visibility issue was made by the owner of a large pickling firm when asked about the potential for expanding his business. At first he cited such constraints as lack of capital and few family members to help but then, in an excited voice and with a furtive look, he stated that no one can become very big here without some relative in a high government position to protect the firm. But he would elaborate no further.

All the picklers mentioned that it would be very difficult for new firms to find new markets or to compete in existing pickled product markets. Three of the five retailing firms (FDR II and VDR I) emphasized the problem of too much competition in the present marketing system. The price and sales pressures from smaller firms for the same product were emphasized as the main sources of competition for seven of the eight pickling firms. This pressure was particularly evident for retailing food pickles which required little capital or experience. As the smallest VDR I firm said, "It is easy to enter this type of business if anybody cannot find a job." Consequently, during certain slack labor periods in the months following the peak harvesting for chinese mustard and garlic many household picklers were said to enter the market at the retail level.

The analysis of garlic growers' production costs called attention to the high costs of production and the major cost component of the seed material, both in its magnitude and relative to all other costs. Another

study[38] of garlic production also emphasized these high costs and the poor quality of the seed material exchanged among farmers. A third study[39] emphasized the extreme yield variability observed among widely dispersed garlic producers. By synthesizing these and related findings, one could argue that revitalization of the seed stock and effective distribution of improved seed material at lower costs would substantially reduce yield variability and vulnerability to weather deviations from the normal pattern. Yet without further farm level research it will be difficult to resolve this argument.

In summary, the several types of problems encountered by the northern pickling-preserving firms with emphasis on garlic can be grouped as external or internal to the firm. The external types, such as raw material variability and seasonality, considerable competition from other firms in the segmented market place, and government intervening activities accentuate the internal problems with working capital, labor, and various quality considerations. Diversification of raw materials and products, special linkage arrangements to suppliers and product clients as needed, and continual searching for new products or product outlets become strategies for survival and growth. The degree of a firm's forward integration seems to have a considerable impact on its ability to weather many of the aforementioned problems and risks inherent in fruit and vegetable processing. Besides integration, the inherent logic of the most frequently followed business practice, i.e., starting small as a one-man operation

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[38]Office of Agricultural Economics, "Problems in Selling Onion, Garlic and Ways to Solve," Ministry of Agriculture and Cooperatives, 1979, (in Thai).

[39]Communication with staff of the Multiple Cropping Project, Chiang Mai University, 1980.

and expanding as one gains experience, establishes a market share, and reinvests earnings (working capital), becomes quite apparent. In fact, this strategy reflects the bounded rationality condition for a firm entering this type of business.

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CHAPTER V

UP-COUNTRY CANNERIES WITH EMPHASIS ON TOMATO

A. INTRODUCTION

The objective of this chapter is to understand the unique procurement, processing, and distribution conditions of up-country canneries, to examine the grower/processor linkage arrangements for one recently introduced raw material (tomato), to compare fresh market and processor procurement practices, and to diagnose problems encountered.

The first two sections of this chapter use a case study approach to understand and identify the unique situations of individual up-country processors in the northern and northeastern regions, with particular emphasis on their procurement systems. The cases range from a small, single product processor to a large, multi-product processing complex; from processing plant location near a small, rural town in Northeast Thailand to proximity to Thailand's second largest city in North Thailand; and from villages of vegetable producers in drought-prone, sparsely populated interior areas to water rich, densely populated roadside villages. The third section uses a subsector approach to analyze market behavior and the demand-supply conditions for tomato, a key raw material for these canning forms. This approach provides an understanding of the key characteristics for cannery procurement systems. The fourth section examines how crop buyers manage tomato procurement for fresh market sale versus canning uses and the final section diagnoses the problems encountered by canning firms.

B. DESCRIPTION AND ANALYSIS OF NORTHERN CANNING FIRMS

The case study firms cover such a wide variety of processor situations that a brief overview is needed in order to place them in the proper perspective. Since they will be described and analyzed on a regional basis it is also useful to place them in their regional setting.

In the North a medium sized firm with a comparatively long yet erratic history as a fruit and vegetable cannery will be called "old timer" (OT). After a period of canning fruits grown in Central and Southern regions, in direct competition with Central Plains processors, this firm tried several different procurement systems designed to encourage local farmers to grow vegetables as raw material for the factory. After four or five years of trial and error this firm finally selected the successful "promoter" approach. However, due to weakening final product demand conditions, competition from processors in the Central Plains and its long, costly struggle to develop a successful approach, this firm may not be able to fully benefit from its current position.

An entrepreneur of considerable skill has steadily expanded a crop buyer's business into a multi-faceted agri-business, including vegetable processing. This firm will be termed "young up-start" (YUS). Beginning as a major "promoter" for a medium sized processing firm, the entrepreneur seemed to personify several of the essential elements necessary for the development of an effective procurement system for fruit and vegetable processors. These elements are based on accurately communicating demand requirements through a traditional crop buyer system to villages of semi-commercial farmers who were previously inexperienced in the production and handling of such perishable vegetables. With its ability to successfully encourage expanding supply conditions, this firm has begun various new processing activities.

The last case in the North, a prime example of "Murphy's Law," was the largest and most sophisticated fruit and vegetable processing complex in Thailand. Due to its eventual demise it will be called the "out-of-business" (OOB) case. This endeavor to transplant a modern technology on a large scale basis into a rural environment fell woefully short of reaching its mark, primarily due to the extreme problems in trying to procure large supplies of quality raw material. This case provides excellent insights into the difficult but frequently encountered development situation wherein potential scale economies in processing raw materials are not realized because raw material supply is currently insufficient to meet the minimum processing scale requirements. It will also illustrate the necessity of adequately incorporating local social attitudes into any scheme to organize fruit and vegetable producer/suppliers.

1. Old Timer (OT)

a. Plant Location

The Lampang area is adjacent to and east of the Chiang Mai Valley, and on the main road leading to Bangkok. In several parts of this area water is available for multiple cropping. The altitude and varied terrain are suitable for a wide variety of fruit and vegetable crops. The city of Lampang is a source of the needed electric and water facilities for the processing plant while providing housing for the factory's management staff. Factory laborers are readily available and willing to work at the pay scales paid by this firm.

Besides this farm, there now are two smaller firms in the immediate area, i.e., a small multi-product plant and a small tomato paste plant.

b. Firm Characteristics

Established in the early 1970s, this medium-sized multiple product canning facility was the first major effort to situate a medium scale, modern fruit and vegetable processing plant in a large valley of North Thailand. Previously, such facilities were in operation nearer Bangkok and within the pineapple production areas, but not in a major vegetable production area.

The processing plant was located on the outskirts of Lampang city with the company's main office in Bangkok. Although the company initially operated small experiment station farms situated at sites conducive to the production of varied raw materials (such as mushroom), most of those facilities were closed during recent years as the company struggled to earn profits during rather trying times.

The firm's major products included jellies, juices, sweetened fruits, some canned pickles (cucumber and chinese mustard), vegetables (mainly baby corn, tomato, and mushroom), and sauces from soybean and tomato. Contracting is mainly for vegetable raw materials, such as peas, leafy mustard, tomato, baby corn, mushroom and cucumber. Fruit raw materials such as longan, pineapple, oranges, and rambutan, are procured on the open market from wholesalers and various crop buyers. The supply schedule for raw materials determines the operating schedule for the factory. Thus September to October are the slack months with March to August being the peak season.

The number of employees changed markedly over time as well as within any particular year. In the start-up period the company anticipated employing over 400 persons but in recent years the range varied from less

than a hundred during the slack period to 200-300 during the peak processing season. The factory was equipped not only with machinery for preparing the raw materials, mixing ingredients, and canning but also with can-making equipment and various transporation vehicles. Thus, as a medium-sized firm with over 20 million baht of registered capital, it has been fairly self-sufficient except for the tin plate and refined sugar shipped in from the Central Plains.

Each raw material that the factory contracted for has distinctive crop commodity characteristics. Baby corn as a crop can be grown under rainfed conditions in upland areas and in a variety of soils, is directly planted rather than transplanted, requires limited amounts of agro-chemicals, and matures within 45 days or so. As a commodity it must be harvested every day for a 10-14 day period, can be held at a collection point for 3-5 days so that a full truck can be sent to the factory, and experiences relatively little damage in transit.

At the other extreme, tomato should be grown with some form of irrigation, is propagated in a nursery before transplanting, responds to considerable amounts of agro-chemicals, and matures about 60 days after transplanting. As a commodity it is harvested several times within a 30-45 day period, should not be held more than a day or two at a collection point, and can be damaged in transit thus accelerating deterioration while stored in the factory prior to processing. Such varied crop-commodity characteristics mean considerable variations in terms of trade, assembly scheduling arrangements, and favorable production sites, i.e., baby corn in uplands but peas, chinese mustard, cucumber, and tomato on lowland areas.

This factory's payment procedure for locally contracted raw materials usually was as follows:

1) one week's delivery was calculated and the amount owed was billed to the Bangkok office as invoices.

2) about a week or so later Bangkok authorized a local bank to pay the factory that amount.

3) the promoters were then paid and they in turn paid the farmers.

However, some promoters contended that ten days after their farmers last harvest the total amount due them was paid even if it must come out of the promoter's own pocket. Of course, whenever promoters provided inputs on credit the costs of inputs provided (including an interest charge) were subtracted from the amount paid.

c. Raw Material Procurement

The main point of this inquiry is to understand and learn from this company's considerable experience with vegetable procurement systems since fruit raw materials were usually purchased in the spot market rather than under contracts. According to knowledgable staff members this company has experimented with a wide range of procurement organizations in the effort to stabilize supply, while improving raw material quality and farmers income. In the early stages the direct farmer approach was considered most appropriate for promoting new crops since it reduced dependency on intermediaries (middlemen), brought technical information directly to farmers and enabled farmers to receive a higher price for the produce. However, such an approach required large expenditures on production credit, inputs, and extension staff to serve a large number of highly dispersed farmers. The procurement manager contended that it was especially difficult to teach farmers about size, color, and maturity considerations. After substantial losses and less than satisfactory performance of the

system, a variety of other methods were tried with varying incentives, cross checks, and staff efforts.

Finally the company decided on a "promoter" procurement system and has used it for the past 6-7 years. This system basically involves the skillful selection and training of local intermediaries who were given training in the nature of the final product that the company wanted to produce, the raw material specifications necessary to get that end product, and as much technical information about the crop as was available from the literature and some adaptive variety selection research. Given this level of information, the "promoter" and/or some cooperating farmers grew small plots to determine how suitable this crop was to their particular production sites. Then, with satisfactory trials the company and promoter signed a contract for relatively small amounts of raw materials with clearly specified conditions, i.e., price, quality, quantity, delivery schedule, etc. Then it became the promoter's responsibility to translate raw material specifications into appropriate production-harvesting recommendations for select groups of willing farmers (verbal agreement), to supervise and to monitor all aspects of crop cultivation from seed to final harvest, to provide inputs if or as needed, and to provide assembly and transportation services when needed. A margin on inputs provided to the farmers and a commission per unit of raw material supplied to the company were the normal returns to the promoter.

The company would provide the promoter with the seed material, various supplies of inputs, and special favors as conditions warranted. The company's benefits were obvious but the farmers' benefits were somewhat more subtle yet no less significant, depending on the expertise and reliability of the "promoter." From an expertise perspective, most promoters

were knowledgeable about vegetable crop production, if not cultivators themselves. They were familiar with the unique production conditions at the farm level, and could either use the farmers' language (terms of reference) or had a local cooperator who was interested in the local farmers' benefit as well as wanting the influence and/or prestige of being associated with the promoter. In other words, the promoter had a natural perception of and linkage to the social-cultural situation and production conditions unique to individual villages. Concerning reliability, as a local resident the promoter had to live and work near the farmers and thus was known to and generally trusted by them. Also of importance was the promoter's accessibility if needed and accountability if things went wrong. Further discussion on these points will be made in other case studies.

Promoters came from a variety of previous occupations, such as crop buyers, traders, and vegetable farmers, and were year-round or seasonal suppliers for the company. Two individual examples will be described to illustrate the flexibility and adaptability of this type of procurement system.

Mr. Pong (alias) had been a noted vegetable gardner and crop buyer for the nearby Lampang City Market for several years. The several rai of land behind his home bordered the river and provided suitable production conditions for a wide variety of fresh vegetables, such as cauliflower, greens, eggplant, and sugar pea. Beginning with rather small contracts to provide the factory with raw material, Mr. Pong convinced other local producers to join his group and to provide raw material at the guaranteed price specified before planting. One success led to another as the company encouraged him to provide larger quantities and more varieties of

vegetables, especially since the company only had to provide technical advice, seed material, and a guaranteed price. Soon Mr. Pong sought out cooperators in distant villages which had production conditions and land area suitable for types of crops different than those his group could grow. As he prospered, his retained earnings were used to provide credit and/or inputs to the farmers in the villages joining his network. He also expanded his operation to employ field men and to buy trucks to handle the assembly of raw materials. He supplied plowing services, seed, fertilizer, chemicals, and advice to his group of farmers. Although his expressed motivation was to help other farmers while making a living, no one can deny that he had become an influential person in the process. First-hand experience in vegetable production, respect of fellow cultivators, and an initially strong financial position in the community were among the factors attributed to his ability to organize and maintain this procurement system at minimal expense to the company. Also his practice of dropping the input debt of farmers who lost their crops due to natural disasters strengthened his position with local farmers.

Mr. Vinai (alias), unlike Mr. Pong, is a relatively new "promoter" being groomed by the company. As a small rice farmer in an area far from Lampang, Mr. Vinai grew leafy mustard during the dry season and served as a commission agent by assembling much of the leafy mustard production from his fellow villagers, hiring a truck and transporting it to the Lampang City, and selling it to local pickling firms. As supply soon surpassed demand, he approached the company and offered to supply it with this product during the next season. With a written contract specifying the quantity, quality, price, and schedules of delivery, he convinced local producers to invest their own money in the expansion of leafy

mustard production for sale to the company at prices lower than the local pickling market price. His plan was to first meet the demand of the picklers then fill the company contract. Although the cannery price was lower than the anticipated price from the picklers, the guaranteed price and volume of purchases were convincing arguments for small producers who previously were unable to sell much of the expanded production.

After a couple of years of filling larger and larger contracts, the company began encouraging this promoter to expand the variety of crops under contract for his group. His initiative and extension activities for his group of farmers enabled him to slowly establish a procurement system without the provision of additional credit or inputs as local conventional wisdom contended was usually required for novice cultivators. This illustrates that the individual's promotion effort in place of the provision of inputs on credit can be an effective incentive for small farmer adoption of such risky cash crops and participation in procurement systems. Yet, as Mr. Vinai mentioned, if the factory provided him with working capital for farmer credit, the amount and quality of his group's output would improve substantially in a short period of time.

d. Insights Gained

Based on this firm's several years of operation and trials with several types of procurement systems for new crops, its strong endorsement of the "promoter" rather than factory-farmer system merits special attention. A major factor that contributed to the heavy losses (i.e., non-repayment of input credit to farmers) within the factory-farmer system was a communication problem in the factory's attempt to transfer technology to

many farmers who were in highly dispersed production areas and producing several commodities under contract at similar times.

The procurement manager said "It was difficult to teach farmers about the size, color, and maturity conditions. Now the factory advises on harvesting time while the promoter does the other training." So why is the promoter a better teacher? A highly successful promoter has said "Experience is better than university teaching! By that I mean extension advice is sought on new crops by the experienced grower, who then adjusts it to the practical situation. Then other growers seek his advice!" Thus experienced growers understand the local farmers "frame of reference" and translate technical information into practical operations suitable to the wide range of cultivation conditions. In the meantime, the promoter accepts responsibility for recruiting growers, negotiating agreeable terms of trade, and organizing the information and material support system as well as scheduling seeding and harvesting. This distribution of responsibilities sharply reduces the company's transactions costs for negotiating purchases, providing information, and enforcing the contractual agreement.

This case has shown that the promoter system is versatile in terms of the types and location of potential promoters who can be involved and in turn can account for the heterogeneity of cultivator needs and cultivation conditions usually found. Besides versatility this promoter system permits a "gradual change", i.e., beginning small and expanding in step with changes in demand and cropping systems. Being well-known and trusted by local farmers are especially important attributes of a promoter. Being influential can enable the promoter to support a larger scale operation. Yet, careful monitoring of promoters' payments to

farmers was advised by the factory in order to maintain its reputation and avoid problems later.

The remaining point is that this medium-sized factory could not afford the heavy investment of capital and time required by extensive crop research and development. The promoter system became an effective approach for quickly screening varieties for a wide range of cultivation conditions at a minimal cost to the factory, because the promoter's farm level plantings determined whether he would or would not supply it to the factory under contract.

2. Young Up-Start (YUS)

a. Plant Location

At the northern end of the Chiang Mai Valley is a small rural amphur. The major all-weather road which goes through this area makes the large Chiang Mai Market readily accessible to traders and farmers. The large irrigation canals which criss-cross this highway provide a reliable source of water during the dry, cool season and thereby enable farmers to grow a wide variety of crops after harvesting their rainy season rice crop. Although known for its fruit crop, this area has recently become noted for extensive vegetable cultivation under the marketing leadership of a local entrepreneur.

b. Firm Characteristics

This family business is unique in several ways. It has become known not only as one of the largest and most respected "promoters" for a medium-sized canning factory, but also as a small processor of special

pickled-preserved products for export to Japan and as a large commission agent for various exportable fruits. This dynamic multi-faceted agri-business is also involved in sales of various agricultural inputs and experimentation with seed production.

The focal point of this inquiry is the method this firm used to establish and to maintain a complex raw material procurement system around which all the other activities were organized. The recent, successful expansion of this system beyond the confines of this rural amphur is evidence of the system's adaptability and merit, especially its working relationship between farmers and crop buyers.

The motivating and organizing force behind this family business is a dynamic mother of two who has taken over her father's commission agent business for fresh fruits and expanded it as opportunities arose. Since fresh fruits, such as mango and longan, are seasonal, this firm began organizing the production and sale of new vegetables to the medium-sized factory in Lampang during the slack periods. The father's good reputation and relationship with growers served as the basis for establishing a network of cooperating vegetable growers. The firm itself directly employed 100 to 200 persons depending on the season and had an authorized share-holding in excess of 5 million baht. The firm facilitated the work of a resident Japanese crop expert as part of a cooperative agreement with a Japanese company importing pickled cucumber from it.

c. Raw Material Procurement

The organizational structure of the procurement system included the lady manager actively investigating market opportunities and making sales arrangements with outside companies. Her husband and two brothers were

responsible for managing the field staff, organizing producers, and providing technical assistance to producers. The extensive field staff included the firm's representatives at the village level who coordinated the villager's production of the contracted raw materials. The promoter-factory and promoter-farmer working arrangements will be examined in order to fully understand the system.

The promoter-factory working agreement included:

1) Written specifications for the raw material were provided to her well before the planting time. Then she tested different varieties in such a way that she could state the raw material specifications simply and clearly to the experienced vegetable growers.

2) The amount to be delivered had a 10 percent leeway stipulation for over- or under-delivery, and a delivery time schedule.

3) The price was an at factory price which was paid from a week to one month after delivery by means of postdated checks (thus she was a source of credit to the factory instead of vice-versa).

4) The factory allowed a margin below quality specifications (such as, percent damaged) before lowering the value for the raw material (the margin varied by commodity, for instance the long distance shipment of rambutan required a larger margin).

5) She was usually responsible for transporting the raw material to the factory.

In her organization of farmers, the following activities were undertaken:

1) Given the quantity specified by the factory, the number of rai required and the rai per village were estimated by the firm. Similarly, the farmer price was calculated by taking the "at factory price" and subtracting the extension, assembly and transport costs and business margin. This iterative process was based on previous experience with yields, production costs, and acceptable price levels for farmers.

2) The field staff managers explained production and harvesting aspects to the village representatives and supervised the grading of the initial harvest.

3) A village leader or trusted farmer became her village representative who, after discussions with fellow villagers, negotiated with her field staff on a) the number of rai of the raw material that the villagers would provide her, b) the price that the farmer would get, c) the arrangements for inputs on credit, d) the explanation of any new techniques necessary, and e) the supervision of the grading.

4) The firm's heavy investment for inputs on credit which could amount to over ฿1,000 per rai for a crop such as cucumber, was possible due to the number and timing of crops involved, as well as to the buying and selling activities of the firm over time. Repayment of the credited inputs was insured because she was the exclusive buyer of these products from the cooperating villages and deducted their costs from the value of the products purchased.

The central issue is to understand how this procurement system was established and expanded. A key starting point frequently discussed was the good reputation of the commission agent business earned by adhering to agreements, even when losses were incurred. An important aspect of that adherence was the necessity to uphold the verbal agreement, especially regarding the price.

An incident that clearly illustrates this point and provides an example of opportunistic behavior involved a price dispute with the factory. When a large amount of contracted chinese mustard was brought to the factory as stipulated, the new factory management staff (for certain unacceptable reasons) wanted to cut the price previously agreed upon. They explained that such a cut was meant to lower the price paid to the farmers. When the lady manager refused to agree to this practice, the factory refused to accept the raw material. Yet, she had to pay the farmers the agreed price and accept the loss of a few hundred thousand baht in order to keep her reputation and maintain her system in tact. This breach of contract terminated her working relationship with that factory management staff. Later, her strenuous activities to rectify the

irregularities of that particular set of managers was said to have led to their dismissal and the reinstatement of her working relationship with the original management staff.

Another practice which she contended was important for her procurement system was the flexibility in handling the repayment of credited inputs from her cooperating farmers. When acts of nature led to major crop losses for a few farmers, she shared that loss by not requiring repayment for the credited inputs used. Because there were several crops grown by many farmers in diverse locations and at varying times, these losses were not serious for her business. On the other hand, such repayment would have been a serious set-back for the individual small producer who may have had to go into debt to repay that loan. Yet it is important to recognize that while her large business could easily win farmer commitment in this way, small promoters might not have this option.

As an off-shoot of this "promoter" work, processing activities arose. When the demand for a particular type of processed product was too small for the medium-sized factory to be concerned with, it would sometimes ask her to process it and the factory would pack it in cans. Also her reputation and ability to recognize economic opportunities led to the processing of special pickled-preserved products for a Japanese company which in turn led to other cooperative ventures with outside companies.

In establishing this procurement system in new villages, the firm would begin by buying other types of crops from a new village in order to test the reliability and character of the villagers. If they seemed industrious and were able to be trusted, she would make inquiries with people knowledgable about that area in the process of identifying someone in or near that village who would be able and interested in becoming her

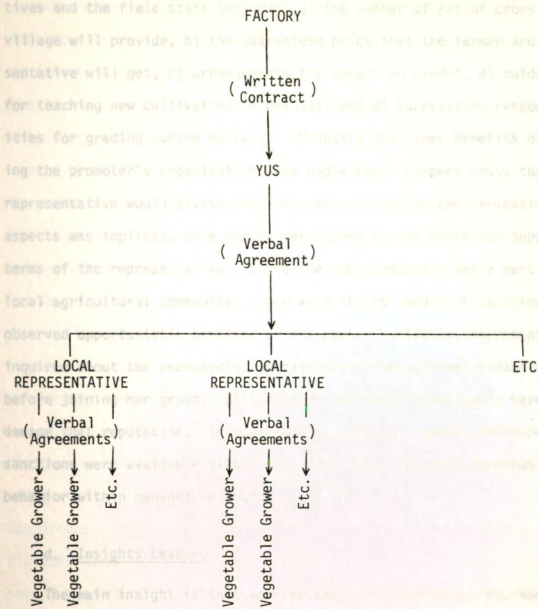
representative. Characteristics, such as locally respected, reliable, and with a certain degree of financial independence, i.e., did not rely only on this activity for income, were sought. The person should not live more than 4-5 km away from these villagers and should share her philosophy which was said to focus on benefiting the local farmers by providing an additional source of income. Because the commission earned from this type of representative activity was not very large, the commission was not the only incentive. In an unspoken way, the representative's social and political status would be improved both as farmers became reliant on him (her) and as the representative became a part of a powerful businesswoman's organization. The motivating aspect of such involvement seemed to be a part of the fabric in rural Thai society, yet it is difficult to measure the persuasive power of such a proposed arrangement.

On the technical side, crops which were harvested several times, such as green pea, required strict grading during the first harvest so that the farmer learned what quality was expected. From 10 kgs harvested maybe only 5 kgs were accepted from the first harvest. In that way, later harvests which tended to be quite large had a much higher level of acceptable raw material.

An organizational chart of the participants in this promoter's procurement system illustrates the degree of complexity involved with organizing and operating the cultivation and assembly of such divergent crops within heterogeneous cultivation conditions (Figure 5-1).

In summary the written contract specified the terms of trade as a certain quantity (with a 10 percent range) of a specified quality (with slight allowances for substandard quality and premiums for unanticipated

Figure 5-1. Organization of the YUS System



Note: This "Young Up-Start" system has family members in charge of sales and field staff.

high quality) at a guaranteed price for delivery over a set period of time. The less formal verbal agreement between the village representatives and the field staff included, a) the number of rai of crops the village will provide, b) the guaranteed price that the farmer and representative will get, c) arrangements for inputs on credit, d) guidelines for teaching new cultivation techniques, and e) supervision responsibilities for grading during harvests. Monetary and other benefits of joining the promoter's organization were explained. Farmers trust that the representative would advise them on crop cultivation and harvesting aspects was implicit, once the farmer agreed to the price and support terms of the representative. Since the representative was a part of the local agricultural community, there were several means of sanctioning observed opportunistic behavior on his part. Similarly, representatives inquired about the promoter's reputation for honesty and reliability before joining her group. Dissatisfied representatives could severely damage that reputation. In other words, various internal socio-political sanctions were available within the local system to keep opportunistic behavior within manageable bounds.

d. Insights Learned

The main insight is that an intricate and demanding procurement system can be organized and operated to the satisfaction of both the factory and promoter. Yet the degree of farmer satisfaction is uncertain beyond the fact that sufficient, willing cultivator were growing the amounts of quality raw materials needed over the past 6-7 years.

The ability to translate the technical quality specification into the farmers' varying frames of reference was repeatedly emphasized, as

was the risk sharing and convenience associated with the provision of inputs on credit, especially for crops unfamiliar to the farmers. Village representatives as part of the promoter's field staff combined both the technical transferral aspects of an extension staff with supervision, agreement, enforcement, and timely assistance. That combination ensured the full commitment of the farmers. If the representative shared the philosophy of "benefiting the local farmers by providing an additional source of income", the farmers' bargaining power was enhanced because the representative not only cooperated with the promoter but acted on behalf of many local villagers to whom he was accountable. The strong motivating power of non-economic incentives, such as increased local influence as an organizer of many farmers (i.e., provider of an income opportunity) and association with a powerful person (i.e, linkage to a person at a higher level in the Thai hierarchical social system), should not be overlooked in a procurement system.

This approach to procurement was said to be an extension of the traditional way that Thai farmers deal with crop buyers, i.e., through local leaders, and, as such, facilitates farmer integration into a closely coordinated commercial system during his transition from primarily subsistence to primarily commercial agriculture. As such, small farmers become experienced in growing these types of crops and more commercially oriented.

Although this firm had unique characteristics, such as a large family with considerable business acumen, the other characteristics of being familiar and respected persons in this location, ability to learn how to adapt new technologies, and an active interest in developing market opportunities are generalizable.

3. Out-of-Business (OOB)[1]

a. Plant Location

The Chiang Mai-Lamphun Valley, as the most developed river basin in North Thailand, supported a population of over 1 million inhabitants in an area of approximately 1,500 square kilometers (110 kilometers long north to south and 30 kilometers at its widest point). The predominantly rural population with over 80 percent engaged in agriculture provided an abundant, yet low cost source of labor for a processing facility. At a high elevation, compared to the Central Plains area, this area's climate, water supply, and soils are favorable for the growth of several fruits and vegetables within multiple cropping systems. Yet, markets for agricultural produce were somewhat constrained due to the distance of 750 kilometers from the huge Bangkok market. Several foreign sponsored and/or foreign aided agricultural projects were active in the Valley due to the recognized agricultural potential as well as the effort of crop replacement (i.e., replacing opium production) in the highland areas.

b. Firm Characteristics

This fruit and vegetable processing complex was designed as the largest processing facility of its type in Southeast Asia. Yet, from its initial conception in the minds of its investors in 1972 to its beginning

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[1]Since this firm was not operating during the study period, and its previous staff was scattered around the country, this summary relies heavily on the insightful study titled, "The Activities of the Chiang Mai Food Complex," by R. Roberts, R. vanLeeuwen, and Pimpan Chareodrat and is supplemented by knowledgable informants. Because of this case's relevance for other development efforts based on introducing large scale, modern processing facilities into a rural area with limited industrial experience, it merits a broader coverage than the other cases.

of operations in 1974-75 and final bankruptcy in 1978-79, the complex was racked with a wide range of economic, technical and social problems. The intent of this case study is to summarize information on the nature of the problems encountered and focus on the lessons learned from the two input procurement systems used by this processing complex.

The initial decision to build the food processing complex with a processing capacity of about 80,000 tons of fruit and vegetables per year was made in 1972 on a joint venture basis, the Eisenberg Group with Thai shareholders. The original financial structure was 43 percent Eisenberg Group (Israel) and 57 percent Thai shareholders (50 percent held by Crown Property and 50 percent by commercial banks) with the start-up total assets estimated at ฿220 million plus full government promotions. In 1973 a feasibility study was instigated by the UNDP and by 1974-75 various facilities were in operation. Although a couple of the subcomponents were subsequently operated by different groups, the complex as a whole was not revitalized as of this writing.

The organization of the complex consisted of three major elements, i.e., the advisory office, the central management office, and the processing plants (companies). The office of the Eisenberg Group in Israel was the primary source of foreign investment, imported machinery, and consultative services. The main company office was in Bangkok where financial and marketing decisions were made. The processing plants located in the Chiang Mai Valley consisted of four distinct, semi-autonomous major operating units, i.e., Thai Tomato Industry Limited, Crown Frost Limited, and Thai Farming Corporation Limited. A brief appraisal of the activities, planned employment, and output of each unit clarifies the scope and complexity of this company.

"Thai Tomato" was a large scale tomato canning operation which intended to produce about 21,000 tons of paste and 8,000 tons of peeled tomato each year from locally grown tomatoes. When in full operation, projected employment was to be 215 employees. (Unfortunately, local tomatoes proved unsuitable for processing, and baby corn, sweet corn, pineapple, papaya and mushrooms were substituted when commercial operations began.) Registered capital amounted to ฿10 million and assets of ฿18.5 million.

"Crown Frost", as the largest processing unit, was designed to produce 20,000 tons of final products per year from about 53,000 tons of such raw materials as pineapple, bush beans, and sweet corn. Although projected full employment was estimated at 420 employees, this figure, as in the Thai Tomato case, was never reached due to considerable underutilization of capacity. Registered capital reached ฿30 million with assets of ฿130 million.

The capacity of "Dehydrated Vegetable" unit was 1,000 tons of final product in crushed, dehydrated, or baked forms from approximately 14,000 tons of raw material per year. Although onion products were intended as the major line, the local varieties were found to be lacking in both suitable quality and quantity thus leading to the plant's closure soon after it began operation in November, 1974. Since the premises were converted to warehouse space, the projected employment of 160 persons never was realized. Registered capital was approximately ฿6.5 million with total assets of ฿21.4 million.

The "Thai Farming" unit was to procure the raw material for the other three units through both contractual arrangements with local farmers and production on its own farm (plantation). Its main activities were to

encourage farmers to produce the appropriate crops for the factory, to disseminate technical and commercial information as an extension service, and to grow the balance of the raw material needs on its own land (estimating a 55,000 ton production capacity). Land purchased at two distant sites provided approximately 12,000 rai for that purpose. Projected full employment for this farming unit was 1,500 employees. Registered capital was ฿8 million with total assets of ฿48 million.

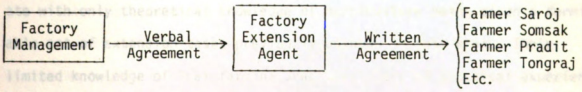
The lack of secondary data and pertinent information in general, little information from a nearby processing company, and oversimplified assumptions contributed to the weak macro level feasibility study. Inadequate and inexperienced staffing, limited testing period, and related personnal problems provided findings which were "partial in its scope and lacking in depth and quality" at the micro level. Consequently, the supply side plans and decisions encountered problems from the very beginning, especially with the "Thai Farming" unit. The unanticipated heavy capital expenditures on purchasing and leveling the land (land previously valued at approximately ฿400/rai cost ฿2,000/rai to purchase); dispersed site locations; conflicts over water rights which necessitated well drilling as well as channel and reservoir construction; and labor management problems all contributed to the slow start of production on this company farm. This caused a major shift from the planned reliance on the company farm for the bulk of raw materials to procurement of most raw materials from local farmers.

c. Raw Material Procurement

The first procurement system was a factory-farmer approach wherein extension workers employed by the factory selected and recruited farmers

to grow specific crops as raw materials, distributed certain inputs on credit, provided technical assistance, and supervised the scheduled deliveries to the factory. The direct factory-farmer system was designed to eliminate middle-man margins and thus increase farmer earnings. Written contracts signed by each farmer specified the responsibilities and rights of both the farmer and factory, including guaranteed price and specified quality of raw materials. This contract was intended to replace the traditional verbal agreements between the farmer and crop buyer. Since things did not happen according to their plans, let us depict the system, consider the perspectives of each set of participants (farmer, extension agent, and factory management), and describe the problems arising from their interaction.

