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State of Washington
Department of Natural Resources *Brian J. Boyle, Commissioner*

Market Analysis and Preliminary Economic Analysis for Products of the Red Seaweed *Porphyra*

Department of Natural Resources

OLYMPIA, WASHINGTON
98504

BRIAN J. BOYL
Commissioner of Public L

June 22, 1982

To the Reader:

Under the authority of RCW 79.68.080, "The Department of Natural Resources shall foster the commercial and recreational use of the aquatic environment for the production of food...and to this end the department may develop and improve production and harvesting of seaweeds..."

Towards this end, the department has undertaken a research and development program to establish a commercial seaweed aquaculture industry utilizing the marine waters of Washington. While research is being performed to determine the biological feasibility of the commercial culture of Porphyra, and the suitability of various sites, it must be simultaneously shown that the product can be produced economically and then marketed successfully.

Hence, this market analysis and preliminary economic analysis for products of the red seaweed Porphyra has been performed for the Department of Natural Resources (Personal Services Contract #684) by Kramer, Chin and Mayo, Inc.

This analysis was designed to answer the question "Can the United States enter and compete in the market for products of the red seaweed Porphyra?" This report shows that a considerable U.S. market potential exists and that a moderate sized nori aquaculture operation can be profitable. Successful market entry and profitability will, of course, depend upon the entrepeneur.

It must be emphasized that this is a preliminary economic analysis. No nori farm yet exists in the U.S. and so the information about equipment and costs was gleened from Japanese industry expertise. However, during the next year, the operation of a DNR pilot scale farm should add more realistic cost estimates.

The use of this information in this report is at the user's own risk. DNR makes no guarantee of the accuracy or correctness of the information contained in the report. The mention of specific products does not constitute an endorsement by DNR or KCM.

This study was supported in part and performed as a regional contribution portion of Project R/A-12, Grant No. NA81AA-D-00030 from the National Oceanic and Atmospheric Administration to the Washington Sea Grant Program.

I would like to solicit comments or suggestions pertaining to improvement of the economic analysis section. These should be directed to Dr. T. Mumford, Marine Land Management Division; 753-3703.

This report has collected and analyzed information about a new potential industry for Washington. This information will allow DNR to better manage the public lands and associated marine resources of Washington and will also allow potential nori farmers and investors to evaluate their potential for nori aquaculture.

Sincerely,

Thomas F. Mumford, Jr., Ph.D.
Natural Resource Scientist III
Marine Research and Development Center

TFM:nes

MARKET ANALYSIS AND PRELIMINARY ECONOMIC ANALYSIS FOR PRODUCTS OF THE RED SEAWEED PORPHYRA

Prepared by

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Prepared for

State of Washington
Department of Natural Resources
Division of Marine Land Management

June 1982

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SUMMARY AND CONCLUSIONS

The development of seaweed culture has been recognized as offering a potential opportunity for resource utilization on State-owned tidelands. This activity is consistent with the State Department of Natural Resources' goal of encouraging commercial production of food on aquatic bedlands. This study is the first step in determining the marketability and economics of production of Porphyra seaweeds grown in intensive culture in Washington waters, which are generally recognized to be ideal for this purpose.

The initial task was to identify the specific product form to be marketed by this type of industry. A survey of current uses for Porphyra (and its by-products) which are marketed worldwide indicated that nori sheets would be the most advantageous product to market. All subsequent analyses were then based on the operational constraints of nori growing and processing ventures.

Existing and potential markets (both foreign and domestic) were surveyed to determine market objectives for a hypothetical Washington-based nori industry. A detailed analysis of the Japanese market provided a profile of activities in a well established nori market, and a general guide for establishing a domestic industry. The conclusion, based on these findings, is that existing domestic markets should be targeted (at least initially) by a domestic industry.

An analysis of the potential market share by the domestic industry was conducted to gauge the need for an extensive market plan. It revealed that small culture operations (e.g., 200 to 300 culture nets or saku) controlled by existing market conditions would individually have little market impact.

Hence, a detailed market plan was not necessary. Instead, a list of west coast importers and distributors was developed to aid potential small farm marketing efforts. It was found that a large culture operation (2,000 saku), on the other hand, needs to pursue a diverse marketing plan, appealing to and developing several market segments. Bulk commodities, ingredient sales, restaurant chain operations, specialty markets, and possibly mail order and supermarket sales, are the promising avenues to be explored in a diversified marketing strategy.

The study culminated with a preliminary analysis of the economics of production of different sizes of nori farms which might be established here in the Puget Sound region. Three-year cash flow proformas were prepared for 100-, 200-, 300-, and 2,000-saku farms to test the economic feasibility of the different magnitudes of operation. Given the operational assumptions that were formulated for this analysis, the 100-saku farm was determined to be infeasible at the present time. The 200-, 300-, and 2,000-saku farms would begin to show a profit in the second year of operation. This is a very promising scenario for an untested industry.

An analysis and comparison of different strategies of revenue generation for the State Department of Natural Resources concluded the study. The important comparison made was that of a yearly land lease fee of $1,000 per acre of bedlands versus an arrangement whereby the State assesses the operation on a percentage of its revenues.

I. STUDY RATIONALE AND APPROACH

Introduction

The purpose of this first phase of study was to provide an analysis which would, in its broadest sense, answer the question: "Can the United States enter and compete in the market for products of the red seaweed Porphyra?" A market analysis and preliminary economic analysis of a potential domestic nori industry is an essential first step in an overall Porphyra farming feasibility investigation. Subsequent phases of the overall study will include the operation of a demonstration nori farm, and a detailed economic analysis of a Washington-based nori operation.

Study Approach and Scope

This study involved the completion of four tasks:

Task A - Literature Search/Product Research

Task B - Analysis of Markets

Task C - Market Plan Analysis

Task D - Preliminary Economic Analysis

A portion of Task A involved an information search for data and documentation needed to conduct subsequent tasks. This began with the compilation of all pertinent DNR in-house data and reports, which consisted of a number of assorted reprints, articles, reports, and books dealing primarily with Porphyra culture. Some information covered product types, and a small amount of data was included on seaweed economics.

KCM conducted a computerized literature search utilizing three commercial bibliographic data base vendors: Lockheed's Dialog, Bibliographic Retrieval Service's BRS, and System Development Corporation's ORBIT—SDC Search Service. These vendors market on-line, interactive information query systems which are the equivalent of various hard-copy literature indexes. These three vendors provided access to computerized literature searches in approximately 160 data bases.

This literature search generated several bibliographies, in computer print-out format, on specific subject key words. The key words utilized for this study included the following:

seaweed		marketing
red seaweed	crossed	economics
nori	with	farming
Porphyra		mariculture
laver		aquaculture
		feasibility
		production
		industry

Study researchers reviewed the bibliographies produced and requested specific items which related to the project. Paper or microform copies of requested research literature were obtained by way of:

1. Direct use of area and state libraries, including the University of Washington, Seattle Public, and the Washington State Library systems, plus other specialized resources.

2. Direct use of out-of-state libraries, utilizing the CLASS (California Library Authority for Systems and Services) network of libraries. Located by computer and telex, a specific reference is requested through interlibrary loan by way of electronic mail interlibrary loan systems.

3. Worldwide loans utilizing the Pacific Northwest Bibliographic Center (PNBC), an interlibrary loan service with offices on the University of Washington campus. Staffed by professional librarians, PNBC has its own telecopy, telex, and computer system for locating information sources on a worldwide basis. Materials are supplied on a fee basis, either in microform or paper copy.

4. On-line ordering capability by way of the computer vendors. The majority of the computerized bibliographic data-base vendors can supply copies of articles cited, utilizing the "on-line ordering capability."

In addition to computerized bibliographies, other reference lists were utilized as they were revealed during routine data collection efforts in documents obtained throughout the study.

The Japanese consulate in Seattle responded admirably to requests for trade data and information, providing the study team with basic information on trade organizations here and overseas.

Appropriate government agencies were contacted in the United States and in other countries, and requests were made for available data and information. In some cases, these contacts were fruitful (particularly the United States, Japan, and Korea), but more often poor statistics or no statistics were available. Some specific agencies contacted included the following:

United States	Bureau of Customs Bureau of Census Trade Administration Department of Agriculture Department of Labor Washington State Private Industry Council
Canada	Ministry of Industry Trade and Commerce (Business Information Office) Statistics Canada
Japan	Ministry of Finance Agriculture, Forestry and Fisheries Ministry Office of the Consulate General - Seattle
Korea	National Fisheries Administration - Production Bureau of Aquaculture Fisheries Section

In addition to government agencies other groups, both public and private, were contacted (see Section IV).

Recent issues of Japanese trade journals (e.g., the Nori Times) were translated (see Appendix C) to provide the study with current industry perspectives. In addition to these data sources, information was regularly provided by invited participants to three monthly workshops held throughout the course of the study. Key participants included Dr. Clinton Atkinson, international fisheries advisor and consultant; Dr. James Crutchfield, resource economist; Mr. Blake Rankin, a principal buyer for a Seattle-based health food wholesaler; Mr. Tomio Moriguchi, president of a large Asian foods importation firm; and Mr. John Merrill of the University of Washington Botany Department. These workshop participants provided advice and guidance throughout the course of this investigation in all study areas.

The second part of Task A was to conduct product research. Although this study focused on the nori industry, it was appropriate to examine the range of current and potential uses, or market forms, of Porphyra worldwide. This

product survey provided a check on the study assumption that the culture of Porphyra for human consumption should be the primary market targeted for by a domestic industry. Other potential uses which were explored included: animal feed, gums (phycocolloids), by-products (dyes, etc.), trace substances (drugs), and energy applications.

In Task B, potential markets for domestically grown Porphyra were analyzed and three market categories were defined:

- o The North American market
- o The Japanese market
- o Other international markets

Historical information was compiled in the form of United States, Japanese, and other statistics to assess market trends in the nori industry. Examination of supply and demand information, import and export trends, and other data proved useful in identifying some of the controlling market factors. An evaluation of market potential was then made for the domestic arena.

Task C of the study included an analysis of appropriate market plans, with specific market segments identified and defined. Marketing strategies appropriate to different market segments have been described. Growth potential is also addressed where appropriate.

The final task of the study (Task D) was to conduct a preliminary economic analysis. This analysis involved the selection of four operational scenarios (four sizes of seaweed farms: 100, 200, 300, and 2,000 nets, or "saku," in size) and the development of a set of operational, production, and processing assumptions for each. Proforma cash flows, including start-up costs, were generated for each scenario, for monthly expenditures

and revenues, for three years of operation. Marketing assumptions were also formulated, where appropriate, including market value of the product and estimates of the rate of revenue generation. In addition to proforma cash flows, proforma profit and loss and proforma balance sheets have been developed.

A sensitivity analysis was conducted to help determine an equitable lease arrangement for DNR lands utilized for seaweed aquaculture. This included analyzing cash flows and potential revenues over three years of operation (for the four sizes of farms) under the conditions (1) where DNR leases wetlands for $1,000 per acre per year and (2) where DNR does not charge a land lease. Specific "percentage of revenues" calculations have been provided as an alternative to direct land lease payments.

All proforma cash flow and profit and loss statements were set up on the KCM DIGICALC computer system to allow performance updating and recalculation as operational assumptions become better defined in the subsequent study phase to be conducted by DNR at their pilot farm operation in Puget Sound.

II. PRODUCT RESEARCH

Introduction

The successful development of a seaweed culture industry in the state of Washington must be geared to the production of a specific product (or products) targeted for a previously identified market. A survey was conducted of products and uses of the red seaweed Porphyra, both actual and potential. Although a fledgling seaweed industry in Washington would rely initially on existing, established markets if it were to become a profitable reality, other potential seaweed uses would provide opportunities which could be explored and developed as the domestic industry gets established.

Porphyra Chemical Constituents

The principal components of Porphyra include water, some carbohydrates (sugars or gums), quantities of protein and fat,* and ash (largely sodium and potassium). In addition to major constituents, trace elements and vitamins are also present. Bardach, et al (1972) provides the following breakdown of the nutrient composition of Porphyra (per 100 g of algal sheets):

water	11.4 g	provitamin A	44,500 IU
protein	35.6 g	vitamin B1	0.25 mg
fat	0.7 g	vitamin B2	1.24 mg
carbohydrate	44.3 g	niacin	10.0 mg
ash	8.0 g	vitamin C	20.0 mg

* Youngblood, et al (1971) found that 62 percent of the total hydrocarbons in Porphyra leucosticta were composed of a 19:5 alkene.

Chapman and Chapman (1980) provides the following comparable breakdown of principle constituents for Porphyra tenera:

water	17.1%
raw protein	25-30%
fat	0.8%
starch sugar	40.1%
ash	10.3%

Porphyra appears to be a good source of proteins. However, the degree to which the protein nitrogen is water-soluble, hence utilizable in digestion, is not certain. A figure of 21.85% for water-soluble nitrogenous substances in P. tenera has been reported by both Chapman and Chapman (1980) and Rao (1965). It is evident that Porphyra is protein-rich and much of this material is probably digestible. The nature of specific proteins has a bearing on their digestibility, as does the additional factor that people can become conditioned to these proteins with persistent use. Some data on amino acid content of P. tenera are available (Rao, 1965):

Amino Acid	% Content in Dry Algae
Tyrosine	0.662
Tryptophane	0.772
Threonine	0.464
Serine	6.568

No data were obtained regarding other amino acids which are present.

With regard to trace substances, different species of Porphyra are reported to contain various quantities of the following vitamins: A, B1, B2 (riboflavin), B12, C (certain species have more than half of this vitamin than is contained in oranges), and others. Kanazawa and Kakimoto (1958), and Kanazawa (1961) report provitamin A, thiamine (B1), riboflavin (B2), pyridoxine (B6), nicotinic acid, folic acid, biotin, lipoic acid, cobalamine

(B12), choline and ascorbic acid (C) have been found in Porphyra tenera. It has been suggested that the vitamin properties of Porphyra could provide an effective treatment for beriberi due to its B1 content (Chapman and Chapman, 1980; Bardach, et al, 1972; a review of Chemical Abstracts titles from 1947 through mid-1981.)

A recent analysis by Noda, et al. (1981) was conducted on dried Porphyra sp. to determine the tasting substances of nori from different localities in Japan. Their work indicated a number of free sugars, predominantly glucose and galactose. Eleven organic acids were also found. In addition, major mineral cations and anions detected included Na^+, K^+, Mg^{2+}, Cl^-, and PO_4^{3-}.

Some work has been done to describe the pigment content and quantities in P. tenera (e.g., Bull Soc. Sci. Fisheries, 1953). These include the substances carotene, phycocyanan, phycoerythrin, and chlorophyll. Other work describes the benefits of fertilizing growing Porphyra to increase the concentration levels of protein, lipid, carotene, thiamine, riboflavin, and cyanocobalamin (Bitamin, 1965). A UV-absorbing peptidal compound, substance "334," was isolated from Porphyra yezoensis (Sivalingam, et al, 1974; 1976; and 1976). Investigations into the substance's physico-chemical properties and physiological roles suggest that "334" may play an important role in either metabolic regulation or in temporal energy transference at some sites (e.g., UV-light absorption sites) in the photosynthetic metabolic pathway of the algae.

The iodine content of Porphyra sp. is low by comparison with other seaweeds. The average concentration is reported in several sources to be 18 parts per million, dry weight (Rao, 1965; Whistler, 1973; and Chapman and Chapman, 1980). Despite the low iodine content, Porphyra could provide treatment for

goitre problems in some areas of the world (Michanek, 1975). Porphyra could provide a double contribution as a treatment for both goitre and beriberi.

Chromatography of a lipid fraction of P. tenera gave a methanol eluant which showed some antioxidant character, similar to the now widely used BHT emulsifiers (Eiyo to Shokuryo, 1968).

Another organic compound, piperidine - 2, 6 - dicarboxylic acid (trans form), or teneric acid, has been isolated from P. tenera (Nippon Suisan Gakkaishi, 44:1371. 1978). The significance of this substance was not explained.

A number of titles in Chemical Abstracts (1947 - 1981) deal with the ability of Porphyra sp. to concentrate, in small amounts, bromine, iodine, and ruthenium. The amounts of these materials are typically insignificant, however, when compared with other industrial sources.

There is evidence that some Porphyra species have antibacterial activity. Noda and Horiguchi (1975) describe the presence of dimethylsulfide and propiothetin in Porphyra tenera. In this same seaweed, Katayama (1962) describes antibacterial action attributable to the presence of fatty acids, a carbonyl and terpenes. Katayama (1964) also identifies the activity of acrylic acid in some species of Porphyra.

Some experiments have demonstrated that Porphyra species can be used to reduce plasma cholesterol levels (Abe and Kaneda, 1972; Kaneda, et al., 1963; Abe, et al., 1967).

Overview of Current Usage

Porphyra is one of the most intensively utilized algae for human food worldwide. It is usually chopped before it is dried, and often formed into sheets which can be flavored and/or cooked. It is generally recognized as a source of assimilable carbohydrate and protein, as well as some minerals, trace elements, and vitamins (particularly A, B, and C).

Porphyra is intensively cultivated in Japan (see Section III for production figures) and other areas of the Far East, most notably South Korea (see Section IV). According to Saito (1976), *Porphyra* is cultured or gathered in some parts of Europe, North America, and South America.

Japan is one of the most important users of *Porphyra*. Typically the seaweed is processed as "nori" sheets. These may be roasted plain, or flavored (with soy sauce and spices) prior to marketing. Nori is often used as a wrapping for sushi (a rice and meat/fish or vegetable cake). In other forms of cooking, nori may be toasted or baked, then crumbled and added to soups or sauces. Table 1 provides a glossary of nori descriptions.

There has been some interest in Japan for finding new applications for nori use. Mixing low-quality nori with chicken feed has been reported recently (*Nori Times*, March 21, September 11, and November 11, 1981). It is claimed that a 3 percent mixture of powdered nori added to chicken feed makes egg shells harder, makes the yolk deeper in color and stronger, and imbues eggs with a higher calcium and iodine content. Marketable applications of this work have not yet been exploited in Japan.

TABLE 1

GLOSSARY OF NORI TERMS

aji-tsuke nori	Flavored, roasted nori often marketed in bite-size (1- by 4-inch) cellophane wrapped sheets
ao-nori	Enteromorpha (sp. and/or Ulva sp.) used as a flavoring in rice crackers (osembe) and food preparations. Usually crushed in bits or slivers, ao-nori is considered a lower-grade product than Porphyra.
bara-nori	Broken or irregular pieces of dried sheets. At the producer/processor level, bara-nori is measured and sold by weight.
fiurikake	A dried condiment or seasoning sprinkled over rice, often containing bits or slivers of either nori or ao-nori. Other ingredients can include bonito, sesame seeds, codfish roe, egg yolk, tea, salt, and monosodium glutamate.
hoshi-nori	Dried, unflavored nori sheets, often used in the preparation of sushi. When used in contrast to the term, sushi-nori, hoshi-nori means nontoasted, lower-grade nori.
kizami-nori	Thinly sliced Porphyra sold in cellophane packs. Used as a condiment sprinkled over rice and noodle dishes.
kuro-nori	Black nori; i.e., nori, Porphyra sp.
maki-zushi	A type of sushi made of vinegared rice with a variety of vegetable or seafood fillings rolled in a sheet of dried, unflavored nori.
maze-nori	A mixture of Porphyra and other species.
nori-maki	Same as maki-zushi, above.
onigiri	Hand-molded ball of rice with a center of either salted salmon bits; pickled, salted plums; etc., and wrapped completely by nori. Often a homemade picnic or lunch item.
osembe	A wide variety of crackers made from rice flour often containing nori or ao-nori visible as green specks or bits imbedded in the cracker. Some types of osembe come wrapped in a strip of nori.

TABLE 1
(continued)

sushi-nori	High-grade, hoshi (dried, unflavored) nori usually pre-toasted. Used in the preparation of sushi and usually marketed in the United States in packages of 10 sheets, though seven-pack sheets are said to be gaining in popularity. In Japan, sushi-nori is sometimes sold in tin containers lined with corrugated paper as a high-priced gourmet item.
tsukudani	A strong-flavored seaweed paste used as a seasoning on rice.

In South Korea, species of Porphyra are cultivated in much the same way as in Japan. The major focus of this industry is also nori production for domestic consumption and export.

Porphyra sp. are collected along the shores of Burgos, Claveria, Aparri, and other towns in the northern provinces of Luzon in the Philippines. "Gamet," as it is called, is often eaten fresh in salads, or with tomatoes. Some production of dried nori sheets also takes place there (Moreland, 1979; Caces-Borja, 1973; Bersamin, et al., 1962).

Although Taiwan produces some quantity of Porphyra (Section IV), it is a net importer of Porphyra products. Chueh and Chen (1978) report that in 1977 Taiwan produced 1,372 metric tons of Porphyra which was only about a quarter of the domestic demand. There, as in other Indo-Pacific countries, Porphyra's primary use is as a food item.

In New Zealand, Porphyra sp. have traditionally been gathered for use as a relish (Moore, 1941). P. atropurpurea has been used medically for poultices and cataplasms, and P. columbina is fermented and used by natives as an aperient (mild diarrhetic) (Brooker and Cooper, 1961).

Its use in the making of "laver" bread, in the British Isles is well known. In South Wales, laverweed is considered a great delicacy and is often fried with bacon and eggs.

Flaked nori is known to be utilized throughout Europe and in this country as a health food.

In many areas along the coasts of the United States, particularly where Asian populations reside, Porphyra sp. are gathered for food.

Product Potential

Potential products manufactured from the seaweed Porphyra are generally classified into two categories, namely food and nonfood items. Of the food items, the manufacture of dried nori sheets is the base upon which a substantial international trade network has been developed. Other food product forms generally utilize nori sheets, bits or flakes as wrappings, and ingredients or condiment-style applications.

Within the category of nonfood items, two general classifications are distinguished, namely bulk products or fine chemicals. Specific examples of these applications include:

Bulk Products

- o Seaweed meal - for animal fodder
- o Bulk chemicals - e.g., phycocolloids
- o Energy production

Fine Chemicals

- o Dyes
- o Drugs
- o Trace substances

Bulk products require large amounts of biomass in some type of bulk chemical process. The use of seaweed meals in animal feeds has been used with some

interesting claims resulting; for example, the addition of low-grade nori to chicken feed as previously discussed. This application has been tried with other varieties of livestock.

Another bulk chemical operation is the extraction of industrial phycocolloids. In this regard, the main polysaccharide in many Porphyra species, porphyran, has been the subject of some research interest (Peat and Rees, 1961). Rees and Conway (1962) extracted porphyran from several Porphyra species, demonstrating seasonal and environmental variations in this compound. Batey, et al. (1974) extracted 30 percent porphyran from P. capensis. Schachat and Glicksman (1959) point out that, although Porphyra sp. is not used as a source of polysaccharide extractive, porphyran could be of some importance because of its "interesting structure."

Energy production from seaweed involves the anaerobic digestion of plant material to methane. This application has been tried with some of the larger kelps, primarily because large amounts of biomass are required to make such an energy source feasible. There is no evidence to date that Porphyra has been contemplated for this kind of application.

Bulk processes generally result in the formation of a relatively low-value product. This is perhaps the major deterrant against the use of cultured Porphyra in any nonfood bulk process application. The combination of large-volume requirements and low-value product would, in most cases, result in a non-cost-effective application.

Fine chemical processes require the extraction of special substances typically found in small concentrations. Novak and Rasmussen (1981) tested a

species of Porphyra, along with nine other genera, for dye potential. According to their results, the Porphyra sp. produced common color, not particularly unusual in the repertoire of natural dyes. Their results are shown in Table 2. The dye potential of Porphyra does not appear to have a market.

TABLE 2

DYE COLORS OBTAINED FROM
PORPHYRA LANCEOLATA WITH DIFFERENT MORDANTS

Mordants	Colors Produced
Tin	Pale yellow green
Iron	Grayish green yellow to light olive
Chrome	Grayish yellow green
Copper	Medium yellow green to dark yellow
Alum	Dark olive yellow to medium olive yellow

Porphyra displays some restorative (Dragendorff, 1898) or pharmaceutical characteristics. However, to date there has been little indication that Porphyra has been marketed for its beneficial drug characteristics.

In summary, there is a lack of evidence that Porphyra has been successfully marketed for anything other than human consumption. The best and most widespread market available for this seaweed is the nori market. This information is significant for the target market considerations of a fledgling domestic industry. The margin of profitability characteristic (for the first years) of a Porphyra operation (see Sections VII, VIII, and IX)

dictate that catering to the existing, established markets should be the aim of the domestic industry.

III. PROFILE OF JAPAN'S NORI INDUSTRY

Introduction

The people of Japan have been growing nori for centuries. Today, nori aquaculture in coastal waters continues to provide full- and part-time employment to thousands of Japanese living in rural areas. Although Japan has been transformed into a modern westernized society, nori continues to be a regular part of the Japanese diet. In 1980, for example, the average Japanese consumed the equivalent of 72 standard sheets of nori, and the year's total production of 8.3 billion sheets was worth over one half billion dollars to nori farmers. Nori remains today the most important aquacultural product in Japan, both in terms of tonnage and value. Japan is also the largest world supplier of nori.

Despite nori's permanence in the Japanese diet, however, the nori industry has been plagued over the last decade with a number of serious problems. Slow growth in demand, over-production, and a decline in product quality have threatened the economic viability of many nori enterprises.

The principal objective of this section is to analyze the problems and prospects of Japan's nori industry; describe its size, structure, and development; and relate preliminary findings of this analysis to the feasibility of a nori production industry in Puget Sound.

Current Production

In the 1980-1981 season, nori production in Japan exceeded industry target production levels by more than 800 million sheets. This was the third

consecutive year in which supply overruns of 10 percent or more have occurred. Inventories going into this season (1981-1982) are at the highest level ever experienced and production is again expected to exceed the industry's goal by at least 300 or 400 million sheets. A four-billion-sheet excess, representing over half a year's production, is currently clogging distribution channels and challenging the industry to find new ways of boosting demand and limiting supply.

Slack demand has also been a serious problem. In recent years, consumption of nori in Japan has stabilized at approximately 7.9 billion sheets per annum, while the industry has struggled unsuccessfully to hold production below that level. Zen-nori, the industry's organization of cooperatives, maintains that production capacity sufficient to produce 9 to 10 billion sheets per year currently exists, despite the considerable adjustments made in the industry over the last decade. From 1969 to 1979, the number of nori enterprises has fallen by more than 55 percent, and farmers have had to incorporate new technology and economies of scale in order to survive. Though the area under cultivation in Japan has decreased somewhat, the amount of nori produced continues to outstrip demand.

This year's crop is forecast to be bountiful once again. The volume of consignment sales at the cooperative level as of January 17, 1982, for example, is reported to be 3.96 billion sheets, a 30 percent increase compared with the same time last year. The value of this amount, however, is down 18.6 percent, and the average price per sheet, 14.41 yen, represents a 3.3-yen-per-sheet decline in the average price compared with that in January 1981.

The industry's problems have been compounded in great measure by a steady decline in the overall quality of nori produced. Industrial pollution, adverse weather, and disease resulting from too intensive farming have, in some areas, reduced the amount of top-grade nori produced to near zero. While industry newspapers are full of accounts of economic hardship and farmers burning crops that will not fetch an average five yen per sheet, bids as high as 120 yen per sheet for top-grade nori have been reported this year (1982) at various cooperative consignment auctions around Japan.

Poor quality, it is felt, has seriously deterred growth of nori consumption in Japan. In dealing with these problems, however, the industry has looked to export markets to relieve some of the pressure. In particular, the industry has focused its attention on the United States which has shown a three-fold increase in nori consumption over the last four years.

Japan as a Market for Puget Sound Nori

In circumstances such as these, in which Japan is eyeing the United States as a market for excess production, Japan itself seems an unlikely market for a new nori industry in Puget Sound struggling to meet startup expenses and establish cost-effective operations. Only if the quality of nori produced here is extremely high (which might, in fact, be possible in light of the almost "ideal" physical environment which is said to exist in Puget Sound) will the market in Japan be an economically viable outlet for production.

For now, the question of Japan as a potential market is not applicable, since nori and nori products continue to be listed by the Japanese government among 22 commodity types of agricultural and fishery products that are "nonliberalized" and, as such, subject to strict import quotas. The 22

items in question include the following products: dairy products (milk, cream, and cheese); meat and processed meat (beef and canned meat); processed rice and wheat products (rice and wheat flour); fruits, vegetables, and their processed products (oranges, tangerines, juices, processed tomato products, and canned pineapple); and regional specialties and related items (beans, peanuts, konjak roots, starch, and glucose). Fisheries-related items include herring, cod, scallops, and cuttlefish. The Ministry of International Trade and Industry (MITI) Notification No. 120 states the items subject to import restrictions include:

Tariff Item No. 12.08:

3-(1) Edible seaweeds, formed into rectangular papery sheets not more than 430 square centimeters per piece.

3-(2) Seaweeds of genus Porphyra and other with genus Porphyra, edible, excluding those falling within heading No. 12.08-3-(1) of the Customs Tariff Schedules.

3-(3) Other edible seaweeds (genus Enteromorpha, genus Monostroma, genus Kjellmaniella, and genus Laminaria).

Except for a small quota alloted to Korea, which was recently withdrawn, imports of products made from Porphyra have been strictly forbidden.

Japan has gone to great lengths in recent years to lift both tariff and nontariff barriers to foreign trade. Since January 1978, the Japanese government has made concessions to the international council on the General Agreement on Tariffs and Trade (GATT) and liberalized thousands of items; for example, machinery, consumer goods, steel products, and other manufactured goods. Japan has been far more reluctant to yield on farm products,

although over the last few years it has increased the quotas on a number of beef, fruit, and vegetable items. Of these last 22 "residual import restriction items," however, "it is the position of the Japanese government that restrictions on these items cannot be abolished in view of the particular situation in which Japan's agriculture is placed."

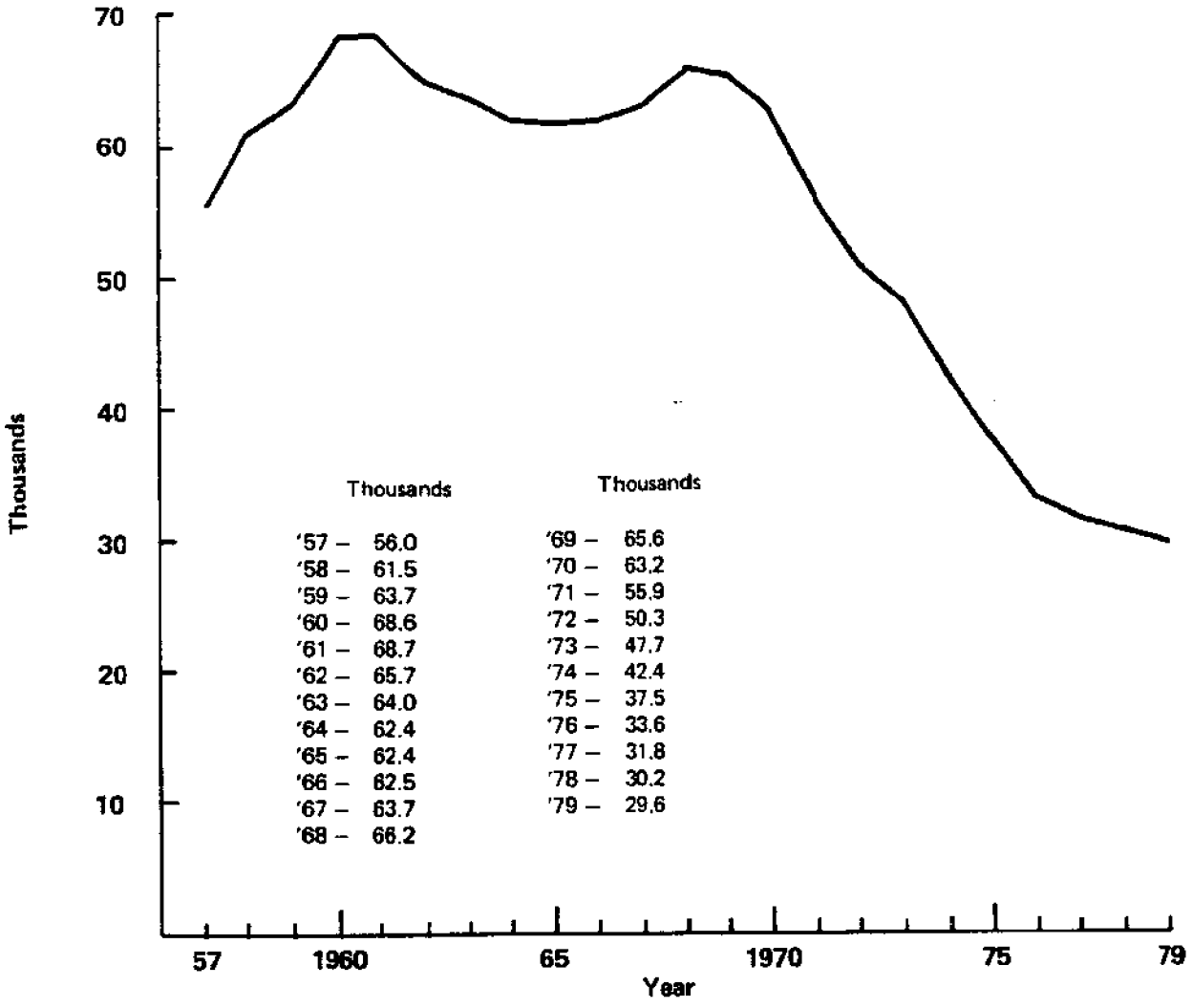
The underlying reason for holding firm on agricultural and marine product barriers has as much to do with politics as it does economics. Japan's Liberal Democratic Party (LDP) is made up of loosely allied factions which derive most of its political support from the rural populace. Although the LDP has been in power since the World War II, in recent times it has maintained its majority in the Diet by only a small margin. Not only does the LDP depend on conservative rural votes to maintain this edge, but the party's members in the Diet are disproportionately large for the populations they represent. This is because the present system of apportioning seats has remained unchanged through the post-war years, while a great shift in population to the cities has occurred. Therefore, even if objective market conditions warranted serious consideration of Japan as a market for Puget Sound nori, the Japanese government is not likely to make further significant concessions in an area which may jeopardize the basis of its political support.

Size and Structure

The most striking feature of the nori industry in Japan has been the steady movement toward a reduction in the number of enterprises engaged in nori culture, and a concentration of effort by means of larger farms and intensive cultivation. Figure 1 indicates the changes in the number of nori enterprises over the last 22 years. Most notable is the decline from 1969

FIGURE 1

Changes in the Number of Nori Culture Enterprises 1957–1979



Source: Gyogyo yoshoku seisan tokei nempo.
Agriculture, Forestry and Fisheries Ministry.

to 1979, when the number dropped from 65,636 to 29,560; a 55 percent decrease in only 10 years.

While the number of nori culture firms has dwindled, the area of coastal waters incorporated into nori aquaculture efforts increased dramatically during the same period. Figure 2 shows the increase in area under cultivation over the same 22 years.* The average size of nori enterprises has grown steadily, from 59 (old) saku in 1957 to 306 saku in 1978 (Figure 3), even though the area under cultivation has decreased by several million saku since the early 1970s.

Production Areas

There are four distinct regions of Japan where nori is cultivated extensively (Figure 4). Typically, these are the areas which have jagged coastlines and contain numerous protected bays and tidal areas. The North Pacific region includes the Pacific side of the main island of Honshu, from its northern tip south to the city of Choshi on the coast just north of Tokyo. The Central Pacific region extends south from there to Mie Prefecture north of Osaka. The Inland Sea region is that area circumscribed by the major islands of Shikoku, Kyushu, and the southern reaches of Honshu; while the China Sea region consists mainly of the highly indented western coast of Japan's southernmost major island, Kyushu.

Nori production in these four areas has not increased at an equal rate (see Figure 5). Twenty years ago, when the Central Pacific region was producing

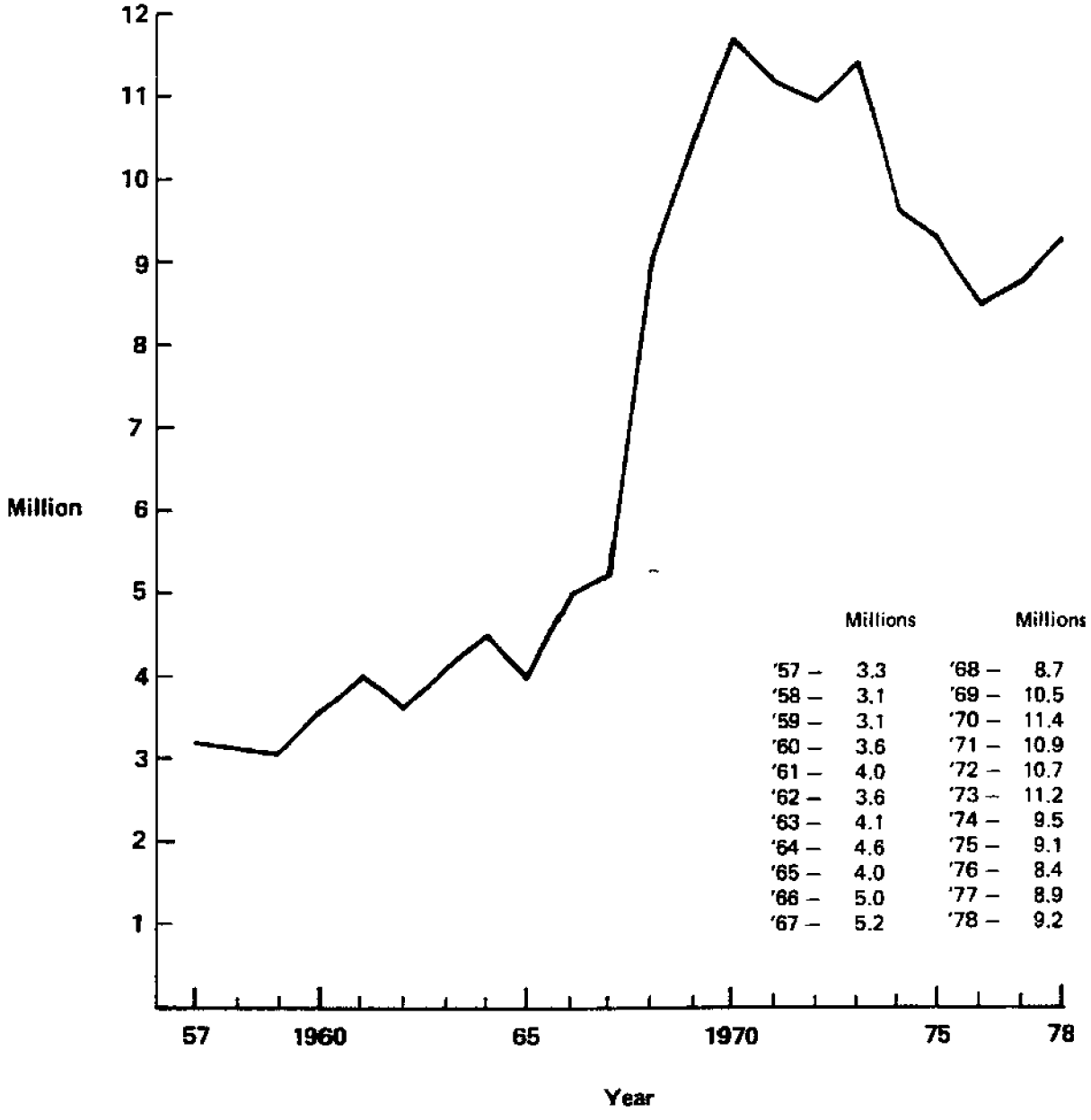
---

* Old units for saku representing an area 1.8m by 1.2m are used here for the sake of consistency. Since 1979, the Japanese standard of measurement for one saku has become 1.8m by 1.5m.