The basic system and participants are depicted as follows:



The farmer's perspective was basically that of a risk-averse cultivator who was highly dependent on his main rice crop for subsistence needs. Most farmers had relatively small farms with limited capital resources and relied heavily on their family labor as a source of income throughout the year. The farmer recruitment program undertaken by the factory staff was a well orchestrated effort involving meetings with influencial persons, farmer organizations, and farmers. This promotional approach initially raised the expectations of the farmers with its emphasis on the high yields possible from the new crop varieties while down playing the low unit price to be offered. When comparing the "achievable" net income for the new crops to the alternative recognized options available to them,

the farmers initially considered the potential change as quite beneficial. The promised provisions of technical assistance, short term credit, and price guarantees were very persuasive measures in gaining their agreement to grow the new crops. Yet following the promotional gatherings and related activities, the farmers' conservatism and wariness of major change began to show as they began questioning the need for "written" versus traditional verbal contracts. Since non-traditional crops seemed risky, they hedged their commitment by growing only small quantities and some farmers began looking for possible ulterior motives for the factory's assistance. In other words, the initial agreement for farmers to try the crops was gained but neither a full commitment to change nor a shift in attitudes was accomplished by the recruitment program.

The extension agent's perspective was that of a young college graduate with only theoretical knowledge of horticulture being given a formidable set of extension tasks previously unknown in this area. Their limited knowledge of Thai farming practices, lack of practical experience in dealing with farmers, and not infrequent language difficulties (some came from other parts of Thailand) did not prepare them for this job. The job included:

1) farmer recruitment (locate and select capable farmers with suitable land),

2) administration of the procurement system (schedule crop planting and harvesting time, arrange short term credit, distribute relevant inputs and equipment, and pay the farmer for the delivered raw materials),

3) provision of technical guidance in crop planting, care and harvesting practices.

To enable them to perform those tasks for their group of farmers who contracted a total of 80 to 150 rai, it was decided that each live in or

near the villages under his (her) jurisdiction. However, problems soon emerged with the combination of their technical and communications shortcomings, the farmers' reservations and hesitancy to follow recommendations, and the extensionists living in unfamiliar surroundings. Rapid demotivation, less frequent visits to the growing areas, and finally a policy change which allowed them to live outside the villages, increased the gap between the extensionists and farmers, thus seriously limiting their effectiveness over time.

The factory management's perspective was mainly that of foreign advisors familiar with the Israeli procurement system with some adjustments for the local conditions. Although some suggestions from other Asian processors were solicited, the method of organization and implementation was basically their own. Monetary incentives were envisioned as the primary motivating force for an effective procurement system, with some allowance for risk reduction. However, a sensitivity to or awareness of the implications of the social-cultural dimensions of change in a traditional rural area seemed lacking.

The problematic interaction of these three perspectives was further exacerbated because the staffing of such a large extension program (80 or more extension agents) had to contend with a scarcity of effective, trained personnel experienced in both horticultural crop production and farmer training. And although the organization and operation of the procurement system seemed logically complete and comprehensive, the human limitations and interactions, the unmanageably large number of participants, and the "alienness" of the system itself worked against this extension program from its inception.

The issue of the problematic interaction will be considered according to each component to that factory-farmer approach as implemented by this factory. The main components were:

1) The written contract was to gain the farmer's commitment by clearly specifying both the farmer's and factory's responsibilities. This was to replace the customary verbal agreement between farmers and crop buyers. However, there was no method of enforcing the terms of this "written" contract which farmers felt was intimidating and "alien" to their preferred ways of making agreements.

2) The short term credit provision was considered necessary since the direct arrangements with farmers to produce a new crop eliminated the traditional credit incentive of the crop buyer. Efforts to encourage a few commercial banks to handle the necessary five million bahts of credit failed because of the bank's requirement that recipients form groups of 20 members or more in order to minimize loan defaults.

3) The distribution of inputs required extension staff to obtain the signature of farmers in triplicate upon delivery of the inputs. Again this alien and time consuming "written" versus verbal approach to transactions increased farmers' apprehension and suspicion while decreasing the extentionist's time available for technical assistance.

4) The payment system to the farmers stipulated that 25 percent of the price of the crop supplied would be paid after delivery with the remaining 75 percent paid when the last harvest was delivered and costs of inputs were deducted. Although this approach tied the farm supply to the company, it required several small payments with consequential payment problems for the new administrative staff, forced further borrowing needs on some farmers, and furthered farmer insecurity and discontent with the company.

In summary, the management's expectations of adequate supplies of quality raw material were based on their technically comprehensive but "alien," rigid procurement plan as implemented by a large, inexperienced extension staff. Management was not cognizant of the potential reactions of an alienated, traditional farm population, nor did management anticipate the range of problems encountered in the organization and operation of their own large farm. Problems plagued the procurement system at

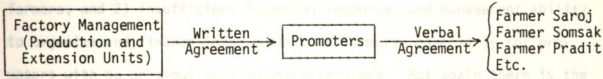
almost every stage of implementation--even in the second year of operation. Planting methods and schedules often varied from those prescribed; cultivation problems went unresolved with marketable yields lower than anticipated; inferior raw material quality was exascerbated by failures to deliver containers to the fields in time; periodic over-supplies at the factory gate caused delays in processing; and farmer protests of differential grading practices necessitated the acceptance of second grade material. Sales by farmers of high quality produce to buyers outside the contract system were among several of the problems that emerged as the system broke down during the first two years of operation.

It is important to remember that the severity of each type of problem affected extension agent-farmer interaction differently according to location, quality of extension agent, experience of farmer, etc., thus complicating problem recognition and system wide corrective action. A procurement system beginning with 80 extension agents and up to 4,000 farmers spread over very divergent types of agricultural conditions makes system coordination and problem resolution very difficult on a timely basis.

The necessity for another type of procurement system became evident as the problems escalated to where three processing plants operated at 30 percent of capacity by 1976, on average. The Thai Farming Company became bankrupt in mid-1975 (cir. ฿20 million deficit) and supplies of raw materials (often of inferior quality) were uneven. The new approach was the factory-promoter-farmer approach. The company reduced the size of the extension staff, shifted it out of the Thai Farming unit into the direct control of the central management unit, and gave it only research and technical assistance responsibilities. Production targets for the

company farm were adjusted downward by 20 percent and the new procurement system was designed more in line with the way local crop buyers and farmers interact.

The basic system and participants are depicted as follows:



The promoters included managers of farmers associations, village committee chairmen, individual organizers (usually large farmers or crop buyers), and development project managers. They were invited to take the initiative and responsibility of mobilizing interested growers.[2] In addition to a guaranteed price, a "bonus" system based on the volume delivered was a motivating force for promoters to organize large groups of farmers. Since the scale of the bonus increased according to the promoter's volume of delivery and the value of the bonus was distributed to both the promoter (20%) and the farmer (80%), the farmers had an incentive to form large groups.

Benefits for the company included; 1) no credit risk since any inputs on credit were the promoter's responsibility, 2) scheduled delivery of large truckloads of raw material by a promoter rather than each farmer's cartload facilitated the operation of the processing plant, 3) a smaller extension staff was on the payroll since it only trained the promoters who were responsible for the provision of technical assistance to farmers, and 4) various production planning activities could be more effectively

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[2]This approach was advocated by farmer organizations from the beginning rather than the factory's original attitude of trying to convince farmers to grow.

coordinated since fewer persons were involved. Yet as the strengths of the system, so also the shortcomings centered around the ability and resources of the promoters. The main shortcomings were; 1) limited agricultural experience and lack of both the skill and expertise to teach farmers, and 2) insufficient financial resources and management ability to organize and finance large numbers of farmers, especially for promoters with no previous crop buying experience. But again there is the scale dimension--if hundreds rather than thousands of farmers had been involved, the screening of effective promoters could have been stricter rather than accepting almost everyone who offered to be a promoter.

> It must be stated, however, that the new system did not really have an opportunity to fully prove itself as the harvest of 1976/77 was largely destroyed by weather conditions and disease. Eighty percent of the sweet corn crop and 60 percent of ribbon beans were lost through drought and all of the broccoli was destroyed in a flash flood.[3]

Thus, with over a ฿40 million loss for 1977 (about ฿20 million more than 1976s loss) the company did not achieve the break-even year as anticipated with its new reorganization and new procurement system. Operating managers argued that large scale refinancing in late 1977 and early 1978 would have led to a profitable operation based on their "claim that the reorganization of supplies and suppliers was beginning to work satisfactorily." Unfortunately the first procurement system was so costly and problematic that the revised system may have come too late.

d. Remaining Issues

In addition to the primary focus on the raw material procurement system itself, two other issues are of particular relevance, i.e., labor in the processing plants and management.

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[3]R. Roberts, et al., Ibid., p. 29.

Labor was considered abundant and cheap. The company's belief that abundant labor was available may have stemmed from the original feasibility studies which seemed to rely on population figures and unemployment rates. Yet in this predominantly rural area the quantity, skill, availability, and working habits of local labor became problematic for the efficient operation of this large complex of modern processing plants. The main problems have been summarized as follows:

(i) Supply (of labor) was uneven particularly in the rice planting and harvesting seasons when farmers and their families were completely and necessarily involved in their own activities.

(ii) At peak factory production periods extra labor was not easy to recruit in sufficient quantity quickly (sic).

(iii) Low wage costs were offset by relatively low labor efficiency; claimed in individual activity rates to be a factor of 12 lower than equivalent workers in Israel (sic).

(iv) Factory work with its machine paced processes was alien to workers recruited mainly from farming stock where self paced work and consequently a great deal more decision making is in the hands of the individual.

(v) Workers unused to factory work contributed to high maintanence costs of machinery which reached five times the figure in comparative European factories--it is claimed.

(vi) Financial incentive schemes designed to increase productivity achieved little, mainly because workers were used to a job and finish approach where after a certain point, they value leisure more highly than money.

(vii) The company was often obliged to transport workers up to 100 km at peak times of need.

(viii) Factory working was a new experience and many workers found they could not cope. Consequently absenteeism and labor turnover was high.

(ix) The problems with labor efficiency resulted in extensive over-manning.

(x) Protective clothing needed to be worn in many jobs was rejected and it is claimed often stolen.[4]

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[4] R. Roberts, et al., Ibid., p. 31.

The central point in listing these problems is not that they are unexpected when introducing a new facility (sets of technologies) and consequent set of work conditions into a traditional rural area, but rather to have them as a signpost of what types of problems to anticipate. Also, this flagging of problems involves calling attention to the scale issues and the trade-offs in sudden versus gradual adjustments through expansion from a smaller to larger processing unit over time. Likewise, it suggests management training through first-hand involvement in the timely resolution of problems while learning from day-to-day problems encountered, instead of a rigid system of prescribed tasks as administered from a distant city (Bangkok).

Regarding management, the viewpoint that the general manager could make the system work seemed clear, as four general managers came and left in as many years. Yet until 1976 the control of the company's farm was not under central authority.

Several other management factors are worth highlighting, besides the obvious implications of the dispersed structural aspects of the Company-Eisenberg Group advising out of Israel, financing and marketing handled in Bangkok, and raw material processing activities located up-country:

-- The scale and rapidity of growth in factory activities was probably beyond management's ability to learn from and correct their mistakes.

-- Both senior foreign managers (removed from day-to-day problems) and local managers, more academically qualified than experienced in dealing with such problems, tended to allow small problems to develop into ones with far-reaching implications.

-- Focusing on the technical factors of crop production and handling the raw materials (likely skills gained from management training and experience) and unawareness or inability to recognize the implications of social norms,

local power structures, and attitudes toward change contributed to the failure to institute either a viable procurement system or an effective labor training environment.

-- Examples of "alien" nature of the complex included a western technology implemented with regimented work schedules, with overtime schemes, etc., and organized according to western "ways-of-doing-things", such as only monetary incentive schemes.

-- As the viability of the company diminished, foreign managers either left or became demotivated as threats of physical violence followed the non-payment of company debts. At the same time, the most marketable local staff, such as trained quality controllers, shift managers, and foremen, were the first to leave thereby accelerating the company's decline.

The key role of managerial skill and personality in the successful operations of any organization is widely recognized. Thus, this company's high turnover rates in both senior and junior staff members, and their seeming lack of sensitivity to the human factors involved in the factory work force and local farmers' behavior contributed a great deal to the company's decline.

The major problems encountered by the OOB case will be organized according to their relevance to 1) the initial information base used for establishing the complex, 2) the raw material procurement system, 3) the factory processing facilities, and 4) the product marketing dimension.

I. Information -- insufficient and misleading feasibility studies on both the vegetable production (micro) and work force (macro) levels.

II. Procurement -- uneven supply of raw material which were generally deficient in quality as well as quantity.

-- Serious technical difficulties with most of the varieties of local fruits and vegetables due to the inadequacies of the micro level research.

-- Land purchased for the company's farm was inferior in quality and lacked sufficient water because local political friction arose when it attempted to obtain large tracts of currently occupied land.

-- Inexperienced college graduates as extension agents who lacked high motivation and lost farmer credibility.

-- Cumbersome administrative procedures widened the extension agent-farmer gap while reducing time for technical assistance activities.

-- Underlying suspicion by farmers and promoters of the company's motives and methods eroded effective communication and coordination of activities.

III. Processing plant -- lack of skilled, experienced, and readily available factory workers accustomed to machine-paced production tasks.

-- Thai management staff which were too theoretically inclined and lacked the ability to adjust for social factors underlying labor and supplier problems.

-- Remoteness and lack of total awareness of day-to-day problems on the part of foreign managers.

-- Conflicts and delays over the provision and quantity of working capital due to the dispersed organizational structure of the Complex.

-- (Informed sources also mentioned concern over initial purchases of mismatched rather than synchronized machinery and a very wide range of irregular practices by junior managers as well as plant laborers.)

IV. Product marketing -- contracts for high quality products preceeded the operation of the facilities thus imposing unrealistic quality standards on the raw material procured from both the farmers and the company farm at the beginning of production.

-- Agreements to supply rather large lots of final products, thus translating back to additional pressure on an already struggling procurement system.

e. Insights Gained

A few of the several insights gained regarding procurement practices, processing technology and product sales practices are worth emphasizing. The apparent lack of understanding regarding local institutions and farmers' attitudes plus the overuse of inexperienced extension agents for administrative activities rather than solving farmer problems hampered

the extension agent-farmer relationship. The insistence on signed "alien" documents (contracts) and receipts further deteriorated their working relationships.

The economic profitability of large scale processing capacity built on high technology machinery and driven by demand for high quality products but placed within a budding raw material supply area in an LDC seems unlikely in the short term and problematic in the long run. The number, scope, interrelatedness, and severity of problems encountered plus the competition from smaller processors in the interim seem insurmountable in the short term. The lack of awareness regarding various technical factors, such as processing inappropriateness of local varieties yet constructing a processing plant based on the local fresh market supply of that raw material (case of onions) is incomprehensible under normal circumstances, as was the insistence on receiving only high quality raw materials from farmers who had practically no previous cultivation experience with that crop.

Very large production capacity during a firm's initial establishment period within an unproven supply area combined with "agricultural" versus "industrial" labor habits and a complex socio-political system for distributing rights and responsibilities embody extreme diseconomies in procurement, processing and sales. Cumbersome foreign management practices and organization, "branch plant" status separate from financing, sales, and top level decision making functions, and inflexible standard operating procedures make timely response to problems difficult while compounding even the simplest problems. Disjointed flows of information and increasing opportunistic behavior were fostered in the resulting chaos.

Interrelatedness is so evident in the processing system and the shortcomings of this firm were so numerous that it is difficult to single out any particular problem as the bottleneck or recommend any single course of corrective action. The question of the real intent of those who proposed and developed this complex is repeatedly brought to mind when reviewing this case.

C. DESCRIPTION AND ANALYSIS OF NORTHEASTERN CANNING FIRMS

In the Northeast the two small firms, termed "growing businesses" (GB), consisted of traders who supplied tomatoes to the Bangkok fresh food markets and processors of tomato paste. The dual nature of their businesses evolved as tomato production expanded in response to their technical and financial support of farmers and a strong fresh market demand in the early season followed by processor demand during the peak season. Recently they switched from supplying distant processors to selling tomato paste processed in their own plants. The combination of seasonal tomato marketing and processing with other types of small scale businesses, such as bamboo racks for noodle making, seems to have benefited both farmers and these businessmen.

The final case is a medium-sized processor whose expressed goal was to support the steady expansion of local vegetable cultivation as a source of future raw material for his factory. Unfortunately, he located his factory within a relatively drought prone area where local farmers had only limited experience with and water for vegetable production. Consequently, most raw materials had to be shipped in from distant regions, thus the title "out-of-reach" (OOR) case. Because the excessive costs of shipping in distant raw materials for current plant operations

constrained the firm's ability to survive, the self-serving procurement strategies which evolved became counter-productive to his original goal or ambition.

1. Growing Business (GB)

a. Plant Location

This case represents a unique "demand driven" expansion of tomato cultivation that evolved over the past decade along with the parallel expansion of local processing capacity. The setting is the Sri Chiang Mai area of Nong Khai Province, Northeast Thailand, with its rich sandy soils, a small supplementary irrigation system, and diligent farmers who have historically grown vegetables to supply the nearby city of Vientiene, Laos. In general, tomato cultivation became a very popular farm enterprise. As the Laotian "state of war" condition produced "on-again," "off-again" trade relations between Thailand and Laos, alternative markets for vegetable crops had to be found. The distant Bangkok and Malaysia markets were the most logical choices. Yet such a long distance of over 500 km requires, 1) fairly large scale production of the same or similar crops in order to facilitate frequent large shipments and 2) less perishable commodities which could withstand such a long haul.

The initial impetus to promote processing varieties of tomatoes in addition to local fresh market varieties came from the activities of local crop buyer-cum-rice mill owner who had previously promoted such cash crops as seed watermelon. About eight to nine years ago he provided imported tomato seed and inputs on credit to farmers and bought their harvests. He sold this to the Bangkok fresh market during the early "off-season"

period and to Central Plains processors later in the season. In competition with such crops as jute and tobacco as well as several other vegetables, tomato production steadily increased in popularity during the dry season, especially early plantings along the ever increasing river banks.[5] From October onward as more and more land on the banks became available, more and more tomato seedlings were planted. When the early plantings were ripe, it was the "off-season" for tomatoes planted in the other parts of Thailand so the farm price was ฿10-11/kg or higher, even for varieties usually preferred for processing rather than fresh market uses.

This crop buyer along with others bought the tomatoes from farmers at premium prices and shipped them to Bangkok. Year after year, as the production area increased, it expanded outward from the river bank area into the adjacent rice paddy fields. However, since the seedlings could not be planted until after the rice harvest, the plantings on paddy fields ripened later with consequent late harvests corresponding to the peak production periods in the northern regions of Thailand. Recognizing the good quality of these tomatoes, especially the Roma and VF134 varieties, even during the late season, the buyers shipped large volumes (over 20 tons/day) at relatively low prices to distant processors.

By the 1977/78 season two small tomato processing firms had begun operations in the center of this area to absorb the excess production in the peak season. One was owned by the original rice miller who supported the introduction of processing tomato varieties. The other was operated

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[5]After the monsoon rains, the river reached its peak depth and width, then continually receded until the following year's monsoon. This phenomenon allowed more plants to be planted every couple of weeks on the rich silt banks as the river went down.

by a crop buyer who had arrived only a couple of years ago. Their primary objective was to produce the low to medium quality tomato paste-sauce for the Thai fish canneries rather than assemble and sell "in-season" tomatoes to distant processors who in turn supplied that fish canning market. In competition with each other and other crop buyers, they used similar forms of factory-farmer verbal contracts to establish and expand their group of growers. During the 1979/80 season about 6,000 rai of tomato was planted and by the 1980/81 season, it was estimated that over 2,000 farmers were growing tomatoes on about 10,000 rai in this and adjacent areas.

b. Firm Characteristics

Mr. Vinich (alias) located his factory in the heart of the tomato cultivation area and set up the processing equipment within a fairly large building which housed parts of his other businesses. The most costly piece of machinery and one which defines the firm's capacity was the evaporator. The initial evaporator had a capacity of about 30 tons per day and was purchased from a sugar mill where it was used in the sugar refining process. In each subsequent year an additional evaporator was added until 90-100 ton capacity was attained. This machine's limited capacity, its low cost as used equipment, and its capability to produce only a product of moderate quality seemed quite suitable for beginning such a small business. Started at an early stage of supply establishment and expansion, this firm began by filling the domestic demand for a relatively cheap intermediate product. Another cost reduction technique was to fill used 20 litre containers with the paste to be sold within the following few months and to fill new 3 litre cans with paste for sale later in the year. The other pieces of equipment, such

as cleaning tubs, choppers, steamers, grinders, etc., were of simple design and constructed locally. Thus, for less than ฿1,000,000 the factory was fully equipped and operations.

In addition to the few steady employees trained to handle the equipment, the main supervisory staff was his steady employees shifted from their other duties. Laborers from local farm families were also hired. When the manager-owner was interviewed in the third year of operation, the full capacity of about 90 tons/day required about 40 males and 80 females to operate the plant and collect the crates of tomato during a workday of two to three shifts for a 2-3 month period. For an area accustomed to having large scale seasonal out-migration of male laborers, this employment opportunity has been especially beneficial.

Although the investment in establishing such a factory was relatively small, the working capital requirements were not. The costs of providing inputs on credit to farmers (cir. ฿500-600/rai), the operating costs of the factory, and payments to the farmers for the large amounts of raw material while holding a considerable amount of final product in inventory added up to over ten million baht. To finance this 2-3 months of factory operations and 1-2 months of trading activities, this firm had to rely on its other small business activities during the rest of the year in order to generate the needed working capital and to support the permanent employees.

The firm's competition in the tomato paste-sauce market has been quite intense with most competition coming from tomato paste imported from Taiwan. The firm's sales arrangement with regular fish factory customers was; 1) to receive orders for several thousand 20 litre containers at the beginning of the tomato season, 2) to use the "Letter of Credit" issued with the order for obtaining a bank loan to cover payments

to growers and inventory costs (interest payments charged to the buyer), and 3) to periodically ship each buyer a certain portion of the order since their demand was fairly even from July to December. With sales to a few additional buyers the inventories were usually depleted by November. However, the uncertainty of large imports of Taiwan tomato paste-sauce constituted a serious threat to the stability of the firm's sales, especially inhibiting plans for expanding business and the following year's agreements with farmers. This situation exemplifies the problem of uncertainty in market conditions.

Mr. Saroj (alias) is a relatively recent crop buyer who established his firm along different lines. Instead of operating an independent firm, as in Mr. Vinich's case, his firm was said to be a branch processing unit for a large and well known canning company near Bangkok. The type of equipment for this firm was comparable to that of the other firm but housed in a relatively small building and had a capacity of about 30 tons per day. Rather than expand capacity in response to increasing local supply, this firm maintained its size and relied on the combination of its capacity and that of the parent company's facilities to meet the growing supply situation. Thus, if the local processing plant could not handle the amount procured from its group of growers and/or the parent plant had underutilized capacity, Saroj shipped truckloads of crated tomatoes to the parent plant.

This factory's employment pattern was similar to the other firm except in magnitude, i.e., employing about 70-80 persons (20 male and 60 female) during the peak period with special emphasis on recruiting farm family members from his group of producers. Besides providing the farm family members of his group an opportunity to earn outside income,

the idea was to make the grower more aware of the quality issue by having family members participating in the processing activities.

c. Raw Material Procurement

Their simple but effective strategy was to make verbal agreements with a large number of local farmers with the incentives of providing certain inputs on credit and guaranteeing to pay the "prevailing market price" yet not letting that price fall below a certain specified level. Then, as the harvests began, they acted as middlemen for their groups of farmers in the early part of the season (November-December) when the fresh market price was high and it was profitable to ship tomatoes to the Bangkok market at a transportation cost of about ฿.40-.50/kg. As the season progressed the fresh market price dropped with the onset of the tomato season in other production areas and finally reached ฿1/kg (the guaranteed minimum price for their group members.)[6] At this lower price they began operating their processing plants. In other words, the farmers gained high returns from their initial high value, yet low volume, harvests, and then they were offered moderate returns along with a guaranteed market outlet during the peak season glut.

The benefits of this system were somewhat skewed in favor of those with access to the river bank areas rather than paddy field land. Those with access to the river bank land (public property) earned returns to an earlier, thus higher valued, commodity which also tended to have

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[6] Their contract price of ฿1.50/kg for the previous year was substantially higher than the lowest price of ฿.50-.60/kg in a major competing area in Northern Thailand. With that previous cost disadvantage in mind, the current guaranteed price was set at ฿1/kg.

higher yields due to the rich silty soils (i.e., 4-5 tons/rai compared to an average of 3-4 tons/rai on paddy land). Those with paddy fields had to delay tomato planting until after the rice harvest and were thereby caught in the lower range of declining prices with their first harvests while having peak harvests at contract or sub-contract prices. However, due to the comparatively high yields and quality of tomatoes in this location relative to other regions of Thailand, even the latter group of farmers earned net returns which were competitive with other crops. Discussions with local agriculturalists and visual inspection of the various crops being produced in fields adjacent to the tomato fields, confirmed the vigorous competition of crops for the available land area and the overriding importance of a guaranteed market outlet for tomatoes in the farmers' decision of which crop to grow.

While interviewing farmers for production cost information, questions were asked about future expectations and general satisfaction with the current procurement system. Most were satisfied with the performance of the factory's procurement system but contended that actual payments to farmers sometimes tended to drop below ฿1/kg during the peak production period. This assertion had been vigorously denied by both factory owners on previous occasions while pointing out quality problems, delays in handling due to the huge volumes involved, and different buying prices for farmers outside their groups.

The universal concern of both factories and growers was that future supply could out-pace demand. Farmers were concerned that further demand (factories) was needed to meet the growers' supply capabilities. Even the competitive activities of a large crop buyer who not only competed with these two firms in the purchase of tomato for shipment to the fresh

market, but also bought tomato on contract to various processors in other parts of Thailand, were perceived as insufficient as supply expanded. Farmers repeatedly emphasized their ability to produce large amounts of tomatoes if only the market could absorb them at a reasonable price (฿1.50/kg was clearly reasonable to most of those interviewed).

The expansion of tomato production in this area seemed so promising that a local field day with exhibits, contests, trips through the processing factory, etc., was organized by agricultural officials and universities. The excellent quality of the tomatoes entered for fresh market and processing competition reflected the promising prospects for the future.

The key ingredients to this demand driven situation were; 1) a procurement strategy which effectively filled the fresh market before considering the tomatoes as raw material for processing, 2) gradual expansion in progressive stages as promoted by the crop buyer-cum-entrepreneur rather than trying to precipitate a massive shift away from other commodities into tomato production, and 3) verbal contracts with systematic support for both production and marketing needs. These were both done as incentives to join rival factory groups but also as an acknowledged method of accepting some of the risk associated with this initially new, perishable crop.

d. Insights Gained

These two single product firms have been very successful in using the factory-farmer procurement system because of their location within a fairly homogeneous production area, the exceptionally industrious and experienced vegetable gardeners who lost their previous market (Ventienne, Laos), and the cultivation similarities between tomato and tobacco, both

of which are highly labor and input intensive cash crops. If the Ventienne market again became open to these growers, if the tobacco market had a stronger demand, or if another off-season crop had a better market, this current expansion of processing tomato production would swiftly change due to the commercial orientation of these farmers. Unlike the other cases, this system originated with growers who were highly commercialized vegetable gardeners whose market opportunities had dramatically changed rather than subsistence rice farmers trying to cultivate a new crop in the dry season.

Although the procurement system initially began with the factory management dealing with individual farmers, now the factories clearly preferred dealing with groups of growers rather than individual small producers due to the higher transactions costs associated with the latter approach. Thus, the processor situation (considerable local competition for grower allegiance) and the farmer cultivation conditions (commercial gardeners with productive soils) can favor a direct factory-farmer system rather than the promoter approach, or stated more accurately, these active crop buyers exemplified the promoter system which evolved into a factory-farmer approach within a commercial agriculture setting.[7]

2. Out-of-Reach (OOR)

a. Plant Location

In Northeastern Thailand considerable growth in economic activity has taken place within the past 5-10 years. Khon Kaen Province which is

[7] Interviews with the processors and farmers indicated that a large local crop buyer may be a "promoter" for a Bangkok processor at the current time.

located in a central position seems to be a hub of much of this activity. It is a special industrial promotion area for the Board of Investment and site of various agro-industries including a huge pulp mill, irrigation projects, sugar mill, and a fruit and vegetable canning factory. However, as a rather barren area due to limited water supply, its development is more an ongoing process than a realized accomplishment.

b. Firm Characteristics

As a fruit and vegetable processing facility located in an area with few locally grown raw materials, this firm can be said to be built on the "hope" of a better future. The owner who successfully established a meat processing company in this area, chose the site in anticipation of an expanding area of vegetable production once irrigation became more readily available and because he lived in Khon Kaen city. In 1979 he obtained sizable loans to build a medium-sized processing facility, to hire an experienced foreign plant manager and local staff, and to initiate nationwide procurement of various raw materials. His firm was registered at over 20 million baht and anticipated more than 350 employees. As of the 1980/81 interview period he mentioned spending over ฿30 million yet needing an additional ฿20 million to make the enterprise really viable. In fact, if other entrepreneurs wished to share in the expenses of establishing such a costly business, he stated that he would be willing to make this a public company rather than a family business.

The products which this firm processed included the primary products of canned tomato juice and paste, as well as longan, mango, pineapple, rambutan, and baby corn. The production schedule began with tomatoes from January to March, mango from April to May, pineapple from April to

October, rambutan from May to July, baby corn throughout the year, and longan from June to July. The bulk of the tomatoes initially came from a large production area a couple of hundred kilometers north of Khon Kaen (Nong Khai area) and later from areas dispersed around the Northeast region as promoted by the factory. Yet, important sources for the other raw materials were quite distant from the processing plant. For example, pineapple came from the southern and central regions, rambutan from the southern and eastern regions, longan from the northern region, and baby corn from several different locations. Although direct purchases from farmers were common for tomato procurement, middlemen were frequently used for procuring the other raw materials.

Much of the processing machinery had to be imported. Other materials such as tin plate, were either imported or shipped from the Bangkok area. Thus, except for labor and to some extent tomatoes, the processing plant relied heavily on in-shipment of raw materials and accessory inputs. Similarly, whatever products that were not sold through a local broker for domestic distribution, were shipped to the Bangkok area for an exporter's European sales (primarily to West Germany and France). Thus, transportation costs constituted a serious cost disadvantage for this firm.

A couple of years after the factory began operation, the firm employed from 100 to 300 employees depending on the product processed. Employment was highest in the processing of rambutan and longan because of the labor intensive nature of the seed removal process. Employment was lowest during the tomato season due to the more mechanized nature of the tomato processing. Basically raw material supplies dictated the work schedule which permitted the plant to operate about 270 days/year after

adjusting for down-time for machine maintenance. Fortunately most of the labor intensive periods corresponded to the slack employment period in this region, thus labor was generally available and relatively inexpensive.

c. Raw Material Procurement

Although this company's procurement system consisted of two major components, i.e., local procurement and nation-wide procurement schemes, this analysis will focus on the strategy to establish a strong local source of tomatoes. According to the factory staff the seed material of the common processing tomato varieties (VF 134, Roma, and VF 78 and VF 79) were provided by the factory free of charge to local cooperating farmers. Within its first two years of operation, the factory's contracts with each participating farmer stipulated a guaranteed farm gate price (฿1/kg in 1979 and ฿1.25/kg in 1980), the area to be planted, and the acceptable quality of the raw material. The factory's extension staff recruited farmers and village representatives in September, arranged for plantings from October to December, provided technical advice on production practices, and scheduled harvesting activities beginning about 3 to 4 months later. Although this quasi-factory-farmer approach depicted by the factory staff was similar to that organized in the Nong Khai area, important complications arose.