FIGURE 2

Changes in the Area under Nori Cultivation
1957–1978

(millions of 1.8 x 1.2 area units)



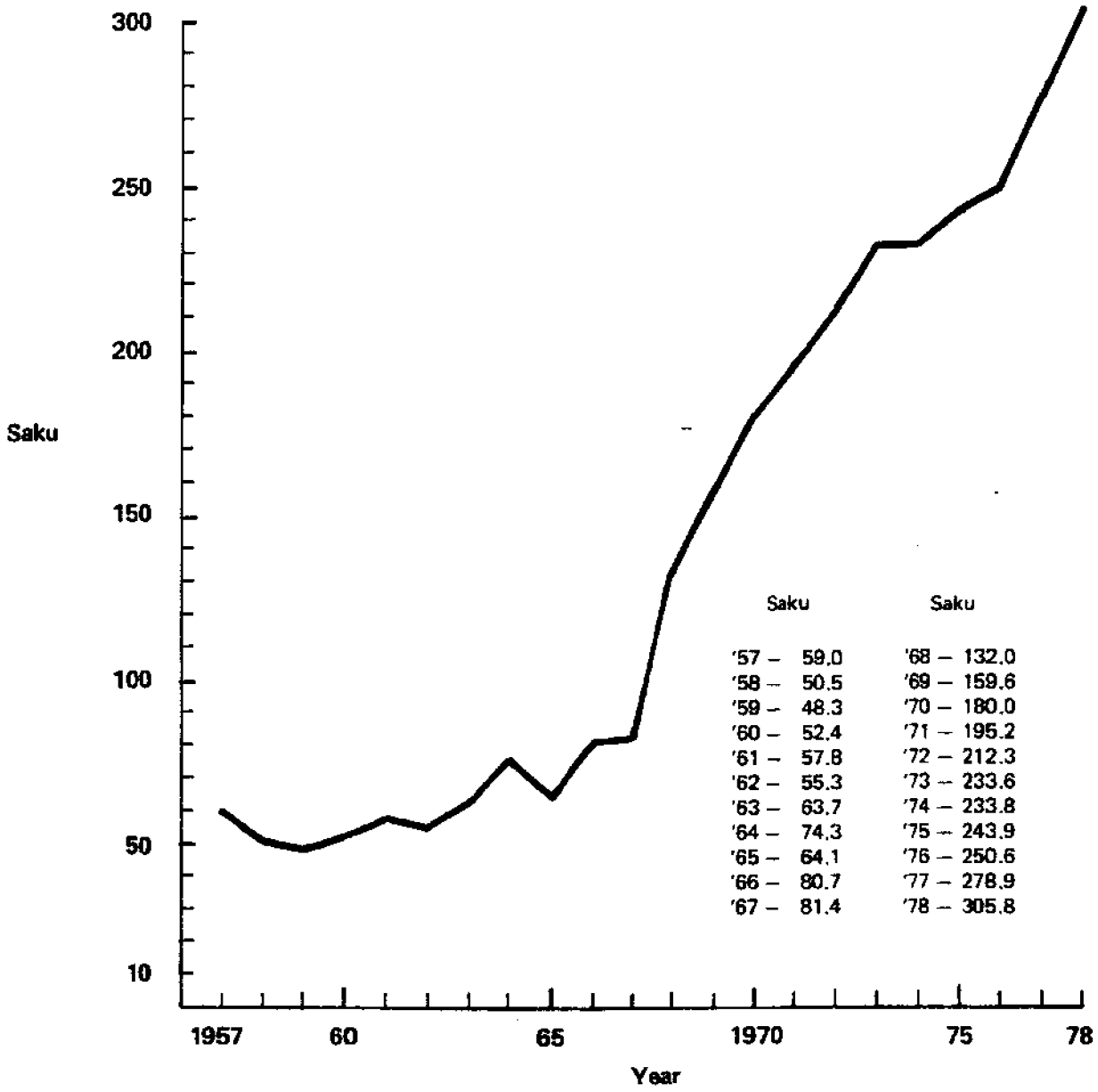
	Millions		Millions
'57 –	3.3	'68 –	8.7
'58 –	3.1	'69 –	10.5
'59 –	3.1	'70 –	11.4
'60 –	3.6	'71 –	10.9
'61 –	4.0	'72 –	10.7
'62 –	3.6	'73 –	11.2
'63 –	4.1	'74 –	9.5
'64 –	4.6	'75 –	9.1
'65 –	4.0	'76 –	8.4
'66 –	5.0	'77 –	8.9
'67 –	5.2	'78 –	9.2

Source: Gyogyo yoshoku seisan tokei nempo.
Agriculture, Forestry and Fisheries Ministry.

FIGURE 3

Changes in the Average Size of Nori Enterprises
1957–1978

(area under cultivation ÷ number of enterprises
1.8 m x 1.2 m units)



Saku		Saku	
'57 –	59.0	'68 –	132.0
'58 –	50.5	'69 –	159.6
'59 –	48.3	'70 –	180.0
'60 –	52.4	'71 –	195.2
'61 –	57.8	'72 –	212.3
'62 –	55.3	'73 –	233.6
'63 –	63.7	'74 –	233.8
'64 –	74.3	'75 –	243.9
'65 –	64.1	'76 –	250.6
'66 –	80.7	'77 –	278.9
'67 –	81.4	'78 –	305.8

Source: Gyogyo yoshoku seisan tokei nempo.
Agriculture, Forestry and Fisheries Ministry.

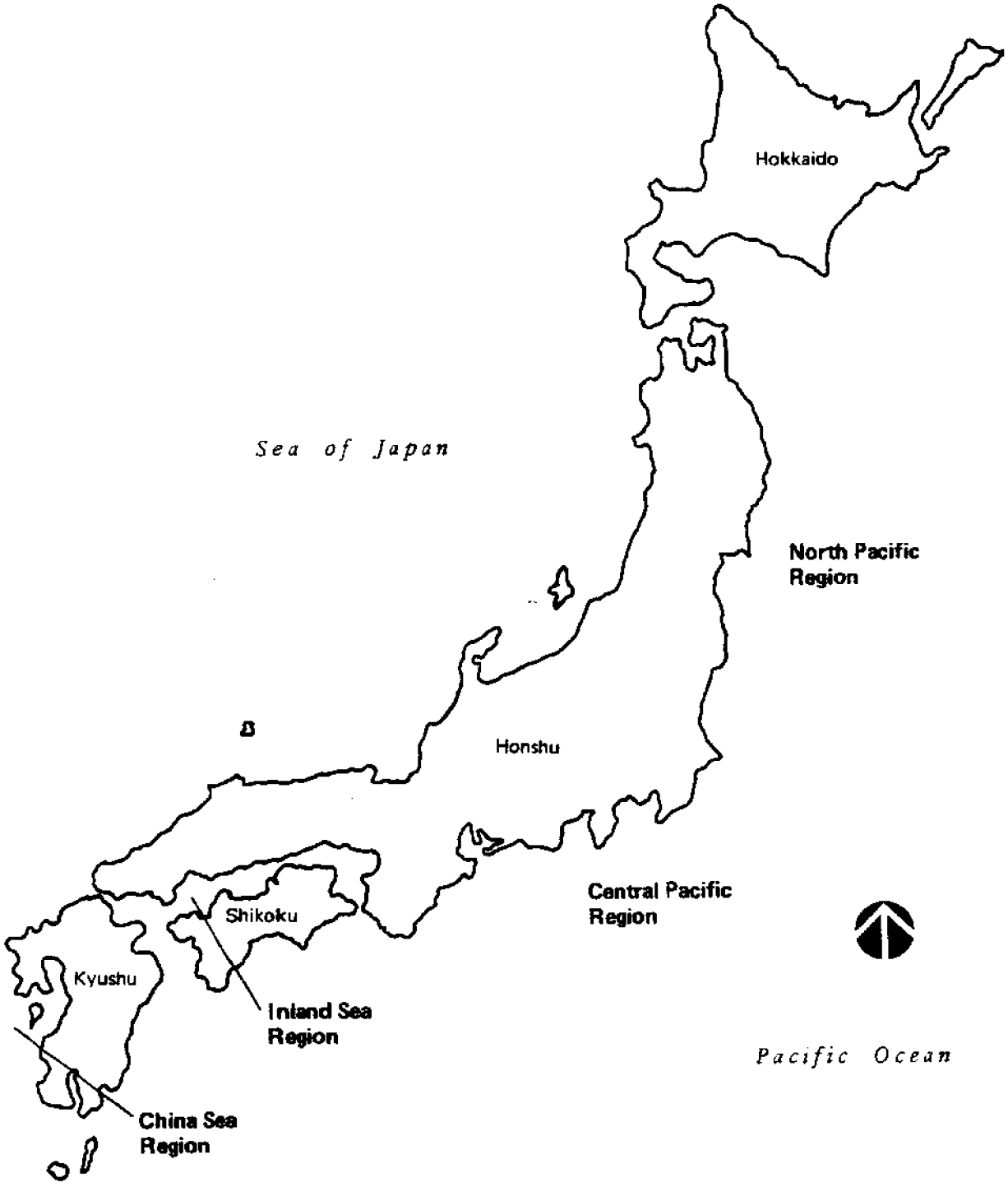


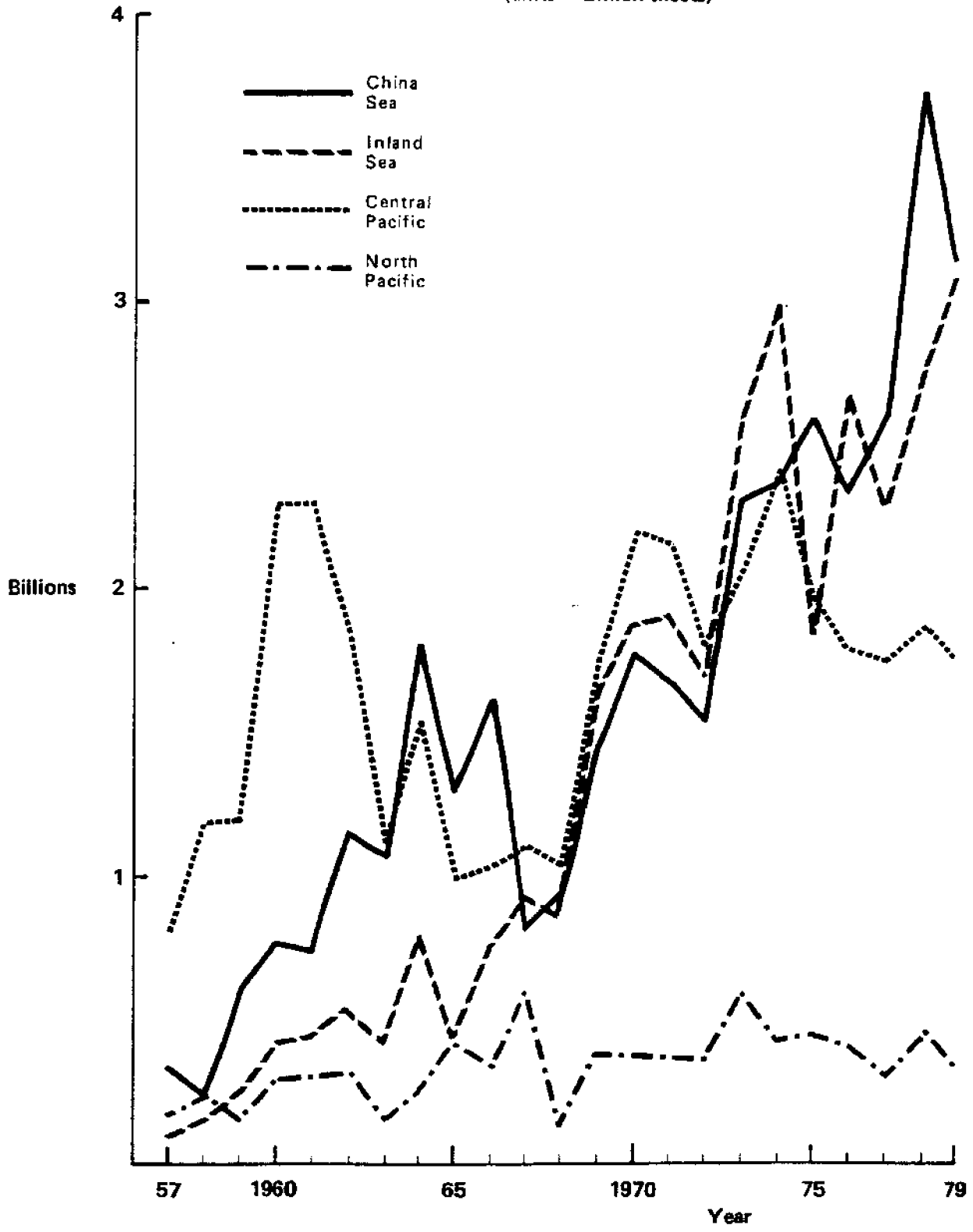
FIGURE 4

***Porphyra* Culture Regions of Japan**

FIGURE 5

Changes in Production of Cultured Nori by Region
1957–1979

(units – billion sheets)



Source: Gyogyo yoshoku seisan tokei nempo.
Agriculture, Forestry and Fisheries Ministry.

most of Japan's nori, the China Sea and Inland Sea regions were largely undeveloped. Today, these areas far surpass the two Pacific regions in production volume. The North Pacific area, unlike any of the other regions, has produced about the same volumes over the entire period.

Supply

A key problem for Japan's nori industry has been chronic over-production. Until 1973, when the industry produced nearly 10 billion sheets and sent markets tumbling, no nationwide guidelines were used to aid producers. Since the 1973 crisis, the National Federation of Nori and Clams Fisheries Cooperatives (Zenkoku Nori Gyogyo Kyodo Kumiai Rengo-kai, commonly known as Zen-nori) has established target production volumes based on year-to-year consumption levels, pricing, and inventories carried over from previous years.

Since the implementation of the target production plan, the industry has only once achieved the planned production level (Table 3). The problem has become acute over the last four years, with overruns of 10 and 20 percent. Sources expect the 1981 crop to exceed the target level of 7.3 billion sheets by 200 to 300 million, an excess of 3 to 4 percent. This reduced excess is an improvement, but it will be some time before the backlog of the last few years works itself out of the distribution system. Currently, 3.3 billion sheets are estimated to have been carried over from 1980, most said to be of inferior quality. Combined with inventories within distribution channels, an oversupply of approximately 4 billion sheets exists. According to one industry source, "the situation hasn't been this bad since 1968." Table 4 depicts changes in available nori supply over the last seven years. Table 5 shows Zen-nori calculations of the estimated changes in the value of

TABLE 3

COMPARISON OF PLANNED AND ACTUAL
NORI PRODUCTION, 1973-1981
(Units: Million Sheets)

Year	Target Production Volume	Actual Production	Over-Production	Percent Over (%)	Cooperative Consignment Sales Average Unit Price	Value of Production (billion ¥)
1973	—	9,642	—	—	10.61	102.3
1974	6,830	6,943	113	2	12.04	83.6
1975	6,500	7,154	654	10	11.27	80.6
1976	6,800	7,146	346	5	14.16	101.2
1977	7,100	7,050	-50	-1	18.41	129.8
1978	7,300	9,000	1,750	23	16.90	152.1
1979	8,000	8,800	800	10	18.68	164.4
1980	7,500	8,300	800	11	14.22	118.0
1981	7,300	7,500 (est.)	200	3		

Source: Nori Times, September 1, 1981 and November 1, 1981 issues.

TABLE 4

CHANGES IN NORI SUPPLY, 1975-1981
(Units: Million Sheets)

	1975	1976	1977	1978	1979	1980	1981
Production volume	7,150	7,146	7,050	9,000	8,800	8,300	(E) 7,500
Carryover	1,900	1,550	1,522	772	1,800	2,900	3,300
Total supply	9,050	8,722	8,572	9,772	10,600	11,200	(E)10,800
Estimated consumption	7,500	7,200	7,200	8,000	7,700	7,900	
Oversupply	1,550	1,522	772	1,772	2,900	3,300	

Source: Nori Times, November 1, 1981

TABLE 5

ESTIMATED PRICE-PRODUCTION COMPARISONS
FOR THE 1981 SEASON

Production (Billion sheets)	Value (Billion yen)	Average Per Sheet Price (Yen per sheet)
11	83.04	7.55
10	97.06	9.71
9	106.77	11.86
8	112.16	14.02
7.3	113.38	15.64
6	110.01	18.33
5	102.46	20.49
4	90.60	22.65

Source: Nori Times, November 1, 1981

the 1981 crop, depending on the level of production. Table 6 provides exact figures on the number of enterprises, area cultivated, and production totals for the last 20 years.

Technology and Cost of Production

One of the ways by which nori growers have been able to boost production and reduce manpower costs has been through the use of new technology. For example, the introduction of the technique of keeping seeded nets in cold storage has greatly increased the production capacity of tidal areas; and, during the last five years, large-scale automatic processing machines have reduced labor costs and shortened processing time.

First introduced in 1976, the new processing machinery has already been purchased by an estimated 15 percent of all nori farmers, according to industry sources. Some areas have adopted the new processing machinery quicker than others. For example, in the Ariake Sea region of Kyushu, Fukuoka Prefecture, members of 23 out of 25 cooperatives in the area have purchased 312 machines, 29 of which are group or jointly owned. Ownership of large-scale machines in Fukuoka Prefecture (as of the fall of 1981) has reached a reported 58.8 percent of all enterprises. With 2,955 people employed in nori aquaculture there, the ratio of workers to machines has reached 9.5:1.

The trend toward automatization is expected to continue. New, more sophisticated equipment has been steadily appearing on the market. For example, machines are able to weed out unhealthy sprouts, to control moisture, temperature, density, and consistency in processing, and to cure and improve

TABLE 6

JAPANESE PRODUCTION OF CULTURED NORI[1]

Year	No. of Operators	Culture Area (000 sk)[2]	Production (1,000 sheets)							Production Totals		
			Kind of Nori[3]			Region				Dried Sheets		Total Wet Wt.
			Kuronori	Mazenori	Aonori	N Pacific	C Pacific	China Sea	Inl'd Sea	(1,000)	Baranori (mt)[4]	(mt)
1957	56,030	3,312	898,349	292,139	267,848	124,033	814,303	348,120	166,912	1,458,337	593	55,397
1958	61,556	3,107	1,376,051	471,778	243,390	216,200	1,241,799	280,180	197,345	2,091,320	480	79,000
1959	63,674	3,078	1,441,254	523,826	329,604	143,056	1,267,679	596,936	285,166	2,294,675	532	86,688
1960	68,629	3,595	2,948,766	665,645	222,254	296,975	2,349,778	786,090	401,425	3,836,666	996	145,069
1961	68,672	3,967	3,115,178	646,440	222,864	352,291	2,367,857	731,380	429,000	3,884,472	977	144,412
1962	65,796	3,641	3,355,734	385,558	181,492	382,502	1,884,272	1,118,618	535,450	3,922,785	591	146,658
1963	64,139	4,086	1,899,192	418,379	249,944	138,562	1,122,325	1,035,318	405,257	2,567,515	429	97,804
1964	62,372	4,637	3,719,074	530,596	190,032	281,275	1,540,474	1,838,425	776,910	4,439,702	711	187,370
1965	62,360	3,996	2,604,839	389,779	195,598	439,131	1,008,199	1,256,741	483,390	3,190,216	828	120,911
1966	62,523	5,043	3,123,075	624,380	210,542	374,343	1,126,424	1,673,442	756,901	3,957,997	847	151,651
1967	63,663	5,180	2,792,682	610,393	148,724	645,456	1,270,593	747,018	854,504	3,551,698	1,016	139,326
1968	66,218	8,743	2,467,278	340,979	146,869	176,603	1,085,984	868,049	801,066	2,955,126	962	121,328
1969	65,636	10,474	2,829,685	344,093	132,381	420,415	1,847,839	1,479,513	1,754,702	3,306,158	970	134,320
1970	63,162	11,371	5,067,413	590,375	133,672	416,180	2,210,989	1,715,627	1,824,245	5,791,460	1,034	231,464
1971	55,942	10,920	5,476,498	601,416	81,938	464,589	2,181,417	1,813,874	1,877,228	6,159,842	899	244,946
1972	50,302	10,677	5,002,542	305,032	85,113	432,611	1,809,580	1,503,790	1,633,788	5,392,687	1,238	217,906
1973	47,734	11,151	7,198,224	541,541	100,453	748,173	2,091,030	2,337,823	2,643,684	7,840,218	1,122	311,410
1974	42,409	9,490	8,130,116	432,131	74,764	476,852	2,569,636	2,540,930	3,017,097	8,637,000	1,233	339,314
1975	37,507	9,148	6,801,772	238,648	75,988	484,285	2,032,498	2,618,923	1,958,797	7,116,408	1,113	278,127
1976	33,625	8,427	7,165,756	211,733	47,853	414,821	1,844,803	2,442,315	2,702,333	7,425,342	795	291,050

TABLE 6

(Continued)

Year	No. of Operators	Culture Area (000 sk)[2]	Production (1,000 sheets)							Production Totals		
			Kind of Nori[3]			Region				Dried Sheets		Total Wet Wt.
			Kuronori	Mazenori	Aonori	N Pacific	C Pacific	China Sea	Inl'd Sea	(1,000)	Baranori (mt)[4]	(mt)
1977	31,763	8,859	6,751,977	261,669	64,055	347,875	1,668,749	2,600,813	2,428,944	7,077,701	1,018	279,031
1978	30,226	9,243	8,621,915	499,993	69,514	488,652	1,952,670	3,846,324	2,890,309	9,191,421	945	350,471
1979	29,560	1,952	7,966,212	283,947	118,864	377,002	1,743,929	3,108,938	3,101,236	8,369,023	1,320	325,686

1. Gyogyo yoshokugyo seisan tokei nenpo. Norinsuisan-sho Tokei Jihobu. (Fisheries and aquaculture production statistical yearbook, 1969, 1978 and 1979. Agriculture, Forestry and Fisheries Ministry Statistical Information Division.

2. *sk* is the abbreviation used here for saku, the Japanese standard of measure for nori culture nets. From 1967 through 1978, a saku measured 18.2 by 1.2 m in size. In 1979, the size was changed to 18.2 by 1.5 m. For the sake of consistent comparison, the (old) saku measurement has been retained here, though government figures in the future will use the new standard measure.

3. Kuronori is *Porphyra sp.*; Mazenori is a mixture of *Porphyra* and other species; and Aonori consists of *Enteromorpha sp.* and/or *Ulva sp.*

4. Baranori is the term used to describe product derived from broken pieces of dried nori sheets. Volumes are measured in metric tons. Baranori is probably shredded and used in condiments and seasonings such as *furikake*.

the grade of processed nori. These machines will in time result in lower production costs and higher-quality product in the future.

Recent surveys by Zen-nori suggest that costs of production have stabilized over the last few years. A study conducted in 1979 of 31 families in seven prefectures (all operators of upper-middle-sized farms) showed cost per sheet of nori produced to have stayed within the 13- to 14-yen-per-sheet range for four years. A sample of 154 enterprises in Aichi Prefecture (near Nagoya) also made during 1979, showed an average cost (per-sheet figure) of ¥ 14.71/sheet (Table 7).

Table 8 gives a breakdown of operational income, expenditures, and other details relating to nori culture for the year 1980.

Quality

The problems of industrial pollution of the coastal waters of Japan are well documented. Oil and chemical pollution have cost the Japanese government and industry millions of dollars in compensation and clean-up costs and, in some areas, have caused the cultivation of nori and other marine products to be stopped completely. Over-farming and self-pollution are also serious problems for the nori industry. Intensive cultivation often leads to outbreaks of disease, a decline in productivity, and lower-quality product.**

For whatever reason (possibly an increase in pole vs. floating culture), the percentage of lower-grade nori produced is reported to be increasing each

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** Discussions of these problems recur in articles about nori cultivation found in industry publications such as the Nori Times, Suisan Shuko, and Nikken Shokuryo Shimbun. For example, see articles in the May 11, August 1, August 11, and October 11, 1981 issues of Nori Times (Appendix C).

TABLE 7

1979 PRODUCTION COSTS IN AICHI PREFECTIVE, KIZAKI COOPERATIVE

Aichi	154 businesses samples	
Prefective	Average size of farm - 110 saku	
	Materials depreciation	1,023,544 yen
	Processing machinery depreciation	2,079,580
	Personnel expenses	2,902,500
	Water, heat, electricity	699,000
	Boat-truck leasing	330,833
	Other expenses	610,198
	Expenses Total	7,915,655
	1979 Gross Sales	10,204,691
		-7,915,655
	Net Profit	2,289,306 yen

Average total expenses - average total production = price per sheet necessary to break even:

i.e., 7,915,655 yen - 537,826 yen = 14.71 yen persheet

Source: Nori Times, July 11, 1980

TABLE 8

OPERATIONAL INCOME, EXPENDITURES AND OTHER DETAIL RELATING TO NORI CULTURE*
for 1980 (Average Values)

Item	Unit	All Japan	Tohoku	Tokyo Bay
Kuronori culture area	m^2	1,801	5,080	1,967
Aonori culture area	m^2	96	---	---
Number working days	day	125	95	144
Labor	person	583	377	666
Family members				
On water men	person	149	104	193
women	person	78	50	77
other employees	person	14	4	21
On shore men	person	139	86	168
women	person	129	116	175
other employees	person	74	17	42
Time worked	hour	3,312	1,993	3,549
Family members				
On water men	hour	697	435	858
women	hour	346	223	329
other employees	hour	72	16	133
On shore men	hour	838	479	906
women	hour	829	719	1,097
other employees	hour	530	121	226
Yield	sheet	432,984	260,280	382,408
Kuronori	sheet	415,245	260,280	360,989
Masanori	sheet	12,733	---	21,024
Aonori	sheet	5,006	---	395
Aquaculture income	1,000 yen	6,158.9	2,319.6	5,562.3
Income from nori	1,000 yen	6,139.4	2,252.5	5,562.3
Kuronori	1,000 yen	5,942.3	2,252.3	5,223.3
Masanori	1,000 yen	143.0	---	334.6
Aonori	1,000 yen	30.4	---	4.4
Other income	1,000 yen	19.5	67.1	---
Rentals	1,000 yen	18.6	67.1	---
By-products	1,000 yen	---	---	---
Other	1,000 yen	0.9	---	---
Aquaculture expenditures	1,000 yen	4,373.0	3,367.4	3,198.2
Wages employees	1,000 yen	391.6	73.8	227.8
Boat	1,000 yen	57.0	64.1	33.3
Equipment/facilities	1,000 yen	272.6	486.7	169.8
Gear	1,000 yen	16.0	---	---
Fuel	1,000 yen	256.8	342.8	211.4
Seed (propagation stock)	1,000 yen	279.5	27.0	39.0
Paint	1,000 yen	4.8	---	---
Processing supplies	1,000 yen	174.2	5.8	325.3
Other supplies	1,000 yen	517.7	497.4	132.1
Rents/Fees	1,000 yen	212.2	325.5	177.1
Sales commission	1,000 yen	212.3	74.6	151.2
Business expenses	1,000 yen	7.0	---	11.1
Other expenditures	1,000 yen	22.0	3.0	17.7
Price support assessment	1,000 yen	1,945.1	1,466.9	1,702.6
Aquaculture earnings	1,000 yen	1,785.9	1,047.8	2,364.1
Estimated return to family	1,000 yen	1,981.9	1,048.3	2,376.2
Operating costs	1,000 yen	6,334.9	4,415.7	5,574.4
Net profit	1,000 yen	196.0	2,096.1	12.1
Invested capital	1,000 yen	9,031.9	7,789.3	6,854.7
Fixed assets	1,000 yen	6,829.1	6,326.1	4,918.8
Liquid assets	1,000 yen	2,202.8	1,463.2	1,935.9
Interest on investment				
Capital investment	1,000 yen	857.1	739.2	650.5
Aquaculture receipts	1,000 yen	68.8	96.2	8.0
Production costs	1,000 yen	7,212.0	5,154.9	6,224.9
Business profit	1,000 yen	1,053.1	2,835.3	862.6
Taxes	1,000 yen	306.6	107.8	182.9
Income after taxes	1,000 yen	1,479.3	1,155.6	2,181.2

*Gyogyo keizai chosa hokoku (Gyoka no bu), showa 55 (Fisheries economic research reports (Fishing family section), 1980). Norinsuisansho, tokei jihobu, February 1982. pp. 224-227

TABLE 8

(Continued)

Item		Unit	Tokai	Ariake Sea	Inland Sea
Kuronori culture area		m^2	2,930	4,807	3,983
Aonori culture area		m^2	34	---	190
Number working days		day	139	123	119
Labor		person	621	586	568
Family members					
On water	men	person	168	153	138
	women	person	81	82	86
	other employees	person	5	36	8
On shore	men	person	167	146	124
	women	person	139	129	116
	other employees	person	61	62	96
Time worked		hour	3,303	3,520	3,293
Family members					
On water	men	hour	709	885	600
	women	hour	319	339	373
	other employees	hour	24	177	36
On shore	men	hour	977	890	782
	women	hour	854	803	780
	other employees	hour	420	426	722
Yield		sheet	413,001	501,925	437,678
Kuronori		sheet	190,728	501,567	413,307
Masanori		sheet	19,950	358	14,726
Aonori		sheet	2,325	---	9,645
Aquaculture income		1,000 yen	6,068.9	8,768.5	5,549.4
Income from nori		1,000 yen	5,966.6	8,701.2	5,544.3
Kuronori		1,000 yen	5,777.4	8,600.0	5,353.4
Masanori		1,000 yen	278.7	2.2	124.0
Aonori		1,000 yen	0.5	---	59.4
Other income		1,000 yen	2.3	67.3	5.1
Rentals		1,000 yen	---	67.3	4.1
By-products		1,000 yen	---	---	---
Other		1,000 yen	2.3	---	1.0
Aquaculture expenditures		1,000 yen	3,523.2	5,652.1	4,487.7
Wages	employees	1,000 yen	309.5	519.6	432.3
Boat		1,000 yen	51.4	93.8	47.9
Equipment/facilities		1,000 yen	492.1	161.1	244.9
Gear		1,000 yen	14.8	11.7	23.3
Fuel		1,000 yen	268.0	191.5	283.5
Seed (propagation stock)		1,000 yen	83.6	109.6	501.9
Paint		1,000 yen	0.3	9.5	5.5
Processing supplies		1,000 yen	424.4	89.8	109.2
Other supplies		1,000 yen	142.5	630.0	695.1
Rents/Fees		1,000 yen	221.0	365.8	139.1
Sales commission		1,000 yen	251.5	241.5	211.7
Business expenses		1,000 yen	15.5	---	6.7
Other expenditures		1,000 yen	8.2	66.7	10.3
Price support assessment		1,000 yen	1,341.0	3,179.5	1,767.2
Aquaculture earnings		1,000 yen	2,545.7	3,116.4	1,061.7
Estimated return to family		1,000 yen	2,523.4	1,991.4	1,778.2
Operating costs		1,000 yen	6,046.6	7,643.5	6,293.9
Net profit		1,000 yen	22.3	1,125.0	714.3
Invested capital		1,000 yen	7,558.2	14,001.5	8,029.8
Fixed assets		1,000 yen	5,155.4	11,769.0	5,784.6
Liquid assets		1,000 yen	2,402.8	2,232.5	2,245.2
Interest on investment					
Capital investment		1,000 yen	717.3	1,328.7	762.0
Aquaculture receipts		1,000 yen	25.7	82.7	89.8
Production costs		1,000 yen	6,763.9	8,972.2	7,035.9
Business profit		1,000 yen	695.0	203.7	1,476.5
Taxes		1,000 yen	381.9	403.1	283.7
Income after taxes		1,000 yen	3,163.8	2,713.3	778.8

TABLE 8

(Continued)

Item	Unit	10-20 hectares	20-30 hectares	30-50 hectares	50 or more hectares
Kuronori culture area	m^2	1,695	2,359	3,955	6,807
Aonori culture area	m^2	---	---	121	245
Number working days	day	120	136	112	138
Labor	person	535	594	529	706
Family members					
On water men	person	141	156	138	172
women	person	78	72	74	91
other employees	person	5	17	9	29
On shore men	person	135	147	125	157
women	person	132	125	113	156
other employees	person	44	76	72	101
Time worked	hour	2,824	3,220	3,018	4,317
Family members					
On water men	hour	570	652	676	896
women	hour	288	278	343	477
other employees	hour	17	95	38	153
On shore men	hour	713	864	754	1,061
women	hour	750	808	707	1,123
other employees	hour	286	523	500	807
Yield	sheet	322,472	369,451	415,403	831,341
Kuronori	sheet	301,420	345,984	409,864	802,756
Masenori	sheet	21,019	22,992	1,715	12,170
Aonori	sheet	33	475	3,824	16,415
Aquaculture income	1,000 yen	4,157.0	5,069.0	6,143.6	9,184.6
Income from nori	1,000 yen	4,144.6	5,067.3	6,100.0	9,179.2
Kuronori	1,000 yen	3,906.3	4,784.4	6,002.9	8,948.3
Masenori	1,000 yen	237.8	278.4	19.4	112.7
Aonori	1,000 yen	0.5	4.5	28.7	101.7
Other income	1,000 yen	12.4	1.7	43.6	5.4
Rentals	1,000 yen	10.0	---	43.6	5.4
By-products	1,000 yen	---	---	---	---
Other	1,000 yen	2.4	1.7	---	---
Aquaculture expenditures	1,000 yen	2,692.1	3,601.2	4,186.3	7,042.0
Wages employees	1,000 yen	192.1	388.0	335.3	668.0
Boat	1,000 yen	24.7	28.4	80.9	80.3
Equipment/facilities	1,000 yen	120.8	388.1	220.0	368.9
Gear	1,000 yen	19.2	35.8	3.4	11.9
Fuel	1,000 yen	279.0	297.4	194.4	295.3
Seed (propagation stock)	1,000 yen	200.1	2,38.0	122.5	657.9
Paint	1,000 yen	3.7	3.3	5.2	5.7
Processing supplies	1,000 yen	171.5	255.4	138.8	145.6
Other supplies	1,000 yen	182.3	196.1	628.2	990.8
Rents/Fees	1,000 yen	81.7	202.7	306.3	184.7
Sales commission	1,000 yen	173.8	209.1	195.3	278.4
Business expenses	1,000 yen	6.2	6.1	6.5	9.6
Other expenditures	1,000 yen	11.5	12.1	30.3	28.5
Price support assessment	1,000 yen	1,219.3	1,342.8	1,914.0	3,312.3
Aquaculture earnings	1,000 yen	1,464.9	1,467.8	1,957.3	2,142.6
Estimated return to family	1,000 yen	1,628.6	2,072.2	1,822.9	2,463.0
Operating costs	1,000 yen	4,320.7	5,673.4	6,008.2	9,505.0
Net profit	1,000 yen	163.7	604.4	134.4	320.4
Invested capital	1,000 yen	4,950.3	6,736.9	8,917.3	15,397.4
Fixed assets	1,000 yen	3,399.8	4,591.4	6,871.0	12,308.2
Liquid assets	1,000 yen	1,550.7	2,165.5	2,046.3	3,089.2
Interest on investment					
Capital investment	1,000 yen	469.8	841.2	846.3	1,461.2
Aquaculture receipts	1,000 yen	11.9	19.8	87.2	143.9
Production costs	1,000 yen	4,796.5	6,314.8	6,855.5	10,966.2
Business profit	1,000 yen	633.5	1,245.8	711.9	1,781.8
Taxes	1,000 yen	194.6	298.9	291.8	449.2
Income after taxes	1,000 yen	1,270.3	1,176.9	1,585.5	1,693.4

year. Zen-nori and industry publications (such as Nori Times) constantly stress the need to improve quality if real growth in consumer demand is to be achieved.

An example of the problem is Kyushu's Ariake Sea region where production of high-grade nori has fallen rapidly (Table 9). Over 40 percent of the region's 1980 crop sold for less than ¥10/sheet, which is far below the break-even point. Product grade 2 and above was extremely scarce.

At present, there is no standardized procedure for establishing quality and grade distinctions for nori in Japan. Typically, each region has its own traditional approach. Aichi and Mie prefectures, for example, have seven grades. Hyogo has 10 and Ariake has 13. Though all grading is based on such considerations as color, texture, appearance, and taste, there is considerable variation between regions and, it is reported, between harvests for the same area. It has been claimed that seasonally hired local inspectors often grade each harvest on its own terms and not against an objective standard (Nori Times, April 21, 1980).

In general, high-quality nori is dark, almost black, glossy, pure with even coloring and a smooth, consistent texture. Poor-quality nori is more green or reddish in color, may be wrinkled with holes and have bits of debris embedded in it (e.g., pieces of nylon from nets, hair, marine organisms, and inorganic matter) as well as lacking in all the characteristics of high-quality nori mentioned above.

Recently, there have been efforts to establish more objective standards of grading, though a national system has not yet been achieved. Newly developed machines using spectro-analysis (Nori Times, May 11, 1980) may make standardization a realistic goal in the near future.

TABLE 9

PERCENTAGE OF TOTAL PRODUCTION
ARIAKE SEA REGION, FUKUOKA PREFECTURE

	Product Grades				
	1	2	3	4	5
1974	12.74	20.17	26.73	24.70	15.66
1975	7.65	16.32	22.49	26.86	26.67
1976	5.14	12.34	15.92	23.18	43.42
1977	6.45	11.64	19.79	45.52	16.60
1978	10.06	12.01	17.02	42.33	18.57
1979	1.61	5.54	15.67	50.82	26.46
1980	0.88	3.25	9.43	21.82	64.62

Source: Nori Times, September 21, 1981

Chiba Prefecture Marine Research Center has developed a grading model that provides a more rational approach to assessing nori quality. Table 10 shows how this system works and how prices paid at the cooperative level are linked to the various grades. Note that the primary consideration in establishing grade is color: kuro (black), tobi (red), and kon (green-blue).

Westernization and Changing Consumer Preferences

Poor-quality nori may, in fact, account for much of the nori industry's current malaise. Post-war changes in consumer habits, however, must be seen as having had a significant long-term impact on demand. Table 11 reveals that consumption of nori during the last half of the 1970s has remained relatively constant. Nevertheless, the pattern of nori consumption during this period has been changing.

Of the three most basic types of nori sales in the Japanese marketplace, household, commercial, and gift giving, the largest segment, household sales, has been declining as a percentage of total sales (Table 11). Westernization of the Japanese diet has probably had the most to do with this decline, having made its greatest impact on breakfast, the one meal at home at which nori is most likely to be served.

More and more families in Japan have changed from the traditional menu of rice, miso soup, fish, nori, and pickled vegetables to a Western-style menu of eggs, buttered toast, and coffee. An important reason for the growing popularity of the Western-style breakfast is its ease of preparation compared with the traditional breakfast.

TABLE 10

QUALITY-PRICE BREAKDOWN
CLINBA PREFECTURE, 1980 SEASON, NOVEMBER THROUGH MARCH
(Units: 10 Sheets)

(Note: Numbers associated with A, B, and C grades indicate percentage of crop sold within that grade for the price indicated.)

Price/10 Sheets		80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	.....	380	% Sales Subtotal	% Sales Total
Kuro (black)	N							C 36.86											B 17.28							A 1.24	56.37	
	X			C 16.60									B 6.37										A 0.53				22.60	83.05
	Y			C 3.56				B 1.32								A 0.01											5.01	
	Z			C 0.04									B 0.10						A 0.03								0.17	
Tobi (red)	N					C 4.49												B 2.63									7.69	
	X		C 3.24												B 1.19				A 0.23				A 0.67				4.57	
	Y				C 0.42					B 0.23																	0.65	13.24
	Z						C 0.09	B 0.08			A 0.17																0.33	
Kon (green-blue)	N								C 0.74								B 0.89				A 0.11						1.54	
	X			C 0.39										B 0.28					A 0.05								0.72	3.71
	Y				C 0.07					B 0.02																	0.09	
	Z	C 1.10				B 0.11				A 0.15																	1.36	
TOTAL		1.10	3.24	20.32	0.81	4.58	0.19	38.93	2.06	–	0.40	0.17	6.47	–	1.28	0.01	0.89	2.63	17.59	–	0.11	–	1.10	–	1.24		100%	100%

Symbol	Grades	Characteristics
N	top grade	–
X	defects arising from processing	wrinkled, light weight, tears, etc.
Y	defects in seeding	–
Z	other	debris, impurities, etc.

Symbol	Grading within Each Category
A	top grade
B	medium grade
C	low grade

Source: *Nori Times*, May 11, 1981

TABLE 11

PERCENTAGE OF NORI CONSUMPTION BY SALES TYPE, 1976-1981

Sales Type	1976	1977	1978	1979	1980	1981
Household	60	55	45	44	43	44
Commercial	10	13	27	29	27	27
Gift Giving	30	32	28	27	30	29
	100%	100%	100%	100%	100%	100%

Source: Nori Times, September 1, 1981; November 1, 1981

Commercial sales of nori, on the other hand, have increased, both as a proportion of total sales and in volume. This trend is consistent with another Western custom, dining out (gaishoku), for which expenditures have been increasing steadily. The restaurant and sushi trade have been directly affected by growth of the Japanese economy. Japanese consumers today enjoy increased leisure time, a higher standard of living, and an appreciation of "convenience factors" that has encouraged this trend.