Contrary to expectations, the selection of prospective tomato producing sites was not entirely successful. The basic criteria for the factory's selection of promising raw material production sites included villages which had, 1) experienced vegetable growers, 2) current production of some vegetables, and 3) proximity to the factory. Assuming that the provision of inputs on credit, technical assistance in crop care, and

a guaranteed price combined with a local farmer as a factory representative were the main ingredients for the procurement system, the factory's extension team aggressively promoted factory-farmer agreement for hundred's of rai within nearby villages.

For the first year's limited area (200-300 rai), the results were encouraging. Yet, for the expanded second year (about 1,500 rai), both nature and human expectations combined to undermine the procurement system. Although several villages agreed to grow tomatoes for the factory, it soon became apparent that agreement did not mean full commitment. Experienced vegetable growers were programmed to react and plan relative to fresh market demand. Also their previous planting times and cultural practices were retained rather than adapted to the practices appropriate for the new varieties.

When the tomato harvests began the higher fresh market price caused substantial amounts of contracted tomatoes to flow into the fresh market and loud grumblings of an unacceptably "low" price paid by the factory. When the peak season approached, several days of high temperatures induced such rapid ripening and deterioration of the picked tomatoes that losses were incurred in both the villages and the factory. When unusually large amounts of tomatoes arrived at the factory, far exceeding the plant capacity (about 60-80 tons/day), they began rotting in the crates. In trying to delay further arrivals, fewer crates were sent back to the growers thus causing losses in the fields. By this time the local fresh market was also unable to handle further deliveries, thus both the farmers with tomatoes rotting in their fields and the factory with tomatoes

rotting in the factory area experienced considerable losses and each blamed the other.[8]

A combination of the grower losses during the harvest season, the comparatively low guaranteed price, and the perceptions that neither profits nor yields met expectations (especially compared to fresh market vegetables previously grown) convinced most of the accessible, vegetable producing villages to withdraw from any further contact with the factory. The factory was disillusioned by the farmers' outcry at not receiving a higher price, by the magnitude of the adverse effects of having most growers facing the same micro-climatic condition when planting at the same time, and by the heavy losses from this direct factory-farmer approach.

The factory then changed its strategy for site selections by focusing on distant, more isolated groups of villages that had at least a minimal amount of water available and reasonably productive soils. The organization and operation of the system was substantially the same as before except for lower levels of inputs on credit and the use of the factory's extension staff on limited technical assistance, and coordination of shipments to the factory in the factory's vehicles. With this approach the growers no longer made comparisons with the fresh market price and the costs of supporting the procurement system were lowered. A wider dispersal of sites and sequenced planting times lessened the glutting effect. Early purchases for sale to distant fresh markets

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[8]It is worth noting the farmers' assertion that favorable soil moisture conditions during the first year resulted in good yields in some villages and induced a "bandwagon" effect for the second year. Then, drought conditions and disease problems during the second year may have set the stage for confrontation with the factory from the original group of farmers.

earned additional income for the factory.[9] And farmers in those areas were willing to accept the processing price because it was not "low" when compared to the few alternative farm or non-farm income opportunities available in those areas during the dry season. Low yields were likewise not such a serious concern to farmers who had few other opportunities.[10] Also with minimal, if any, previous experience with vegetable production there were no old habits to break. Farmers had only to learn how to grow processing tomatoes.

Interviews with farmers during a production cost survey in one of these areas provided useful information on the variability in cultivation methods and costs. The results of that survey will be discussed in the tomato subsector analysis. Interestingly this new approach by the factory seemed to have merit in the short-run but some price adjustments are likely to be required if it is intended as a long-run procurement strategy.

The strategy for locating this plant in a "potentially" rather than "actively" productive fruit and vegetable area was based on a "demand-pull" approach to improve farmer income, i.e., provide additional markets for farm products in conjunction with input and technical support. Although the idea clearly had merit and offered considerably long-run benefits to farmers, the weak competitive position of the firm and the magnitude of

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[9]The factory sometimes only paid the contract price for early harvests which it sold at a distant market for several times that price. This short-run strategy may soon harm the farmer-factory relationship.

[10]In a major production site yields became problematic when the factory encouraged earlier plantings in the second year of cultivation so that subsequent earlier harvests could be sold in the fresh market at considerably higher prices, i.e., the difference between ฿1.50/kg to farmers and ฿4-5/kg in the distant fresh market. Unfortunately, earlier plantings meant heavy disease and weed problems which subsequently lowered yields. The unacceptably low yields (and consequent returns) for farmers may terminate the system in this area.

losses in the initial years may have undermined its ability to follow long-run policies favorable to farmers. Competing with firms located near their source of primary raw materials, accessory inputs, and the product market (Central Plains area) or near a wide variety of raw materials (Northern area), was extremely difficult when positioned far from both types of input and product markets.

Thus, the original long-run strategies were adjusted to short-run tactics in order to at least permit survival. For instance, promoting off-season tomato production in remote areas in order to earn wider profit margins between the processing price paid to the farmers and the higher fresh market price when shipped to the Bangkok wholesale market. However, as farmers came to learn about these "unfair practices" they discounted production and forced the factory to search for other remote areas. Knowledgable sources remarked that this factory's approach was earning a reputation which would insure its demise if it did not change its approach in the near future.

d. Insights Gained

This case illustrated the problems of identifying prospective supply areas for a new crop which has both fresh market and processor demand. The initial approach emphasized village proximity to the factory, experienced vegetable growers with current production of some types of vegetables, and a factory-farmer verbal contract for a few hundred rai of tomatoes. Later grower comparison of processor price with accessible fresh market prices led to some diversion of early harvests into the fresh market. Vegetable gardeners comparison of the tomato crop with other vegetable crops resulted in the more experienced growers not joining this

procurement system after the first season. The fresh market attraction and promising yields in some villages during the first year caused a 6-7 times increase in contracted area, with disasterous consequences. The unexpectedly high temperatures during the harvest period caused such a surge of arrivals (far beyond the plant's capacity) that the factory broke its contracts, i.e., refused to purchase the tomatoes.

The heavy losses to the farmers and the factory (non-repayment of credited inputs) caused a shift in policy to, 1) search for remote areas in which to promote and support production, and 2) honor contract price only as long as limited raw materials are available in the market, i.e., decrease the purchase price if gluts occurred. The subsequent erosion of farmer and crop buyer confidence in this factory due to broken contracts became a part of the cycle of losses which encouraged further opportunistic behavior on the part of the factory. The effort to recover previous losses in turn caused longer term losses as the firm's business reputation eroded.

On the other hand, the factory seemed to have few realistic options considering its poor financial position overall. If this factory's procurement system was 1) fully supported (credit for a substantially higher level of inputs due to inaccessibility of inputs in isolated areas), 2) developed (varietal screening and cultural practice improvements tested) and 3) reliable (not adjust guaranteed price according to alternative sources of supply), it would not have been financially feasible.

D. TOMATO AS A RAW MATERIAL VIEWED IN A MARKETING SYSTEMS CONTEXT

In this section the demand for various tomato commodities and products as well as consumption patterns will be considered. The selected

characteristics of the tomato marketing system, i.e., organization and operation; price trends, seasonality, and variability; and competitive conditions will be analyzed. And the supply dimensions both in terms of trends and changes at the aggregate level and grower-cultivation conditions at the disaggregate level will be assessed.

1. Uses of Tomato

The two main uses of tomato in Thailand are a) fresh market commodities, i.e., a "fruit" as well as some use as a side dish, and b) processed products both in final form, i.e., tomato ketchup, and in intermediate form, i.e., tomato sauce or paste.

In the fresh fruit and vegetable markets two fairly distinct types of tomato are found, i.e., the varied sizes and shades of red-green or pink fruit from indeterminant plants, and fairly uniform sized and bright orangish-red fruit grown on determinant plants. The latter type are usually referred to as "processing tomatoes" and the former are called "fresh market tomatoes."

For several decades vegetable gardeners on the periphery of population centers have cultivated staked tomatoes which continue to ripen over an extended period and are harvested on a daily basis for sale in local markets. Fruit color, firmness, and shape vary widely between varieties. There are several varieties among those indeterminant varieties, a few of which do not require staking. In Thai markets the small pink fruits seem most popular and widely available even though larger round types in varied stage of ripening (green and yellow-red) are also prevalent. Usually the less ripe tomatoes are shipped long distances and kept in retail markets for further ripening. In general the fresh market varieties

are said to have a sweeter taste than processing varieties which also come onto the fresh market.

With the advent of the tomato processing industry in areas further from population centers, the excess of the newly introduced processing varieties (determinant varieties) came onto the fresh food market at very low prices. Although their taste was sourer, their comparatively low price and good appearance (uniformly red unlike the yellow-red or greener shoulders of some indeterminant varieties) earned them an every increasing market share, particularly during the cool season.

Varietal characteristics of the various fresh market and processing varieties affect their marketability, production location relative to market outlets, and seasonality of availability. The small sized pink tomatoes have such thin skins that long distance transportation causes heavy damage, thus their cultivation is restricted to areas near consumer markets. Temperature and rainfall damage also curtail their periods of economic cultivation.

Certain varieties of medium-sized red tomatoes, i.e., processing varieties such as VF134, are firm with thicker skins which allow for long distance transportation. Thus, cultivation expanded within the favorable conditions in the Northeast and large quantities were shipped to major fresh markets in Bangkok or as far away as Malaysia. Daily shipments continued into January before the peak season harvests brought farm prices low enough for processor procurement. In other words, varieties which could be transported long distances and the accessibility of the production area to a major market outlet facilitated the extension of tomato's cultivation season within a favorable micro-climatic and cultivation

conditions, thereby earning particularly favorable farm prices of ฿10-11/kg in November and December ("off-season").

During the "off-season" other fresh market varieties were continually entering the market, i.e., usually flowing through supply area markets toward the high priced Bangkok markets. These varieties were harvested in various stages of ripening in order to withstand the hot, humid weather conditions during the shipment and repacking process. The riper tomatoes were sold on local markets, the less ripe and better quality shipped to Bangkok.

One further characteristic is quality. Quality varies by season and is particularly important because under up-country conditions the processing varieties are said to have better fruit "quality" in the cooler months of December and January. They typically begin to display less desirable features in February and March, up until the heat of April prevents further fruit sets. Usually the first clusters on a plant are better quality than the last clusters, yet since tomato supply is more limited during the early part of the season (cooler months and first clusters), the fresh market prices for the first fruits are usually too high for processors to compete with. Consequently, the best quality tomatoes are sold in the fresh market and processors have to purchase later in the season when quality is comparatively poorer. This situation presents several problems for processors' ambitions to export, since mediocre quality raw material cannot readily produce top quality tomato products! This aspect has major long term implications for the tomato processing industry.

In addition to the tomato commodity found in fresh markets there are several intermediate and final products made from tomato. Usually certain

varietal characteristics such as pH and total solids content are needed to produce higher quality products.

> Tomatoes for canning and for juice should be medium large, smooth, of uniform rich, red flesh, and evenly ripened all over without green shoulders and possessing a large portion of solid meat of good flavor. Tomatoes of irregular shape and wrinkled skins are difficult to peel, and the loss in preparation is excessive. Those with large seed cavities soften badily in the can, giving an unattractive appearance and a slack-filled can.[11]

Likewise, the attributes of high color, rich flavor, and high total acidity of pear-shaped varieties (such as Roma) are as important for tomatoes used for juice as are shape and texture for varieties used for canned whole tomatoes. High solids content is needed for paste. Tomato paste has a range of qualities usually dependent on the quality of the raw material (variety, degree of damage, and stage of ripeness) and the number of kilograms of raw material per kilogram of paste, for instance, 6-7 kg per 1 kg of paste (24 brix), 7-8 kg per 1 kg of paste (26 brix), or 8-10 kg per 1 kg of paste (28 brix).[12]

Tomato ketchup, juice, sauce and paste are readily available in Bangkok food markets. Tomato ketchup, a popular final product, previously was only imported. Now several distributors of food products contract with certain processing factories for a bottled ketchup which can compete with imported brands. The distributors attach their brand label and market the ketchup within their distribution system whether in the domestic or foreign markets. Common brands included Roza Ketchup, Brooks Ketchup and Royal Ketchup. Although those brands compete somewhat with imported

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[11] R. Rodriguez, B. L. Raina, Er. B. Pantastico, and M. B. Bhatti, "Quality of Raw Materials for Processing," Postharvest Physiology, Handling and Utilization of Tropical and Subtropical Fruits and Vegetables, Edited by Er. B. Pantastico, Westport, Conn.: AVI Publishing Company, 1975, p. 499.

[12] Brix is a measure of paste quality in terms of sugar content.

brands, such as Heinz, they mostly compete among themselves because their quality is poor to fair due to problems in obtaining sufficient quantities of high quality raw material.

Tomato paste and sauces do not seem to have a strong market as a final product, i.e., bought directly by individual consumers, since Thai dishes usually do not use such ingredients. However, hotels and restaurants catering to foreign clientele do purchase various amounts of higher quality pastes. The fish canneries commonly use lower quality tomato paste when packing certain species of fish, such as mackerel and sardines, especially during the July to December period. Thus, the bulk of locally produced tomato paste and sauce is for an intermediate product and directly depends on the fortunes of the fishing industry which was not particularly healthy in the 1980/81 period.

Originally much of the lower quality paste was imported from Taiwan since local tomato production was limited and quality was reportedly poor. In fact, several fish canneries interviewed contended that the Thai quality still is too poor for their higher quality products but is adequate for domestic fish products.

The structure of the fish industry is beyond the scope of this study. Yet, due to its crucial importance as the major market for tomato paste, a few aspects merit explanation. In 1979 the foreign trade in Thai seafood products amounted to ฿7.5 billion and included fresh frozen shrimp and squid as well as growing amounts of canned tuna and sardines. In the domestic market, fish products reached every corner of Thailand in substantial quantities (considering that only 15 percent of the 1979 catch was exported) both as human food and animal feed. One estimate of the industry structure during that period was that there were about 10 large,

export-oriented firms (mostly joint ventures) and over 40 smaller fish canneries.[13]

Although the total demand for tomato paste by the fish canneries is uncertain, one knowledgeable source estimated it was over 3 million kg of paste (i.e., ฿40-60 million) in 1980.

2. Demand Dimensions

Data concerning the demand for tomato commodities and products is quite limited beyond that discussed regarding uses of tomato. However, a brief discussion of consumption patterns and trade characteristics will broaden the understanding of the tradeoffs in commodity and product uses.

a. Consumption Patterns

There is very limited information available on the actual consumption of tomato commodities and products from nutrition or household consumption surveys. The only information available is of the weekly expenditures on tomatoes by households in the North, Northeast, and Central regions according to various population centers (Table 5-1). Expenditures were largest in the primary production areas, i.e., the North and Northeast, and in their larger population centers. Yet, due to the highly seasonal character of this commodity, the period in which the survey was actually conducted would substantially alter the results. Consequently, this information must be interpreted with caution, especially since the large quantities shipped to the Bangkok area from the up-country growers could have been overlooked.

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[13] Bangkok Post, "The Thai Marine Products Association." Bangkok Post Supplement, December 1980.

Table 5-1. Average Household Expenditures on Tomatoes in a 7-Day Period, by Region, 1975-76

Region	Population Center		
	Municipal Area	Sanitary District	Villages
	----------Baht per Household----------		
North	0.78	0.33	0.21
Northeast	0.66	0.43	0.15
Central	0.25	0.15	0.13

Source: Adapted from National Statistical Office, Ibid.

Inferences regarding consumption patterns based on tomato production statistics are difficult not only because the proportion grown for processing versus fresh market uses has changed considerably from year to year, but also due to the reliability of the statistics themselves. For instance, according to available statistics, there was a 35 percent increase in tomato production between 1969/70 to 1978/79. Yet, processing use increased substantially and there was no indication that fresh market consumption decreased, especially since both population and income had increased markedly over that period. This is especially peculiar because one would ordinarily associate tomato income elasticities with those of fruits and canned products. However, without additional information no further remark about demand can be made.

b. Characteristics of Products Traded

An examination of the import and export statistics on tomato commodities and products (Tables 5-2 and 5-3) provides insights into the tomato

Table 5-2. Value and Quantities of Imported Tomato Products and Commodities, 1970-79

Item	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average 1970-79
						฿1,000					
Products											
Tomato in Airtight Containers				210.8	415.9	207.1	640.2	569.3	2833.4	874.8	575.2
Tomato Juice	2368.5	525.6	827.5	1157.6	751.0	884.9	1349.2	1205.9	200.7	-----	927.1
Tomato Sauce -- Ketchup	2011.5	2151.8	1293.2	2870.6	321.9	1879.4	1371.9	2716.6	1749.3	2387.0	1875.3
Fruit Puree Pastes for Industrial Use	243.0	198.5	111.9	291.4	159.4	178.4	127.0	168.7	115.6	573.4	216.7
Total: (Nominal/ Value)	4623.0	2875.9	2232.6	4530.4	1648.2	3149.8	3488.3	4660.5	4899.0	3835.2	3594.3
(1976 Prices)	7666.7	4753.6	3515.9	6180.6	1807.2	3281.0	3488.3	4331.3	4219.6	3005.6	4225.0
Commodities											
Fresh Tomatoes	*	*	*	*	*	6.1	------	------	------	295.0	
						M/T					
Products											
Tomato in Airtight Containers				12.8	21.7	9.4	40.2	47.1	232.7	63.8	42.8
Tomato Juice	388.7	79.3	110.0	143.4	88.1	78.7	99.3	87.0	13.9	-----	108.8
Tomato Sauce -- Ketchup	189.6	162.6	95.7	179.4	20.3	79.7	65.4	126.6	82.4	117.2	111.9
Fruit Puree Pastes for Industrial Use	24.7	11.0	5.8	12.2	6.8	7.2	4.8	5.0	3.5	16.2	9.7
Total	603.0	252.9	211.5	347.8	136.9	175.0	209.7	265.7	332.5	197.2	273.2
Commodities											
Fresh Tomatoes	*	*	*	*	*	3.0	-----	-----	-----	37.0	

*Period not considered

Source: Customs Bureau

Table 5-3. Value and Quantity of Export Tomato Products and Commodities, 1970-79

Item	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	Average 1970-79
	----------	----------	----------	----------	----------	฿1,000	----------	----------	----------	----------	----------
Products											
Tomato in Airtight Containers	-----	-----	-----	-----	-----	13.5	87.5	64.3	25.3	-----	19.1
Tomato Juice	-----	1.5	-----	9.0	-----	3.1	215.6	228.4	10.7	2.1	47.0
Tomato Sauce -- Ketchup	2.4	9.6	7.8	-----	112.9	-----	-----	-----	-----	-----	13.3
Fruit Puree Pastes for Industrial Use	151.8	30.1	18.0	253.3	47.2	106.7	-----	-----	-----	322.7	93.0
Total: (Nominal/ Value)	154.2	41.2	25.8	262.3	160.1	123.3	303.1	292.7	36.0	324.8	172.4
(1976 Prices)	255.7	68.1	40.6	357.8	175.6	128.4	303.1	272.0	31.0	254.5	188.7
Commodities											
Fresh Tomatoes	*	*	*	*	*	697.0	771.0	132.0	32.0	-----	
	----------	----------	----------	----------	----------	M/T	----------	----------	----------	----------	----------
Products											
Tomato in Airtight Containers	-----	-----	-----	-----	-----	1.5	8.3	4.0	.5	-----	1.4
Tomato Juice	-----	0.1	-----	0.6	-----	0.2	30.2	20.3	.8	.1	5.2
Tomato Sauce -- Ketchup	.9	2.6	2.4	-----	6.2	-----	-----	-----	-----	-----	1.2
Fruit Puree Pastes for Industrial Use	19.3	4.4	5.2	15.2	4.5	6.0	-----	-----	-----	22.2	7.7
Total	20.2	7.1	7.6	15.8	10.7	7.7	38.5	24.3	1.3	22.3	15.6
Commodities											
Fresh Tomatoes	*	*	*	*	*	252.0	249.0	26.0	6.0	-----	

*Period not considered

Source: Customs Bureau

subsector relative to both domestic and foreign markets. The pattern of imports of some products, such as "tomato in air-tight containers" suggests an increasing demand for a product which local tomato processors have not been able to meet. The decreasing value of tomato juice imports indicates the likelihood of import substitution by local processors (as some asserted). The value and quantity of tomato sauce-ketchup imports followed a peculiar pattern considering the exceptionally low value of 1975 which happened to correspond to the period when the new large tomato processing plant in Chiang Mai had begun its operations. One can conjecture that imports were delayed in anticipation of huge quantities of less expensive tomato products entering the market from that factory and when they did not materialize the previous import pattern reemerged. Although the values of imported sauce-ketchup fluctuated sharply and erratically over the ten year period, it is possible to infer a certain degree of import substitution because one would expect a steadily increasing trend based on 1) the population and income increases previously noted and 2) the existence of several local brands of ketchup found in several stores and restaurants. It is assumed that the import classification of "fruit and purees and pastes for industrial uses" included tomato paste but limited information on classification subcategories makes that assumption tenuous. The substantial increase in imported value in 1979 corresponded to other information regarding the recent favoring of imported tomato paste for use in fish canning.

Basically the value of exports appears inconsequential especially since some of that may only be exports of imported products. It is very likely that the surge in export values of tomato juice and tomato in air-tight containers in 1976 and 1977 represented an effort by local

businesses to benefit from Thailand's access to countries with quotas on Taiwan's tomato products as mentioned by industry sources. Note the substantial imports of those products in 1976-77 (Table 5-2). A knowledgable source mentioned the common practice of importing certain vegetable products from Taiwan and re-exporting them as originating from Thailand thereby circumventing import restrictions in certain markets.

On balance, imports of tomato products continue to exceed exports by ฿2-4 million per year providing a strong incentive for improving and supporting the tomato processing industry. Although exports of tomato commodities (fresh tomatoes) exceeded imports until 1979, their decreasing trend suggests a weakening market position.

Although various knowledgable sources considered that Thailand's tomato products are too inferior to earn a share of the international market, others have contended that markets in the Middle East and Asia, such as Hong Kong and Singapore, are less discriminating and therefore possible future outlets. An examination of the export statistics does not confirm that Thailand has made any significant inroads into those markets as of 1979.

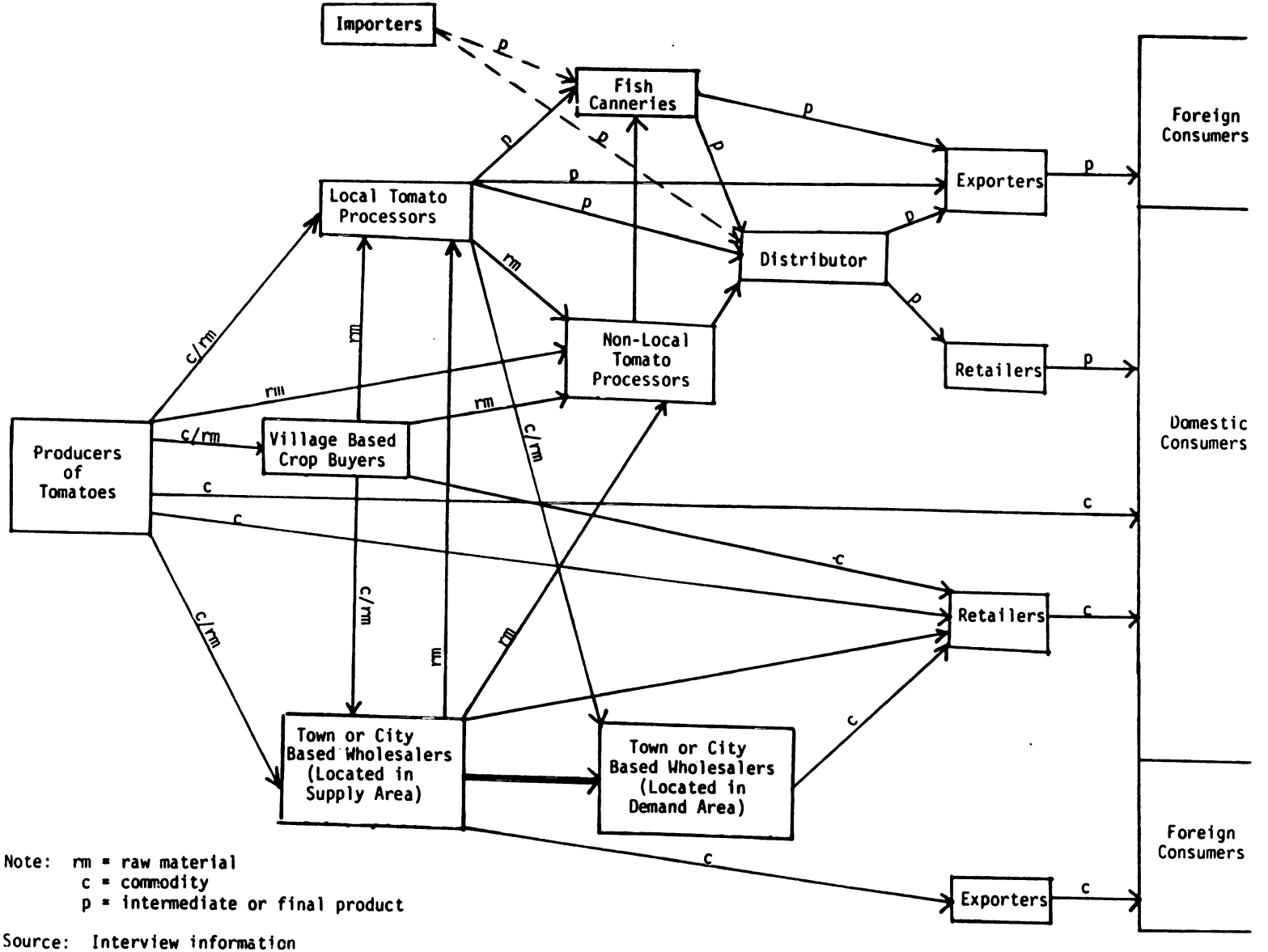
3. Selected Characteristics of the Tomato Marketing System

The main characteristics within this section are the organization and operation of the marketing system; price trends, seasonality, and variability; and competitive conditions.

a. Organization and Operation

The organization of the marketing system for tomatoes is somewhat complex (Figure 5-2). Tomato growers in general have few outlets for

Figure 5-2. Market Participants in the Tomato Subsector



Note: rm = raw material
c = commodity
p = intermediate or final product

Source: Interview information

their harvests, although some clearly had only one. Unlike a storable commodity such as dry garlic, this marketing system has tighter linkages and quicker throughput because of the commodity's perishability. Normally a crop buyer needs reliable buyers for his purchases before assembling tomatoes from farmers. Farmers located further from vegetable markets want purchase assurances from specific crop buyers before planting tomatoes unless they are located within a traditional tomato production area. These interrelationships and the various forms of behavior they elicited will be dealt with in a later section.

From a broad perspective this market organization also fits the hourglass analogy (as mentioned for garlic) but with more of a local market character. There are a multitude of small scale tomato growers in clusters, substantially fewer local crop buyers, a few large wholesalers in major supply and demand areas, a large number of retailers (often of fruit commodities), and a multitude of consumers. Initially when only the more delicate fresh market varieties were available, the degree of interregional shipment was mostly confined to certain "green varieties" thus the local markets displayed the hourglass organization. But after the more transportable processing varieties became prominent, the link between major supply areas in the North and Northeast and the major demand area of Bangkok began to emerge, especially during the "in-season" periods.

During the "in-season" period many types of farmers grew tomatoes and crop buyers purchased tomatoes in several locations. During the "off-season" periods only certain types of growers, such as those in higher elevations or vegetable gardeners, supplied a select set of wholesalers who knew which demand area wholesalers were in business at

that time. Although the "in-season" and "off-season" terms of exchange varied with price being the key variable, the crops buyer's guarantee to purchase the farmer's entire harvest during the "in-season" was an especially important term of exchange.

Besides the structural dimensions of the market, the channel leadership and the implications of change in that role merit an explanation. As in the garlic subsector, the major wholesale markets in Bangkok have become the focal point of the fresh marketing system for tomatoes, mainly because of the favorable prices from its higher income clientele. As long as the quality and volume of tomato in the supply area market are adequate for shipment on a particular day in the "off-season," it is shipped directly to Bangkok. Later, as the "in-season" crops begin flooding the Bangkok market, shipments are closely regulated in order to avoid spoilage from the irregular arrivals from both major supply areas. In this case direct linkages between Bangkok wholesalers and larger Chiang Mai wholesalers were found even to the extent of one Chiang Mai wholesaler initiating several special buying arrangements with various villages of producers so that special varieties could be promoted and their staggered harvest periods would provide a steady supply of quality tomatoes throughout the season.

Although a price letter is sent from demand to supply area wholesalers, it appears that during the in-season other more frequent means of communication are likely in order to lessen the possibility of huge surges in arrivals. Although difficult to adequately document, informal communications among wholesalers within the same market place concerning prices and arrivals are said to exist. Such communication and exchange of price information by supply area crop buyers were witnessed on various occasions.

Normally the largest wholesaler was the reference point and the one questioned about various prices and the market conditions on that day. One point is clear, that is, buyers recognize a need (formal or informal) for some form of coordinated flow of tomatoes through the fresh market. Although prices are said to fluctuate considerably on a daily basis, they seemed to do so within bounds.

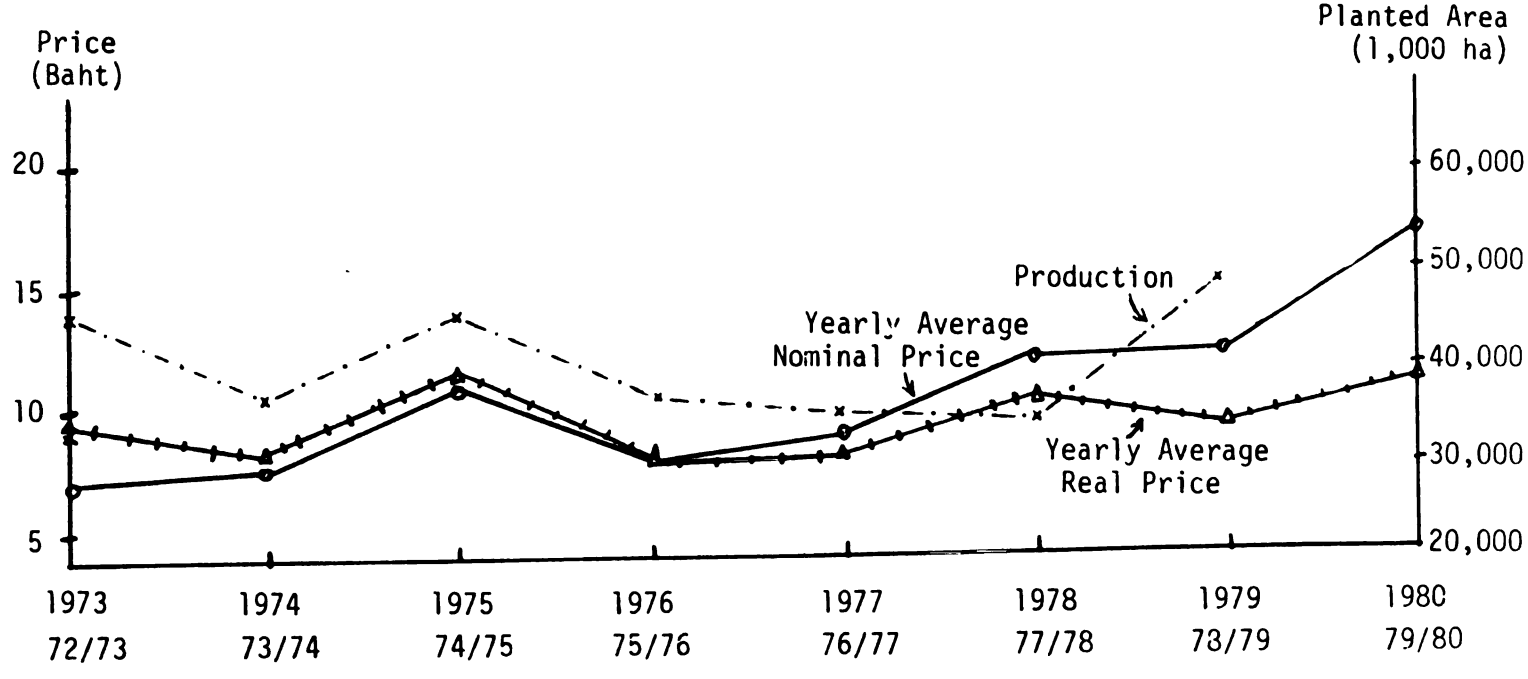
Also important is the linkage of distant processors to the fresh market system. For instance, some larger wholesalers in the supply area were informed that a particular Bangkok factory was paying ฿2.50/kg for processing tomatoes at their factory. Thus, whenever the inflow of tomatoes increased beyond what the Bangkok fresh market could bear, the Bangkok factories were contacted and deliveries made. Another method was for the larger processing factories in the Central Plains to contract with certain larger crop buyers in the supply area for a specific quantity of tomatoes with a definite "at factory" price. The crop buyer's responsibility was to organize and support production, assemble raw material, and ship it directly to the factory.

b. Price Trends, Seasonality, and Variability

The yearly average prices for tomatoes in the Bangkok market from 1973-80 display an increasing trend in nominal terms but a very slight upward trend in real terms (Figure 5-3). Planted area has not responded consistently in response to nominal prices.