Prices

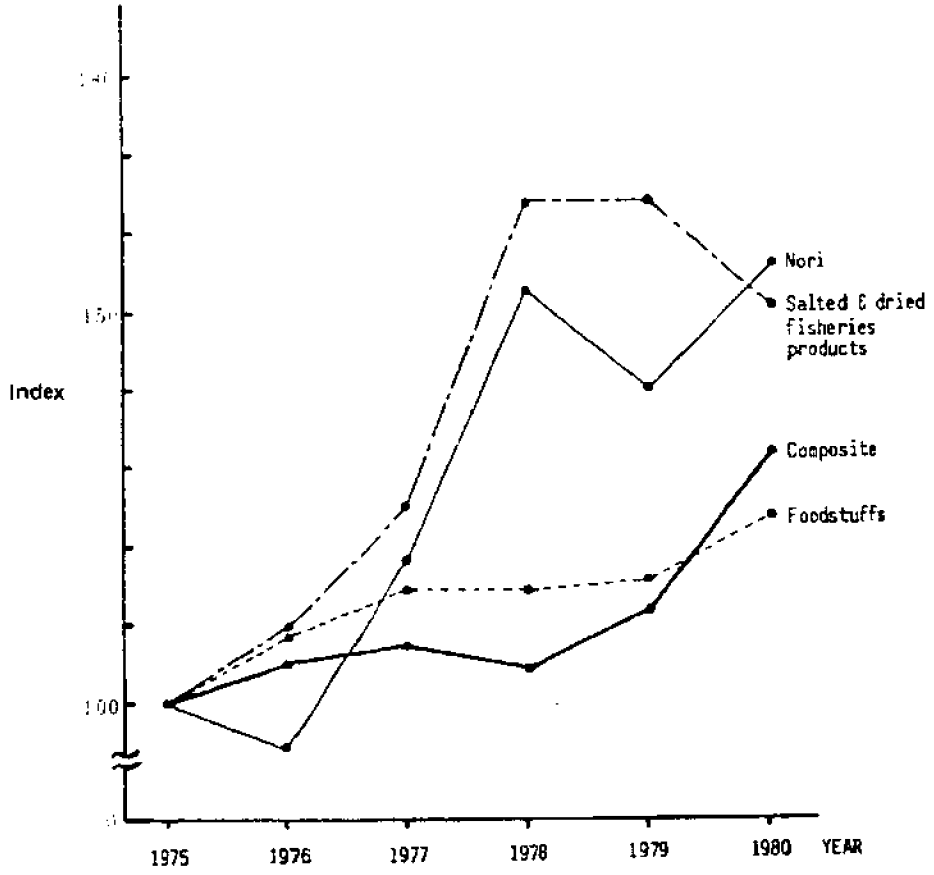
Rising prices have been partially responsible for the slack consumer demand of the past five years. Figures 6 and 7 show significant increases in both wholesale and consumer prices during the last half of the 1970s. Indexed to prices in 1975 (which were depressed), consumer prices peaked in 1979, dropping off in 1980 by more than 24 percent. Wholesale prices in the 1981-1982 season are also expected to decline. Table 3 (page 3-8) shows the actual cooperative consignment sales average unit prices for the years 1973 through 1980.

Sales Promotion

In Japan, there are two times during the year in which consumer activity is especially intense. These periods are the gift-giving holidays of New Year and O-Chugen, which fall during midsummer as part of the Buddhist festival of O-Bon. Both holidays occur just after workers are given their semi-annual bonuses (often equivalent to several month's pay), which serve to ensure that most people are able to participate in the more commercial aspects of the two holidays. Gifts are given to immediate business superiors and to other friends and associates with whom there may be obligations

FIGURE 6

Wholesale Price Index
(1975 = 100)



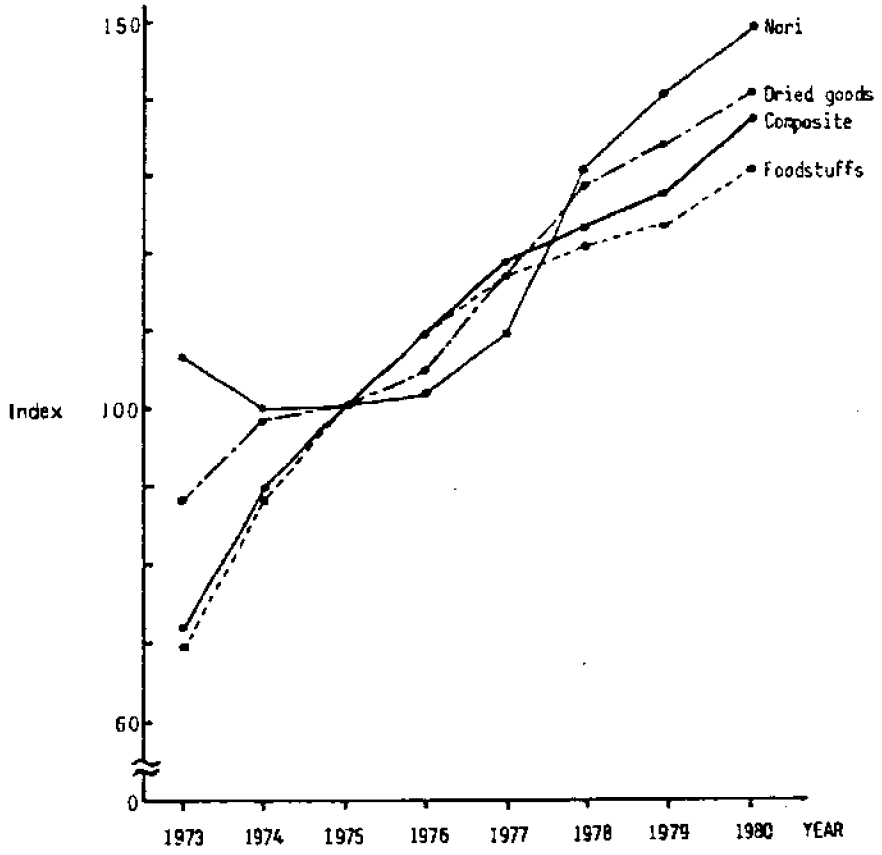
Item \ Year	1975	1976	1977	1978	1979	1980
Composite	100.0	105.0	107.0	104.3	111.9	131.8
Foodstuffs	100.0	108.8	114.6	114.6	115.5	124.1
Salted, dried fisheries products	100.0	109.0	135.1	164.1	164.1	150.1
Nori	100.0	93.6	117.6	152.9	140.4	155.1

Source: Bank of Japan, Statistics Department, Information Bureau (Nichi-gin Tokeikyoku Sodanjo).

Notes: 1) Wholesale price indexes other than those for nori are for calendar years (January-December).
2) Wholesale price indexes for nori are based on average unit prices in cooperative sales for the harvesting season of the previous year (from a study by the National Federation of Nori and Shellfish Fisheries Cooperative Associations).

FIGURE 7

Consumer Price Index
(1975 = 100)



Item \ Year	1973	1974	1975	1976	1977	1978	1979	1980
Composite	71.9	89.4	100.0	109.3	118.1	122.6	127.0	137.2
Foodstuffs	69.3	88.5	100.0	109.1	116.4	120.5	123.1	130.5
Dried goods	89.0	98.5	100.0	104.7	116.2	128.3	133.3	140.9
Nori	106.3	99.8	100.0	101.5	109.1	130.2	140.1	149.7

Source: Prime Minister's Office, Statistics Bureau (nori consumer price indexes are for intermediate-grade product).

(e.g., teachers, marriage go-betweens, etc.). Food products, boxed and gift-wrapped, are often given during these times.

At the very top of the list of most popular gifts at this time is nori. Nearly one-third of all nori produced each year (Table 11, previously) is sold during the weeks immediately preceeding New Year and O-Chugen. To capitalize on these consumer buying periods, nori is sold in gift packs ranging from ¥ 3,000 to ¥ 3,500, the average amount spent for a gift by most consumers.*** Market studies have shown that consumers perceive nori as "uniquely Japanese" and, as such, very appropriate for these traditional holidays. Nori is also compact and lightweight, making it easy and inexpensive to send by mail.

One of the fundamental responsibilities of Zen-nori is to assist in the promotion of nori at both the regional and national level. In carrying out its promotional efforts, Zen-nori conducts each year a spring sales campaign, a summer sales campaign, a fall sales campaign, and so on. Typically, Zen-nori will participate in agricultural and fisheries fairs, buy television and radio commercial time, and assist local distributors with point-of-sale promotions by providing free giveaways (for example, product samples, shopping bags, tissues, iron-on patches for children, and so on). Each year, February 6 is celebrated as "Nori Day" when similar promotional activities are conducted throughout Japan.

*** Nori Times, December 11, 1980 (Appendix C).

Over the last few years, Zen-nori has striven to focus promotion on such product concepts as nutrition, naturalness, and freshness. Slogans appearing on 1981 Zen-nori posters reflect this approach: "Nori nutrition: from the clean ocean directly to you."

Promotional efforts have also been directed at educators and administrators within the Japanese elementary and secondary school systems, emphasizing nori's nutrition. Posters and bulletin board materials specifically for this purpose were prepared and sent to over 23,000 schools in 1980.

Imports

The only foreign-produced nori to appear in the Japanese marketplace has been from Korea. Korea, like Japan, has long cultivated nori by traditional methods for its own domestic consumption. Over the past 20 years, Korea has exported relatively small amounts of nori to Japan under special arrangements with the Japanese government. During this period, the volume of Korean imports has fluctuated widely with a peak of approximately 580 million sheets in 1968 (Table 12).

Nori from Korea ceased coming into Japan altogether after 1977 when only 26 million sheets were imported. Problems with production and growing demand in Korea were reportedly the reasons for a ban on nori exports made by the Korean government. As a result, no imports of nori into Japan have occurred over the last three years. The June 21, 1981 issue of Japan's industry daily, the Nori Times, reported that Korea had requested a resumption of trade and the right to import two million sheets in 1981. According to this account, the request was expected to be approved. No other information is currently available.

TABLE 12

DRIED NORI
KOREAN EXPORTS TO JAPAN, 1960 THROUGH 1980

	Metric Tons	1,000 Sheets	Value (million yen)
1960	202	96,974	562
1961	239		293
1962	236		429
1963	280	99,992	432
1964	487		1,887
1965	65	27	0
1966	1,230	511,717	3,474
1967		540,722	3,924
1968		579,971	5,953
1969		376,676	6,441
1970		476,652	3,098
1971		441,188	1,337
1972		76,593	768
1973		286,952	2,958
1974		7,791	59
1975		72,342	221
1976		10,660	42
1977		26,453	264
1978		0	0
1979		0	0
1980		0	0

Source: Suisan Shuho, Fishing and Food Industry Weekly, August 15, 1981 issue

Exports

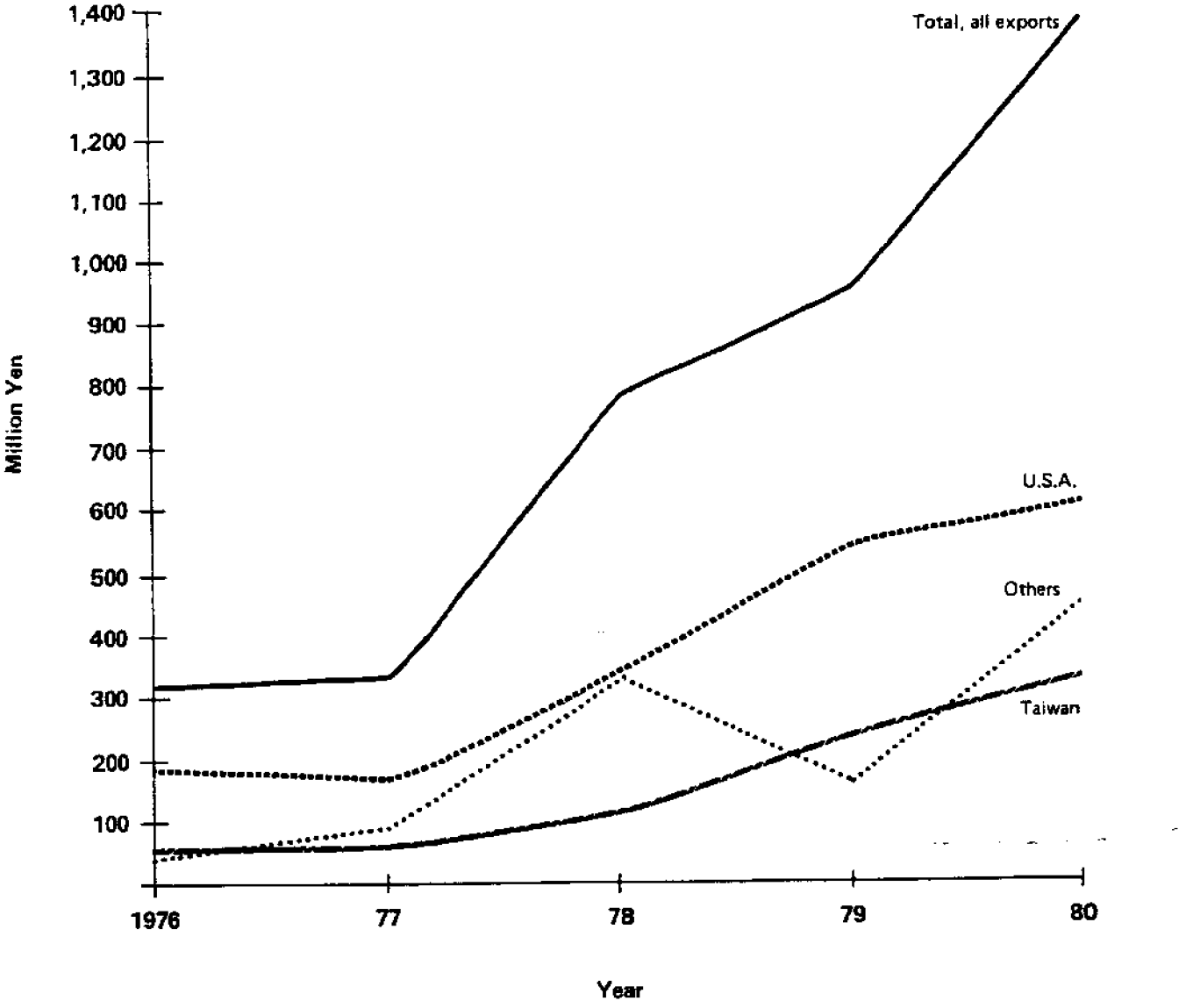
Until recently, world markets for nori consisted mainly of (1) Taiwan and Korea, which not only cultivate nori traditionally on their own, but also have been under the direct cultural, economic, and political influence of Japan through much of the 20th century, (2) the United States, and (3) other countries which have significant numbers of Japanese and Korean emigres.

Over the last five years, several new factors have begun to influence Japan's export figures. Japan's overall economic success and its aggressive pursuit of export markets have resulted in many Japanese businessmen living permanently or semi-permanently overseas. Similarly, large numbers of Korean and Japanese laborers and engineers work and reside in several Middle East countries, such as Saudi Arabia and Iraq, where large public works projects are underway. As might be expected, consumption of nori has increased in countries that have experienced growth of their Japanese and Korean populations.

Although Korea periodically imports nori to cover for production shortfalls, Taiwan and the United States together still account for most of Japan's export volume (Figure 8). In the United States, in particular, a new phenomenon affecting export growth has occurred. Figure 9, showing nori exports to the United States over the past five years, reveals a many-fold increase in exports of dried nori, the kind used as an ingredient in sushi, as well as in roasted, seasoned nori. The growth of dried nori reflects the growing popularity of Japanese food (sushi in particular) among consumers other than the Japanese-businessman and Japanese-American communities.

FIGURE 8

Total Exports of All Japanese Nori Products by Value
1976–1980

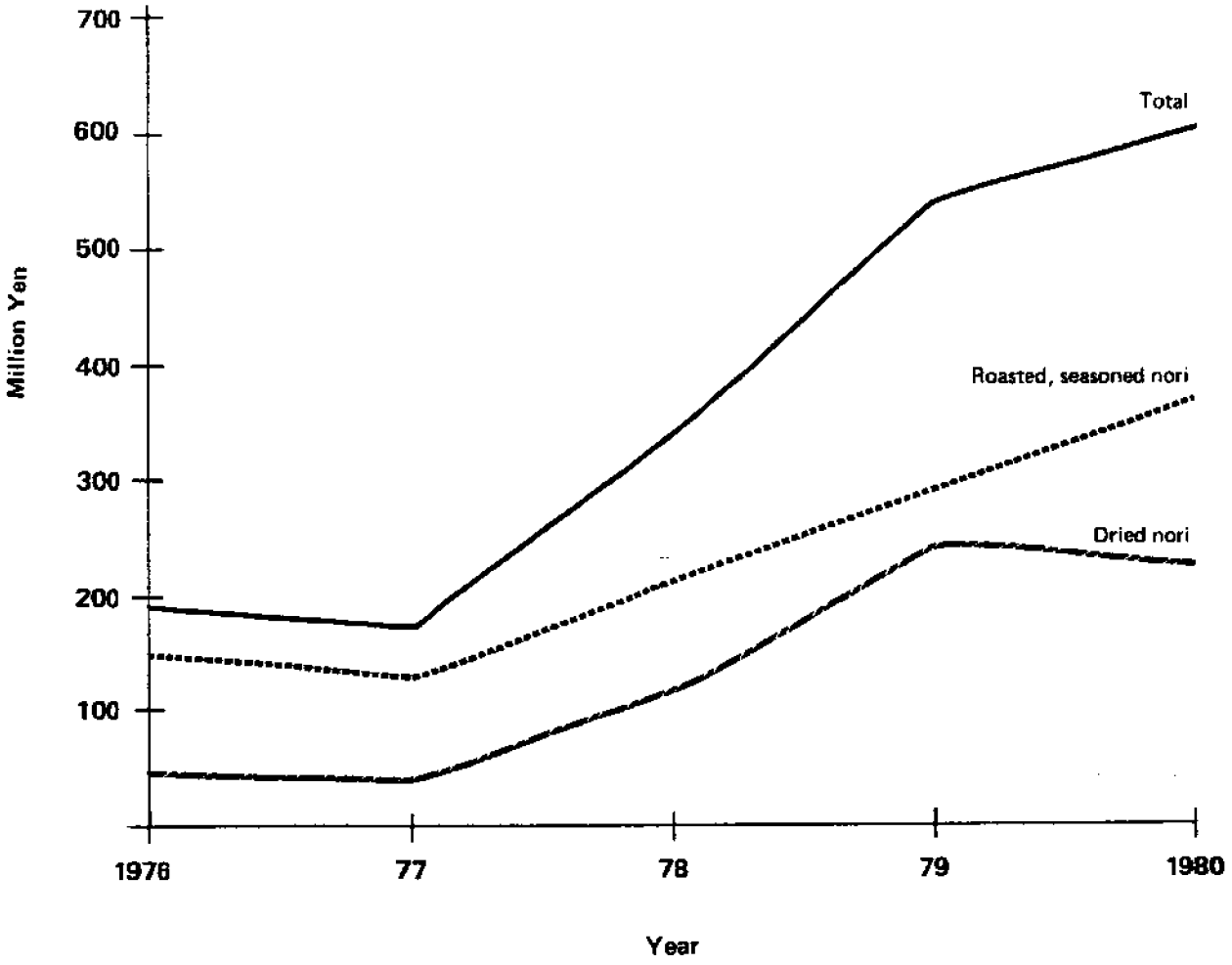


	Total (Million Yen)	U.S.A.	Taiwan	All Others
1976	318	193	64	61
1977	335	176	67	92
1978	786	341	114	331 *
1979	957	542	242	172
1980	1,391	604	328	459 *

*In 1978 and 1980, Korea imported nori valued at 220 and 264 million yen, respectively, to make up for domestic production shortfalls.
Source: Kanzeikyoku Boeki Tokei Shiryo

FIGURE 9

Nori Exports to the United States
1976—1980
By Value (Million Yen)



	Dried Nori	Roasted, Seasoned Nori	Total
1976	43,632,000	149,428,000	193,060,000
1977	40,117,000	135,922,000	176,039,000
1978	119,137,000	221,927,000	341,064,000
1979	250,887,000	291,101,000	541,988,000
1980	232,788,000	371,440,000	604,228,000

Source: Kanzeikyoku Boeki Tokei Shiryo

Dried nori exports have increased worldwide as Figure 10 (for Taiwan) and Figure 11 reveal.

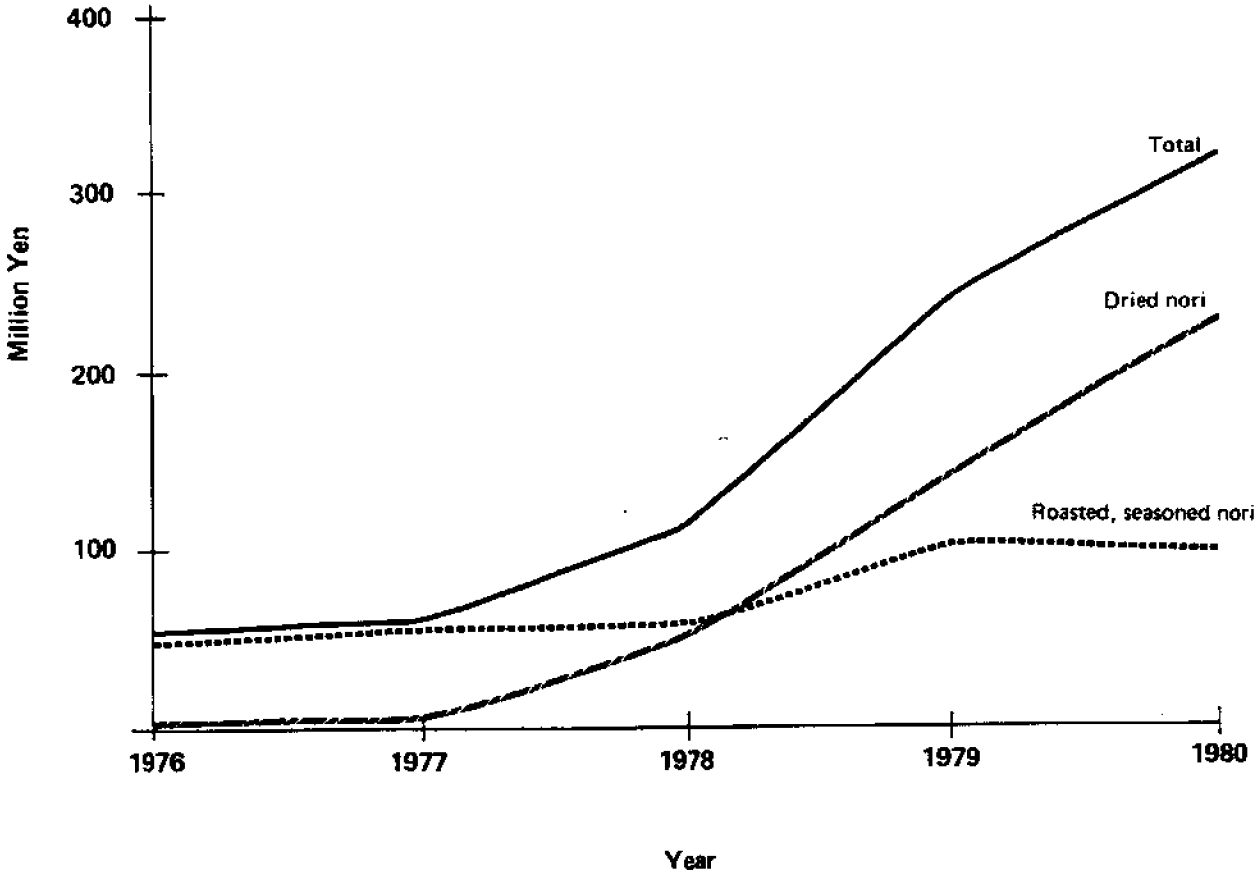
The expansion of nori consumption to include a broader, non-Oriental segment of the American population has increased the interest of Japan's nori industry and resulted in several fact-finding missions to the United States by Zen-nori. After visiting Hawaii and west coast cities, representatives of the Zen-nori delegations concluded that: 1) the quality of nori available in the United States is very poor, 2) Japanese restaurants, and sushi counters in particular, are increasing rapidly, 3) nori's health benefits should be emphasized to appeal to health-conscious Americans, and 4) roasted, seasoned nori should be promoted in the household market with carefully designed programs of consumer education.

The Japanese nori industry has been very supportive of the State of Washington's plans to establish a pilot project to cultivate nori domestically and sees the benefits of having nori produced in the United States as far outweighing the disadvantages. As the industry sees it, "distribution in America's vast market is difficult. Production of nori in America, however, would heighten interest among consumers and encourage development of nori products appropriate for the American market. Obtaining rights to coastal waters in the United States is difficult, and expanding the area available for cultivation would accordingly be a difficult process. Most of the nori required to meet demand would, therefore, most likely be imported from Japan."****

**** Nori Times, October 18, 1980

FIGURE 10

Nori Exports to Taiwan
1976–1980
By Value (Million Yen)

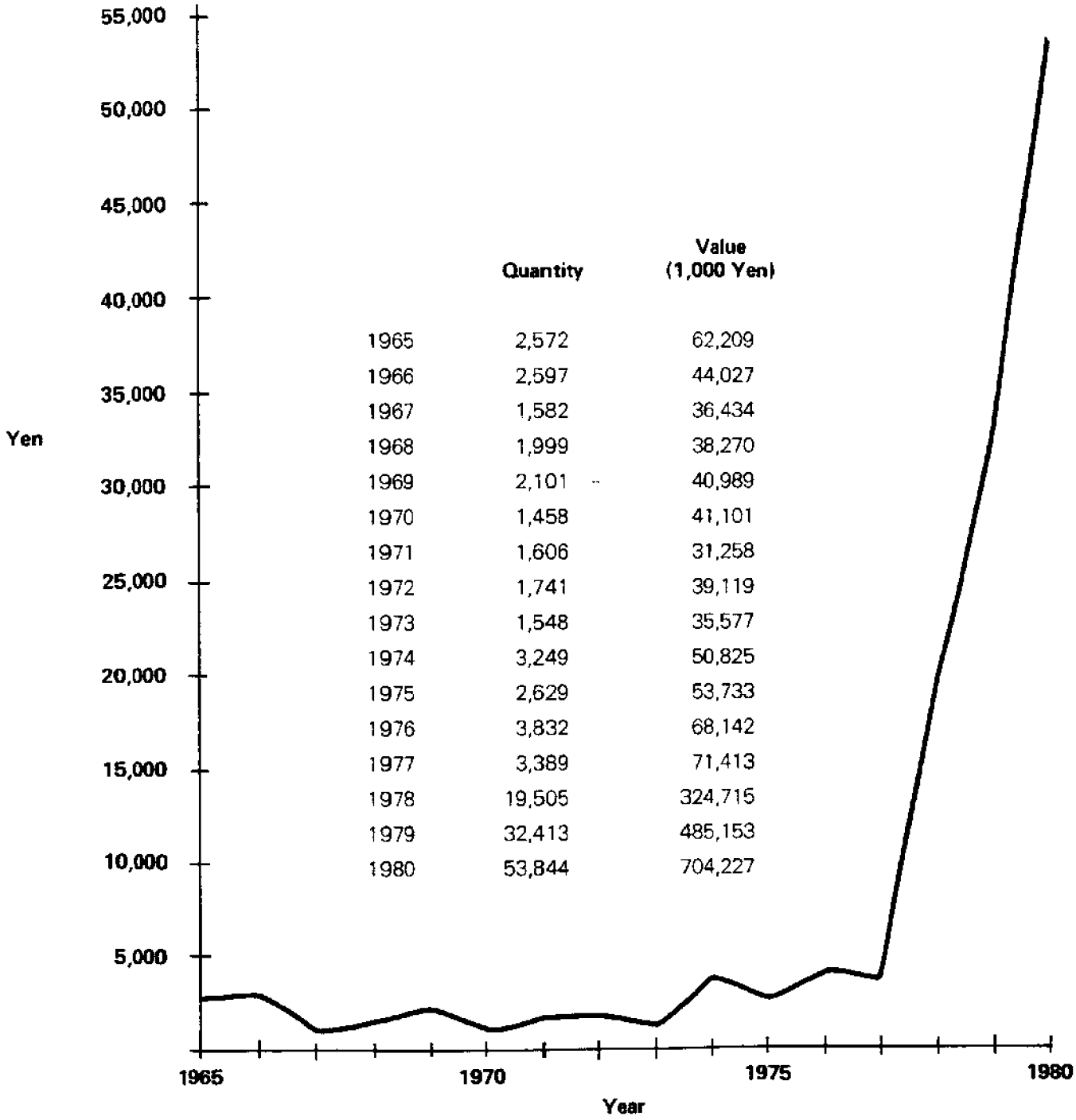


	Dried Nori	Roasted, Seasoned Nori	Total
1976	3,494,000	60,970,000	64,464,000
1977	4,697,000	62,210,000	66,907,000
1978	51,466,000	62,577,000	114,043,000
1979	141,969,000	100,902,000	242,871,000
1980	228,113,000	99,937,000	328,050,000

Source: Kanzeikyoku Boeki Tokei Shiryo.
Ministry of Finance.

FIGURE 11

Total Exports of Dried Nori (1,000 Sheets)
1965—1980
(Excluding Roasted, Seasoned Nori)



	Quantity	Value (1,000 Yen)
1965	2,572	62,209
1966	2,597	44,027
1967	1,582	36,434
1968	1,999	38,270
1969	2,101	40,989
1970	1,458	41,101
1971	1,606	31,258
1972	1,741	39,119
1973	1,548	35,577
1974	3,249	50,825
1975	2,629	53,733
1976	3,832	68,142
1977	3,389	71,413
1978	19,505	324,715
1979	32,413	485,153
1980	53,844	704,227

Source: Kanzeikyoku Boeki Tokei Shiryo.
Ministry of Finance.

Considering Japan's technological expertise, marketing strength, and production capabilities, it would seem crucial to the overall economic success of Washington's pilot project that the current cooperative, cordial relations with Zen-nori and the Japanese nori industry be maintained.

LIST OF JAPANESE IMPORTERS' ORGANIZATIONS

JAPAN FEDERATION OF IMPORTERS' ORGANIZATIONS	Nihonbashi Daiwa Bldg., Nihonbashi Honcho 1-chome, Chuo-ku, Tokyo 103 Tel.: 270-0791-5
THE JAPAN DRIED LAVERS IMPORT ASSOCIATION	c/o Toshoku Corp. Marine Product Sec., Food Dept. No. 3, 2-4, Muromachi Nihonbashi, Chuo-ku, Tokyo 103 Tel.: 245-2211
ZENKOKU NORI KAIRUI GYOGYO KYODO KUMIAI RENGO-KAI (National Federation of Nori and Clams Fisheries Cooperatives)	16-5, Takanawa 2, Minato-ku, Tokyo, 108 Tel.: 443-8511
ZENKOKU KANSUI YOGY KYOKAI RENGOKAI (Assoc. of Marine Fish Culture)	Suisan Kaikan, 2-1, Nakanoshima 2-chome, Hyogo-ku, Kobe City, Kyogo-Pref., 752 Tel.: 681-9106
NIHON BOEKI SHINKOKAI (JETRO) (Japan External Trade Organization)	2-5, Toranomon 2, Minato-ku, Tokyo, 107 Tel.: 582-5511
NIHON SUISANBATSU YUNYU KYOKAI (Japan Marine Products Importers Assoc.)	Yurakucho Bldg., 10-1, Yurakucho 1, Chiyoda-ku, Tokyo, 100 Tel.: 212-8638

NORI EXPORTERS TO THE UNITED STATES

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   2-4-1, Marunouchi, Chiyoda-ku, Tokyo 100
   Telephone: (03) 213-3471
   Telex: J 26424
   President: Masao Nagoya
   Export Mgr.: Setsuro Obara, No. 2 Foodstuff Department

   Their U.S. outlet is:

   Uwajimaya Inc.
   519 - 6th Avenue S., Seattle, WA 98164
   Telephone: 206-624-6248
   Telex: 25910 4444 009 SEASIA SEA
   Import Mgr.: Mr. Oki

2. Tokyo Kyodo Boeki (English name: Tokyo Mutual Trading Co. Ltd.)
   4-26-4 Taito, Taito-ku, Tokyo 110
   Telephone: (03) 835-8101
   Telex: J. 25231
   President: Noritoshi Kanai
   Export Mgr.: Isao Noji, Export Department

   Their U.S. outlets are:

   a. Mutual Trading Co. Inc.
      431 Crocker St., Los Angeles, CA 90013
      Telephone: 213-626-9458
      Telex: 230 673-118
      Person in charge: Yasuo Katsumata

   b. New York Mutual Trading Inc.
      165 Chubb Ave., Lyndhurst, NJ 07071
      Telephone: 201-933-9555
      Telex: 133192
      Person in charge: Akira Takahashi

- - - - - - - - - - - - - - - -

Remarks: Taiheiyo Boeki is the largest exporter to the United States handling over 50 percent of the volume.

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Nippon boeki geppo. Okurasho. (Japan Trade Monthly, Ministry of Finance, 1960 through 1980.) December issues have year-to-date totals by country and commodity.

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Statistical Survey of Japan's Economy, 1980. Economic and Foreign Affairs Research Association (Keizai Gaiko Kenkyukai), Tokyo.

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IV. OTHER FOREIGN MARKETS

Introduction

A survey was conducted by study team staff of potential overseas markets other than Japan. This survey consisted of visiting, or otherwise contacting, government officials, industry representatives, academics, and others to collect specific information on market history, current market conditions, and the potential for a United States-produced Porphyra product to enter and compete in any of these markets.

The survey was designed to collect specific quantitative information, where possible, through the use of a questionnaire. The questionnaire, first developed for a study visit to South Korea, was generalized for use in interviews and correspondence with contacts in other countries. This questionnaire appears on page 4.4.

The following contacts were made in person, by telephone or telex, or by written correspondence. Proprietary contacts are denoted by their position description or title only.

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Foreign Market Survey Results

Korea - Nearly all nori in Korea is produced by single-family units, with the exception of one larger production company. No lists of the growers are available at the national level; however, such lists can probably be obtained from the local cooperatives.

Nori production figures from 1962 to 1981 appear in Table 13. These figures are stated in thousand SOK; 1 SOK equals 100 sheets of nori. The low in 1962 was 1,720,000 SOK and the high in 1981 was 34,090,000 SOK. 1982 production is projected to be approximately 35 million SOK.

SAMPLE

QUESTIONNAIRE

A. Producers of Nori

1. Who are the major nori growers? Are lists available?

2. Are production figures available for current and past (up to 20 years) production? What are capabilities for future expansion of the industry?

3. Generally, what is the distribution of nori grades produced?

4. What are major distribution channels for domestic use? For exports?

5. Can these channels handle increased production?

6. What are some of the peculiarities of nori farming (as opposed to the Japanese system)?

7. Are any products, other than nori, produced from Porphyra grown domestically?

B. Distributors of Nori (or Any Other Porphyra Products)

1. Who are the major wholesale and retail outlets for nori? Are lists available for these?

2. What are major nori trade organizations?

3. Are export levels controlled, either directly or indirectly, by domestic demand?

4. Who are major trade partners for nori exports?

5. Are historic records available for nori exports?

6. What are current wholesale and retail price ranges for nori? Is information available on price trends over the past 10 to 20 years?

7. What are the current trade restrictions, and/or other jurisdictional problems, associated with importing nori from a potential United States supplier?

TABLE 13

KOREAN NORI PRODUCTION

Year	No. of SOK*	Year	No. of SOK*
1962	1,720	1972	11,520
1963	8,390	1973	17,280
1964	5,540	1974	27,220
1965	4,920	1975	22,340
1966	4,240	1976	21,620
1967	13,010	1977	29,090
1968	18,220	1978	11,950
1969	8,100	1979	23,610
1970	17,890	1980	29,240
1971	17,400	1981	34,090

* 1 SOK = 100 nori sheets

The Korean government controls production at this time and estimates that the country could easily produce 50 percent more nori.

All nori is graded by local cooperatives in each Kun (equivalent to a county) and is graded into four grades of approximately equal proportions.

Most (97 to 98 percent) of all Korean nori is consumed domestically; the only exports are to communities of Korean expatriates overseas such as in Saudi Arabia. In the 1950s, 90 percent of Korea's production was exported to Japan. In 1970, about 10 million SOK went to Japan, but Japan banned all imports of nori from Korea a few years ago (according to the Korea officials interviewed).

All nori is processed and packaged at the household level and then delivered to the local cooperative for grading. Following the grading, the nori is auctioned off every Monday in each Kun to the distributors and individual retailers. Distributors maintain a year-round supply of dried nori.

Nori production in Korea is similar to that in Japan except that there is little use of automatic equipment. Eighty percent of the production is still air dried in the sun with only 20 percent being handled on any type of automated equipment.

The growing season in Korea is from November until April or May, depending on the water temperature, which cannot exceed 10 degrees C. Most of the production is located along the southwest section of the coast of Korea (approximately 80 percent) with the rest produced primarily on the west coast, north of Pusan on the Yellow Sea.

No products, other than nori, are produced from Porphyra grown in Korea.

The Federation of Fisheries Cooperatives is the only trade organization in Korea and is the inspection agency designated by the government.

Exports are not controlled, but they have not found any ready markets, according to the officials interviewed. There are no major traders currently in the market. There are no historic records available for nori exports.

Regarding past and current wholesale and retail price ranges for nori, 1978 was a disastrous production year and fetched the all-time high price. The wholesale price in 1978 ranged from 4,000 to 5,000 wan per SOK. In 1981 the price had settled down to a range of 2,500 to 4,000 wan per SOK. The retail price is approximately 20 percent higher. The current value of Korean currency is 708 wan equals 1 U.S. dollar.

Although there is no specific restriction on nori imports, it is classified as being up to the director's discretion. In reality, any imports would be restricted because the Koreans feel that they can produce at least 50 percent more nori. Historically the Korean government has a policy of being highly protective of local production.

Although nori production has been erratic, it has been on an upswing since 1978. This trend has important implications with regard to Korea's ability to fulfill domestic needs as well as supply some export trade. The feeling that production could be increased by 50 percent, although possibly inflated, argues against easy acceptability of a U.S. product by the Korean market. This is probably reinforced by the fact that, although there is no specific restriction on nori imports as in Japan, Korean government agency discretion and policy will be protective of local nori production.

Australia/New Zealand - The import and market for Porphyra appears to be unlikely.

India, Sri Lanka, Bangladesh, Burma, Peninsular Malaysia - Both Porphyra and Monostroma are present but are not harvested or utilized. No market has been identified.

Brunei - No information was reported on Porphyra or its marketability. Porphyra is probably not indigenous to Brunei waters.

Sarawak - A local form of Porphyra (Porphyra vietnamensis) is found in the rocky areas of Tanjong Kedurong and Tanjong Batu at Bintulu. Despite harvesting difficulties, local preference for this thin wafer of soup-grade nori supports a small local industry. There are no records of exports and Porphyra beds are declining with the development of deep sea ports and LNG projects in the area. Porphyra production in Sarawak represents the most equatorial production known.

Indonesia - A limited Porphyra market exists in the hotel trade catering to Japanese tourists, principally in the Japanese-owned hotel in Djakarta and in the hotels of the Sanur section of Denpassar (the market) in Bali. Otherwise there appears to be very little Porphyra production or consumption. However, in 1975, 49 tons of agar were imported (U.S. $98,000) while over 8,000 tons of "seaweed" were produced and 1,900 tons were exported (U.S. $58,000) according to fisheries statistics of Indonesia, 1976. It is not known which genera are being referred to in this account.

Singapore - A small Porphyra market is found in the hotel trade but there is no farming or local crop.

The Singapore Department of Statistics Library provided import and export figures for "seaweeds" (see Table 14).

TABLE 14

SINGAPORE SEAWEED TRADE

Source or Receiver	Imports kg	Exports kg
Hong Kong	7,593	54,090
Brunei	—	263
Sabah	86,236	614
Sarawak	—	11,549
Peninsular Malaysia	11,834	20,869
Sri Lanka	—	6
Taiwan	6,000	3,000
United Kingdom	—	14,980
United States	—	326,409
Denmark	409	521,247
France	—	142,384
German Fed. Rep.	—	12,000
Australia	12	—

Philippines - Porphyra production and consumption appears to be limited to research programs and local fishing communities on Ilocos Norte, respectively. Research programs are aided by JICA (Japanese International Cooperation Agency). To date there is no exportation of Porphyra and very little consumption.

People's Republic of China - The dried purple laver is utilized for food.

Production in 1980 was 7,200 tons with most of this being consumed locally. The remainder is exported to Japan and southeast Asian countries. A domestic market potential exists for much larger quantities if production costs can be reduced and the locals can be shown additional ways to utilize this product.