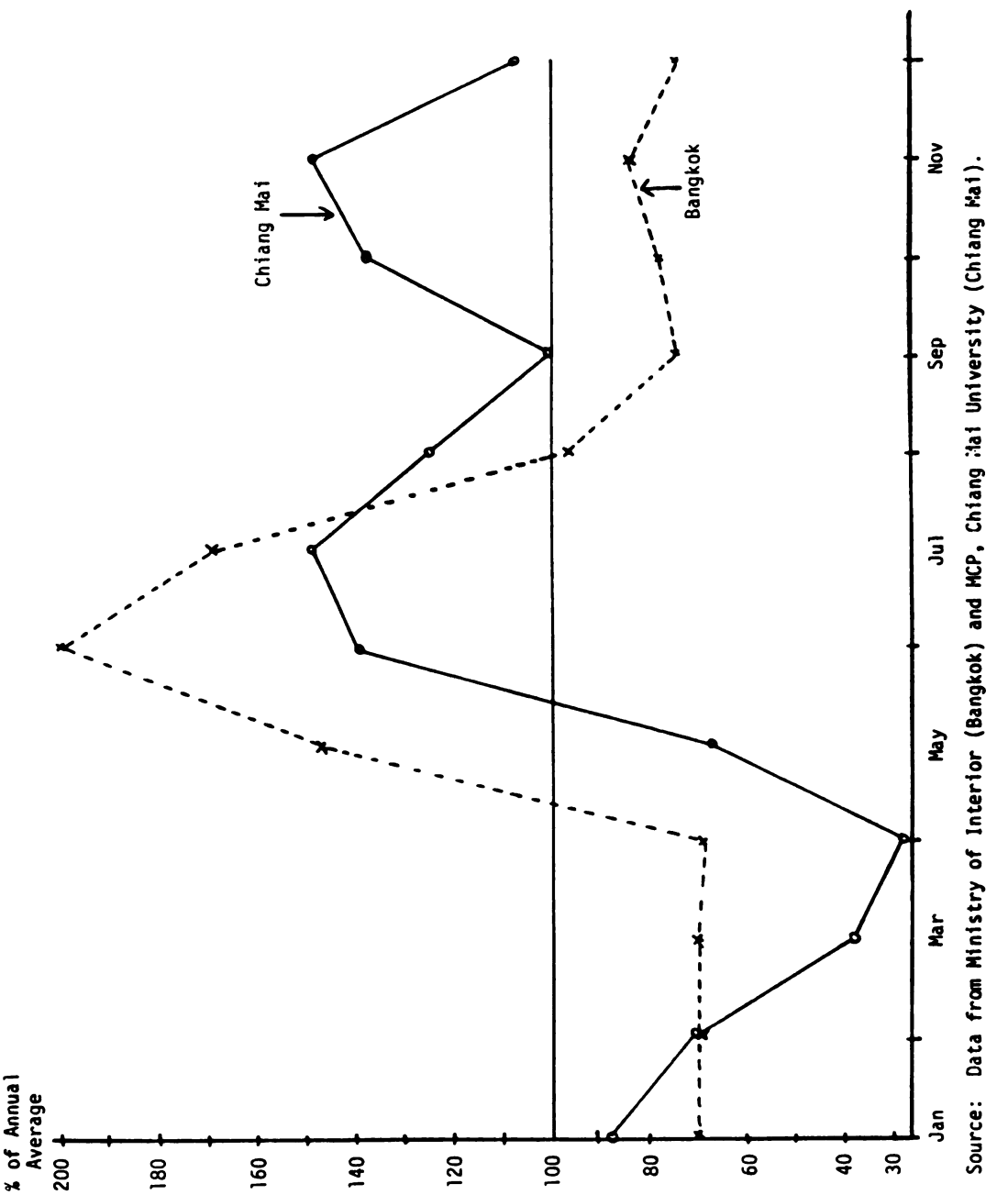
The seasonality of wholesale prices within the Chiang Mai supply area for 1976-78 reflects the major marketing period from February to May (Figure 5-4). Because of the "off-season" crop harvest around September, there are two price peaks rather than one. The seasonality of wholesale

Figure 5-3. Yearly Average Real and Nominal Wholesale Price for Tomato (1973-80) and Planted Area of Tomato (1972-73 - 1978/79)



Source: Data from Ministry of Agriculture and Cooperatives.

Figure 5-4. Seasonality of Tomato Wholesale Prices in Bangkok and Chiang Mai, 1976-78



Source: Data from Ministry of Interior (Bangkok) and MCP, Chiang Mai University (Chiang Mai).

prices within the Bangkok demand area for this same period is similar but considerably less extreme than that in Chiang Mai.

From an examination of 1973-80 monthly price indices it is apparent that considerable change in price seasonality has been occurring in December and January (Figure 5-5).[14] The downward pressure on prices for December and January probably reflected the recent expansion of processing tomato cultivation early in the cool season in the Nong Khai production area along the Banks of the Mekong River.

The comparison of monthly wholesale prices for tomatoes in 1977 for three district markets, i.e., Khon Kaen, Chiang Mai, and Bangkok, illustrates the considerable degree of variation by location (Figure 5-6). The prices in the comparatively small city market (Khon Kaen) on the main route between the large production areas in Nong Khai and the major urban market of Bangkok were influenced by the January to May shipments south. However, once the rainy season began and those shipments ceased, prices increased rapidly.[15] Chiang Mai is the second largest city in Thailand besides being located in the center of a vegetable production region noted for tomato cultivation. The extremely low wholesale price of ฿0.85/kg in April reflects the extent of the local market glut at that time. The relatively low peak price in August was largely due to continous supplies of "off-season" tomato grown in nearby areas, some of which were shipped directly to Bangkok until those prices were brought down to September to December levels. The huge Bangkok market which not only supplies the city but nearby population centers continuously absorbs large amounts of

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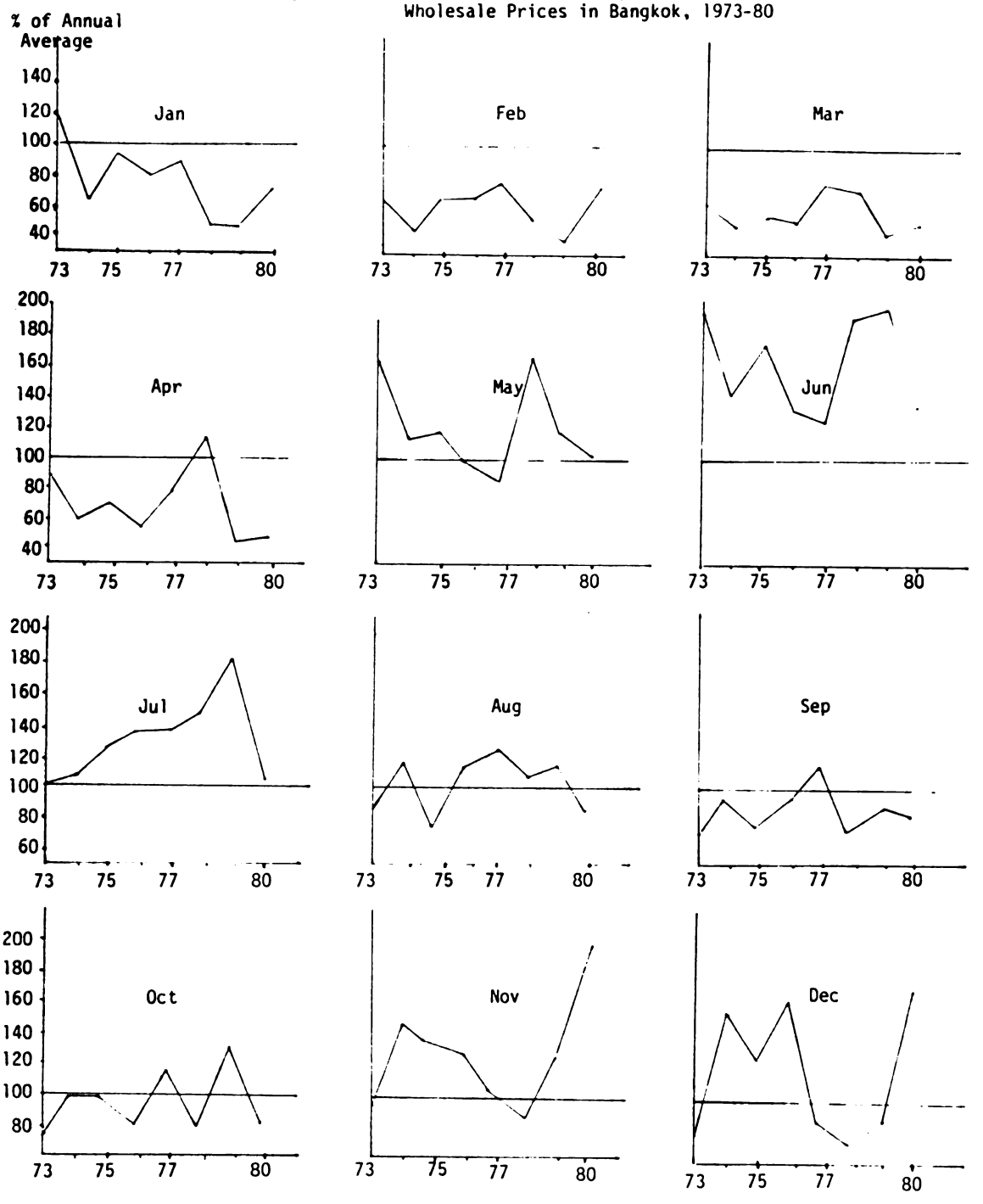
[14]Note that the indices for 1973 and 1980 were outliers relative to the basic emerging pattern.

[15]The absence of wholesale price data for September to December may be due to data collection problems or a lack of sales.

Figure 5-5. Changes in Seasonality of Tomato Wholesale Prices in Bangkok, 1973-80



Source: Data from Ministry of Interior.

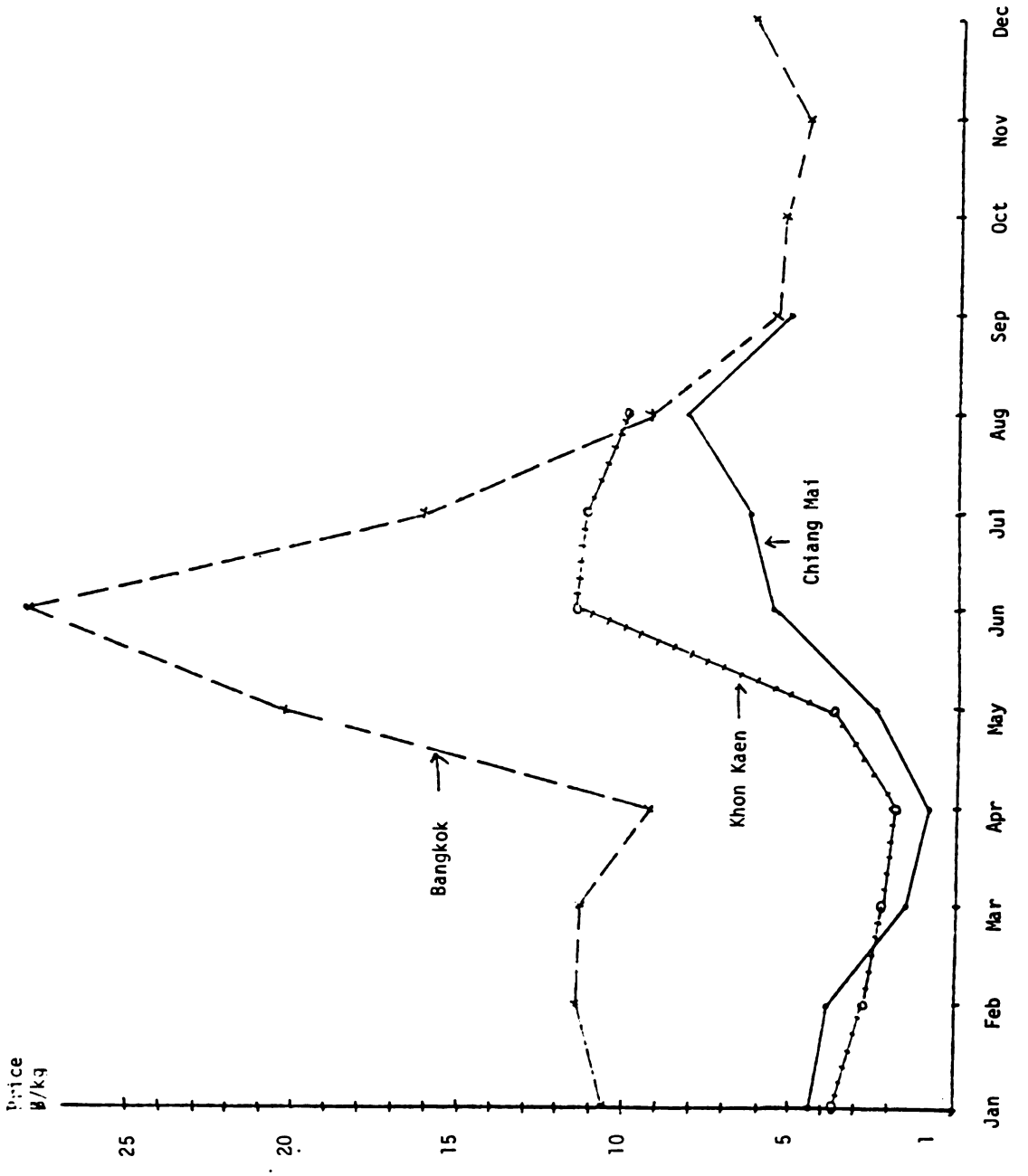


Figure 5-6. Monthly Wholesale Prices of Tomato in Khon Kaen, Chiang Mai and Bangkok, 1977

tomato from all regions of Thailand, especially from Chiang Mai and Nong Khai. The exceptionally high Bangkok prices in May and June not only resulted from supply induced shortages but monsoon rain problems of flooding within the Bangkok area. Such periodic lack of accessibility inflates prices for short periods.

It is important to note that transportation costs of ฿0.50-0.80/kg from these two supply areas to Bangkok explain very little of the wide price margins between the supply areas and this major demand area. Heat and less firm tomatoes may have induced considerable transportation and handling losses from March to June but not for the January to February period.

The monthly average prices usually do not adequately reflect the degree of daily price fluctuations experienced with perishable commodities such as tomatoes. The primary consideration for the marketing agents is daily market arrivals. The more even those arrivals, i.e., minimal degree of wide fluctuations in arrivals, the less the daily fluctuations in prices paid at the wholesale level and the lower the risk of a crop buyer paying growers too much on any particular day. With only a couple of days within which to sell the commodity before spoilage, timing is very crucial both in terms of movement from the field to the wholesale market in the demand areas and from the wholesaler to the final consumer. Although daily price statistics are not available in order to determine the extent of arrival coordination, interviews with various marketing agents indicated considerable fluctuations.

Another aspect is the evaluation of price transmission through the market system, yet here measurement problems arise. "It is difficult to assess how well prices were transmitted from wholesale to farm market

since the quality of the commodities varied at different market levels."[16] However, a few important changes in price transmission and their noted impact on farm prices merit consideration. During the 1979/80 peak season some of the crop buyers in the Chiang Mai Valley as well as the factories and wholesalers in Nong Khai were said to be only vaguely aware of conditions in their competing areas, thus while the Chiang Mai crop buyers (and some processors) paid farmers as little as ฿0.50-0.60/kg, the factories and wholesalers in Nong Khai maintained a contract price in excess of ฿1/kg. However, in the 1980/81 season prices moved in surprisingly parallel fashion over time. Not only had the Nong Khai processors lowered their contract price but they knew when and where to send their trucks to the North for purchases of non-contract tomatoes late in the season. While interviewing crop buyers and factory managers in both areas it was found that each was well aware of supply and price conditions in the other areas at that particular point in time, yet they would not say how they obtained their information, except that their buyers mentioned it. One can only surmise that one or more large wholesalers in Bangkok were taking a more active role in transmitting price and supply information.

Price behavior at the farm level was fairly typical of what one would expect for a perishable vegetable. Crop buyers depend heavily on the previous day's "prevailing price" and their judgment regarding impending changes (Wiboonpongse and Kellogg, 1980). Since they frequently sell their purchases (i.e., almost daily purchases and sales), they are in continual contact with higher level wholesalers and in touch with market conditions.

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[16] Wiboonpongse and Kellogg, Ibid., p. 145.

Generally, the further the growers are from the wholesale markets the more dependent they become on their crop buyer for price information and timely purchase of their small harvests. Thus distant tomato growers become price takers for most of their sales.

The farm price varies considerably not only because of seasonality but also due to crop variety, type of buyer, distance to wholesale markets, and conditions in distant markets, such as Bangkok. For instance, a general pattern is for extremely low prices and sometimes even no buyers during the peak harvest season in the North and Northeast, i.e., usually February-April. Because of the local contract system with a minimum price guarantee in the Northeast, farm prices usually do not fall as much as in the North where little area was under contract. Thus, the low of ฿0.80/kg in the Nong Khai area was higher than the ฿0.50-0.60/kg in the Chiang Mai Valley during the 1979/80 season.

During the "off-season", farm prices are generally higher but not always.

> For off-season tomatoes, the cost of producing a kilogram of tomatoes (1975/76) was almost the same as the amount received through the market (฿2.75/kg). However, the usual case observed in other studies, off-season tomatoes produced by farmers in the Multiple Cropping Village program cost ฿1.27/kg to produce while the price received was ฿4.75/kg in May/June (1974/75).[17]

In other words, farm price variability is considerable even within the seasons. Although the general pattern is price risk (best yields) during the "in-season" and production risk (highest price) for the "off-season", prices sometimes were contrary to expectation.

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[17] Wiboonpongse and Kellogg, Ibid., pp. 35-36.

What are the implications of these characteristics of price and price behavior for processor procurement? Several different approaches were used to determine farmer's understanding of price and the role of price in his decision to grow relatively new crops (such as tomatoes). From interviews with promoters and factory managers it was learned that not only the price but the supply of inputs on credit and the guarantee to buy all of the farmers output are important factors affecting decisions. And after the growers had experienced a year or so of successfully cultivating a particular crop, the factory was generally able to reduce the price offered, especially in the case of processing tomatoes. This experience generally supports the idea of relatively higher prices needed to cover the risk involved for a trial period.

During our production cost survey of processing tomato growers, each farmer was asked, "What is the minimum price you would accept given your cultivation method, yields, etc.?" Invariably the prices were higher than the prevailing prices paid to these farmers, except for the farmers in Ban Yoi Hai who received exceptionally high prices early in the season. Clearly a majority of the farmers wanted higher prices, yet they were willing to continue cultivating tomato at the lower price level since better alternatives were not available.

Another approach was to ask at what price they would stop harvesting their current crop and not cultivate tomato the following year. The response in the North was ฿.50-.60/kg and in the Northeast it was somewhat below ฿1/kg but more often associated with non-price considerations, such as the reliability of the buyer. The farmers in the North seemed willing to accept ฿0.80/kg until another crop option was more profitable, whereas those in the Northeast were very apprehensive with anything below ฿1/kg.

The effective price margin that the up-country processors seemed to have was between ฿0.80-1.30/kg in the North and ฿1-1.30/kg in the Northeast given a raw material breakeven cost of ฿1.30/kg as mentioned by various processors under 1980/81 market conditions and processing costs. The later analysis of farm production costs indicates that farmer returns above cash costs occurred at a farm price of ฿1/kg. Consequently, a contract price of ฿1/kg combined with efforts to coordinate cultivation in areas with more widely spaced planting times, cost reducing and yield improving technological developments, and better handling practices would provide the basis for a strategy for a stable expansion of tomato cultivation beneficial to both farmer and factory.

c. Competitive Conditions

In the analysis of competitive conditions, the structure of the market, the conditions facilitating competition, the storage dimension, and various signs of competition are generally considered. However, for tomato as a commodity there is no storage because of its perishable nature and the data on market structure is very limited. In fact, at the wholesale level only a few large tomato wholesalers were located in the Chiang Mai Wholesale Market, in Nong Khai the two factory managers in addition to one large wholesaler handled purchases for the fresh market, and in areas promoted by the Khon Kaen factory, it was the only major buyer. At the village level the Wiboonpongse and Kellogg study noted that tomato growers recognized a few buyers as accessible to them and in our survey the number of tomato buyers varied by location with Udon Thani growers mentioning only one but other growers noted two or more.

The nature of this perishable commodity usually required some form of buyer assurance to purchase a grower's harvest unless the grower is located within a traditional tomato growing village. Yet even within such a village we found three local buyers offering growers different incentives in order to include them in the buyers' regular grower group. In other words, rather than compete with other buyers according to price, buyers offered inputs on credit, a minimum guaranteed price, etc. in order to gain grower allegiance. Then all buyers paid farmers the "prevailing market price."

The conditions facilitating competition in the North such as the good road system, proximity to market places, small buyers trying to gain a larger share of the market, etc. were somewhat similar to those mentioned for garlic. Yet, unlike fresh garlic wherein many nearby picklers were buying on a daily basis, the number of local canneries buying tomatoes was few. Distant canneries either dealt with one or two of the few large wholesalers or a particular set of crop buyers with their own group of farmers. Consequently, farmers occasionally could sell part of their harvest to an outside buyer but usually their regular buyer received most of their harvest. If not satisfied with their buyer, they would switch to another for the following year.

A sign that the fresh market system here was becoming more organized was the example of a large Chiang Mai wholesaler who organized a network of tomato growers in select villages at the advice of her Bangkok buyer. Although this system enabled her to receive a special variety of tomato through the seed she distributed, she bought all their harvests at a "prevailing market price" rather than any guaranteed price.

In the Nong Khai area a similar pattern existed, again competition for buyer allegiance to particular buyers and payment according to prevailing price until the price reached the guaranteed minimum. Only in the isolated areas promoted by the Khon Kaen processor was there a one major buyer and one guaranteed price system.

The Central Plains processors purchased from their buying agents or large wholesalers in the North according to an "at factory price" which decreased according to the market conditions during the peak season. In other words, competition between buyers was mainly in terms of gaining grower allegiance rather than paying prices above a "prevailing price." Continuous buying and selling informed them of up-channel prices and their experience and judgment enabled them to anticipate impending changes in those prices. Fresh market buyers bought the earlier harvests then competed with processors once the price fell within their price range.

4. Supply Dimensions

This section will first summarize the characteristics of tomato as a crop. Then, after noting Thailand's position among world producers of tomato, trends and changes in tomato planted area and production for the past decade will be assessed. Finally, the tomato grower and cultivation conditions will be considered from two perspectives, i.e., general conditions and cultivation patterns for individual growers and specific differences between villages of growers as determined from a survey of production costs and sales patterns.

Tomato as a crop has several distinguishing features. Basically there are two major types of tomato crops, i.e., indeterminant varieties, commonly sold as fresh market tomato, and determinant varieties usually

used for processing but sometimes found in the fresh food markets. Characteristics common to the indeterminant varieties include continuous growth of the vines, fruit set over an extended period of time, i.e., 2 to 3 months, and relative sensitivity to environmental conditions. The determinant varieties are short plants (limited vegetative growth), ripen more uniformly within a 1 to 1½ month period, and are more tolerant of varied environmental and production conditions. Cultural practices, labor use, production costs, producers' location relative to sales outlet and form of income flow are substantially different for these two types of varieties. For this study the focus is on determinant varieties used for processing (and the fresh market) with references to indeterminant varieties whenever appropriate.

The fruit of processing varieties is small to moderate in size and of a uniform red color. The crop is 4-5 months in the field (including nursery bed time); requires moderate levels of management, water, and cash inputs; is adaptable to areas relatively far from vegetable markets; and fits crop rotation schemes with rice or upland crops.

Varietal differences among processing varieties are considerable, for instance the Roma variety sets fruit in slightly higher temperatures than other varieties thus it can be used as a late season crop. VF 134 fruit is firmer and can stay in the field for longer periods between pickings, thus it can be shipped longer distances with minimal damage and requires fewer pickings. Some varieties have higher yields while others have juicier fruit especially suitable for juices, yet still others are more solid and suitable as canned whole tomatoes. In other words, different varieties suit processor and grower goals in various and sometimes opposing ways. Therefore considerable care in varietal selection and promotion are required for a successful procurement system.

Unlike garlic, tomato varieties allow for a wide geographical dispersion, yet the quality and quantity of their harvest is vulnerable to temperate changes.

> Tomatoes can be grown on most types of soils and in a wide range of climates . . . They produce best at average monthly temperatures of 70° to 75° F. but are grown at average temperatures down to 65° and up to 80° F. Quality, however, is strongly influenced by temperature . . . .[18]

Besides temperature effects, the agro-climatic conditions within the regions of major production affect the crop in different ways. In the Northern region with its higher elevations and more humid weather (relative to the Northeast) there are several serious disease problems which damage tomatoes.

> The diseases are caused by fungi, bacteria, virus, and nematode, such as leaf mold, early blight, target spot, powdery mildew, late blight, cercospora leaf spot, bacterial wilt, leaf curl, T.M.V., and root knot nematodes. All tomato diseases induce plant damage but some such as bacterial wilt and virus are especially serious for 'off-season' tomatoes.[19]

In the drier Northeast, diseases were said to be less problematic than insect damage, thus facilitating higher yields at lower costs in the long run, according to a knowledgable horticultural scientist.

The seasonality dimension of this crop has three primary components, i.e., price, quantity, and quality. The price fluctuations resulting from surges and scarcity of arrivals for "in-season" and "off-season" marketing of tomatoes were already noted. Likewise reference was made to the dual aspect of quality deterioration, i.e., decreasing quality of the harvested tomato on aging plants and deteriorating quality due to increased heat. The remaining aspect of quantity "seasonality" needs

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[18]Raymond A. Seelig, Marketing Fresh Tomatoes, Washington, D.C.: United Fruit and Vegetable Association, 1956, p. 9.

[19]Manee Winatronguane, "Outline of a Proposal," mimeographed paper, 1980.

attention both in terms of aggregate production and individual farmer yields, in order to better understand the tradeoffs in price versus yield risks.

The "in-season" cultivation period, i.e., the cool dry season generally extending from plantings in October to December to harvests in January to April, is the most favorable period for plant growth. Not only do the plants grow better but the amounts of disease and insect damage are generally less. Also this period is usually a fallow or "off-season" for the main rice crops and depending on water availability, various cash crops compete for inclusion in many cropping systems. The combination of higher yields and several potential cultivators usually result in excess aggregate production in various place-time conditions. Consequently this is a "price-risk" and "sales-risk" period, i.e., low and declining prices and difficulties in finding buyers. And due to accelerated deterioration of tomatoes within the marketing channels during the hot weather of April-May, sizeable losses are occasionally experienced.

"Off-season" tomato cultivation, i.e., dry to rainy season cultivation extending from April/May to September plantings, corresponds to the cultivation period for the main rice crop and is a "yield-risk" period due to unfavorable growing and handling conditions, such as very dry or flooded conditions during the planting period as well as warm, rainy days during the harvest times. These cultivation-handling conditions are particularly unfavorable since the added humidity and rain increased the severity of disease and insect damage on tomato varieties which generally do not grow well in that climate, thus lowering both marketable and plant yields.

Intensive plant breeding research at the Asian Vegetable Research and Development Center in Taiwan and adaptative research in Thailand have led to improved varieties for lowland cultivation during this period. Yet, even improved varieties must compete with the main rice crops for labor and land, as well as earn large returns to offset losses in handling, thus implying comparatively higher prices than "in-season" tomatoes in order to insure a substantial shift of cultivation resources from rice or else establishment of "off-season" tomatoes in locations with few other competing crops during that season.

Processors commonly import seed material and screen varieties for cultivation suitability and processing characteristics. Some firms interviewed reportedly bought seed for ฿500-600/pound and sold it to farmers at ฿100/20 gm while others provided seed free as part of the terms of trade. Private firms, such as Adams International, were said to be engaged in tomato seed production in the Northeast. Unfortunately a major public sector plant breeding effort for tomato variety improvement has gained only limited financial support and is focused primarily on heat tolerant "varieties" suitable for "off-season" cultivation rather than crossing in-season varieties with yield improvement potential.

The yield performance of Taiwan farmers who consistently grow 10,000 kg/rai at a profit, appears much better than Thai farmers whose best fields in the fertile soils in the extreme Northeast have difficulty consistently yielding 5,000 kg/rai. The productivity gap must be narrowed if Thailand ever hopes to replace Taiwan as a large tomato paste processor.

a. Thailand's Position Among World Producers

Thailand's harvested area, production and yields reflect a neophyte producer with several other Asian countries cultivating substantially more tomatoes with far better yields (Table 5-4). When comparing harvested area and yields to major tomato processing countries, such as the United States, Italy, and Spain, it becomes apparent that Thailand must exert considerable effort to join their ranks in the future. Yet, a significant constraint in realizing this goal may be Thailand's reliance on varieties developed for more temperate climates.

b. Trends and Changes in Tomato Production

The trends and changes in harvested area and production are important for an understanding of the direction of change in the tomato subsector. The main characteristics of supply over the recent ten-year period extending from 1969/70 to 1978/79 are shown in Table 5-5. Production increased steadily in the whole kingdom until the boom year of 1974/75, then decreased by one half, and ended 35 percent higher in 1978/79 as compared to the first year of this period. Total harvested area fluctuated in a less pronounced way with a peak in 1974/75 while ending with only 7 percent more harvested area than during the beginning of the period.

Apparently either the statistical data are questionable or there has not been a major increase in harvested area resulting from the increased demand from the processing industry. The higher yields of processing varieties in the cool season seem to have accounted for the sizeable increase in production (35%) as processing varieties displaced fresh market varieties. The 1974/75 season roughly corresponded to the year in which the large Chiang Mai processor began a promotional campaign to

Table 5-4. Recent Trends in Harvested Area, Yields, and Production of Tomatoes by Regions and Major Producing Countries

	Harvested Area (1,000 ha)			Yield (kg/ha)			Production (1,000 MT)		
	1969-71	1979	1980	1969-71	1979	1980	1969-71	1979	1980
Asia	565	688	702	13,217	16,822	16,878	7,467	11,580	11,855
(China)	242F	284F	289F	11,294	13,884	14,286	2,734F	3,943F	4,130F
(Turkey)	74	108	108	23,680	32,407	32,407	1,756	3,500	3,500
(India)	65	80F	82F	9,538	9,125	9,146	620	730F	750F
(Thailand)	5	7F	7F	2,889	4,545	4,545	13	30F	30F
Europe	440	480	475	24,807	31,761	30,700	10,870	15,257	14,572
(Italy)	127	132	127	28,108	38,879	39,695	3,571	5,132	5,023
(Romania)	57	70*	72F	13,757	19,642	18,425	780	1,381*	1,334F
(Spain)	66	64	61	25,436	34,709	35,623	1,687	2,204	2,173
USSR	291	382*	394*	14,336	16,197	15,765	4,171	6,192*	6,210*
Africa	247	357	374	12,883	13,653	13,679	3,181	4,876	5,121
(Egypt)	102	139	147*	15,524	17,461	17,490	1,580	2,421	2,571*
N. C. America	272	330	305	26,008	30,259	30,175	7,080	9,991	9,197
(U.S.A.)	162	177	158	34,053	43,479	42,818	5,516	7,698	6,753
(Mexico)	68	89	80F	13,231	14,900	17,750	901	1,331	1,420*
South America	111	131	129	15,990	21,119	22,894	1,769	2,777	2,947
(Brazil)	45	56	50	16,944	26,560	32,346	762	1,500	1,611
Oceania	9	10	10	24,096	24,420	24,784	225	242	251
World	1,935	2,380	2,389	17,966	21,395	20,993	34,764	50,915	50,153

Source: FAO, 1980 FAO Production Yearbook, Volume 34, Rome.