Taiwan - A small Porphyra industry exists along the northeast shore. It is harvested with other seaweeds like Enteromorpha during winter months, washed through circular screen-bottomed forms, dried, and sold in local markets. The product, a circular thick sheet (1.5 to 2.0 mm), is of poor quality. No production records are available through those contacted (see discussion on Taiwan in Section II.C).

South America - A large Japanese population in Brazil (over 800,000) indicates at least a limited market potential, but no import market records were made available to this inquiry.

Africa - No Porphyra market or Porphyra import was identified.

Europe - There are scattered concentrations of Japanese throughout Europe; however, the only significant concentration is in West Germany (12,649 in 1979). Although traditional nori markets may be limited, there is some indication that the health food trade might offer some market potential for an American-made Porphyra product. No specifics on market potential could be developed within the time constraints of this study.

V. THE DOMESTIC MARKET

Domestic Supply

The absence of any existing domestic production of Porphyra products focuses the analysis of the domestic supply on the import sector. United States import statistics are compiled by the Customs Department of the Bureau of the Census. Itemized by commodity, categories are identified by TSUSA (Trade Statistic of the United States) number. The category which includes nori is TSUSA No. 1824800, "Seaweeds and Marine Plants Prep for Edible Uses." Major suppliers are identified by country under this category, as well as by quantity and value of imports. Statistics are available from 1960 through 1980 (Table 15), when about 1.4 million pounds were imported, valued at about 5.5 million dollars. These statistics indicate an average current value of $4 per pound.

Japan is consistently the source of one half or more of the United States supply, importing predominantly (90 percent) to four major cities - Honolulu, Los Angeles, New York, and San Francisco (Figure 12). The Standard Trade Index of Japan lists seaweed exporters as follows:

Aburamasa Shotin	Obata Co.
Kadoya	T. Katayama
Kobi Yoko	Tayo Minka Karsha

Products included in the TSUSA category include seaweed products, such as algins, which are used as food ingredients. No more specific identification of product forms is provided. Nevertheless, as the major import centers are also the major centers of Asian population, a more direct local consumption

TABLE 15

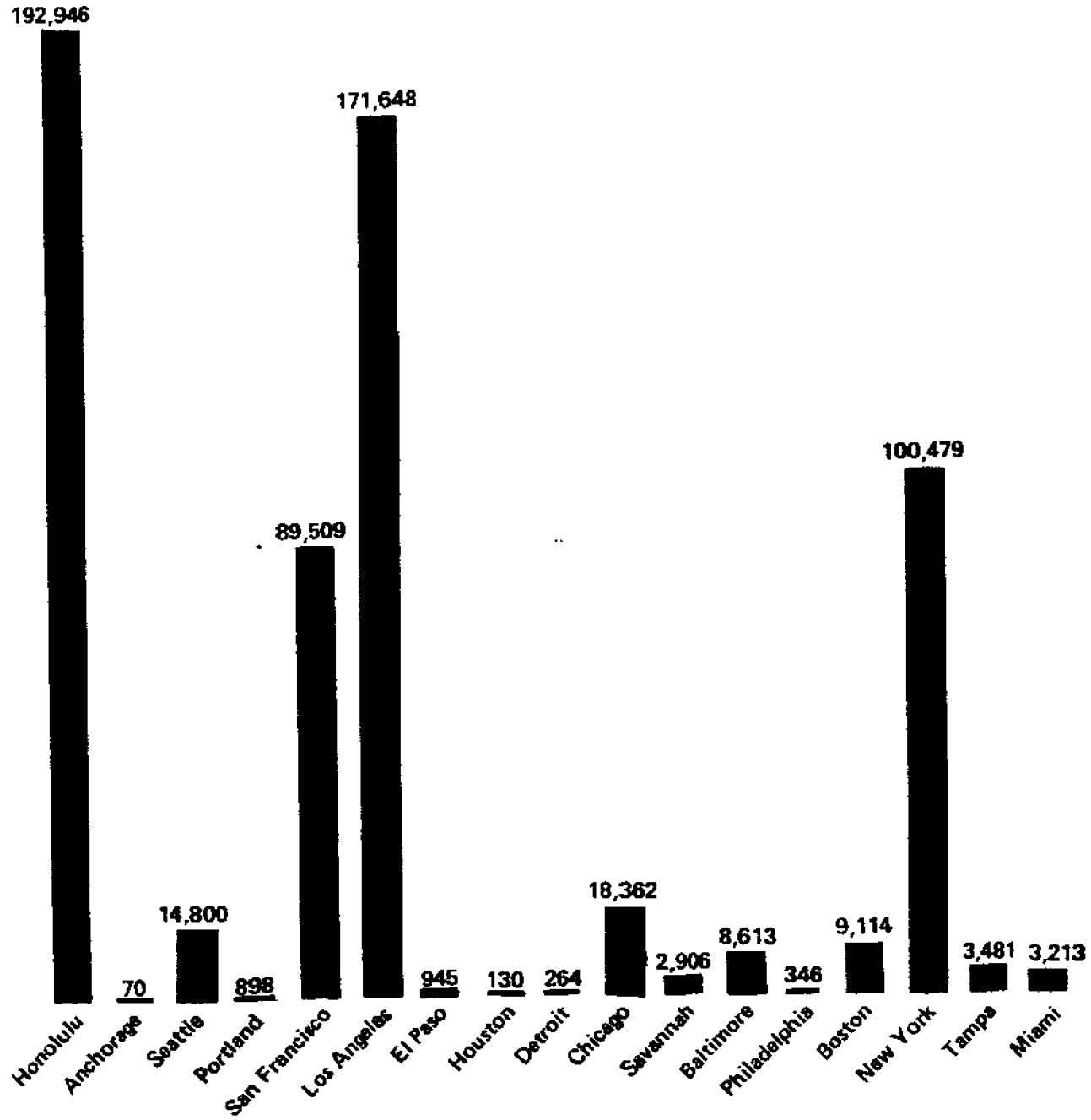
U.S. Seaweed Imports by Country of Origin
(in thousands of U.S. dollars)

	Japan	Korea	Canada	China - M	China - T	Hong Kong	France	U.K.	Italy	Denmark	Others	Belgium	Total
1960+													
1961+													
1962+													
1963	$ 122.4	$ 16.4	$ 88.0			$ 0.2				$ 7.7			$ 234.9
1964	14.7										3.9		18.5
1965	267.3	47.9	15.5							2.0	0.6		364.6
1966	231.7	34.8	8.8							6.9	4.3		338.4
1967	294.2	130.1	15.0		1.5					4.7	15.7		470.2
1968	289.9	61.6	189.1								0.6		690.7
1969	267.5	28.5	12.4								0.1		317.0
1970	292.1	166.9	10.4					3.8			1.4		473.5
1971	358.3	71.4	14.7		1.7			63.0		4.3	9.6	0.5	556.8
1972	321.2	67.0	11.0	0.2	0.2	3.7		40.2	1.5		0.6		445.6
1973	358.2	81.0	7.7	1.3		98.4		3.6			0.5		550.8
1974													84.0
1975	323.4	74.8	—								32.7		430.9
1976	409.5	204.8	—								108.6		722.9
1977	418.6	291.8	66.0		6.8						118.2		901.3
1978	503.6	191.1 *	30.2		16.7	21.9	44.1				42.5		850.0
1979	568.6	201.3	157.4	21.8	9.4						161.9		1,119.4
1980	617.7	540.2	48.0	38.2	—						145.2		1,389.3
1981													
1982													

*Production failure in Korea

FIGURE 12

U.S. Seaweed Imports from Japan
1980
Quantity (in pounds)



can be inferred. Table 16 ranks both the Asian populations and seaweed imports by state. Maine is the location of Marine Colloids Corp., which explains the fifth-ranking level of imports for that state (mostly supplied by Canada).

Distribution Channels

The Japanese National Federation of Nori and Shellfish Fisheries Cooperative Associations has sponsored three United States West Coast Nori Market Surveys. The last survey was in June 1981.

The survey identified the existing market channels for nori in the United States as illustrated in Figure 13. The Japanese exporting firms deal with affiliated importers in the United States who distribute about 50 percent of the total supply to supermarkets directly. Other wholesalers and military markets represent another 30 percent of the supply. Restaurants purchase the remaining 20 percent. Consumers are identified as Japanese nationals, Japanese Americans, and Koreans. Some of the imported product is purchased in bulk and packaged in the United States under the label of the distributor.

A local Washington distributor carries nori under his own label. The product, a purplish-tinted (low-quality) nori, retails (the 10-sheet package) for about $1.89. The Cooperative Association's survey included sheet nori prices by group:

- o High-grade - $3.00 to $3.99
- o Medium-grade - $1.99 to $2.80
- o Low-grade - $0.99 to $1.70

TABLE 16

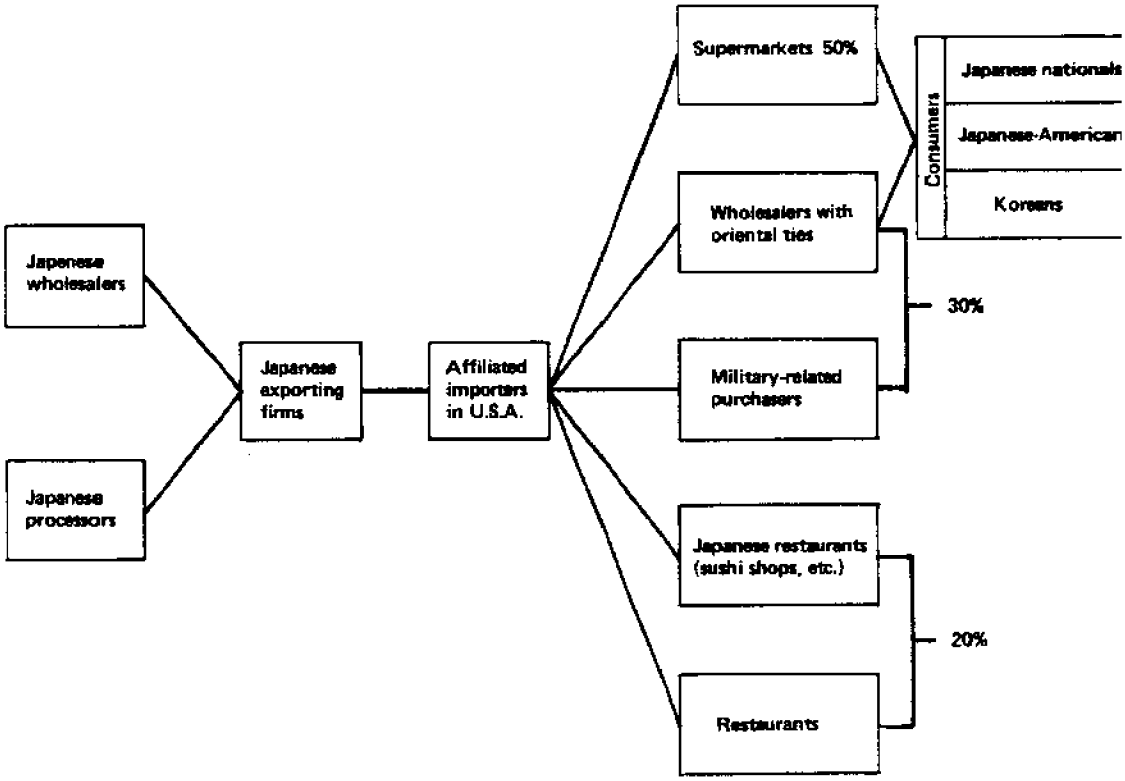
ASIAN POPULATION AND SEAWEED IMPORTS

(Rank by State)

Asian Population	Seaweed Imports
1. California	1. California
2. Hawaii	2. New York
3. New York	3. Hawaii
4. Illinois	4. Illinois
5. Texas	5. Maine
6. New Jersey	6. Washington
7. Washington	7. Maryland
8. Virginia	8. Massachusetts
9. Pennsylvania	9. Florida
10. Maryland	10. Texas

FIGURE 13

Existing Market Channels



A medium-grade sheet is between $0.20 to $0.28. Wholesale costs were quoted by Mr. Blake Rankin of Granum Co., Seattle, at approximately $0.11.5 for a medium-grade nori. This suggests a substantial markup of 50 percent, typical of most specialty or gourmet food items in retail stores. Mr. Rankin purchases four types of nori products in modest amounts. He provided his landed cost in Seattle:

Hoshi nori	$0.085 per sheet
Sushi nori "B"	$0.190 per sheet
Sushi nori "C"	$0.160 per sheet
Flavored nori	$0.150 per sheet

Japanese statistics provide further detail (Table 17), giving nori data specifically. The Japanese figures for dried sheets are given as the number of sheets exported. Assuming a weight of 3 grams per sheet, the nori exports (including roasted and seasoned nori) represented about 28 percent of the Japanese seaweed exports to the United States in 1979 and 1980. These figures are also more current than the U.S. data, showing partial figures for Japanese exports to the United States during 1981.

The rapid and recent expansion of Korean exports to the United States (Figure 14) has occurred over the last five years with a visible interruption during the 1978 production failure. Korean statistics are not available to verify these figures and Korean producers claim they have no significant export markets. It is interesting to note that the Korean population in the United States has grown over 400 percent in the last 10 years (Figure 15), but neither the import data nor the population data provide sufficient detail to allow evaluation for statistical correlation.

TABLE 17

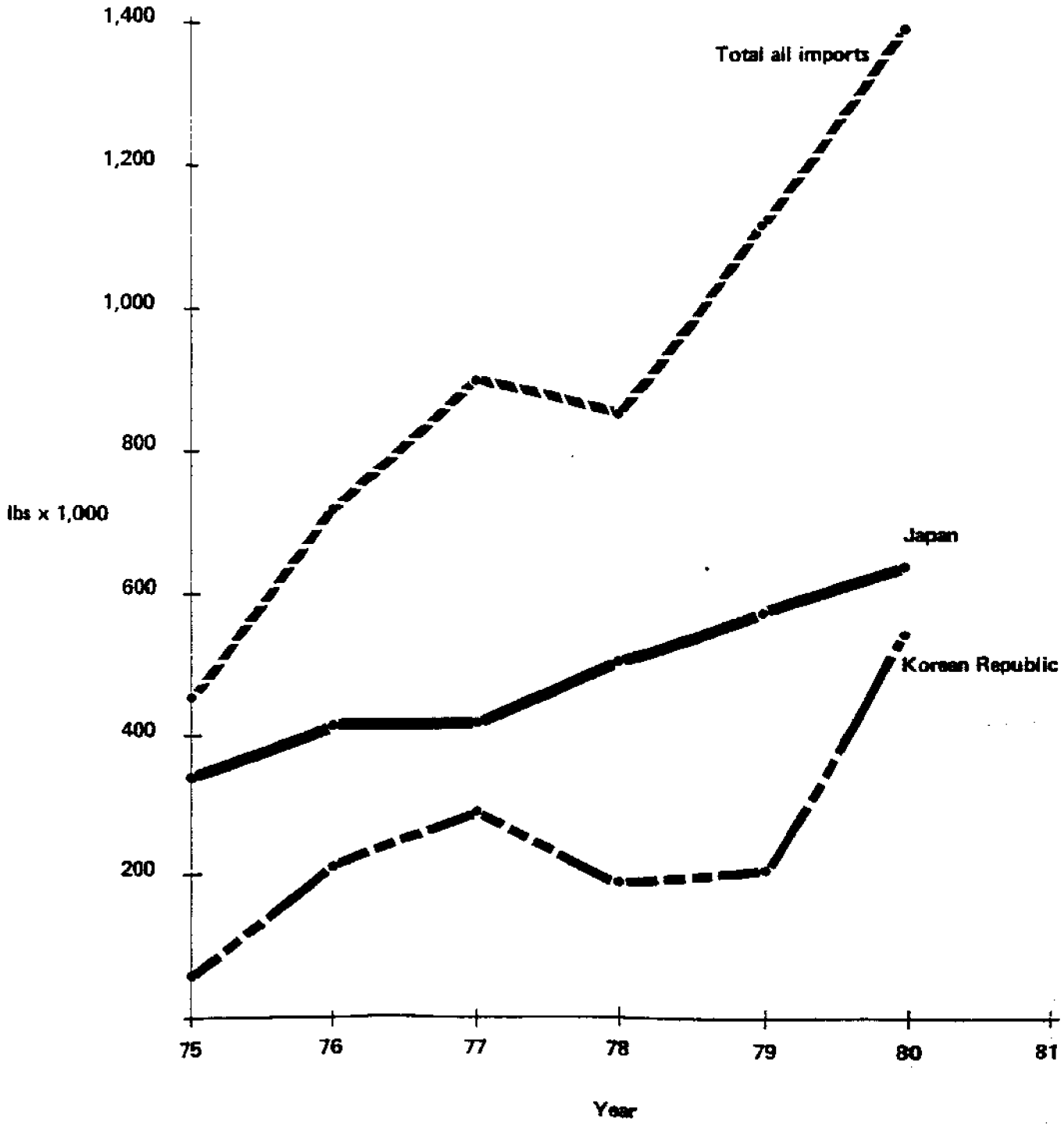
JAPANESE EXPORTS OF NORI TO THE UNITED STATES

Year	Sheets (x 1,000)	Kg	Estimated* Weight in Pounds	Percent of Total Japanese TSUSA Imports to U.S.A.
1976	2,715	15,391	51,779	13
1977	1,912	14,806	45,192	11
1978	6,071	16,876	77,360	15
1979	16,467	23,036	159,690	28
1980	15,407	31,478	171,290	28
1981(partial)	3,997	6,307	40,340	NA

* Sheets are assumed to weigh 3 grams each.

FIGURE 14

U.S. Imports
Seaweeds and Other Marine Plants
Prepared for Edible Uses

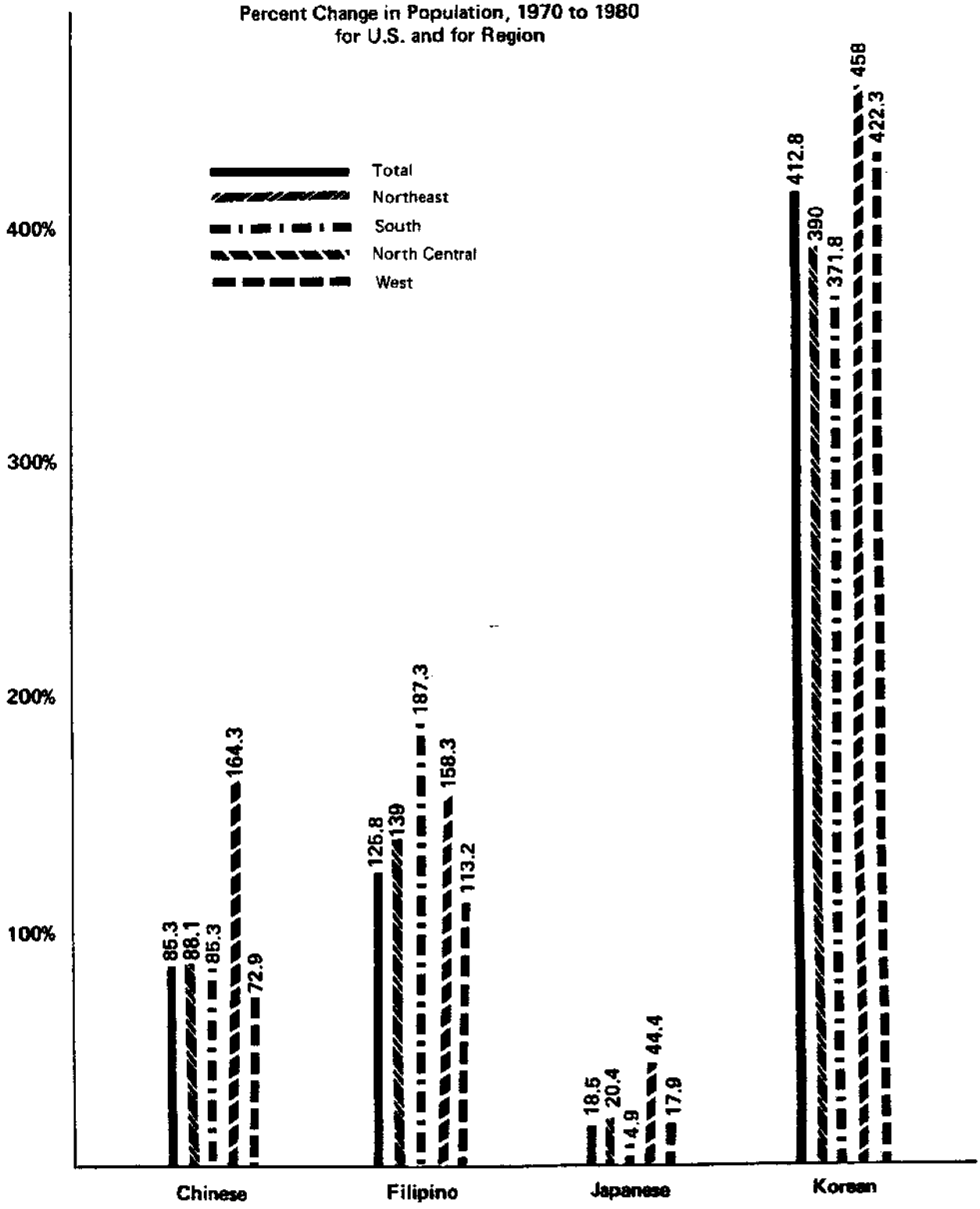


Bureau of the Census

FIGURE 15

Asian Populations

Percent Change in Population, 1970 to 1980
for U.S. and for Region



Another potential factor, or competitive edge, attributable to a domestic operation would be the cost savings in shipping fees, duties, and other charges associated with nori importation. A breakdown and description of applicable charges to foreign imports (in this case, Japan) is provided below.