F = FAO Estimate

* = Unofficial Figure

Table 5-5. Regional Shifts in the Production and Harvested Area of Tomato, 1969/70 - 1978/79

Regions	Production										
	1969/70	1970/71	1971/72	1972/73	1973/74	1974/75	1975/76	1976/77	1977/78	1978/79	Average 69/70-78/79
	Ton										
North	5,704	3,931	7,330	9,062	9,944	28,226	8,305	7,277	6,816	6,699	9,379
Northeast	5,600	7,289	5,496	10,282	9,268	18,430	9,091	9,881	13,241	12,404	10,098
Central	11,587	13,170	12,888	9,286	13,605	11,986	8,856	9,659	7,637	11,101	10,978
South	510	890	1,256	1,950	1,225	2,222	4,635	1,918	1,450	1,372	1,743
Whole Kingdom	23,401	25,280	26,970	30,580	34,042	60,864	31,387	28,735	29,144	31,576	32,198
Percent Change (%)	---	+ 8	+ 7	+ 13	+ 11	+ 79	- 48	- 8	+ 1	+ 8	+ 35
	Harvested Area										
	Rai										
North	9,886	8,808	10,568	12,408	11,108	16,131	12,295	11,270	8,749	8,327	10,955
Northeast	16,585	12,422	12,331	17,028	13,791	18,230	15,288	11,924	16,198	20,673	15,447
Central	17,504	19,690	17,131	12,773	13,092	13,654	12,469	13,105	9,061	16,412	14,495
South	1,256	1,613	3,454	5,066	2,748	3,478	6,676	3,589	3,796	3,091	3,477
Whole Kingdom	45,331	42,533	43,534	47,275	40,649	51,493	46,728	39,888	37,804	48,503	44,374
Percent Change (%)	---	- 6	+ 2	+ 9	- 14	+ 27	- 9	- 15	- 5	+ 28	+ 7

Source: Ministry of Agriculture and Cooperatives

induce a major increase in tomato supply. And the comparatively lower harvested area and production in the following year reflected the consequences of grower disillusionment with the failure of that procurement system and farmer losses during that previous season.

The major change over the ten-year period was the emerging dominance of the Northeatern region in both harvested area and production. The primary area of concentrated tomato cultivation that may have initiated this dominance was Nong Khai Province. Although the parallel expansion of tomato cultivation and local processing capacity really began in 1978/79, it had been steadily growing since the early 1970s. Meanwhile, tomato cultivation in the North remained erratic as processor-farmer relationships changed over time.

The substantial changes in the rankings of the major five provinces according to harvested areas between 1969/70 (Table 5-6) and 1978/79 (Table 5-7) highlights the magnitude of the change involved. The marked shift in the source of supply becomes apparent in that two previously unlisted provinces become top ranked while provinces with the second and fourth largest harvested areas in 1969/70 were no longer among the top ranked ones ten years later. The previously dominant Central Plains provinces (where lower yielding fresh market varieties grow) were replaced by provinces in the Northeast. Likewise the structure of the harvested area and production changed markedly in that the top five provinces accounted for 31 percent and 33 percent of total area and production during the earlier period and 44 percent and 47 percent by 1978/79, respectively. This shift toward more concentrated production is expected as the influence of processors increases and the marketing system reinforces the locational comparative advantage of cultivation in the North and Northeast regions.

Table 5-6. Harvested Area and Production of Tomatoes for the Five Major Producing Provinces, 1969-70

Province (Region)	Harvested Area (Rai)	Harvested Area (%)	Production (M/T)	Production (%)
Nakhon Ratchasima (NE)	4,321	9.5	951	4.1
Samut Sakhon (C)	2,884	6.4	2,307	9.9
Nakhon Pathom (C)	2,546	5.6	2,546	10.9
Prachuap Khiri Khan (C)	2,220	4.9	888	3.8
Chiang Mai (N)	2,034	4.5	915	3.9
Whole Kingdom	45,331		23,401	

Source: Ministry of Agriculture and Cooperatives.

Note: Regions: NE = Northeast, N = North, C = Central Plains.

Table 5-7. Harvested Area and Production of Tomatoes for the Five Major Producing Provinces, 1978-79

Province (Region)	Harvested Area (Rai)	Harvested Area (%)	Production (M/T)	Production (%)
Nong Khai (NE)	5,996	13.5	4,797	14.9
Prachin Buri (C)	4,615	10.4	4,384	13.6
Nakhon Ratchasima (NE)	3,551	8.0	1,960	6.1
Nakhon Pathom (C)	2,941	6.6	1,765	5.5
Chiang Mai (N)	2,299	5.2	2,294	7.1
Whole Kingdom	44,374		32,198	

Source: Ministry of Agriculture and Cooperatives

Note: These figures take into account certain data irregularities noted in the original data.

A closer examination of the statistical data brings up a few of the information collection problems with this type of crop/commodity. Although weather has been known to radically alter tomato yields in certain cases, it is unlikely to explain such major differences as found in the Northern region yields (Table 5-5) of 895 kg/rai, 1,750 kg/rai, and 716 kg/rai for 1973/74, 1974/75, and 1975/76, respectively. Perhaps yields of fresh market varieties were sampled for the first and third year whereas higher yielding processing varieties were used for the middle year. Or perhaps the middle year recorded "field yields" and the other two years "marketable yields." Whatever the reason, major discrepancies such as this make trend analysis somewhat hazardous without a thorough understanding of this subsector.

c. Grower and Cultivation Conditions

The distinction between major types of tomato cultivators and their basic cultivation practices for tomato will be discussed before the analysis of different tomato cultivation possibilities for farmers. This latter topic provides insights into the wide range of farmer perspectives regarding tomato sales options.

Tomato cultivators are of two major types, the vegetable gardeners in areas surrounding population centers and vegetable growers relatively near or far from population centers. Vegetable gardeners grow a variety of vegetable crops of which a fresh market tomato variety could be one, however, they generally grow limited quantities of tomatoes. Some vegetable growers are located relatively close to population centers in which case their "in-season" cultivation is usually coupled with considerable sales efforts. Common sales practices include delivery to wholesalers,

retailers, and even consumers or a household member sells tomatoes outside of the vegetable market or at locations where people congregate.

Vegetable growers located further from population centers (our major concern and the largest group of tomato cultivators), basically relay on someone else to market their harvests and to pay them a "fair" return. Since their cultivation is usually in area-time favorable for tomato cultivation, their cultivation efforts generally result in larger yields then growers nearer the population centers. However, diversity of cultivation practices (technologies), variability in terms of trade, and differences in opportunity costs make general characterization of these growers quite difficult. Thus, following a summary of the cultivation practices observed, case studies of tomato producing villages will be examined to highlight similarities and differences with special emphasis on farmer-crop buyer relationships.

A profile of cultivation practices provides a means of identifying pertinent field operations or cost components which would either 1) prohibit the rapid expansion of this particular crop, 2) cause shifts away from this crop if substitutes became available, or 3) reduce yields or areas planted due to the unavailability or increased costs of certain materials or labor costs in the near future. For the tomato crop this profile illustrates the major adjustments in cultivation practices which have allowed it to be cultivated in so many diverse cultivation conditions. Such a profile for tomatoes would include:

A. Nursery bed formation--mix in chemical or organic fertilizers while lossening soil on a small plot or at the top of a bed of soil, level it, broadcast seed, cover with rice straw, and sprinkle with water (daily application of water and occasional fertilization and pesticide application as seen fit for a 25-40 day period) (male or female work).

B. Land preparation:

1) Plow field one or both ways so as to break up the soil into clumps (male with an animal or machine).

2) No plowing.

C. Bed formation:

1) After plowing, break the clumps and form beds of varying widths and heights with hoes (male or female work at a ratio of 1 hr. male = 2 hrs. female work).

2) No plowing, use hoes to dig up large clumps into beds and later smash clumps on the top of the beds (labor ratio as above).

3) No plowing, use hoes to dig small to medium sized holes in the soil or sand into which a mixture of compost and chemical fertilizers are placed (male or female work).

D. Transplant by heavily watering and removing seedlings from their nursery bed, digging one or two rows of holes per bed (sometimes putting a compost-chemical fertilizer mixture into the holes) if using beds 1) or 2) above, otherwise planting and covering the roots of each seedling, and watering each plant (sometimes water is put in the hole before the plant) (female and male work).

E. Periodic watering, such as weekly splashing with a kajok, 10-15 day furrow irrigation, or daily sprinkling (sometimes both in the early morning and late evening). (Female and male work at ratios that depend on method, such as splashing 1 hr. male = 1½ hrs. female work.)

F. One, if any, weeding dependent on the field condition one to two months after planting, yet various forms of intertilling, such as

forming a small bed if the C-3 method was used or scrapping additional soil onto the existing beds (female and male work).

G. One, two, or more top dressings of chemical fertilizers (placement near or around the base of the plants) beginning 1 to 2 weeks after transplanting as a joint operation with intertilling, spraying, or watering (female or male labor).

H. Six or more applications of insecticide-fungicide as well as "hormone" which was often just a urea/water mixture (male uses a sprayer, sometimes with a female preparing the spraying materials).

I. For each harvest (5-20+ times) activities included picking the ripening tomatoes, placing them in buckets or small containers, carrying the full containers to assembly points for sorting and placing in carrying baskets, carry baskets home at each end of a bamboo stick, and place tomatoes into the buyers' containers (female and male work).

J. Miscellaneous activities include placing straw on the beds to prevent the ripening fruit from touching the soil (done only by certain farmers). Sales activities, usually undertaken by the head of the household,vary widely often in relation to the proximity of a fresh market outlet for tomatoes, yet generally include checking on prices received by neighbors growing this crop and arranging the tomatoes in the buyers' containers in a fashion which exposed the best fruits and hid the others. Proximity to a market outlet usually meant occasional trips to sell his better quality tomatoes rather than await the arrival of his regular buyer.

The above generalization of the cultivation practices disguises the degree and sources of variation actually encountered. The variations are extremely broad and reflect local "ways-of-doing-things." The vegetable

gardeners near Khon Kaen City dug holes and planted flat fields of tomato seedlings just as was commonly done for pepper and egglant seedlings; in the interior of Udon Thani shallow beds were planted with 2-3 rows of tomato seedlings each, as customary for cabbage crops; in the rice paddy fields near the Mekong River experienced tobacco growers hilled tomatoes into high one-row beds just like their traditional tobacco crop, etc. Having considerable experience using agro-chemicals as well as the credit support to do so, the Nong Khai tomato growers invested heavily in most cultural practices whereas the poor farmers in the Udon Thani interior had neither the experience nor resources to invest and consequently relied primarily on their family labor.

Technologies varied markedly for several cultural practices from use of hoe, buffalo, and/or power tiller use in field preparation and bed formation (or lack of formation) to sprinkling can, canal, and/or pumpset applications of water. Applications of insecticides and fungicides were usually in response to cases of insect and disease damage but in some locations scheduled applications were used as preventive measures. In other words, cultural practices varied significantly from location to location and often mirrored cultural practices used on crops with which farmers had prior experience.

Tomato growers in upcountry Thailand represent a very heterogeneous group of farmers. For an understanding of the different possibilities for farmers becoming tomato growers, it is important to place current growers within a village context so that both the impact of internal and external relationships can be identified and assessed. Villages with a large percentage of households as tomato growers thus become the unit of analysis. Such villages were traced backwards from crop buyers or

factories that serviced them, or found in traditional supply areas. Then, after attempting a systematic sampling procedure, difficulties in finding farmers combined with severe time and financial constraints, resulted in interviews with tomato farmers wherever that village's farmers could be located, that is within the village, in their fields, and at the roadsides. Sample dispersion was accomplished by directing interviewers to different parts of the village and fields. The village headman and/or other village leaders were questioned about the various characteristics of the village itself.

In the previous case studies of processors and their procurement systems, the diversity of village conditions in the North, problems procuring from villages near urban areas versus isolated villages, etc. were alluded to from the processors' perspective. In this analysis the reasons for and implications of divergent village conditions will be examined from the village tomato grower perspective. Again the information will be organized as case studies in order to identify several of the pertinent interrelationships and factors involved. A tomato cultivation-sales survey is the basis for the village cases as described in Appendix A and summarized here.

The six villages surveyed were located in the North and Northeast regions, i.e., Ban Ta and Ban Tongpun in the Chiang Mai Valley, Ban Yoi Hai and Ban Pran in Nong Khai Province, Ban Kong Bo in Udon Thani Province, and Ban Mueng Peng in Khon Kaen Province. The two Chiang Mai villages reflected different sales conditions, i.e., one group of villagers was part of a local crop buyer's group which had a contract with a distant processor and the other group was confronted by several aggressive crop buyers (primarily for the fresh market). The four Northeastern

villages represented substantially different production and sales conditions. In Nong Khai one group of villagers cultivated tomatoes on a river bed and sold mostly to the fresh market whereas the other group grew tomato in paddy fields and sold mostly to the processors. One processor's procurement system included two of these villages, i.e., an isolated village in Udon Thani and a village near an urban market in Kohn Kaen. The former village maintained a working relationship with the factory whereas the latter reverted to supplying the fresh food market with other vegetables.

In this summary analysis four sets of tables will be compared and contrasted. Village conditions, cultivation-sales conditions, cost structures, and labor structures are the main sets of factors which illustrate the competing forces at work, divergence of opportunity sets, and implications for alternative procurement systems.

The village conditions of the two Chiang Mai villages (Cases I and II) are quite similar given proximity to each other (12 kilometers) but quite distinct from those in the Northeast (Tables 5-8 and 5-9). Their proximity to the major fresh market in Chiang Mai is only overshadowed by Case D in the Northeast which rejected the processing tomato market for short term vegetables with fresh market demand. The Nong Khai villages (Cases A and B) were within a traditional vegetable cultivation area therefore crop buyers for fresh market vegetables continually competed for local vegetables whereas Case C was in an isolated area with minimal contact by vegetable crop buyers.

Land values, normal rice yields, percent of houses built in the past three years, and general appearance suggest the Nong Khai villagers and Chiang Mai villagers are doing well compared to the Khon Kaen and Udon Thani villagers. One could infer that the cultivators of tomato would

Table 5-8. A Comparison of Village Conditions in Ban Ta and Ban Tongpun, Chiang Mai Province, 1979-80[a]

Item	Case I	Case II
Size (number of households)	28	50+
Distance to:		
a) Provincial capital (km)	23	35
b) All-weather road (km)	1 1/2	1/2
c) Nearest processor (km)	35+	47+
Frequently mentioned land values (฿/rai)	10,000-12,000	10,000+
Normal rice yields (kg/rai)	600-800	500-600
Percent of houses built in past 3 years	11%	na
General appearance	good	good

[a]Province: Chiang Mai Case I Ban Ta
Case II Ban Tongpun

Source: Survey information

Table 5-9. A Comparison of Village Conditions in Selected Villages of Nong Khai, Udorn Thani, and Khon Kaen Provinces, 1979-80[a]

Item	Case A	Case B	Case C	Case D
Size (number of households)	38	250+	214	185
Distance to:				
a) Provincial Capital (km)	60	60	70+	15
b) All-weather road (km)	beside	beside	10+	2
c) Nearest processor (km)	1	1	100+	16
Frequently mentioned land value (฿/rai)	10,000-40,000	20,000	2,000-3,000	5,000-6,000
Normal rice yields (kg/rai)	300-500	na	250-300	na
Percent of houses built in past 3 years	15-20%	na	2%	12%
General appearance	prosperous	prosperous	poor	fair

[a]Province: Nong Khai — Case A — Ban Yoi Hai
Case B — Ban Pran
Udorn Thani — Case C — Ban Kong Bo
Khon Kaen — Case D — Ban Mueng Peng

Source: Survey information

likewise be more or less able and willing to invest cash inputs into this type of crop in response to the alternative forms of market demand. But let us first see if cultivation-sales conditions vary markedly by these villages.

The cultivation-sales conditions of the two Chiang Mai villages are not as similar to each other as their village conditions had been and vary substantially from the Northeastern villages (Tables 5-10 and 5-11). Case I villagers are less experienced tomato growers, cultivate smaller field sizes, have a wider range of yields and received a narrower range of prices than the Case II tomato growers. Village interviews and observations suggested that Case II farmers were more widely known for their vegetable cultivation ability and therefore received special attention by several crop buyers including the large wholesaler from Chiang Mai. Consequently their price expectations were quite high and knowledge of the market conditions good whereas Case I farmers were more dependent on their local crop buyer, yet sometimes responsive to itinerant buyers. Market price fluctuations were reportedly very pronounced for both groups of cultivators.

In the Northeast the Nong Khai river bed farmers (Case A) were vegetable gardeners in terms of experience, reliant on mechanized power sources, and recipients of high early season prices from sales to fresh market buyers. Both this group and Case B used cultivation practices similar to those used for local tobacco cultivation rather than the two rows per bed formation found in the North. Case B farmers cultivated tomato later in the season after their rice crop thus their harvests corresponded to the peak season supply and earned the lower prices. The relatively narrow range of yields suggests considerable ability in cultivating tomato.

Table 5-10. A Comparison of Cultivation-Sales Conditions for the Tomato Crop in Ban Ta and Ban Tongpun, Chiang Mai Province, 1979-80[a]

Item	Case I	Case II
Tomato Cultivation Experience (years)	1-5 (2.7 aver)	1-6 (4.1 aver)
Cultivation Method;		
a) Power source for land preparation	Buffalo and Power Tiller	Buffalo and Hoe
b) Bed Formation	2 rows per bed	2 rows per bed
c) Water Application	Furrow and Kajok	Furrow
Field Size Range and Mode (rai)	0.25-2 1	0.50-2 2
Yield Range (kg/rai)	800-4,800	2,000-5,000
Commodity Price Range (฿/kg)	0.80-2.50	0.50-3.00

[a]Province: Chiang Mai Case I Ban Ta
Case II Ban Tongpun

Source: Survey of tomato growers

Table 5-11. A Comparison of Cultivation-Sales Conditions for the Tomato Crop in Selected Villages of Nong Khai, Udorn Thani, and Khon Kaen Provinces, 1979-80[a]

Item	Case A	Case B	Case C	Case D
Tomato Cultivation Experience (years)	10-35 (17.1 aver)	2-6 (3.8 aver)	1-2 (2 mode)	1
Cultivation Method;				
a) Power source for land preparation	Power tiller	Power tiller and hoe	Buffalo and hoe	Hoe
b) Bed formation	1 row per bed	1 row per bed	2-3 rows per bed	no bed
c) Water application	plastic hose	furrow and sprinkling cans	sprinkling cans	sprinkling cans
Field Size Range and Mode (rai)	2-10 4.9 (aver)	3-6 4	0.5-3.5 2	0.25-1.00 1
Yield Range (kg/rai)	1,667-5,000	2,222-3,763	500-4,000	300-3,600
Commodity Price Range (฿/kg)	1.00-6.00	0.75-1.50	1.00-1.50	1.00

[a]Province: Nong Khai — Case A Ban Yoi Hai; Case B Ban Pran
Udorn Thani — Case C Ban Kong Bo
Khon Kaen — Case D Ban Mueng Peng

Source: Survey of tomato growers

Cases C and D are basically examples of novice cultivators, several experimenting with cultivation on relatively small plots. Their sales options were exclusively to that one processor. Use of sprinkling cans reflects the scarcity of water available and implies extensive use of family labor. Case C used a cultivation method similar to that used for some leafy vegetables whereas Case D's method corresponded to that for pepper. In summary, from a cultivation perspective each set of farmers used cultivation methods similar to that of crops with which they had some prior experience rather than adapting any one package of practices. And from a sales perspective, options were influenced by location (proximity to fresh markets), historical reputation for vegetable cultivation, and the sales system(s) in place when the crop was introduced (processor procurement system).

Cost and labor structures reflect a part of the internal production dimensions. In the North, the two villages within 12 kilometers of each other had similar sources of water, situated on the same side of the valley and cultivated the same crop within the same season following their rice crops. Although average total costs were remarkably similar, i.e., within ฿92, their methods in arriving at those costs varied, especially Ban Tongpun's reliance on non-mechanized cultivation, less expenditure on agro-chemicals, less time spent on irrigation, and larger proportion of hired labor (Tables 5-12 and 5-13). More of Case I's cultivators had input credit than those in Case II. The average farm sizes were similar (10.5 rai versus 9 rai) but Case II had a mode of 2 rai per field of tomato whereas Case I's mode was only 1 rai. A primary reason for the difference in commitment of land to tomato cultivation is probably the number and types of outlets for tomato, i.e., Case I's sales were

Table 5-12. A Comparison of the Structure of Production Costs and Returns per Rai of Tomatoes in Ban Ta and Ban Tongpun, Chiang Mai Province, 1979/80[a]

Cost Items	Case I (N=7)	Case II (N=10)	All Samples (N=17)
	---------- Baht Per Rai ----------		
Cash:			
Labor	84	203	154
Power Source	64	10	32
Seed	68	60	63
Pesticide	95	129	115
Fertilizer: Inorganic	638	445	524
Organic	36	41	39
Water Fee	10	10	10
Subtotal	997	898	938
Non-Cash:			
Labor	1,182	1,314	1,260
Fertilizer: Organic	141	34	78
Power Source	27	15	20
Interest on Capital	39	33	36
Subtotal	1,389	1,396	1,394
Total Costs	2,386	2,294	2,332
Revenue	2,787	3,326	3,104
Net Return: (all costs)	401	1,032	772
(cash costs)	1,790	2,428	2,166
Yield (kg)	(2,293)	(3,326)	(2,901)
Breakeven Price:			
All costs	1.04/kg	.69/kg	.80/kg
Cash costs	.44/kg	.27/kg	.32/kg

[a]Province: Chiang Mai Case I Ban Ta
Case II Ban Tongpun

Source: Survey of tomato growers

Table 5-13. A Comparison of the Structure of Labor Use per Rai of Tomatoes in Ban Ta and Ban Tongpun, Chiang Mai Province, 1979/80[a]

Cultural Practices	Case I (N=7)	Case II (N=10)	All Samples (N=17)
	Person Hours (%)		
Nursery	10.2 (2)	5.6 (1)	7.5 (2)
Land Preparation	30.3 (7)	59.7 (13)	47.6 (10)
Transplant	30.2 (7)	16.7 (4)	22.3 (5)
Fertilize	30.8 (7)	12.6 (3)	20.1 (4)
Spray	21.6 (5)	35.0 (7)	29.5 (6)
Intertill and/or Weed	22.3 (5)	32.0 (7)	28.0 (6)
Irrigate	152.8 (35)	100.2 (21)	121.9 (27)
Harvest	144.0 (32)	209.7 (44)	182.6 (40)
Total	442.2 (100)	471.5 (100)	459.5 (100)

[a]Province: Chiang Mai Case I Ban Ta
Case II Ban Tongpun

Source: Survey of tomato growers

organized around what Khun Saroj would agree to buy in terms of area in production whereas Case II had several options including the Chiang Mai Wholesaler and three local buyers. Likewise Case II's farmers had considerable experience with vegetable production thus facilitating the judicious use of inputs to obtain the better yields. But the variables influencing yields are so complexly interrelated that it is often difficult to identify whether weather, planting time, timely application or amounts of agro-chemicals or water, seed variety, grower experience,

soil, etc., was the major factor in Case II versus Case I. But the external relationship with the market is clearly evident as were its implications.

In the Northeast the contrasts are so sharp that any average production cost or labor use figures would be practically meaningless as shown in Tables 5-14 and 5-15. Nong Khai tomato growers had 2-8 times larger cash costs but computed total costs were much more similar to those in Udon Thani and Khon Kaen. Yet, even in Nong Khai the river bed system (Case A) used half the cash costs that the rice paddy system (Case B) required. Likewise, the combination of family and hired labor use in Nong Khai was substantially different from the exclusive use of family labor in the other cases. But beyond the internal variations the nature of the market linkage is especially relevant, in that Case A's favorable cost situation was accentuated by early harvests at higher prices as buyers quickly assembled and shipped the harvests to distant fresh markets. With inputs on credit and several buyers readily willing to do business with the grower if his current buyer proved unsatisfactory, the Case A farmers were in a very strong bargaining position. The Case B farmers were assured of a buyer, given inputs on credit, and knew that a minimum price was guaranteed thus their emphasis was to increase yields from as much available land as possible. Cases C and D were not only novice tomato growers but had serious cultivation and buyer misgivings. Sprinkling can irrigation clearly limits land area in tomatoes and depending on timing and soil conditions that form of watering can lead to disease problems. For Case C the buyer's reputation for breaking agreements and opportunistic behavior argued for minimal cash inputs for fear of indebtedness while for Case D the comparison of fresh market and

Table 5-14. A Comparison of the Structure of Production Costs and Returns per Rai of Tomatoes in Villages of Nong Khai, Udorn Thani, and Khon Kaen Provinces, 1979/80[a]

Cost Items	Case A (N=7)	Case B (N=5)	Case C (N=7)	Case D (N=4)	All Samples (N=23)
	Baht Per Rai				
Cash:					
Labor	354	763			274
Power Source	121	88			56
Seed	20	170			43
Pesticide	95	411	84	77	157
Fertilizer: Inorganic	332	490	150	297	305
Organic	95	73	24	12	54
Water Fee	30	107			32
Miscellaneous			9	120	24
Subtotal	1,047	2,102	267	506	945
Non-Cash:					
Labor	1,093	1,034	2,351	1,819	1,589
Fertilizer: Organic		90	51	48	43
Power Source			10		3
Interest on Capital	36	66	11	20	32
Miscellaneous	120		100	100	84
Subtotal	1,249	1,190	2,523	1,987	1,751
Total Costs	2,296	3,292	2,790	2,493	2,696
Revenue	4,840	4,058	2,778	1,800	3,514
Net Return: (all costs)	2,544	766	12	693	818
(cash costs)	3,793	1,956	2,511	1,294	2,569
Yield (kg)	(3,074)	(3,151)	(2,380)	(1,800)	(2,658)
Breakeven Price: (all costs)	.75/kg	1.04/kg	1.17/kg.	1.38/kg	1.01/kg
(cash costs)	.34/kg	.67/kg	.11/kg	.28/kg	.36/kg

[a]Province: Nong Khai — Case A Ban Yoi Hai; Case B Ban Pran
Udorn Thani — Case C Ban Kong Bo
Khon Kaen — Case D Ban Mueng Peng

Source: Survey of tomato growers

Table 5-15. A Comparison of the Structure of Labor Use Per Rai of Tomatoes in Villages of Nong Khai, Udorn Thani, and Khon Kaen Provinces, 1979/80[a]

Cultural Practices	Case A (N=7)		Case B (N=5)		Case C (N=7)		Case D (N=4)		All Samples (N=28)	
	Person Hours (%)									
Nursery	6.1	(2)	5.6	(1)	9.2	(1)	2.2	(1)	6.3	(1)
Land Preparation	25.1	(6)	93.6	(21)	48.9	(6)	25.9	(4)	47.4	(8)
Transplant	55.9	(14)	55.4	(13)	21.1	(2)	47.5	(8)	43.7	(8)
Fertilize	17.7	(5)	10.3	(2)	13.0	(2)	20.5	(3)	15.2	(3)
Spray	24.4	(6)	22.3	(5)	22.6	(3)	15.4	(3)	21.8	(4)
Intertill and/or Weed	43.2	(11)	3.6	(1)	14.3	(2)	0	(0)	18.3	(3)
Irrigate	28.3	(7)	50.5	(12)	461.3	(56)	352.0	(61)	221.2	(39)
Harvest	194.0	(49)	197.0	(45)	236.9	(28)	114.5	(20)	193.9	(34)
Total	394.7	(100)	438.3	(100)	827.3	(100)	578.0	(100)	567.8	(100)

[a]Province: Nong Khai — Case A Ban Yai Hai; Case B Ban Pran
Udorn Thani — Case C Ban Kong Bo
Khon Kaen — Case D Ban Mueng Peng

Source: Survey of tomato growers

processing prices as well as the test nature of the crop inhibited full commitment to the crop. Consequently, neither crop generated much revenue yet illustrated a potential to do so, especially if other alternatives were not available as in Case C.

It was interesting to note that the breakeven prices for all costs was ฿.80/kg in the North and ฿1.01/kg in the Northeast for the villages in this study. These figures were mentioned as minimal, reasonable prices by middlemen, researchers, and farmers throughout the course of the study.

Although variability in production conditions and costs in the northern villages were minimal due to proximity of the sample villages they display considerable variation from those in the Northeast. The diverse production conditions in the Northeast accentuated that variability. The relevance of external relationships, especially on the output market side was particularly evident, likewise was the scope of income opportunities.

In summary, the cultivation of processing varieties of tomato is a somewhat recent phenomenon as introduced by the canning industry. The procurement systems designed to promote this and other new crops contend with problems arising from farmer adoption of new technologies. Also during the establishment and operation of the system adoption problems can be compounded by the aggressive buying practices of local crop buyers who perceive sales opportunities in the fresh market.

The village is usually the arena where the forces of fresh market and processor demand interact and compete for the farmers' harvests. Although the farmers may have received incentives from the processor and agree to provide all their harvests, local crop buyers can be very persuasive, especially if paying a higher price in cash. Consequently, the processor's screening of villages (directly or indirectly) may be

necessary in order to assure it of reliable deliveries outside of the peak harvest season. Thus, it is important to understand village level differences both in order to design the most effective procurement system (tailored to village conditions) and to insure a strong competitive position during the harvest period.

Other researchers have used farm household modeling approaches to determine the potential of a processing tomato crop to compete with other enterprises for increasing farm income. Assumptions underlying that form of analysis are that existing resources of a time-quantity nature constrain the selection of alternative income earning opportunities or that higher returns to resources dictate the farmer's choice among alternative available enterprises or labor use activities. As demonstrated above, the farmer's ability to, 1) vary field size (economy of scale implications), 2) substitute farm for purchased inputs (organic versus inorganic fertilizers), 3) initially experiment with cultural practices and/or technologies similar to those of familiar crops, 4) use stocks of time (8 hours to plant) as well as flows of time (1 hour/day each day) to perform certain field operations such as watering, 5) complete field operations partially or completely (i.e., small hills for tomato seedlings or large beds) as time and labor permit, 6) cultivate only after more progressive neighbors have done so, 7) cultivate perishable crops in concert with several others so that the volume of harvests induces buyers to come or allows economic transportation by the group of growers, etc., generally enabled the farmer to adjust cultivation practices according to resource constraints in the process of growing a new crop. Following the initial cultivation experience the farmer evaluates his production potential, relative costs incurred, and the risk of obtaining a reasonable

return. Yet, the actual appearance of reliable buyers purchasing at anticipated prices (at least on the low side of the price range in mind) was often beyond his knowledge, skill, and resources and thus the greatest source of risk for the cultivation of perishable commodities.

With the foregoing perception of the adoption process and qualifications regarding the modeling assumptions, it is worth referring to the findings regarding the competitive position of a new processing tomato crop relative to other farm, off-farm, and non-farm enterprises given resource constraints in modelled farm situations of select Northeast villages.

In the Northeast Region a poly-period linear programming model was developed to examine the trade-offs between alternative sources of farm household income for three different farm size groups for both rainfed and irrigated areas.[20] For medium-sized, fully irrigated farms the introduction of the new tomato crop contributed to a new optimal solution to the model whereby the net income was increased by 8.7 percent above the basic model. The solution contributed to a more intensive cropping system and caused more family involvement in cropping activities rather than in cottage indutries as previously indicated by the basic model. Again a reaffirmation of the potential merits of vegetable crops during the dry season given sufficient water and an accessible buyer, such as the fruit and vegetable processor.

E. TOMATO PROCUREMENT PRACTICES

The objective here is to note under what conditions the fresh market buyer will affect the processor procurement system. To accomplish this

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[20]Priebprom dissertation, Ibid., p. 222.

it is essential to understand the crop buyers standard operating procedure and the tomato growers sales practices. Then, the usual approach used by fresh market buyers can be compared to that used by processors. Interviews with various crop buyers, tomato growers, processors, and the results of the Wiboonpongse-Kellogg study will be used for this purpose.

In the Wiboonpongse-Kellogg study five tomato buyers graded the assembled tomatoes into two or three grades for the following reasons; 1) convenience in dealing (100%), 2) better price (80%), and 3) better return to grading costs (60%). "Tomatoes were classified into 2-3 grades based on size and variety (apple or plum shapes) . . . methods of grading were subjective and depended on the merchant's judgment. This made marketing these crops more difficult and gave an opportunity for merchants to take advantage of each other and of the farmers."[21] Since measurement of their purchases was usually done by the crop buyers themselves (80% of those sampled), they had some opportunities to adjust for various grade compositions sold by the growers. In other words, their tomato growers became both price and quantity takers.

The local crop buyers usually buy in the afternoon (after the morning harvests) and sell that evening to wholesalers in the city or to the local processors. The wholesaler then has the option to ship a truckload of tomato to distant markets during the cool of the evening. The crop buyer's frequent interaction with wholesalers or retailers is his main source of information on the "prevailing price." That price information together with his experienced judgment is the basis for his bid price to growers.

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[21]Wiboonpongse and Kellogg, Ibid., p. 72.

Fresh market tomatoes are usually either brought by the grower to the city for sale to wholesalers or sold to local crop buyers whichever method is feasible (distance and quantity factors) and desirable (convenient and more profitable). However, due to the perishability and fragile character of this commodity, the time between harvests and sale in the retail outlets has to be short. Consequently, growers far from the market place are usually concerned about both an assured crop buyer as well as the price paid, especially since each day's arrivals could sharply affect that day's price.

In the North the arrival of the large processing factory seemed to provide an added dimension. Its procurement system involved inputs on credit, one guaranteed price for a specific quality of tomatoes, exclusive commitment of all harvests to the factory, and deferred payments over the delivery period. The local fresh market system, on the other hand, involved less (if any) inputs on credit, a price which varied according to wholesale market prices, commitment to a particular crop buyer but with the understanding that some of the harvest could be sold elsewhere, and cash payment on delivery of "acceptable tomatoes" (considerable range of grades implied). The results of the competition between those two approaches has been discussed in the OOB case study above.

The crucial point is that subsequent procurement systems by processors in the North have been substantially different from the OOB case. Processors via promoters or crop buyers provided some inputs on credit to selected groups of village growers but began buying tomatoes only after the "prevailing market price" reached a certain level, then used the "prevailing market price" whenever buying from their group of farmers. Although some guaranteed a minimum price, others did not. All purchase

generally "acceptable tomatoes" within broad grades rather than strict standards. In other words, the processors' procurement systems have become integrated within the prevailing fresh market for tomatoes as an alternative source of demand during the peak harvest period rather than a separable market.

The farmers interviewed in this region related several stories about factories non-payment for contracted tomatoes, or rejecting everything delivered by farmers, or crop buyers going bankrupt and not paying farmers because the factory did not pay those crop buyers. Thus, many farmers seemed hesitant to consider growing tomatoes in the future and preferred inputs on credit as a way to hedge against the perceived risks.

In the Northeast the procurement system varied by location and processor. The Nong Khai situation basically reflects the merging of both the fresh market and processor market depending on the price movement within the harvest season. The provision of inputs on credit and various services together with cash payments emerged as the local buyers compete for grower allegiance. The Udorn Thani and Khon Kaen cases reflect a processor's effort to separate processor and fresh market systems by supporting cultivation in isolated villages and paying a single guaranteed price for "acceptable tomatoes." Its recent effort to sell its early season procurements at higher fresh market prices while maintaining one farm price will be difficult to continue given grower dissatisfaction.

Important points include the ability of processors in Nong Khai to support cultivation at high levels, pay higher farm price by selling the farmers' harvests in both the fresh and processing markets, and thereby expand both the area in tomato and the quality and yield per producer. Thai agricultural scientists who conducted field trips in this area were

impressed with the progress being made. And Nong Khai farmers expressed concern that demand could not keep pace with their output even with the two local processors working at full capacity.

A particularly problematic consideration with this system of combining processor and fresh market demands within the same market is that processors will not have access to the better quality tomato during the early part of the season and their processing period is quite short. Also the current procurement systems used by the processors do not incorporate enough incentives for quality improvement, such as a dual price, i.e., different price for first and second grade raw material. Thus, the potential for processors to produce any quality beyond tomato paste for fish canneries or low grade ketchup seems limited at this time.

In summary, a fresh market demand has developed for a set of varieties originally designed for processing purposes. When the large processor in the North instituted a large promotion scheme for the cultivation of these varieties but refused to accept tomatoes below stringent standards originally set by the company, the fresh market began absorbing large quantities at very low prices. Ever since that time these processing varieties have steadily displaced fresh market varieties and during the early part of the "in-season" their harvests flow into the fresh market while most of excess peak harvests go to processors. Local processors indirectly support groups of growers, provide seeds of preferred varieties, and pay farm prices corresponding to a "prevailing market price." Although they usually obtain as much raw material as their capacity could handle during good crop years, it is irregular. Other processors who attempt to pay only one price regardless of harvest time have yet to be entirely successful.

F. DIAGNOSIS OF PROBLEMS ENCOUNTERED

A central problem for the fruit and vegetable canning industry is the limited domestic demand for canned fruits and vegetables. In the United States and Europe the canning industry was founded on and expanded from seasonal demand for fruits and vegetables, especially during the winter months. Later, the changes in tastes and preferences, need for convenience, etc. strengthened and diversified the demand for canned products. However, in the more tropical climate of Thailand with year-round availability of a wide variety of quality fruits and vegetables, local demand for canned products is more or less limited to gifts and for substitution for imported canned products. Competition for lower quality exports for less discriminating consumers has been quite pronounced and comes from several Asian, Middle East, and African countries. Consequently, the market share available for Thailand is limited. Without a consistent and expanding source of demand it will be difficult for other canned products to expand as rapidly as was done for the tropical fruit of pineapple. The exporting of new medium to high quality products will require better coordination within the industry regarding standards, and substantially more varietal adaptation to local agro-climatic conditions.

Procurement related problems varied by raw material, firm and location. In the "Out-of-Business" case, the original procurement system (factory-farmer approach) did not provide adequate amounts of raw materials within the required specifications for several raw materials. Neither the organization nor operation of the procurement system suited its content (information and materials) which probably was beyond the cultivation conditions of the targeted farmers at that time. A shift from the factory-farmer approach to the "promoter approach" as well as

some modifications in the raw material specifications seemed to have rectified many of the procurement related problems but the company was too far in debt to benefit from that change.

The "Old Timer" firm had experienced somewhat similar problems with the factory-farmer approach within a nearby area before successfully changing to the promoter approach. However, it became concerned with another type of raw material procurement problem, i.e., market development within production areas under contract. Whenever new contract farmers heard about the price and cultivated the same crop and/or weather conditions were particularly favorable, supply would exceed factory capacity and demand. A "spot market" developed as local crop buyers and wholesalers bought the excess production at "distress prices" during the few critical weeks of excess harvest. Since this company had committed itself to purchasing from its promoters at a guaranteed price which was above these "distress prices," the relatively high price of its final product could not compete with the product prices of Central Plains processors who took advantage of the "distress price." Since some Central Plains firms processed those raw materials as a sideline, they could come in and go out of the market for that commodity without influencing their general position whereas this up-country firm relied on these raw materials for its economic viability. The "free rider" effect remains very problematic for up-country firms which support and expand cultivation. Besides strategies for controlling cultivated area, few easy solutions are evident.

In the Northeast the "Out-of-Reach" firm initially had considerable problems with farmer comparisons of fresh market and processor prices, adverse weather causing surges in arrivals, and limited processing capacity for locally available raw materials. At a later time its heavy debt

position encouraged the firm to contract with isolated farmers and use various forms of opportunistic behavior to obtain local raw materials at relatively low prices. Yet, most types of raw materials were shipped in from other regions and continued to put the firm at a competitive disadvantage. Thus, the viability of both this procurement scheme and the firm have come into serious question due to continuing losses.

During the 1979/80 season the "Growing Business" firms were concerned with the relatively high minimum price they paid (฿1.50/kg) compared to prices in the North (฿0.50-0.80/kg). But in the following season as they marketed and processed their commodities according to the general market conditions with a ฿1.00/kg minimum price, their ability to maintain grower allegiance was their main concern. Considering their small size, single product of low to medium quality, location within a comparatively homogeneous concentrated area of cultivation, expansion in step with supply expansion, and experience as crop buyers, one would not anticipate many problems on the supply side.

The low yields of the varieties currently used, the particularly small fields on which they are grown, and the strong fresh market demand during the early harvest period (best quality) are among the serious problems with this particular crop for processing. The continued expansion of tomato cultivation in the Nong Khai area seems to be one of the few chances for this commodity becoming a viable, long-term canned product (in intermediate and final forms) in Thailand, especially given so many other countries with stronger evolving tomato industries. The expansion of the fish canning industry has provided a particularly favorable opportunity for that crop, yet the import situation seems to be squelching even that opportunity.

The costs of transporting various fabricating materials and parts, such as tin plate and refined sugar, from the Central Plains area were very serious concerns for the medium and large scale up-country firms, especially since much of their final products had to be shipped to the Bangkok area. Since the cost of the can is a large component of the final product cost, this is perceived as an important cost disadvantage relative to the Central Plains processors.

The relatively large export of tin from Thailand, yet the continued large imports of tin plate needs attention by the canning industry. This would seem to impose unnecessarily high costs on this industry. Thailand's tin plate manufacturing has recently increased but is still relatively small considering the expansion of local demand for cans.

Problems regarding the processing technologies involved will only be handled in general terms due to the limited information available and the focus of this study. It was often stated that high technology machinery could not convert poor raw material into high quality exportable products. Conversely, however, high quality exportable products could not be produced with inferior machinery. The basic pro's and con's of high technology were as follows:

> High technology machines cost comparatively more, are more efficient, have less breakdown, and produce an exportable product while low technology machines cost less, are less efficient, have frequent breakdowns (production days lost!), and produce a product which can only serve the local market.[22]

Essentially capacity of low and high technology machinery could be comparable but efficiency and the quality of the product were continually emphasized.

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[22]Interview with technical personnel who evaluated loan applications for a large finance company that provided loans for some up-country processors.

Problems of hiring and keeping qualified staff for maintaining or repairing high technology machinery were alluded to in the OOB case. Processing problems encountered by this firm often resulted from the laborers inability to operate and maintain such equipment and machinery thereby causing serious problems with downtime. Some knowledgable sources asserted that the machinery was mismatched, i.e., linkage of lower with higher capacity units, and not as "new" as initially proposed. The OT firm located nearby mentioned no serious problems with their machinery, and casual observations noted a considerable number and assortment of locally produced pieces of equipment in concert with higher technology machinery. However, with over ten years of experience, most of its processing equipment problems probably had been solved.

In the Northeast the only serious concern with technology was the trade-offs between alternative types of the central piece of equipment for tomato processing. Basically it was the choice between purchases of a used, Thai manufactured one-stage evaporator (previously used in local sugar cane processing and costing about ฿300,000) or a Japanese three-stage evaporator (as sold by small Japanese processors who were going out of business and costing approximately ฿1 million). Although more expensive, the latter machinery had slightly more capacity as well as provided improvements in operation efficiency and product quality, thus meriting attention. The important point is the breadth of technologies available to a firm, even to the extent of incorporating used machinery from similar processes such as sugar refining.

Another problem for the small factories was that only 3-4 months of operation (single product firms) made economic viability difficult. Even though the managers were engaged in other businesses during the

"off-season", the heavy investment in working capital on this seasonal basis should be carefully evaluated by other small firms considering processing a single product on a seasonal basis.

Export markets for most fruit and vegetable processors were mostly the less discriminating Asian markets, such as Hong Kong and Singapore or nations in the Near East. The basic market establishment problem which has affected most Asian countries at one point or another in time was that of fierce product price competition among processing firms within the exporting country. As each firm attempted to undercut their local rivals for a share of the export market, they emphasized cost reduction to the detriment of quality. Such a strategy usually earned the country as a whole a reputation for "cheap, inferior products", a problem for Thailand as explained in Chapter III. Consequently, it became increasingly difficult for importers of higher quality products to deal with (trust) any firm from that country. Examples of large import restrictions on various Thai food products have been cited earlier.

The problems for Thailand's competitive position for canned fruits and vegetables relative to its Asian neighbors have been very low yields for most of the raw materials, such as tomato and mushroom, and its fierce cost-cutting, internal competition among firms. Without yield improvements and guidelines coordinating competition these problems will seriously hamper its competitive position.

The prosperity of the fish canneries was of direct concern to the up-country tomato canneries because it was their main product market and because the less stringent quality requirements allowed for the gradual improvement in tomato quality at both the farm and factory levels. Yet, serious problems existed, such as in early 1980;

> But then, early this year, Thai seafood exporters received a triple shock. Italy, Thailand's main market within the European Common Market (EC) banned temporarily the import of Thai seafood; Japan discovered bacteria in some canned seafood and therefore severely curtailed imports (Japan being Thailand's single largest client for seafood) and the United States, another very important buyer, suddenly imposed its own set of very strict hygiene standards, thus effectively blocking several lucrative types of canned and frozen seafood from the market.[23]

The government's attempt to rectify this situation was through indirect means, i.e., via a private institution. First, all exporters were required to become members of the Thailand Marine Producers Association in order to get export permission. And second, the government put pressure on that association to police its members and impose quality control measures.

Government interventions were not frequently mentioned in the discussions with the canneries. However, the serious problem with the competing imports of Taiwan tomato paste[24] continued to arise even with an import duty. An import duty of ฿20-30/kg for tomato paste was to be collected from the importing firm unless the paste was used in exported products. i.e., re-exported within one year. Yet, imported paste continued to find its way onto the domestic market, according to informed sources, because of the usual limited enforcement practices and difficulties of checking the degree of dilution in fish products. Meanwhile, large scale, BOI privileged fish processing firms came on line with various import privileges for their exports, such as imported paste with no duty. And finally, a large trading company imported very large quantities of Taiwan paste and distributed it to interested fish processors on the

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[23] Bangkok Post, "The Thai Marine Products Association," Ibid.

[24] In 1980 the price of Taiwan tomato paste was ฿18/kg (CIF) for 28 brix whereas in 1981 large quantities were said to have been imported at ฿14.40/kg.

condition that this company arrange the sale of those processors' fish exports. Thus, the bottom seemed to be falling out of the domestic processors' paste market by mid-1981, according to the very concerned, larger Nong Khai processor.

CHAPTER VI

FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY AND SYNTHESIS OF FINDINGS

1. Background and Objectives

Since the 1960s the government of Thailand has been promoting the establishment of labor intensive and export-oriented agro-businesses as a source of foreign exchange, rural employment, foreign investment, and advanced technologies. The fruit and vegetable canning industry was a strong candidate because of the perceived abundance of raw materials and the low cost of rural labor in Thailand. Within the region, there was also the foreseeable shift of this industry out of Taiwan due to the pressures of increasing labor costs and land usage. The "export thrust" for fresh tropical fruits was initiated in response to these factors.

By 1980 the initial enthusiasm and euphoria surrounding this strategy had slackened in the face of the world-wide depressed economic situation and several adverse events within the Thai canning industry, such as excess capacity, supply procurement irregularities, weakening demand (especially in reaction to the poor quality of several export products), and business failures. In northern Thailand the collapse of the largest food processing complex of its kind in Asia further accentuated the need to reassess this strategy and to examine the causes of the problems encountered.

Since raw material procurement was central to problems encountered, the examination of the inconsistent supply of quality raw materials to that food complex became the initial motivating force for this study. And the study's main goal became to "determine how to improve the performance of procurement systems for new fruits and vegetables and thereby help expand employment and income generation activities in rural areas." Specific objectives are the following:

1) to develop a framework identifying the key characteristics of procurement arrangements in the fruit and vegetable production-distribution-consumption system.

2) to describe the grower/processor linkage arrangements and coordination mechanisms for a long established crop (case of garlic) and newly introduced crop (case of tomatoes).

3) to diagnose the sources and implications of procurement problems, and then analyze factors affecting the successful establishment and expansion of procurement arrangements within these grower/processor systems.

4) to suggest public and private sector strategies and policies for developing effective raw material procurement systems that supply fruit and vegetable processing firms.

The first objective was accomplished through the development of a subsector diagnostic framework which identified key participants, linkages, and intervening forces that affect alternative procurement systems (Figure 2-2). The remaining objectives were attained through a case study approach to the up-country picklers and canneries, with emphasis on the processor's perspective and commodity perspective, and the application of transactions cost reasoning.

2. Summary and Synthesis of Findings

a. Overview of the Fruit and Vegetable Production-Distribution System

The category of fruits and vegetables available in Thailand includes over 150 tropical and/or temperate climate crops grown within a country

somewhat larger than the state of California, and consumed as a very wide range of commodities and products. The abundance of "fruits and vegetables" has been a primary factor for promoting the development of the canning industry and the "export trust" of fresh fruits. Yet, the extreme heterogeneity and large size of this group of crops makes a thorough understanding of its many production and distribution systems very difficult, and consequently lessens one's ability to project the consequences of various policies or structural changes, such as introducing large scale canning.

Vegetables comprise such an heterogeneous group of crops that generalizations can be tenuous, however, most crops are a) highly seasonal, b) perishable, c) bulky (making transportation costly, d) labor intensive to grow, e) require considerable cash inputs, and f) exhibit price and yield risks depending on the season. Although most are grown by vegetable gardeners (near urban areas or in household plots), the role of vegetable growers increases as transportation improves and improved varieties are cultivated.

Fruits are also heterogeneous in nature and display characteristics similar to vegetables except that they generally require a) long periods of tree growth before bearing fruit, b) limited crop care before relative to after fruit initiation and c) intense labor use during the harvest period, as well as exhibit yield vulnerabiility to weather conditions. The main types of growers include household growers, farmer tree crop growers, and orchardmen.

The pickling-preserving industry has a long history of pickling a wide array of seasonally available fruits and vegetables by firms located either within the main production areas of their major raw materials, or

near the main demand area (Bangkok). Pickling firms are usually family businesses and were found to range from small household firms to larger manufacturing firms. A large percentage of firms outside of the Central Plains area are not registered but their characteristics are similar to those registered, i.e., labor rather than capital intensive, mostly small to moderate size, and operate on a seasonal basis.

The canning industry began in 1967 by a joint venture with Taiwan and Japan, has steadily expanded from its Central Plains base, and earned Thailand the position of second or third largest world exporter of canned pineapple. This industry can be characterized by the corporate nature of its firms, joint venture arrangements for the larger firms, location in the Central Plains primarily for fruits and in the North for vegetables, more capital intensive than picklers but more labor intensive than counterparts in Western countries. It is also an industry which provides income for not only a large number of factory employees but also for farmers.

The fruit and vegetable system is so complex and heterogeneous that it is difficult to make broad generalizations or to formulate all encompassing findings that uniformly apply to all commodities within the system. However, the outcry of concern by Bangkok residents over the seasonal shortages of vegetables and the evident irregular supply of certain promising tropical fruits (resulting from the influence of weather) exemplifies some of the sources of problems in coordinating this system. The expectations of large amounts of good quality commodities and raw materials for the export markets can only be realized if a well coordinated system is built on a solid foundation of supply and demand information dissemination, and understanding of the system. Unfortunately

there is little evidence that such information readily moves through the system to the farm level, that supply and demand dimensions are fully understood, and that coordinating institutions or mechanisms are in place to improve the system's performance.

b. Pickling-Preserving Firms with Emphasis on Garlic

The northern pickling firms sampled are located in or near Chiang Mai City; exhibit considerable differences in products, markets served, and degree of forward integration; and employ very similar processing technologies. The different types of firms were distinguished by product dominance, relative number of products (multiple versus single products), and degree of forward integration. Each type of firm developed raw material procurement systems suitable for their particular processing capabilities and the raw material markets in which they competed. For instance, within the garlic subsector the high quality multiple product firms established linkage arrangements backwards to certain village level commission agents whereas mixed quality single product firms bought from whomever delivered garlic to their factory. The degree of forward integration seemed to have substantial effects on the firm's working capital constraints and consequently on raw material procurement practices and limitations.

Semi-dry and dry garlic are consumed year-round by a large number of consumers as an ingredient for several foods, whereas pickled garlic was found to have a narrower and shallower market as a side dish, more often preferred by the older generation or Thais. Although the analysis indicated a strong upward trend in garlic consumption, this varies substantially by province with the residents in the Northeast eating the least.

The extent of trade in dry garlic is variable with imports seldom accounting for more than 4 percent of supply and exports generally at lower levels. Trade in pickled garlic is uncertain except that imports are minimal while exports are said to have been increasing substantially. Inventories of both dry and pickled garlic may be an important source of the considerable price variability observed for dry garlic. During years of particularly large supply, the speculative behavior of various market participants further accentuates the variability and uncertainty inherent within the production and distribution system.

As a crop, garlic is highly complex due to its three harvested forms (fresh, semi-dry, and dry), and its high yield and price variability. The perishability of the fresh and semi-dry forms contrasts with the storability of its dry form. Production has increased by 253 percent from 1969/70 to 1978/79 and become increasingly concentrated in the North. A cyclical price trend is evident and suggestive of delayed farmer production response to fluctuating prices (over- and under-production). The slightly decreasing trend in real prices suggests a coming change in the general upward production trend.

The problems encountered by the pickling-preserving firms included; 1) working capital constraints, 2) increasing and fluctuating prices for raw materials, 3) much competition within the retail markets, 4) peak processing period did not correspond to peak sales period thus large inventories of final products, 5) labor related constraints in "downtown" factories, and 6) a considerable range of problems arising from the interventions by government agencies. Yield and price variability as well as high cash costs of production were problems from the garlic grower's perspective.

Findings regarding the vertical coordination within the "garlic" system whether in terms of the fresh food channel or processed food channel, indicate signs of market failure or the inability to consistently coordinate supply and demand. The cyclical nature of wholesale prices and supply, the considerable variability of supply from year to year and the marked seasonality of production result in high degrees of risk and uncertainty at many levels, especially for growers, picklers, and consumers. Since farmers receive flat rate prices rather than payments according to grades, there is little if any mechanism for quality improvement over time. The examples of opportunistic behavior between various participants illustrates the deterioration rather than improvement of coordination. For instance, farmer application of weed killer and/or hormone to their garlic crop misled new buyers buying the crop "green", thus inhibiting the entry of new crop buyers at the farm level. Crop buyer's practice of soaking the bags of fresh garlic before delivery may partially counter-balance the buyer's practice of adjusting their scale but both practices adversely affect the system's ability to accurately transfer price information. And pickler's or wholesaler's practice of circumspectly inducing truckers to bring farmer's harvests to them, again distorts the price mechanism and adversely affects farmer's bargaining position.

An important finding regarding the garlic system is its failure to generate any progress at the farm level in terms of new varieties with less yield variability and/or susceptability to weather conditions. Although it is likely that a "cobweb" type of supply response occurs in this subsector, there are no effective public and private efforts to stabilize the market. In fact, the import restrictions finally instituted

by the government resulted in increased instability in the system rather than more stability.

The various forms of government interventions within the pickling industry seemed to increase instability and uncertainty rather than improve coordination. Current government policies and procedures could be designed to reduce instability and uncertainty while accomplishing their designated goals, such as guarding public health. However, new policies for diminishing the cyclical characteristics of garlic supply will be much more difficult to determine and implement.

The characteristics of the processing firms influenced both their procurement system and potential for growth. A number of key findings concerning small scale family firms in the fruit and vegetable processing industry have emerged from the study of the pickling firms. These included;

a) The family firm's children play a crucial role, not only in its marketing and production activities, but also in formulating the firm's goal to expand or to maintain its present size. Likewise, the firm's active training of their children provides the basis for future entrepreneurial talent in this and related businesses, as well as indicates a potential entry point for improving firm performance through programs designed to expand the abilities of this new generation of entrepreneurs.

b) There is considerable logic in the practice of starting a small business as a one-person operation and expanding as one gains experience, accumulates working capital, and establishes a market share because of the complex and uncertain conditions associated with fruit and vegetable processing in up-country

Thailand. An adapted version of this practice warrants consideration as a possible strategy for establishing up-country canneries, i.e., build small to moderate-sized facilities, purchase labor intensive equipment (preferably not high technology), procure small to moderate quantities of a wide range of raw materials on a "market" or promoter basis, process raw materials into several products (economies of scope), distribute products in several segments of the market, and expand over time in response to the most favorable economic opportunities. Initial emphasis should be on processing the quality of raw materials available, then gradually changing to processing preferred qualities as the firm gains experience in promoting raw material cultivation and establishing its product markets.

c) The ability to avoid compliance with government regulations was found to increase more than proportionately to firm size as the firm became more visible and more regulations become applicable. The vague or all-encompassing wording of several regulations (especially health regulations) allowed for such local discretion in implementation that "pay-offs" or other forms of opportunistic behavior were commonplace. The negative influences of such direct regulations (cases of acetic acid and plant layouts) or potential interventions (case of saccharin) increase business uncertainty and increase costs for consumers.

d) Retailers of pickled products, crop traders in raw materials, and children of current picklers are the main sources of entrepreneurs for new pickling firms. The tendency of the retail

food market to absorb seasonally or fully unemployed persons, and for the backward integration of some of them into processing represents an employment option and source of entrepreneurs too readily overlooked in studies of rural and/or small scale industries. The business experience taught, the timely income generated, and the flexibility to expand or contract business activities according to economic conditions encountered argue for the inclusion of such integrated commerce activities within employment studies of small scale firms.

e) The extent of forward integration into wholesaling or retailing by a multiple product pickler substantially affects its ability to cope with the working capital constraints inherent in seasonal raw material procurement and delayed product sales periods. Retailing was found to not only improve cash flow for paying recurring operating expenses, but also to reduce the burden of large accounts receivable, lessen product spoilage due to timely re-packaging, and facilitate direct contact with and ideas from consumers. The partially integrated, multiple product firms (wholesalers) encountered considerable pressures from working capital constraints due to the additional costs associated with accounts receivable, acceptance of damaged or spoiled products, less control over product sales, and less access to consumers. This finding helps explain why most multiple product picklers feared competition from small pickler/retailers rather than with larger picklers.

f) Firm location affects the internal operation of the firm as well as sales strength. Firms located outside of the "downtown" area of Chiang Mai City experienced fewer labor-related problems

and were in better positions to physically expand their businesses, i.e., expand their storage area. Firms with large retail outlets, especially within the "Night Bazaar" area of the city, sold a much wider array of products and had better access to the tourist market (main source of demand for their products) than firms with smaller retail outlets located in fresh food markets or which relied on retailers or wholesalers for their product sales.

c. Up-Country Canneries with Emphasis on Tomato

The upcountry canneries were very few in number; varied markedly in location, size, organization, and operation; responded to a different set of economic opportunities; processed a different mix or type of product; and used substantially different technologies. In the North, the Old Timer (OT) firm experimented with several procurement systems before successfully implementing the promoter approach; the Young-Up-Start (YUS) firm was a multi-faceted agribusiness, one aspect of which exemplified the promoter procurement approach; and the Out-of-Business (OOB) case illustrated many of the characteristics and problems of locating a large factory within up-country conditions and using western management practices to operate it.

In the Northeast, the Growing Business (GB) successfully coordinated fresh market and processing demand for processing varieties of tomato while actively supporting farmer production of that crop and the Out-of-Reach (OOR) firm illustrated the potential losses which can arise if processing varieties are promoted within inappropriate production areas, such as near urban areas and vegetable market places. Except for the

two small firms (GB), all the canneries experienced raw material procurement problems at one time or another.

Processing varieties of tomatoes as a commodity were found to be consumed primarily during "in-season" periods and displaced previously dominant fresh market varieties. Although consumption information is limited, tomatoes do not seem to be as popular as several traditional tropical fruits among the majority of consumers but are found as side dishes in western restaurants and within the homes of foreign residents. As an intermediate product, local and imported tomato paste is demanded by the expanding Thai fish canning industry. As a final product, local and foreign brands of tomato ketchup are found in western restaurants, supermarkets, and certain types of food stores. Import and export data indicate substantially more imports than exports although changes in import trends of certain product forms suggest increases in successful import substitution. In summary, the tomato commodity market seems somewhat shallow and of a seasonal nature, while the product market shows considerable potential in terms of import substitution, especially for tomato paste.

As a crop, tomato has been cultivated in many areas either as processing or fresh market varieties. The seasonality, bulkiness, and perishability of fresh market varieties have mostly confined them to areas near market places where they are cultivated in limited amounts per production area. The promotion of processing varieties with less perishability and the additional demand from processors resulted in an extended "in-season" cultivation in more favorable production sites, and more production concentration, especially within the Northeast.

The general seasonality, bulkiness, and perishability of tomatoes require fairly tight procurement linkages between all the participants within the procurement system. However, crop and commodity susceptibility to insects and diseases as well as surges in supply due to periods of especially warm temperatures make this a risky crop during "off-seasons" and a risky commodity during the "in-season." Since the multiple types of demand, i.e., as a fruit commodity or processed product (intermediate or final forms) are for the same form of harvest, access to more buyers rather than a multitude of commodity forms are sales options for farmers once the harvests begin.

The procurement systems initially used to rapidly expand cultivation in the North caused sizable losses for many cultivators and left a sense of marketing risk still prevalent among growers in the area. There is a gradual decline in tomato quality as temperatures increase during the peak harvest season. This represents a serious problem for processors trying to eventually reach export standards for their tomato quality, especially since the fresh market demand is strong during the early harvest season. Because processing substantially reduces the weight of the raw materials, the up-country processors have a comparative advantage in terms of lower transportation costs, compared to Central Plains processors. The potential for continued expansion of tomato cultivation in the Nong Khai area is jeopardized by the effective removal of import restrictions protecting the establishment of domestic production for tomato paste.

Findings regarding the vertical coordination of the "tomato" system whether in terms of the fresh food channel or processed food channel suggest instances of market failure or an inability to fully integrate

supply and demand on a consistent basis. The extreme seasonality of this perishable commodity has been lessened somewhat (increased supply in December and January) yet signs of peak season over-production in certain areas are still evident. Since farmers are paid a flat rate price rather than payments according to grades, there is little if any effective mechanism for quality improvement over time. The ease with which processed varieties seem to be replacing fresh market varieties during the "in-season" further indicates the lack of varietal development for the latter varieties. Examples of opportunistic behavior between farmers and processors were found to usually reflect reactions to over-production or unfamiliarity with the commodity, rather than a regular set of practices as observed within the garlic system. For instance, when rapid ripening induced surges of arrivals at the factory, the factory delayed distribution of crates, refused various marginal quality (yet processed it), etc. while farmers carefully arranged the best tomatoes on the top and the damaged ones on the bottom of the crates. More problematic were the cases of non-payment by buyers to some farmers after the tomatoes had been delivered.

Inconsistent application of import duties on imported tomato paste, and the diversion of part of the imported paste onto the domestic market undermines the continued expansion of the domestic tomato paste market which is accessible to up-country processors. Consequently, investment risk and uncertainty will hamper the growth of this industry.

Each processor of tomatoes recognized a different economic opportunity originating mainly from a demand perspective. These included demand for high quality paste in the world market and low quality paste in the domestic fish canning industry. The small, single product firms,

which introduced and supported the cultivation of processed tomato varieties, were motivated by fresh market sale potential.

Other specific findings about canneries include; 1) the effectiveness of the promoter versus factory-farmer approach within the agricultural and village conditions of the North; 2) the merits of expanding raw material supply based on coordinating the system so as to first satisfy fresh market demand then fulfill processor demand (as accomplished in the Nong Khai area); and 3) the hazards involved in processor recruitment of experienced vegetable gardeners located near population centers rather than potential vegetable growers in isolated villages in the Northeast.

The nature and origin of the demand/supply conditions for fruits and vegetables in tropical countries are distinctly different from those in temperate countries with serious implications for the establishment, development, and growth of a viable processing industry. From the experiences of fruit and vegetable processors within temperate climates, such as in Europe and the United States, we know that the scarcity of fresh fruit and vegetable commodities on a seasonal basis (winter) facilitated the development of domestic markets for processed products. Then later the improvements in varieties and processing technologies, changes in tastes and preferences (convenience foods and eating away from home), etc. encouraged the growth and expansion of the industry which recognized and responded to both domestic and foreign demand options. However, in Thailand no such seasonal scarcity exists, tastes and preferences for fresh commodities are strong and prevalent, and the fresh food marketing system is very pervasive and active. Consequently during their start up period the up-country processors have had to rely heavily on unstable export markets, to compete with imports of similar products, and to

contend with an aggressive commodity marketing system which bid away raw materials in certain instances. Also the breadth of viable fresh market commodities seems to reduce the likelihood of any considerable depth or dominance of particular crops especially because of the degree of possible substitution on the supply side. Logically a wide variety of potentially profitable crops reduces the need for and merits of large scale cultivation by small farmers of any particular type unless it is uniquely suitable for local cultivation conditions. In fact, except for a few traditional crops, such as mango, relatively few fruit and vegetable crops have distinct varieties suitable for exclusive use of processing rather than fresh market consumption. Consequently processors promoting a new crop must recognize this non-separable market phenomenon and adjust their procurement strategy to that condition.

Each village or group of adjacent villages exhibited diverse agricultural conditions and consequently distinct cultivation practices for the tomato crop. Heterogeneous opportunity sets (sometimes associated with access to fresh market outlets and proximity to population centers) resulted in a wide range of opportunity costs such that widely varying profit margins are acceptable to farmers. In other words, farmers in isolated villages with few, if any, income generating opportunities during the dry season were willing to spend hundreds of hours using sprinkling cans to water their small plots of tomatoes whereas farmers in villages close to population centers quickly lost interest in such an approach for the low valued processed tomato varieties.

d. Procurement Systems for Marketing Agents and Processors

The marketing system for many fruits and vegetables can be depicted as an hour-glass structure with many growers on one end and multitudes of

consumers at the other end. The first-handler marketing agents within the fresh market procurement system are village crop buyers who respond to the opportunities (price and volume of purchases) provided by supply area wholesalers. Supply area wholesalers often referred to the supply, demand, and reference price information regularly distributed by the Bangkok wholesalers who provided the overall coordination of the system. This system is designed to handle whatever quantities and qualities of commodities that are produced rather than systematically signal appropriate areas that should be planted each season or initiate progressive changes at either the production or consumption ends of the market.

The processor's procurement systems center on two basic approaches, i.e., purchasing the raw material on the open market or instituting special arrangements for the production of the raw material either on the company's plantations or as contracted, directly or indirectly, with fruit and vegetable growers. Spot market purchases usually involve peak season procurement at relatively low prices for such specific fruits and vegetables as longan, rambutan, and pineapple, as well as Chinese mustard and garlic. The processor tailors his processing lines to the timing, quantity, quality, and costs associated with the brief "over-production" period.

Special procurement arrangements include crop production on the factory's land (less common practice) or contracting directly with growers (factory-farmer approach) or contracting indirectly through intermediaries (promoter approach). The following findings from different firm's use of these alternative options provide insights into the relative merits and limitations of each.

Fresh and processed food demand forces for garlic and tomatoes have not led to separate groups of commodity suppliers as one commonly finds in various Western countries, i.e., one set of farmers producing exclusively for the processor and another for the fresh market buyers. All the studied picklers buy their raw materials from traders or crop buyers who supply both fresh market and pickler needs. Efforts by the OOB firm to use written contracts within a direct factory-farmer system to create a separate market for processing varieties of tomatoes proved disastrous. With later modifications to a "promoter approach" the procurement system began to meet the factory raw material requirements while also providing commodities for the fresh market. The OOR firm's attempt to become the exclusive buyer of raw materials from isolated farmers has yet to prove itself.

A firm's product market segmentation and quality considerations directly affect raw material procurement. Based on the types of products processed and the market segments served, the picklers use different procurement practices when competing for garlic and other raw materials within commodity markets. Multiple product picklers of quality bottled products ("snack pickles") maintain a regular business relationship with a particular set of commission agents and entered the market early in the harvest season. Thereby these picklers satisfy peak product demand during the early tourist season, reduce their bounded rationality regarding the raw material supply situation, and obtain the preferred quality as identified and assembled by trusted commission agents. Since early entry into the commodity market usually means paying the higher early season prices, the access to reliable supply side information from knowledgable commission agents is particularly important. Meanwhile, single

product picklers of "food pickles" are less concerned with obtaining one particular quality of raw material and were found to buy raw materials as delivered by farmers and crop buyers on a "first come-first serve" basis. They also use a range of prices to differentiate both quality and type of supplier (i.e., higher price paid to crop buyers than individual farmers). The important point is that there is no one "best" procurement pattern but rather that both types of procurement practices successfully satisfy the particular processing conditions and market segments served by the respective type of firm.

Unlike the picklers procurement systems which "plug into" established commodity markets for raw material suited to their product needs, the canneries tried to institute procurement systems where no commodity market existed because the crops were yet to be introduced in sufficient quantity and/or quality. The OOB firm needed to produce large volumes of high quality exportable tomato products. It decided that a direct factory-farmer procurement system was appropriate for obtaining the volume of high quality raw materials (tomatoes) needed. Key among the factors which led to failure were the inability of sufficient numbers of farmers to meet the stringent quality specification prescribed and the unanticipated flow of quality raw materials into the fresh market system. The subsequent conversion to a "promoter procurement approach" (accompanied by redefining the export market served to include low to moderate quality products) resulted in the firm obtaining larger amounts of adequate quality raw material, on a scheduled basis and at agreeable prices.

Another type of cannery (GB firms) originally introduced new processing varieties of tomatoes as an "off-season" commodity for fresh food markets. The incentive system of inputs on credit, distribution of

shipping containers, and purchase at "prevailing market price" supported the expansion and quality improvement of this new crop until "in-season" harvest volume warranted the operation of processing plants. In other words, a strong demand-pull type market for the new commodity kept pace with and orchestrated the expansion of a new crop by first satisfying fresh market demand during the high-price early season, then satisfying processing demand when the peak season glut occurred. Although the most popular variety grown in this area and the late season quality of tomatoes were not optimal for a high quality tomato product, these processors only required low quality paste as demanded by domestic fish canneries.

The successful linkage arrangements or contracting systems between farmers and merchants reflect the local "ways-of-doing-things" and include local persons conversant with village farmers. The content of "contracts" and "agreements" varied by the type of system and the composition of its participants. The basics were the guaranteed price for a specified quality of commodity, scheduled delivery to the processing factory, and the provision of packing crates (and sometimes inputs on credit) by the factory just prior to harvesting time. There are considerable production and price risks associated with this new, relatively vulnerable crop (tomatoes). Therefore the linkage arrangements require a maximum of transferability and interpretation of technical and exchange information. Likewise, local accountability of the organizer as well as some degree of shared risk, such as inputs on credit, improved the commitment of the farmers to the contracting system.

The seasonality, perishability, variability, bulkiness, and interdependence characteristics of raw materials promoted directly impinge on the design of a processor's procurement system and its required incentive structure. For instance, the seasonality of production of processing tomato varieties suggests that much more land be planted in September and October so that large quantities are harvested when the best quality tomatoes ripened. However, rice cultivation activities continue until December and limit the land area accessible thereby curtailing the quality options for the procurement system. The highly perishable commodities, such as fresh garlic and tomatoes, require "tighter" linkage arrangements between the village level buyer and processor as compared to storable commodities, such as dry garlic. For the "in-season" perishable crops there are both price risk and risk of not finding a buyer during the peak harvest period. In general, very new and/or risky crops (price and/or yield risks) that require considerable cash inputs often require the provision of inputs on credit (risk sharing) and/or a guaranteed minimum price to induce farmers to grow them in substantial amounts. The analysis shows that for Chiang Mai farmers support was minimal so only a small portion of their farm was planted in tomato, whereas in Nong Khai the opposite results were found.

Government intervening forces (or lack thereof) were evident at the factory level regarding processing and product related matters, such as registration permits, labor laws, and product health standards, rather than for procurement matters. The opportunity and costs of avoiding compliance with such forces seemed directly related to firm size and

visibility. The lack of effective import protection or a form of continually reduced import protection has the potential to adversely affect the stability and expansion of tomato cultivation within the Nong Khai area with consequent reduction in factory and farmer incomes.

B. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions are made according to four major topics; 1) appropriateness of the promoter approach to procurement organization, 2) a village orientation for procurement systems, 3) middlemen as a source of entrepreneurial talent for agribusiness development, and 4) "gradualism" as an appropriate strategy for a new processor's establishment of procurement systems.

1. Main Conclusions

a. The "Promoter Approach" to Organizing Raw Material Procurement is Particularly Effective for Canneries Introducing New Processing Varieties in Dispersed Heterogeneous Cultivation Areas with Mostly Semi-Subsistence Farmers

The promoter approach basically means an intermediary between the factory and farmers performs the functions of organizing, teaching and managing the cultivation and assembly of the raw material within the specified quantity, quality, time, and cost conditions. The factory and promoter, (i.e., local trader, crop buyer, or other interested and skilled person) sign written contracts specifying the mutually agreed upon rights and responsibilities with the factory providing seed material, training in cultivation practices and raw material handling methods, and crates for the raw materials. The promoter uses informal verbal agreements with crop growers either directly or via village representatives, in which

certain credited inputs and/or services are agreed upon in return for raw materials at a certain price (i.e., guaranteed or "prevailing market price"). Then the promoter provides the agreed upon information (services) and materials, schedules cultivation, assembly, and shipment of the raw materials, and pays the farmer for his harvests.

The strength of this approach is the promoter's knowledge of and experience in dealing with farmers' attitudes and ways of initiating exchange activities. This approach reduces bounded rationality on the supply side, which is often a problem confronting a newly established cannery or one operating within areas of considerable heterogeneity in agricultural and village conditions. The promoter approach is effective in procuring desirable raw materials because it facilitates the transfer of technology from the factory's plant science perspective to the farmer's frame of reference with considerable clarity, minimal misunderstanding, and reduced costs. The promoter's accessibility and accountability to farmers strengthens enforcement of farmer commitment, while the written contract for sizable amounts of raw materials strengthens the accountability of both the factory and promoter for their respective terms of trade. The YUS case illustrated how the promoter can protect the farmers (i.e., improve their bargaining position) if the factory management attempts opportunistic behavior harmful to farmers in the short run (and to the promoter in the long run).

The promoter approach also implies "responding to" rather than "recruiting" cultivators interested in and capable of providing the needed raw materials. The promoter's agreement to provide a certain raw material comes from his knowledge of grower conditions and interests rather than factory speculation about "potential growers," i.e., defined as

technically capable, financially interested, readily accessible or related criteria for growers. Consequently much of the risk and uncertainty associated with selecting non-receptive villages of growers is eliminated, as noted in the OOR case. Costs of searching for, recruiting, and negotiating agreements are also reduced. Also the recruiting approach implies the factory's intent to gain control of the system whereas the promoter approach indicates two independent entities operating according to their own best interests. In North Thailand this independence of firms is said to be more compatible than strong outside control.

b. Selection by Village Rather than Just by Individual Farmer is a Very Crucial Component of an Effective Raw Material Procurement Strategy in Thailand

Village character, resources, and location are important factors affecting the opportunity costs of farmers and the level of support they need to adequately cultivate new crops. An assessment of the village condition is necessary to account for the presence and level of forces beyond control of individual farmers, such as proximity to market places and presence of input suppliers, as well as to estimate those conditions within farmer's control. The experience of the OOR case exemplifies problems (such as the comparison of fresh market price with processor prices, the grower insistence on cultivation practices not suitable for the new crop, etc.) that are associated with selecting vegetable gardeners in villages near population centers versus villages of potential vegetable growers in more isolated areas.

From the processor's perspective, transactions cost reasoning suggests that dealing with scattered individual small farmers is far more

costly and less effective than working with several farmers within particular villages. Costs of negotiating contracts, distributing credited inputs, providing extension services, and assembling raw materials can be reduced if they are focused on groups of farmers within one or a few villages. And as noted from other studies the decision-making role of village leaders has traditionally been crucial for instituting change, such as wide-spread cultivation of a new processing crop.

> Although villagers are involved in legitimating and giving authority to local leaders, it is not their duty to participate in the decision-making process. Direct villager participation occurs after a decision has been made as villagers are called on to behave in accordance with it. Each villager then has the culturally sanctioned option of accepting or rejecting the decision. In practice, the system usually operates smoothly because rural leaders are sensitive to local conditions and can make decisions acceptable to most villagers.[1]

c. Middlemen are Uniquely Qualified to Both Initiate Changes in Village Enterprises and Become a Major Source of Entrepreneurial Talent for Rural Small Scale Industries

The trader (wholesaler), crop buyer, and input supplier are in the key position of being very knowledgable about both 1) the production-distribution characteristics of crops/commodities they deal with, and 2) villagers frame of reference, i.e., exchange practices, opportunity sets, cultivation practices, and general cropping systems. As members of the local agricultural community, villagers generally perceive middlemen as the link between the farmer and the outside economy. The YUS, GB, and some pickling firm cases represent a few of the many instances identified in the study wherein traders, as local entrepreneurs, extended their

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[1]Marcus Ingle, "Local Governance and Rural Development in Thailand," Rural Development Committee, Cornell University, 1974, p. 76.

commerce expertise into processing activities. They recognized economic opportunities, applied their business acumen, and invested in the rural areas where they live and work.

Retailers and wholesalers of pickled products have also become fruit and vegetable processors (picklers) as found in certain FDR II and VDR I firms. As persons closely in touch with consumers, these firms were especially effective in sales and processing of multiple pickled products. On the other hand, the VDR IV (single product) firms very frequently came from the ranks of crop traders who operated multi-faceted agribusinesses.

During the extensive field work with the ROFEAP other crop based rural small scale industries, such as kenaf baling, were found to be owned and operated by former crop buyers or traders who dealt with those particular commodities. A large share of the activities in such agribusinesses involve 1) dealing with crop buyers and farmers, 2) attaining an intimate understanding of crop/commodity characteristics by season and location, and 3) managing working capital on a seasonal basis. Such activities are also part of a crop buyer's business, thus making this type of businessman well trained and suited for small scale agribusiness.

d. "Gradualism" is a Desirable Strategy for Establishing a Procurement System for New Processing Varieties of Fruits and Vegetables Under Up-Country Conditions

The wisdom and workability of a strategy of starting small and gradually promoting the production and expansion of new varieties emerges from this study. This is because of the time required to reduce bounded rationality about village farmers and their exchange systems, the ever-changing or destabilizing effects of crop/commodity/product characteristics on procurement systems, and the need to gain farmer trust which in

the past has been eroded by the various instances of opportunistic behavior prevalent under up-country conditions.

The alternative sources of income (opportunities) available to farmers vary by type of village, i.e., size, degree of isolation, etc., as well as the type of farmer (semi-subsistent, commercial, etc.) and agricultural conditions (irrigation, climate, soils, etc.). The receptivity of villages of farmers to the promotion of a new crop not only varies when the crop is introduced but can readily change as new opportunities arise for farmers. Thus, the changes that arise from the trial and error process of identifying promising production areas require time to stabilize.

Management time and bounded rationality are involved in determining production feasibility. These two factors are also prevalent in determining an effective linkage arrangement which is amenable to the village exchange and knowledge dissemination systems familiar to the farmers. Once determined, the transfer of appropriate technologies and commitment to agreeable terms of trade can take place. Both aspects require time for adjustments even when using the promoter system.

Crop sensitivity to local agro-climatic conditions also induces yield variability which in turn is problematic for procurement system stability. For example, the surveys found that several days of high temperature during the harvest period caused such a surge in ripenings that processors could not handle the arrivals of processing tomatoes. Commodity perishability, bulkiness, and multiple uses required "tight" systems of procurement, imposed high transportation costs on distant buyers, and restricted the periods when the processor's price was reasonably competitive with fresh market prices. The characteristics of

processed products (especially if related to high quality and uniformity) sometimes imposes unrealistically stringent requirements on the quality of raw materials due to "raw material-product interdependence." Farmers were found to usually account for the cultivation and sales risks associated with such new crop/commodity characteristics by cultivating small trial plots, copying cultivation practices from crops most familiar to them, and refraining from the commitment of large amounts of cash inputs. Consequently, time and continual adjustments are required to build a stable set of cultivation practices and commitment of cash inputs for high yields.

The numerous examples of opportunistic behavior observed within existing fresh market and processor procurement systems suggests that time will be needed to restore trust for long term working relationship between various groups of farmers and a new processor. The ethnic roles of the Chinese wholesalers and Thai crop buyers, and their rights, responsibilities, and positions in the Thai socio-political hierarchy need to be better understood when instituting procurement systems using "intermediaries" (promoter approach) appropriate to the local "ways-of-doing-things."

2. Recommendations for Processors

Unfortunately there is little effective working relationships between up-country canneries. In other countries an association of canneries can finance or otherwise support varietal development which would benefit all canneries processing that raw material. Plant breeding is generally expensive yet returns to investment are difficult to realize if other processors gain access to the new variety which can occur one or two years

after the variety is grown by farmers. Consequently individual firms are reluctant to make such an investment and prefer public sector research or broad based funding arrangements.

Other specific recommendations relative to up-country procurement are:

1) Several recommendations for up-country processors follow directly from the conclusions of this study, such as a) use the promoter approach to organize effective raw material procurement, especially for newly introduced varieties, b) focus procurement strategies on the "village" as the source of supply relative to which incentives, technical and input support, and assembly methods, are arranged, c) recruit crop marketing agents as effective promoters based on their recognized entrepreneurial skills and working relationship with local farmers, and d) design a procurement strategy which begins small and gradually expands as "time and place" constraints to new crop introduction are resolved.

2) Farmers are concerned with investing too much and getting a high yield which in turn earn such a low price that losses are incurred. Yet on the other hand they do not want to miss the golden opportunity of having a reasonable harvest whenever the price is high. The implication for a processor is to find ways to establish at least a minimum guaranteed price if an absolute guaranteed price is not advisable (given competition from other buyers) so that farmers are less apprehensive of price risk.

3) Field crop farmers who have had no prior experience growing perishable, delicate fruits or vegetables are seldom sensitive to concerns about "timing of picking," stages of ripening, acceptable versus unacceptable quality, careful placement in containers, careful transfer from picking containers to shipping containers, etc. Consequently, processors

of such perishable raw materials must devise several check and cross-check procedures to insure that promoters and/or farmers have field supervision during the early harvest period.

4) The improvement of raw material quality requires incentives which reward additional cost and/or effort. One approach is a dual price system which pays somewhat more for grade 1 raw materials based on an assessment of the percent of grade 1 and grade 2 per delivery. Although a random sampling procedure can be used to estimate the percentage of each grade, it is desirable that the quality control person in charge of this estimation should be employed by a group other than the factory in order to insure unbiased evaluation.

5) A common practice found among vegetable growers was that the appearance of the crop after the first week or two in the field influenced the level of crop care and inputs applied, in other words, a vigorous initial growth merited considerable follow-up effort whereas a less healthy crop received just enough care to earn a basic return. The implication for processors is that special care and effort should be directed at insuring a healthy, uniform growth of the seedlings so that the initial stands are strong and merit as well as respond to considerable care. Thus, more stable and higher quality supply is more likely. One approach to consider is for a local, experienced cultivator to be responsible for growing and selling seedlings within each village of vegetable growers.

3. Recommendations for the Public Sector

There are two sets of recommendations relevant to the public sector. One is related to overall vertical coordination and another to problems

and opportunities identified. Vertical coordination of the systems for cannery raw materials/products exhibits weaknesses at both the raw material procurement and product export levels, whereas the fresh market system for commodities is especially inept at signaling and supporting innovations at the farm production level. The following recommended changes are intended to improve system coordination:

1) Government should explore ways of providing incentives for trading companies to become "channel captains" in order to better coordinate export demand for fruit and vegetable products and commodities (i.e., improve export reliability, standardization of exports, bulking of small processors output, etc.) as well as actively provide technical, marketing and financial assistance to growing small and medium sized processors.

Various methods of linking production-marketing assistance with export services would be feasible, for instance, the trading company could station a team of 2-3 specialists near or in cooperating firms to oversee and improve quality control, product development, and crop production expansion activities. Such teams could effectively bridge the quality gap between dispersed firms and thus facilitate the export of large volumes of fairly uniform products, which are preferred in most foreign markets.

2) The recent regulatory powers given the Fish Canneries Association represents an effort to discourage harmful export competition which gives Thailand the reputation for "poor quality" and undependability in trade. A similar arrangement should be considered for the Fruit and Vegetable Exporters Association (i.e., mandatory membership before issuing an export license, internal fees to finance some association

monitoring of export quality and pricing practices, etc.) especially if the trading companies do not become actively involved in this system.

3. Development of a "Fruit and Vegetable Institute" to coordinate public and private efforts (research and development) should be seriously considered by the Thai government at this juncture in its export development strategy. A commodity oriented institute which would combine public and private interests while obtaining financial and political support from the members of the fruit and vegetable system could directly support both the agro-business and "export thrust" strategies of the RTG. The various types of output and activities could include situation and outlook reports, compilation and basic analysis of relevant statistical data and survey information that prospective investors and current firms could draw upon, trade information and policy formulation action committees, research and development technical groups for problem areas of an industrial and agricultural nature (including consultants accessible from "Donor" programs), etc. In other words, one can envision an institute that a) receives both public and private financial and personnel support, b) is a conduit for (and coordinator of) industry and "outside donor organizations" research and action program funds, and c) compiles, analyzes, and disseminates subsector information or actively supports that set of activities by a public agency. Anyone familiar with the existing data collection systems, diverse research efforts, and limited coordination of public sector involvement within the fruit and vegetable system is well aware of the urgent need for such a commodity oriented institution.

The establishment of Specialized Vegetable Production Areas is one method to focus public sector research skills and development funds on

pertinent production and marketing problems at the farm and market levels. This approach of focusing varietal and cultivation developments on areas with a historical comparative advantage in vegetable production and improving market linkage arrangements between these production sites and major urban areas has been in operation in Taiwan for several years. Alternatively various aspects of the Marketing Assistance Program in the Philippines merit consideration for addressing farm level problems within the vegetable marketing system.

4. Other recommendations relative to problems and opportunities identified are as follows:

a. Government policies and regulations regarding health standards should be articulated in such a way that ambiguity does not cause confusion within the industry nor facilitate opportunistic behavior by implementing agencies in up-country areas. Recent regulations regarding the physical lay-out of the food processing factories have already created considerable confusion and should be restated or revised.

b. Product development is needed especially for pickled products. New preserved fruit and vegetable products preferred by Thai consumers, especially during the hot dry season when desirable fresh vegetables are higher priced and less available, would be beneficial to consumers, picklers, and farmers. Although some picklers currently export pickled products to the USA (due to the demand from refugees) and to the Middle East (because of Thai laborers there), additional suitable export-oriented products could also be identified.

c. In addition to the use of agricultural by-products for the production of natural vinegars, informed sources repeatedly referred to an export potential for various beverages made from grain and fruits. However, the production of such beverages was reportedly hampered by the policies and activities of the Tobacco and Alcohol Monopoly. An overall evaluation of this state agency's policies and activities as they affect new product development options should be conducted. Emphasis should be placed on the potential for new products which could increase foreign exchange earnings while expanding the use of agricultural raw materials.

d. Based on the concern expressed by vegetable growers in this and other studies there is the need for improving the government system for monitoring and sanctioning the adulteration of agro-chemicals, especially pesticides, so as to reduce farmer costs and improve yields.

e. Better integration of the public sector's research institutions into the overall fruit and vegetable system merits considerable attention in order to address such problems as those associated with garlic seed production and distribution. Plant breeding efforts to improve and expand the varietal base for garlic, seed production and certification programs for garlic, and the like should be considered by the relevant government agencies.

4. Recommendations for Further Research

1) Research is needed on the production of and market for garlic seed material with special plant breeding efforts to expand the breadth of economic varieties, especially those most suited for culinary (powdered form) and medicinal uses.

2) The research is needed to determine the causes of the price and supply cyclical behavior of garlic. This will require an analysis of farm level crop substitution practices following a year of particularly unfavorable farm prices, a determination of the farm price interrelationship between the three forms of garlic (fresh, semi-dry, and dry), and further research on the demand for both dry and pickled garlic. Hypotheses regarding the possible substitution of other cash crops (such as chili) for garlic or the possibility of long term cash flow problems resulting from cash losses due to especially low prices warrant special consideration in the farm level study. Hypotheses regarding the effects of that price and supply behavior on processors, especially on the viability of a garlic powder processor, deserves attention.

3) Government import and export policy for agricultural commodities and products should be based on a better understanding of the total systems involved (i.e., participants and their behavior), thus research determining the mechanisms currently used to attain such understanding and ways to improve these mechanisms is urgently needed.

4) Research is needed on the effectiveness of health regulations in attaining their objectives and the implications of regulation implementation or non-implementation on the food processing industries, if consumers are to be better protected and processors costs (uncertainty of intervention) reduced.

5) Considerable horticultural research on screening or developing varieties suitable for Thailand and post-harvest research on handling fruits and vegetables is required if yields and quality are to be improved for both raw material use and fresh commodity exports.

6) Agricultural economic research for horticultural crops is so meager that the need for research at all levels of the system involved is far overdue and vital for the government's goals for the fruit and vegetable system.

APPENDIX

CASE STUDIES OF VILLAGES OF TOMATO CULTIVATORS

APPENDIX

CASE STUDIES OF VILLAGES OF TOMATO CULTIVATORS

This analysis will center on the village as a unit of analysis because the village context is considered crucial for an understanding of tomato cultivation considerations, the organization of tomato procurement systems, and realistic terms of trade.

In the Chiang Mai Valley, the village of Ban Ta was part of a local crop buyer's group of tomato growers which supplied tomato processors in the Central Plains area. Further south of Ban Ta was Ban Tongpun whose tomato growers supplied a large tomato wholesaler from the Chiang Mai Market and several local crop buyers with tomatoes for both fresh market and processing uses.

In the Northeast, two villages in Nong Khai Province (Yoi Hai and Pan Pran) represented the "river bank" and "rice paddy" cultivation conditions of processing tomato varieties which were sold both in distant fresh markets and to local processors. Another village (Kong Bo) was in Udon Thani Province much further south of those two and was part of a group of isolated, interior villages linked to a distant processing plant struggling to become a competitive tomato processor. And finally, in Khon Kaen Province Muang Peng's tomato cultivation efforts reflected the continuous conflict between fresh market and processing market bids for accessible tomato harvests as well as the tradeoffs between cultivating tomato and other fresh market vegetables when located near a large vegetable market.

The data used in this analysis was collected by a survey team interviewing tomato growers and local leaders in each village. The methodology

for computing the production cost component for this analysis entailed the following considerations. The actual hours of labor used were averaged according to adult and children[1] laborers, sex (male and female), and employment status (hired or family labor) for all field operations, except harvest labor. Adult labor (male and female) and children labor hours were converted into "person hours of labor" according to each field operation in order to determine comparable labor structures. Table A-1 provides the conversion ratios used for all labor data.

Table A-1

Person Hours of Labor Account for Adult Male or Female or Children's Comparative Advantage or Productivity in Each Particular Field Operation

Field Operation	Conversion Ratios		
	M	F	C
1) Nursery	1	.8	.6
2) Land Preparation	1	.8	.6
3) Transplant	1	1	.8
4) Fertilize	1	1	.8
5) Spray	1	.8	.6
6) Intertill and/or Weed	1	1	.8
7) Irrigate[a]	1	.8	.6
8) Harvest	1	1	.8

[a]Often used hand held splashing tool, thus required considerable strength.

Village headmen reported basic wage rates for males and females during the pertinent cultivation season and the farmers mentioned wages paid according to each field operation. Although the wage rates reported

[1]Children were defined as persons 15 years of age or younger.

by farmers for hired labor were usually used to compute family labor wages for that village, season, and sex of labor per field operation, a common set of values for hired labor use were substituted in villages where limited hired labor was used (Table A-2). Although the actual opportunity cost of labor for Kong Bo, Udon Thani Province, was apparently lower than computed by using this method, this approach enabled a reasonable comparison between locations given the limited data on the opportunity cost of labor.

Table A-2

Illustration of Values for Labor as Corresponding to the Hired Price of Labor for that Field Operation Per Male or Female Performing It in that Village

Field Operation	Wages	
	M	F & C
1) Nursery	฿30	฿20
2) Land Preparation	฿40	฿30
3) Transplant	฿20	฿20
4) Fertilize	฿20	฿20
5) Spray	฿40	฿30
6) Intertill and/or Weed	฿25	฿25
7) Irrigate[a]	฿30	฿20
8) Harvest	฿30	฿20

[a]Often used hand held splashing tool, thus required considerable strength.

Due to the multiple harvests for tomatoes (sometimes over 15 pickings) the farmer's recollection of harvest labor use was not only weak but often was very suspect, consequently the information from the most complete questionnaires was used to estimate harvest and handling labor

time per 100 kgs of harvest. That conversion ratio was then used to compute labor time for the average yield of the village.

The interest rate of capital was based on information that 1 percent per month was locally used for inputs on credit. Thus, 4 percent of the cash expenditures was computed for this four month crop. In general, the interest costs were relatively minimal.

Northern Tomato Growers

"Ban Ta" (Case I)

In this tomato production area of Amphur San Pa Tong, approximately 23 kilometers south of Chiang Mai City there was a group of four small villages. Several farmers from one of those villages, Ban Ta, were interviewed regarding their tomato cultivation practices, costs, and returns. Particular emphasis was given to sales practices. This village among other neighboring villages was within Khun Saroj's (alias) contracted area. As a local promoter for a processor in the Central Plains, Khun Saroj organized and supported a system of 60-80 rai of tomatoes for processing. The farmers agreed to sell him their harvests at the "prevailing price" until it reached the guaranteed minimum of ฿1/kg at which time all sales were at that price. In return, certain inputs on credit, some technical advice, and shipping crates would be provided.

Farmers in this small village (28 households) had a wide range of experience with tomato, pepper, and watermelon cultivation during the cool dry season and with rice during the rainy season. Crop buyers came from nearby villages to purchase their crops. Labor wages were generally ฿30/day for males and females during the dry season but ฿40/day (males)

and ฿30/day (females) during the rainy season. The usual yields for glutinous rice during the rainy season were 600-800 kg/rai.

The condition of the villagers' houses was quite good with 11 percent having been newly constructed within the past three years. Two farmers owned and rented out power tillers. The most frequently mentioned land values for this village were ฿10,000-12,000/rai. In summary this village was moderately well-to-do, located within 1 1/2 kilometers of a major all-weather road to the provincial capital, and received canal irrigation for a large part of the cool dry season.

Cultivation practices began with the nursery bed plantings in early December. After 25-35 days of growth, the seedlings were planted in the field with two rows per bed. Irrigation was usually done by letting water into the field and using a "Kajoe" or dipper to put the water near the plant every four days to one week while one top dressing of fertilizer, application of pesticides every seven to ten days for eight or nine times (including hormones) and intertillage/weeding once at 15 days or one month after transplanting were fairly common practices. Family male labor did the largest share of those field operations. During the 1 1/2 month harvest period, the tomatoes were usually picked every other day (12-15 times) and taken to the farmer's house for repacking in the buyers crates or baskets.

The local promoter bought most of the output of these seven farmers, although two farmers sold to a local factory. The terms of trade included either cash on delivery, or a week or two delayed payment with no complaints of non-payment. The buyers generally picked up the crates at each farmer's house, thus the farmer did not incur any transportation costs except movement of the harvest from the field to the house (two

baskets on the ends of a carrying stick). Most farmers received a range of four or more prices for their harvest, however, the two who sold to the factory received only one price (฿.80/kg or ฿1/kg). Although more than one buyer was apparently active in this location, the local promoter's system was prevalent.

Tomato cultivation was apparently quite profitable whether considering returns to all costs or those beyond cash costs, i.e., ฿401 and ฿1,790, respectively (Table A-3). Average cash costs of ฿997 were 42 percent of the total cost with chemical fertilizers being the major cash cost (26 percent of total costs). These crops were cultivated on rather small fields (0.25-2 rai with 1 rai mode) with considerable use of labor. With an average farm size of 10.5 rai (4.25-16 rai range), the tomato fields were a relatively small part of their farm. The wide range of yields (800-4,800 kg/rai) reflected considerable variation among farmers. Variations in the number of users and non-users of cash inputs were also noted by a comparison of the average costs for the whole sample to the average costs for the farmers incurring that cost, particularly regarding hired labor, rented power source, and the purchase of organic fertilizers.

The structure of labor use (Table A-4) emphasized the heavy labor input for irrigation and harvest activities and the preference for family versus hired labor use per farmer. Land preparation required the most use of hired labor. Intensive use of mostly family labor constrained the field size for tomato cultivation. As one cultivator notes, his attempt to grow two rai of tomato during his first year resulted in losses due to limited time available to properly manage and work in the crop. But his second year with only 1 rai suited his available management and labor time and resulted in a profitable crop.

Table A-3

The Structure of Production Costs and Returns per Rai of Processing Tomatoes in Ban Ta, Chiang Mai Province, 1979/80

Cost Items	Averages of Total Sample		Averages of Farmers Incurring That Cost
	(฿)	(%)	(฿)
Cash:			
Labor	84	(4)	339
Power Source	66	(3)	92
Seed	68	(3)	68
Pesticide	95	(4)	95
Fertilizer:			
Inorganic	638	(26)	638
Organic	36	(1)	250
Water Fee	10	(1)	10
Subtotal	997	(42)	1,492
Non-Cash:			
Labor	1,182	(49)	1,182
Fertilizer:			
Organic	141	(6)	198
Power Source	27	(1)	95
Interest on Capital	39	(2)	55
Subtotal	1,389	(58)	1,530

Total Costs: ฿ 2,386 (100)
Revenue: ฿ 2,787
Net Return:
(all costs) ฿ 401
(cash costs) ฿ 1,790
Yield 800-4,800 kg range, 2,293 kg average
Prices Received: ฿ 0.80-2.50/kg
Varieties: Chailar or Apple

Prior Crops in Field: Rice (4), Soybean (1), Tobacco (1)
Power Sources: Buffalo and Tiller
Field Sizes: 0.25-2 rai, 1 rai mode
Production Experience: 1-5 years, 2.7 years average

Table A-4

The Structure of Labor Use per Rai of Processing Tomatoes in Ban Ta, Chiang Mai Province, 1979/80

Cultivation Practices	Averages of Total Sample			Averages of Farmers Performing That Practice		
	Hired	Family	Total	Hired	Family	Total
	Person/Hours					
Nursery	0	10.2	10.2	0	10.2	10.2
Land Preparation	9.3	21.0	30.3	21.7	24.5	46.2
Transplant	.9	29.3	30.2	6.0	29.3	35.3
Fertilize	0	30.8	30.8	0	30.8	30.8
Spray	1.1	20.5	21.6	8.0	20.5	28.5
Intertill and/or Weed	0	22.3	22.3	0	26.0	26.0
Irrigate	0	152.8	152.8	0	152.8	152.8
Harvest	7.2	136.8	144.0	50.4	136.8	187.2
Total	18.5	423.7	442.2	86.1	430.9	517.0

"Ban Tongpun" (Case II)

Further south of Ban Ta in Amphur Chom Tong is Ban Tongpun, about 35 kilometers from Chiang Mai City. This village consisted of two parts stretched along an interior road beside the local irrigation canal. A large tomato wholesaler from the Chiang Mai Wholesale Market had a special purchase arrangement with several local cultivators. The wholesaler supplied a particularly good imported variety of seed, delivered

fertilizer on a cash basis, and purchased the cultivators' harvests at the "prevailing" market price.

Farmers in this medium-sized village (over 50 households) had a long history of vegetable cultivation which included large scale onion production for several years before switching to tomatoes due to declining onion prices. Since 3-4 village households owned small pickup trucks, they also served as crop buyers during the main harvest seasons. Labor wages were generally ฿30/day (male) and ฿25/day (female) during the dry season, and ฿40/day (male) and ฿30/day (female) during the rainy season. The usual yields for glutinous rice during the rainy season were 500-600 kg/rai.

The condition of the villagers' houses was good with several constructed within the past few years. Few farmers owned and rented power tillers but several used their own pumpsets. Land values for their irrigated plots were in excess of ฿10,000/rai. In summary, this village was moderately well-to-do, within less than 1/2 kilometer of a major all-weather road, and received limited amounts of canal irrigation during the early part of the dry season.

Cultivation practices were similar although planting times differed according to early versus late planting schemes, i.e., nurseries planted in early November versus early January. After 30-40 days of growth, the seedlings were planted in the field with two rows per bed. Furrow irrigation once a week, 2-3 top dressings of chemical fertilizers, application of pesticides every 7 to 10 days for 7 to 10 times (including hormones), and intertillage/weeding twice before the harvest period were common practices. Family male labor was very prevalent in these field operations. During the 1 1/2 month harvest periods, the tomatoes were

picked (7 to 10 times) in baskets and taken to the farmer's house for repacking in the buyer's baskets. One problem was the ineffectiveness of some locally purchased pesticides to kill insects.

Although a large tomato wholesaler bought from several of these ten farmers, several other buyers came to this village, such as nearby retailers, middlemen from Mae Jo and San Pa Tong areas, and farmer-merchants living in this village. Each of the three local farmer-merchants had distinct ways of gaining farmer commitment, i.e., one provided inputs (cash basis) and paid farmers at the "market price," another provided inputs on credit and the farmer repayed from the amount of output sold to this buyer at the "market price," and the third offered inputs on credit and farmers repayed from the output sold to this buyer at the "market price" to a minimum guaranteed price of ฿.80/kg. However, the terms of trade included delayed payments of 30 days to 2 months by all buyers, a few of which still had not paid some farmers several months after picking up the tomatoes at the farmer's house. Marketing costs for the farmers usually did not extend beyond his house where the buyers picked up the crates or baskets of tomato. A few farmers only received one or two prices for their tomatoes but most received three or more prices which steadily decreased over time. A frequently mentioned problem was the non-payment of a local factory for the tomatoes collected a couple of years ago. As can be noted above, there were a variety of sales arrangements for this village of tomato growers.

Tomato cultivation was quite profitable both in terms of returns above all costs or those beyond cash costs, i.e., ฿1,032 and ฿2,428, respectively (Table A-5). Average cash costs of ฿898 were only

Table A-5

The Structure of Production Costs and Returns per Rai of Processing Tomatoes in Ban Tongpun, Chiang Mai Province, 1979/80

Cost Items	Averages of Total Sample (฿)	(%)	Farmers Incurring That Cost (฿)
Cash:			
Labor	203	(9)	647
Power Source	10	(.5)	50
Seed	60	(2)	60
Pesticide	129	(6)	129
Fertilizer:			
Inorganic	445	(19)	445
Organic	41	(2)	207
Water Fee	10	(.5)	10
Subtotal	898	(39)	1,548
Non-Cash:			
Labor	1,314	(58)	1,314
Fertilizer:			
Organic	34	(1)	38
Power Source	15	(1)	50
Interest on Capital	33	(1)	51
Subtotal	1,396	(61)	1,453

Total Costs: ฿ 2,294 (100)
Revenue: ฿ 3,326
Net Return:
(all costs) ฿ 1,032
(cash costs) ฿ 2,428
Yield 2,000-5,000 range, 3,326 kg average
Prices Received: ฿0.50-3.00/kg, mode ฿1/kg
Varieties: "J" and VF134

Prior Crops in Field: Rice (7), Cucumber (1)
Power Sources: Buffalo and Hoe
Field Sizes: 0.5-2 rai, 2 rai mode
Production Experience: 1-6 years, 4.1 year average

39 percent of total costs with chemical fertilizers being the major cash cost (19 percent of total costs). These crops were cultivated on rather small fields (0.5-2 rai with a 2 rai mode) with a large amount of labor. Since the average farm size for these farmers was 9 rai (1.5 rai to 22 rai range), the tomato fields were especially small. The moderate range of yields (2,000-5,000 kg/rai) was influenced by several years of experience with tomato cultivation (1-6 years with a 4.1 year average). The very wide range of prices was typical for tomato growers who sold most of their harvests in the fresh market. The variations in users and non-users of particular cash inputs were evident for hired labor, power source, and the purchase of organic fertilizers.

The structure of labor use (Table A-6) indicated hired labor use for several types of cultural practices but mostly related to land preparation and harvesting. The variation between the total sample average and the average of farmers performing a particular practice showed that relatively few farmers employed hired labor other than for land preparation and harvesting. The construction of beds on which to plant the seedlings required considerable labor as did harvest and irrigation practices.

Table A-6

The Structure of Labor Use per Rai of Processing Tomatoes in Ban Tongpun, Chiang Mai Province, 1979/80

Cultivation Practices	Averages of					
	Total Sample			Farmers Performing That Practice		
	Hired	Family	Total	Hired	Family	Total
	Person Hours					
Nursery	.6	5.0	5.6	6.0	5.0	11.0
Land Preparation	16.8	42.9	59.7	33.7	47.7	81.4
Transplant	.6	16.1	16.7	6.0	16.1	22.1
Fertilize	0	12.6	12.6	0	12.6	12.6
Spray	1.6	33.4	35.0	16.0	33.4	49.4
Intertill and/or Weed	0	32.0	32.0	0	32.0	32.0
Irrigate	0	100.2	100.2	0	100.2	100.2
Harvest	31.5	178.2	209.7	105.0	178.2	283.2
Total	51.1	420.4	471.5	166.7	425.2	591.9

Northeastern Tomato Growers

"Ban Yoi Hai" (Case A)

In the tomato production areas of Sri Chiang Amphur about 60 kilometers west of the provincial capital of Nong Khai in Northeast Thailand, there were two basic cultivation conditions, i.e., the banks and shoulders of the Mekong River and the rice paddy land further away

from the river. Villagers in Ban Yoi Hai represent the former and Ban Pan Pran the latter condition.

In Ban Yoi Hai tomato seedlings were planted as early as September on the river banks as the river receded. As described in the previous case study of tomato processors the early harvests of these river bank crops earned premium prices since most of their harvests were sold by factory managers and crop buyers to the Bangkok and Malaysia wholesalers.

Farmers in this village of 38 households had extensive experience in vegetable cultivation during the cool dry season. Crop buyers both lived in this village and came from nearby cities to buy a wide array of vegetables as well as tobacco. Some interviewees said that labor wages were similar in the rainy and dry seasons at ฿40/day (male) and ฿30/day (female), but others contended that the lack of employment during the dry season resulted in substantial seasonal out-migration of males during the dry season and consequently meant a ฿30/day wage for both males and females during that season. The usual yields of rice during the rainy season were 300-500 kg/rai with periodic flooding causing yield losses.

The condition of the villagers' houses varied considerably with some apparently damaged by high water with 15-20 percent constructed within the past three years. Few farmers owned power tillers. The most frequently mentioned land values were ฿10,000/rai with up to ฿40,000/rai for prime river bank areas. In summary, this village was moderately well-to-do depending on the flood conditions of the river, situated on the major all-weather road to the provincial capital over 60 kilometers away, and received water from the Mekong River as needed.

Cultivation practices were somewhat similar but varied by level of inputs. The nursery beds were planted in early September or October and after 30-45 days of growth, the seedlings were transplanted in holes along the river banks. A mixture of compost and chemical fertilizers was placed in the holes before transplanting the seedlings. Sprinkling cans or plastic hoses were used to water each plant a few times until its root system tapped the water table under the silty soil. Two to three top dressings of fertilizer, 4-9 applications of pesticide every week to ten days, and a hilling up around the plants to support the plants in single rows were common practices. Female laborers (hired and family) performed the largest share of work on this crop. During the 30-60 day harvest period the crop was harvested at irregular intervals every four to seven days and carried to the farmer's house for repacking in the buyer's baskets or crates.

The tomato buyers mainly consisted of the two processors and the large crop buyer from Nong Khai City. With each competing for the growers' harvests the terms of trade were quite similar, i.e., provision of crates to the farmer, collection of the full crates from the farmer's house, payment within 2-5 days after collection of the tomatoes, and prices corresponding to the "prevailing market price." Most of these seven tomato growers received three or more different prices for their harvests. No one mentioned any serious problems with this crop or the buying arrangements.

Tomato cultivation was extremely profitable due to two important reasons; 1) from a cultivation perspective the fertile, changing silty soils of the river bank did not seem to harbor much disease or many insects because of flooding each year and also water was drawn up through

these soils such that minimal irrigation was needed (thereby reducing pesticide and irrigation costs significantly) and 2) from a marketing perspective, the exceptionally early harvests earned premium prices ranging up to ฿11/kg. The net return of ฿2,544/rai included all costs with ฿3,793 above cash costs (Table A-7). Both labor and chemical fertilizers were important sources of cash costs at 15 percent of total costs each. And unlike most other areas the field sizes were especially large, ranging from 2-10 rai and averaging 4.9 rai. Relative to an average farm size of 20.9 rai (4-40 rai range), these fields were not so large. The range of yields was moderately wide from 1,667 to 5,000 kg/rai and averaged 3,074 kgs/rai, yet considering their breadth of tomato cultivation experience (10-35 years with a 17.1 year average) one could expect more similarity in yields. The variation between the number of users and non-users of particular cash inputs centered around the extent of hired labor used and sources of seed, i.e., received free from certain buyers or bought it themselves. As mentioned above the level of labor costs (hired and family) was quite low due to the nature of the cultivation condition.

The structure of labor use (Table A-8) emphasized the unique method of transplanting in this situation because as the river receded plantings would occur regularly on the new dry areas as described above. Very little land preparation was needed. In a few weeks the sand was drawn up into small beds to support the new plants' growth. After a couple of initial irrigations the plants no longer needed surface water but drew upon the ample supply of underground water. With the relatively large areas involved, considerable hired labor was used. In fact, there

Table A-7

The Structure of Production Costs and Returns per Rai of Processing Tomatoes in Ban Yoi Hai, Nong Khai Province, 1979/80

Cost Items	Averages of Total Sample (฿)	Total Sample (%)	Farmers Incurring That Cost (฿)
Cash:			
Labor	354	(15)	808
Power Source	121	(5)	121
Seed	20	(1)	140
Pesticide	95	(4)	95
Fertilizer:			
Inorganic	332	(15)	332
Organic	95	(4)	95
Water Fee	30	(1)	52
Subtotal	1,047	(45)	1,643
Non-Cash:			
Labor	1,093		1,093
Fertilizer:			
Organic	---		---
Power Source	---		---
Interest on Capital	36	(2)	56
Miscellaneous	120	(5)	140
Subtotal	1,249	(55)	1,289

Total Costs: ฿ 2,296 (100)
Revenue: ฿ 4,840
Net Return:
(all costs) ฿2,544
(cash costs) ฿3,793
Yield 1,667-5,000 kg range, 3,074 kg average
Price Received: ฿1-6/kg, mode ฿1.50/kg
Varieties: Roma and VF134

Prior Crops: Tobacco (3), Corn (2), Local Tomato (3), Pumpkin (1)
Power Source: Power Tiller
Field Sizes: 2-10 rai, 4.9 rai average
Production Experience: 10-35 years, 17.1 years average

Table A-8

The Structure of Labor Use per Rai of Processing Tomatoes in Ban Yoi Hai, Nong Khai Province, 1979/80

Cultivation Practices	Averages of Total Sample			Averages of Farmers Performing That Practice		
	Hired	Family	Total	Hired	Family	Total
	---------- Person Hours ----------					
Nursery	1.1	5.0	6.1	8.0	5.0	13.0
Land Preparation	4.1	21.0	25.1	14.4	21.0	35.4
Transplant	12.0	43.9	55.9	42.0	43.9	85.9
Fertilize	0	17.7	17.7	0	17.7	17.7
Spray	10.2	14.2	24.4	23.8	19.9	43.7
Intertill and/or Weed	16.0	27.2	43.2	37.3	27.2	64.5
Irrigate	0	28.3	28.3	0	28.3	28.3
Harvest	38.8	155.2	194.0	67.9	155.2	223.1
Total	82.2	312.5	394.7	193.4	318.2	511.6

appeared to be an under-recording of labor use for a few farms but that could not be confirmed.

"Ban Pan Pran" (Case B)

This village of Pan Pran, part of the Amphur Sri Chiang Mai, was located in the major production area for processing tomatoes (between 8-10,000 rai in 1980/81 period). Its farmers were members of the supply

groups for the local processors and the major crop buyer in this area. Because they grew processing tomatoes in their rice fields after the rice harvest, their tomato harvests were relatively late in the season, consequently earning lower prices than the river bank farmers in nearby Yoi Hai village.

Farmers in this large village with over 250 households had some previous experience with tomato cultivation ranging from 2 to 6 years with a 3.8 year average. Crop buyers were from as far away as Nong Khai City and were particularly interested in rice, tobacco, and various vegetables, including tomatoes. Labor wages were generally ฿40/day (male) and ฿30/day (female) during the wet season and ฿30/day (male and female) during the dry season.

The condition of the village (town) reflected a recent stagnation in growth since the closure of the border with Laos, yet there were signs of considerable previous activity. The most frequently mentioned land values of ฿20,000/rai may have been more a reflection of proximity to a population center than to productive capacity of the land itself. Several types and sizes of vehicles were owned and operated out of this village. In summary, this large village was the hub of various non-farm and farm activities, located on the major all-weather road leading to the provincial capital and received canal irrigation for a large part of the cool dry season.

Cultivation practices began in early November or December with the nursery bed and generally followed a pattern similar to that for tobacco cultivation. The fields were plowed and harrowed (sometimes in both directions), and holes dug in straight lines. After about 30-40 days of growth, the seedlings were transplanted into those holes and after 2-3 days a mixture of compost/chemical fertilizers were placed at the base

of the plants. Then within a couple of weeks the soil was pulled up around the base of the plants to form single row beds of tomato plants. Watering was done in a variety of ways and frequencies, including furrow and sprinkling can irrigation from 4 to 25 times. Usually 2-3 top dressings of chemical fertilizer, several applications of pesticides (almost every week) and very little intertilling or weeding were done. Slightly more male than female labor was used for those field operations. The tomatoes were picked every 5-6 days for 5 or more times and carried to the farmer's house where they were repacked in the buyer's baskets and crates. A cultivation problem sometimes encountered was the holes eaten into the near ripe tomatoes by worms, thus reducing marketable yields.

The factory buyers for these five tomato growers were somewhat less solicitous than for the growers in the nearby river bank areas. Although the terms of trade were substantially the same, these growers were paid 5 to 10 days after the buyers picked up their tomatoes and generally received one or two different prices (none above the guaranteed price of ฿1.50/kg but some below that price). However, the good yields and prices above ฿1/kg were no problem that year but concern was expressed about the following year's ฿1/kg guaranteed price.

Tomato cultivation was quite profitable both in terms of returns above all costs (฿766) and beyond cash costs (฿1,956) (Table A-9). Average cash costs of ฿2,102 were 64 percent of total costs with heavy expenditures on labor, chemical fertilizers, and pesticides, (23%, 15%, and 13% of total costs, respectively). The tomato field sizes were quite large, ranged from 3-6 rai, and had a mode of 4 rai. And with an average farm size of 6.7 rai (5 to 10 rai range), those fields consisted of most

Table A-9

The Structure of Production Costs and Returns per Rai of Processing Tomatoes in Ban Pan Pran, Nong Khai Province, 1979/80

Cost Items	Averages of Total Sample (฿)	(%)	Farmers Incurring That Cost (฿)
Cash:			
Labor	763	(23)	1,299
Power Source	88	(3)	110
Seed	170	(5)	170
Pesticides	411	(13)	411
Fertilizer:			
Inorganic	490	(15)	490
Organic	73	(2)	183
Water Fee	107	(3)	107
Subtotal	2,102	(64)	2,770
Non-Cash:			
Labor	1,034	(31)	1,293
Fertilizer:			
Organic	90	(3)	225
Power Source	--		---
Interest on Capital	66	(2)	81
Subtotal	1,190	(36)	1,599
Total Costs:	฿ 3,292	(100)	Prior Crops in Field: Rice (5)
Revenue:	฿ 4,058		
Net Return:			Power Source: Power Tiller and Hoe
(all costs)	฿ 766		
(cash costs)	฿ 1,956		Field Sizes: 3-6 rai, 4 rai mode
Yield 2,222-3,763 kg range, 3,151 average			Production Experience: 2-6 years, 3.8 years average
Prices Received: ฿0.75-1.50/kg, mode ฿1.50/kg			
Varieties: Roma and VF134			

of the farmer's available land area. The narrow range of yields (2,222-3,763 kg/rai) reflected similarity in cultivation practices and experienced commercial farmers with some experience in tomato cultivation (2-6 years of experience with a 3.8 year average) as well as access to very experienced vegetable gardeners in Yoi Hai. The major variations in the number of users and non-users of cash inputs were for hired labor and purchased organic fertilizers. Most farmers liberally used all types of cash inputs in order to handle such relatively large areas in tomato.

The structure of labor use (Table A-10) identifies the relatively even distribution of labor use among the various cultural practices except for the considerable labor needed to convert the flat rice paddy fields into the large beds similar to those used in tobacco cultivation. The availability of adequate amounts of irrigation water from the small system they had in place allowed for infrequent farrow irrigation which held irrigation labor time to a minimum. As various knowledgeable sources noted, these farmers were experienced with the labor intensive cultivation of tobacco and adapted that method to the cultivation of processing tomato with a minimum of change. Consequently, the cultivators technical capabilities, accustomed use of cash inputs, input and market support by the processors, and local soil fertility led to a rapid and profitable transition to processing tomato cultivation.

"Ban Kong Bo" (Case C)

In this tomato cultivation area of Amphur Nonbua Lampoo, over 70 kilometers west of Udon Thani City, there was a set of 5-6 small to medium-sized villages arrayed along a small river. These villages were

Table A-10

The Structure of Labor Use per Rai of Processing Tomatoes in Ban Pan Pran, Nong Khai Province, 1979/80

Cultivation Practices	Averages of Total Sample			Averages of Farmers Performing That Practice		
	Hired	Family	Total	Hired	Family	Total
	Person Hours					
Nursery	1.6	4.0	5.6	4.0	4.0	8.0
Land Preparation	18.0	75.6	93.6	30.0	94.5	124.5
Transplant	20.9	34.5	55.4	34.8	34.5	69.3
Fertilize	0	10.3	10.3	0	10.3	10.3
Spray	14.3	8.0	22.3	23.8	10.0	33.8
Intertill and/or Weed	2.2	1.4	3.6	5.6	3.5	9.1
Irrigate	.9	49.6	50.5	4.6	49.6	54.2
Harvest	118.2	78.8	197.0	197.0	98.5	295.5
Total	176.1	262.2	438.3	299.8	304.9	604.7

said to have between 600-700 rai in tomato during the 1980/81 season. This rural area was generally isolated from much of the economic and market activities found nearer the provincial capital of Udon Thani. A medium-sized processor had stationed some of his staff in this village in order for them to promote tomato cultivation among hundreds of local farmers within this and the neighboring 4-5 villages whose land was near the river. The considerable distance over pot-holed dirt roads and long ride by all-weather road to Udon Thani City make market access minimal,

thus few perishable cash crops were grown in this area, especially during the dry season. The processor's guarantee of ฿1.50/kg for processing tomato plus free supply of seed and the processor's vehicles for transporting the harvests induced farmers to try this crop.

Farmers in this village of over 50 families had little previous experience growing vegetables except for some garden plots of cabbage and peppers. Usually after the rainy season rice crop, livestock and a few up-land crops such as cassava were the major sources of farm income. Crop buyers occasionally came from nearby villages to purchase their crops. Labor wages were generally ฿30/day for males and females during both the wet and dry seasons; however, due to the considerable amount of slack labor during the dry season few farmers ever hired labor, even for less than ฿20/day. The usual yields for glutinous rice were low at 250-300 kg/rai and very uncertain since floods during the rainy season caused considerable damage to their rice crops.

The condition of the village houses was very poor with less than 5 percent having been built within the past three years. Practically no machinery of any type was owned by the villagers and the few pumpsets that were owned were seldom used due to the costs and inconvenience of transporting fuel. Electricity had not yet arrived in this area. The most frequently mentioned land values for this village were ฿2,000-3,000/rai with relatively few sales within the recent past. In summary, this village was poor, located 3 kilometers from a pot-holed dirt road which led to the amphur town over 20 kilometers away, and received no canal water during the dry season.

Cultivation practices varied considerably among these tomato growers who planted their nurseries sometime in November or December. After

20-40 days of growth, the seedlings were planted in the field with 2 or 3 rows per bed. Water from sprinkling cans was applied in the early morning and/or evening every day for 100 to 120 days. Two to three top dressings of fertilizer, 10-12 applications of pesticides, and inter-tillage/weeding at least once before the harvest period were common practices. Female family labor did the bulk of the field operations. Every other day or so for 30-45 days the tomatoes were picked in baskets and taken to the farmer's house for repacking in the processor's crates. Few cultivation problems were mentioned for this "in season" crop of tomatoes.

The processor was the major buyer for these tomatoes. The terms of trade guaranteed ฿1.50/kg, yet in practice the processor paid only ฿1.20/kg near the end of the season. Most payments were made two weeks to one month after the crates (supplied by the factory) were picked up from the farmer's house and transported to the factory in the processor's trucks. In general, the seven farmers found this buying arrangement satisfactory.

Tomato cultivation earned no significant returns above all costs of production but earned considerable returns above cash costs, i.e., ฿12 and ฿2,511, respectively (Table A-11). Average cash costs were extremely low at ฿267 and consisted of 10 percent of total costs. These crops were cultivated on small to medium-sized fields (0.5-3.5 rai with a 2 rai mode) and used considerable labor. Although the average farm size was 29 rai (12-75 rai range), the lack of water made the tomato fields quite valuable to the farmers. The wide range of yields (500-4,000 kg/rai) were expected for these inexperienced growers with widely varying field conditions, especially type of field (upland versus bounded paddy field) and proximity to the small river. At this extremely low level of cash

Table A-11

The Structure of Production Costs and Returns per Rai of Processing Tomatoes in Ban Kong Bo, Udon Thani Province, 1979/80

Cost Items	Averages of Total Sample (฿)	(%)	Farmers Incurring That Cost (฿)
Cash:			
Labor	0		0
Power Source	0		0
Seed	0		0
Pesticide	84	(3)	84
Fertilizer:			
Inorganic	150	(5)	150
Organic	24	(1)	56
Water Fee	0		0
Miscellaneous	9	(1)	16
Subtotal	267	(10)	306
Non-Cash:			
Labor	2,351	(84)	2,351
Fertilizer:			
Organic	51	(2)	60
Power Source	10	(1)	35
Interest on Capital	11	(1)	12
Miscellaneous	100	(4)	100
Subtotal	2,523	(90)	2,558
Total Costs:	฿ 2,790	(100)	
Revenue:	฿ 2,778		
Net Return:			
(all costs)	฿ 12		
(cash costs)	฿ 2,511		
Yield 500-4,000 kg range, 2,380 kg average			
Prices Received: ฿1-1.50/kg, mode ฿1.50			
Variety: Roma			
Prior Crops: Rice (7)			
Power Source: Buffalo and Hoe			
Field Sizes: 0.5-3.5 rai, 2 rai mode			
Production Experience: 1-2 years, 2 year mode			

inputs there was little difference between the number of users and non-users of particular cash inputs.

The structure of labor use (Table A-12) reflected the farmers' exclusive use of family labor and difficulties getting water to the tomato plants growing on dispersed plots of land along the small river. Mornings and evenings were spent filling sprinkling cans and watering their tomato crops. The distance of their fields from the village and multiple harvests required considerable time for harvesting.

Table A-12

The Structure of Labor Use per Rai of Processing Tomatoes in Ban Kong Bo, Udon Thani Province, 1979/80

Cultivation Practice	Averages of					
	Total Sample			Farmer Performing That Practice		
	Hired	Family	Total	Hired	Family	Total
	Person Hours					
Nursery	0	9.2	9.2	0	9.2	9.2
Land Preparation	0	48.9	48.9	0	48.9	48.9
Transplant	0	21.1	21.1	0	21.1	21.1
Fertilize	0	13.0	13.0	0	13.0	13.0
Spray	0	22.6	22.6	0	22.6	22.6
Intertill and/or Weed	0	14.3	14.3	0	14.3	14.3
Irrigate	0	461.3	461.3	0	461.3	461.3
Harvest	0	236.9	236.9	0	236.9	236.9
Total	0	827.3	827.3	0	827.3	827.3

From several interviews in a village further interior it was learned that the amount of land that villagers farmed above the "flood plain" determined their relative prosperity. Villagers in that interior village were more prosperous than those in Kong Bo because unlike Kong Bo farmers, they had at least some area above the flood plain and thus were not subject to such regular flood damage.

"Ban Muang Peng" (Case D)

In this vegetable growing village of Muang Peng, approximately 15 kilometers east of Khon Kaen City, several farmers were enticed to supply tomatoes to a nearby processor. Although the village was close to the factory, it was also close to the main vegetable wholesale market in that area and its farmers were accustomed to growing vegetables for the fresh market. Thus, the price of fresh market tomatoes was constantly compared to the processor's lower price as well as comparisons of returns to the processing tomato crop relative to returns to competing fresh market vegetables. Since their cultivation corresponded to the year of the disasterous surge in tomato arrivals (induced by weather conditions) at the factory, this village effectively discontinued tomato cultivation after that season. However, the structure of its costs merits attention due to its location and continuing involvement with vegetable cultivation.

Farmers in this large village of about 185 households had limited experience in tomato cultivation but extensive experience in the cultivation of a wide range of vegetables, such as small onion and Chinese mustard during the dry season due to access to small ponds near the village. No local farmer was considered a crop buyer, but the presence

of several small vehicles in the village allowed local farmers to ship their produce directly to the wholesale market on a daily basis. The labor wages were generally ฿30/day (male) and ฿20/day (female) during the dry season and ฿5-10/day higher during the rainy season. However, during our interview period most of the male laborers were working for a government work project which was said to pay over ฿50/day thus few eligible male laborers were available at the aforementioned general wage scale.

The village was a mix of prosperous and not so prosperous looking houses with about 12 percent of the houses constructed within the past three years. That may have reflected the distribution of households with access to the pond water during the dry season and those without that vegetable production option but reliance on such low value crops as cassava. The most frequently mentioned land values for this village were ฿5,000-6,000/rai. In summary, this village displayed a wide range of household conditions within 2 kilometers of a major all-weather road to the nearby provincial capital, and relied on ponds or streams to water small vegetable plots during the dry season.

Cultivation practices were begun with the formation of a nursery bed in early December. Prior to transplanting the seedlings a mixture of compost and chemical fertilizer was placed in holes dug near the rice stubble on the flat paddy field. Then, after 25-35 days of growth, the seedlings were transplanted in composted holes. Every day the plants were watered with sprinkling cans in the early morning and evening hours, while one or two light top dressings of chemical fertilizer, application of pesticides every 10 days or so for 4-6 times, and little, if any, intertillage/weeding before the harvest period were the common

cultivation practices. Female family labor was mostly used in these field operations. During the 1 1/2 month harvest period, the tomatoes were picked in baskets every 2-3 days and taken to the farmer's house for repacking in the buyer's crates.

The only buyer for this crop was the nearby factory which had promoted tomato production in this area with a contract price of ฿1.50/kg. The four farmers had to arrange and pay for transportation of their harvests to the factory which paid ฿1.20/kg (including ฿.20/kg for transportation expense and ฿1/kg for the tomatoes) in cash. The farmers complained about both the low price and the occasional delays in the arrival of crates which hampered their harvest activities.

Tomato cultivation was not particularly profitable whether considering returns to all costs or those beyond cash costs, i.e., ฿693 and ฿1,294, respectively (Table A-13). Average cash costs of ฿506 were only 20 percent of total costs with chemical fertilizers being a major cash cost (11 percent of total costs). The tomato crops were cultivated on small plots (0.25-1 rai with a 1 rai mode) with considerable amounts of family labor. With an average farm size of 8 rai (6-11.5 rai range) and very limited water available, the tomato field was not that small in relative terms. The very wide range of yields (300-3,600 kg/rai) reflected much variation in individual farmer yields due to the limited experience and "trial" basis of this new crop. Those latter points explained the especially low cash costs for this crop and limited variations in the number of users and non-users of cash inputs.

The structure of the labor use (Table A-14) emphasized the heavy and concentrated labor input in irrigation. All growers watered the crop by a family member using two sprinkling cans each day for a couple

Table A-13

The Structure of Production Costs and Returns per Rai of Processing Tomatoes in Muang Peng, Khon Kaen Province, 1979/80

Cost Items	Averages of Total Sample (฿)	(%)	Farmers Incurring That Cost (฿)
Cash:			
Labor	0		0
Power Source	0		0
Seed	0		0
Pesticide	77	(3)	77
Fertilizer:			
Inorganic	297	(11)	297
Organic	12	(1)	50
Water Fee	0		0
Miscellaneous	120	(5)	120
Subtotal	506	(20)	544
Non-Cash:			
Labor	1,819	(73)	1,819
Fertilizer:			
Organic	48	(2)	63
Power Source	0		0
Interest on Capital	20	(1)	22
Miscellaneous	100	(4)	100
Subtotal	1,987	(80)	2,004
Total Costs:	฿ 2,493	(100)	
Revenue:	฿ 1,800		
Net Revenue:			
(all costs)	฿ 693		
(cash costs)	฿ 1,294		
Yield 300-3,600 kg range, 1,800 kg average			
Prices Received: ฿ 1/kg			
Varieties: Roma			
Prior Crops in Field: Rice (2), Vegetables (1), Small Onion (1)			
Power Source: Hoe			
Field Sizes: .25-1 rai, 1 rai mode			
Production Experience: 1 year			

Table A-14

The Structure of Labor Use per Rai of Processing Tomatoes in Ban Muang Peng, Khon Kaen Province, 1979/80

Cultivation Practices	Averages of					
	Total Sample			Farmers Performing That Practice		
	Hired	Family	Total	Hired	Family	Total
	---------- Person Hours ----------					
Nursery	0	2.2	2.2	0	2.2	2.2
Land Preparation	0	25.9	25.9	0	25.9	25.9
Transplant	0	47.5	47.5	0	47.5	47.5
Fertilize	0	20.5	20.5	0	20.5	20.5
Spray	0	15.4	15.4	0	15.4	15.4
Intertill and/or Weed	0	0	0	0	0	0
Irrigation	0	352.0	352.0	0	352.0	352.0
Harvest	-	114.5	114.5	0	114.5	114.5
Total	0	578.0	578.0	0	578.0	578.0

of hours (depending on field size) in the early morning and late evening. The important point to note was that this arrangement allowed for a full day of work elsewhere during the main work hours of the day, thus supplemented rather than substituted for other employment opportunities. Also worth noting was the fact that their cultivation practices mirrored those used for the pepper crop with which they had experience rather than coincided with the factory's suggested cultivation practices. By digging a small hole in the rice stubble, field expenses for land

preparation and bed formation were reduced considerably. While reducing costs considerably, this method generally did not result in desirable yields (averages 1,800 kg/rai). The women and children of the family did most of the work for this crop.

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