The Korean nori production has grown dramatically over the last 20 years. Japan was formerly the market for 90 percent of the Korean production but it has banned or limited Korean imports more recently. The entire United States market would amount to less than 0.5 percent of the Korean supply. Consequently, even if the Korean producers captured a large share of the U.S. market, they might justifiably claim no "significant" exports. Wholesale prices in Korea were quoted at $0.04 per sheet, while Japanese costs are estimated at about $0.06 per sheet, indicating they have a competitive advantage.

Potential Competition for Domestic Markets

The financial and economic feasibility of a potential Washington-based nori culture operation is dependent, in some part, upon its vulnerability to competition, both foreign and domestic. The major present threat is from foreign competitors, as there is no evidence of any domestic West Coast operations at the present time. Domestic competition could result in the long term, as it is conceivable that individuals in Oregon and California could adopt the Washington plan now being developed.

Foreign Competition

A Washington-based operation would have some competitive edge over foreign competition by the fact that the growing season could be extended to almost

twice that of some of the Pacific rim countries, and thus result in lower costs of production. This situation may indeed be true for certain grades of nori by comparison with a country like Japan where labor costs are comparable with those in the United States. Based on the extended season, a domestically produced sheet of nori could cost two to eight cents to produce (Section IX.). This compares favorably with an average cost of nori produced in Japan of approximately six to seven cents per sheet (Section IX.). This comparison is not as favorable for other Pacific rim nations where operations are less industrialized, and where labor is substantially cheaper than in the United States-Japan case. Korea, for example, has an approximate cost of production of 3.5 to 5.5 cents per sheet (Section IV) for grades of nori that are generally lower in quality than those produced in Japan and for the U.S. market. This could be detrimental to the U.S. domestic production if the distinction and preference for better-grade nori are not major considerations among United States nori consumers.

Another potential factor, or competitive edge, attributable to a domestic operation would be the cost savings in not paying shipping, duties, and other charges associated with nori importation from another country. A breakdown and description of applicable charges to foreign imports (in this case, Japan) is provided in Table 18.

The accumulation of all these costs amounts to about an additional half cent per sheet. For an eight-cent sheet, this accounts for 6.25 percent of the imported product cost.

TABLE 18

JAPANESE IMPORT EXPENSES
(Source: Rankin,* personal communication)

Duty	All nori products except tsukudani (seaweed paste) are classified as sea vegetables and are not subject to duty. Tsukudani is classified as a sauce and, as such, is subject to a duty of 7 percent.
Freight	Costs for freight are related to physical volume, not weight. Expenses, therefore, fluctuate slightly as a percentage of product cost, depending on the quality and value of the product imported. A freight cost from Japan to the United States is roughly 1 to 5 percent of the landed cost. One relatively small importer in Seattle reports a cost of 4.6 percent for most of his low-quality nori imports. The same importer, however, realizes some savings by lumping his nori products in with many other food products in the same shipping container. Under this arrangement, the freight company rate in the category for "groceries" is slightly less than for "sea vegetables."
Insurance	Rates among companies may vary but insurance is relatively low. Seattle importers pay 0.00675 of the value of the cargo, or a little more than half a cent on the dollar.
Custom broker charges	Costs range from $80 - $150 per single entry of a shipment. These fees are constant whether $10,000 or $10 million worth of product is imported. A paper work fee, broker charges can be eliminated altogether by the importer directly handling the import procedures.
Other considerations	Sushi-nori, because it is vacuum-packed, occupies little space and a greater number of sheets will fit in shipping containers than other nori products. Some small-scale importers realize greater savings by utilizing non-conference vessels which are, according to one Seattle importer, "cheaper, just as reliable and more responsive to claims" than conference vessels.

*Mr. Blake Rankin, of Granum Company, distributor.

As this additional import cost is not substantial, it does not constitute a strong competitive edge for a domestic industry. Exports to the United States constitute a relatively small portion of the total Japanese market. The same is true of the Korean market for nori. Unless a substantial savings in cost of production is realized by a domestic industry, which depends solely on a domestic market, foreign importers will be able to meet or beat domestic prices (even at the risk of losing some profits) in order to keep their United States markets open.

Domestic Competition

Porphyra is already collected, on a small scale, along most of the west coast of the United States and used as a food. It is conceivable that any measure of success with Porphyra farming in Washington could lead to the development of similar operations elsewhere. Candidate culture areas would be similar in physical and chemical oceanographic character to the waters of Washington in general, and Puget Sound in particular.

The quality of water in Puget Sound for Porphyra depends largely on characteristics of source waters, circulation patterns, mixing, surface exchange, and local chemical processes. Fresh water enters the Sound at the surface primarily from the larger rivers, and coastal seawater flows in through the Strait of Juan de Fuca at depth. These two sources with opposite flows, plus the tidal intermixing, tend to maintain a steady water quality balance. Surface salinities can increase from near zero, at a river mouth, to about 32 ppt on the coast. Overall, the waters of the Sound are a dynamic mixture averaging roughly ten parts of coastal water to one part of river water.

Surface temperatures vary seasonally between 8 to 13 degrees C, although some extreme low and high temperatures can occur. Oxygen in the surface

waters is replenished by surface exchange and photosynthesis. The primary source of phosphates is the inflowing seawater rather than the river water. Phosphate is generally available then to surface waters where mixing occurs between upper and lower water layers. Other nutrients may enter the Sound in river water or other fresh water sources.

Within this environment, Porphyra species are diverse and abundant. Their distribution extends throughout the San Juan Archipelago, the Strait of Juan de Fuca, and Puget Sound proper (Mumford, 1980).

Good conditions for the proliferation of Porphyra, however, exist in many areas. These conditions have been summarized by Merrill (1981):

Optimal temperature	8 - 12 degrees C
Light intensity	5,000 lux
Optimal salinity	20 - 30 ppt
Optimal pH	8.0 - 8.2
Nitrogen level	0.07 - 0.8 mg/l
Phosphorus level	0.005 - over 0.20 mg/l
N:P ratio	10:3
Current speed	1 - 1.5 knots
Wave heights	up to 1 meter

It is possible that wild stocks could be harvested and manufactured into some product form. A collection of Porphyra species was harvested recently by DNR personnel and sent to Japan for processing into sheets. A fair product resulted. Porphyra abbottae proved best in quality. Near San Luis Obispo (California), a family of Japanese origin ran a wild crop Porphyra harvesting business for several years (ending in 1977), marketing their

product on the West Coast (possibly San Francisco and Vancouver, B.C.) and in Hawaii through the Wing Coffee Company.

Woessner, Sorenson and Coon (1977) describe the epiphyte Porphyra nereocystis occurring in considerable quantities, approximately 500 wet kg/km, along the central California coast during the winter. Some of this Porphyra was processed into nori sheets and found to be similar in quality to foreign noris. They point out, however, that harvesting American Porphyra is, at best, economically marginal.

There is little quantitative information on the abundance in British Columbia of Porphyra, but sizeable natural stands occur in many areas (Skagel, 1971). The same can be said for the Oregon coast and many parts of California. Table 19 shows the seasonal occurrence of several Porphyra species along the northwest coast of North America.

It is reasonable to assume that a successful seaweed culture industry in Washington would generate interest in culturing Porphyra in other areas, rather than harvesting natural stocks. This in turn could lead to domestic competition for domestic markets initially. The degree and impact of this competition would depend naturally on the availability, flexibility, and character of target markets.

Although domestic competition is not a factor of immediate concern with regard to establishing a seaweed culture industry, securing local markets from potential competition may become a priority once a culture operation appears to be economically viable.

TABLE 19

SEASONAL OCCURRENCE OF *PORPHYRA* SPECIES
FROM THE NORTHWEST COAST OF NORTH AMERICA

Spring-Summer	Winter-Spring	Year Round
P. perforata	*P. pseudolanceolata*	*P. sanjuanensis*
P. abbottae	*P. schizophylla*	
P. kanakaensis	*P. brumalis*	
P. papenfussii	*P. torta*	
P. schizophylla		
P. miniata		
P. variegata		
P. occidentalis		
P. nereocystis		
P. smithii		
P. fucicola		
P. gardneri		
P. thuretii		
P. maculosa		

Source: Garbary, et al. (1980).

VI. MARKET PLAN ANALYSIS

Although proposed domestic ventures will be producing the same marketable commodity, their objectives and strategic marketing approaches will vary. This is best demonstrated by the differences in targeted market share:

	Farm Size		
	200-Saku	300-Saku	2,000-Saku
Estimate of yearly production in sheets	2 million	3 million	20 million
Estimated target market share	2%	6%	20%

These percentages are based on an estimate of a total domestic market for nori of 50 million sheets. Reviewing the Japanese statistics, their highest import level to the United States accounted for 25 million sheets. If Korean imports are of a similar composition (about 30 percent nori), they could provide another 25 million sheets.

Smaller facilities have neither the profit nor the volume to justify an extensive market plan. Each facility will probably enter the existing wholesale distribution channels without notable impact, and will be a "price taker," (i.e., not having sufficient volume to affect the going price greatly). Greater profitability will be achieved if an operation can find a specific market niche for "value-added" products. Specific market segments where this could occur are discussed in the following section. The ingenuity and attributes of the particular operation will be the factors determining the best approach.

The larger 2,000-saku facility is faced with a more substantial marketing objective. It must displace a healthy portion of the existing supply or significantly expand the existing market. Most likely a combination of the two will occur. A possible marketing approach would include a combination of markets, probably entered in phases:

1. Bulk commodities
2. Military procurement
3. Ingredient sales
4. Restaurant and food service
5. Specialty foods markets
6. Mail order
7. Supermarkets

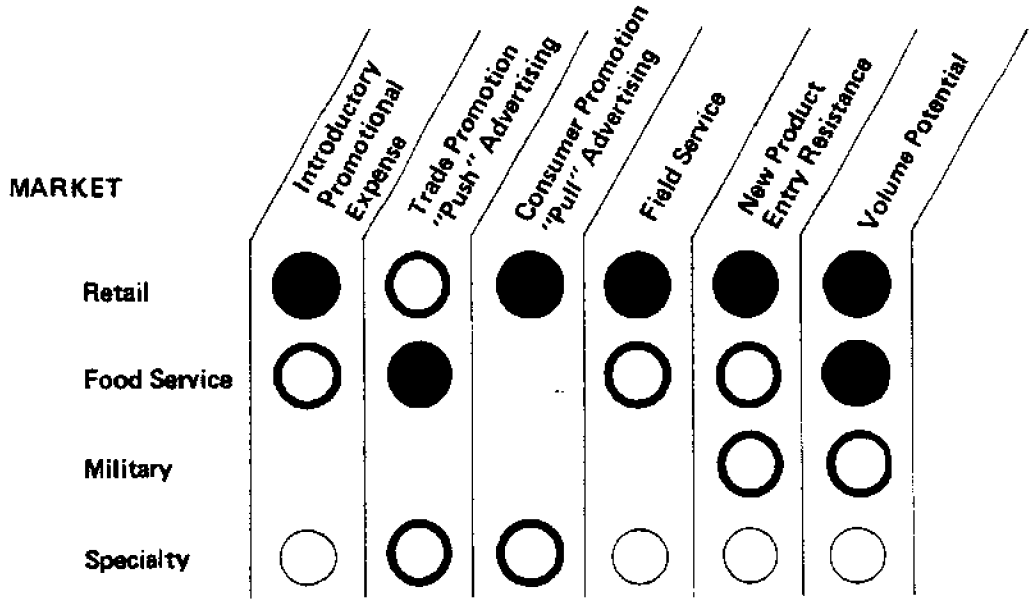
Each of these market segments has specific requirements which are compared in Figure 16. Therefore, each must be individually considered and a specific plan developed. Careful evaluation is necessary in the planning stage, and product introductions must be given substantial support. Test marketing concepts for each segment are recommended. A regional marketing approach, targeting the West Coast and Hawaii, is advisable for larger market segments. Some specific information on various segments follows.

Bulk Commodities

The major importers have the established distribution systems which supply the existing market. Price and quality of Washington-grown nori will be major factors for market entry; however, established relationships and preference for "authentic" nori may hamper penetration. Ties with Japanese trading companies are long standing. The rapid growth of Korean imports,

FIGURE 16

SUMMARY OF FOOD INDUSTRY
SEGMENT MARKETING REQUIREMENTS



● = high

◎ = medium

○ = low

however (discussed in Section V), suggests that new sources are accepted on a competitive basis. Major importers on the West Coast are listed in Table 20.

TABLE 20

MAJOR WEST COAST IMPORTERS

Ikeda and Company, Inc.
912 Maynard Avenue South
Seattle, Washington 98134

Seasia (Uwajimaya)
P.O. Box 3642
Seattle, Washington 98124

North Coast Importing Company
P.O. Box 3111
Seattle, Washington 98114

Anzen Pacific Corporation
P.O. Box 11407
Portland, Oregon 97211

North American Trading Company
412 R Street
Sacramento, California 95814

Hosoda Trading Company
Sacramento, California
(full address unavailable)

Cisco Food Company
14108 Southwestern Avenue
Gardena, California 90247

New Meiji Trading Corporation
1620 West Redmond Beach
Gardena, California 90247

Nishimoto Trading Company
410 East Grand Avenue
San Francisco, California 94080

JFC International, Inc.
445 Kauffmann Court
South San Francisco, California 94080

Mutual Trading Company, Inc.
P.O. Box 2919
Terminal Annex
Los Angeles, California 90051

Central Boeki (USA Limited)
32-26 Greenpoint Avenue
Long Island City, New York 11101

Marukai Corporation
New York, New York
(full address unavailable)

Military Procurement

Although military purchases are mentioned in the Japanese Nori Association analysis of the U.S. market, this could not be confirmed. The Defense Personnel Support Center, Philadelphia, Pennsylvania handles most of military food procurement. It had no listing for nori or anything similar.

Nori does, however, appear regularly in the ethnic food sections of most military commissaries, notably in Hawaii. It is probably purchased directly through the procurement offices at base level, whic have the authority to make local purchases of small volumes of specialty and ethnic foods.

Ingredient Sales

Broken nori pieces can be sold in bulk for food ingredient use. Developing such an outlet in the United States for broken nori would be beneficial as little additional manufacturing costs are involved. Likely targets are spice or flavoring manufacturers, such as Crescent Manufacturing, Seattle, Washington; Schillings, Specialty Brands (Spice Islands Brand), San Francisco, California. These companies have existing regional retail distribution channels. Dick Weaver, Vice President of Crescent Manufacturing, expressed interest in exploring new product concepts utilizing nori.

Restaurant/Food Service

The greatest growth in domestic nori consumption appears to be generated in this market sector. Preparation of sushi in most Japanese restaurants is left to cooks trained in Japanese traditional methods. This characteristic may prove a barrier for a domestic product. The desire to utilize "authentic" Japanese nori would probably be most pronounced in the "white tablecloth" sector of the trade.

The Chalon Corporation of Bellevue is a Japanese-based company which plans a chain of restaurants in the United States. They have expressed interest in using Washington state agricultural products in their restaurants both here and in Japan, which might help overcome other buyers' resistance to Washington-grown nori.

Sea Galley restaurants in Washington have demonstrated innovative management which has been rewarded with good growth. They have a more general clientele and would provide a good vehicle for expanding the consumption of nori into the American populace.

Although the restaurant business offers greater concentration in use, distribution and marketing requirements for a limited product line are prohibitive. For this reason, direct sales opportunities to chain operations should be emphasized.

Specialty Food Markets

As a high-priced luxury food and gift item, nori best fits the specialty foods approach to retail trade. Both the health food and gourmet food segments merit consideration. Mr. Blake Rankin, of Granum Company, currently distributes nori products to health food outlets. Its high protein and vitamin content, as well as additional health benefits claims, give it appeal to that clientele.

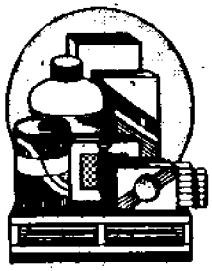
The gourmet market is one of the fastest growing areas in the food industry (see following Wall Street Journal article). Interest in Japanese food has been demonstrated in recent articles in various gourmet cooking magazines. Promotion and packaging are especially important to success in this market which is most similar to the Japanese nori gift trade.

Gourmet-Food Market Grows As Affluent Shoppers Indulge

By Janet Guyon
Staff Reporter of The Wall Street Journal

JONATHAN HEILICZER WILL DRIVE 60 miles into New Jersey from New York City to save money on clothing for his twin sons, but when it comes to food-shopping for himself, he takes a different view of economy. Then his favorite store is Balducci's, a Greenwich Village gourmet grocery where the shelves are stocked with such high-priced exotica as quail eggs, a dozen varieties of olives and stuffed baby eggplant.

"I like to eat, and I might as well eat well," says the 31-year-old Manhattan physician, loading his shopping basket with fresh pasta and farm butter that costs 60 cents a pound more than the supermarket kind. "This is kind of my little splurge. I'm probably spending an extra $10 to $12 a week, but it tastes better."



Young, affluent and well-educated, Dr. Heiliczer is typical of the shoppers propelling the gourmet-food market, one of the fastest-growing segments of the slow-growing food industry. Retail sales of gourmet foods last year, says Frost & Sullivan Inc., a market researcher, were $2.2 billion.

That's nearly twice the sales of much-publicized generic, or no-name, supermarket products. Moreover, says Frost & Sullivan, retail food sales could increase to $3.5 billion by 1985 and $6.2 billion by 1990, with unit sales growing an average of more than 4% a year.

ADDITIONAL EVIDENCE of the gourmet-food boom can be found in the trebling of Bon Appetit magazine's circulation in just five years and 15% annual real growth rates in sales of Heublein Inc.'s Grey Poupon mustard and CPC International Inc.'s Swiss-made Knorr soups. Sales of Godiva candy, Belgian-style chocolates made in Reading, Pa., by a subsidiary of Campbell Soup Co., have risen ninefold since 1978.

"If you want to share in the good life, you can't buy a Rolls-Royce like a duke and you can't go to Tiffany to buy a ring," says Albert Pechenik, Godiva's president. "But you can buy the same food. It's a symbol of quality available to most people in this country."

Godiva is working hard to make its products available. It plans to open as many as 50 retail outlets in the next three years, it recently introduced $5-a-pint ice cream (soon to jump to $6) and it has hired French chef Paul Bocuse to develop more gourmet foods.

Defining what is and isn't gourmet food, however, is tricky. Supermarkets usually consider food that's expensive, imported, and is characterized by high profit-margins and low sales volume, to be gourmet; Frost & Sullivan says gourmet food is hard-to-find and exotic and has a special taste and added value. Godiva's Mr. Pechenik offers a third viewpoint: "A lot of what's on gourmet shelves," he says, "is mundane, bulk commercial stuff with a French name and a very high price."

WHO BUYS THESE GOODIES? Mostly upper-income adults in small households who care a lot about the healthfulness, quality or status of their lives, says Frost & Sullivan. Most are between 25 and 44 years old and have household incomes of more than $30,000. They like to indulge themselves. "If financial conditions require the eating of hamburger," says the market research concern, "then it will be a special hamburger—cooked with some special sauce or with unusual ingredients worked into the ground meat."

The roots of such desires lie in the increased travel and sophistication of Americans that followed World War II. Two-income households are better able to afford gourmet foods, and the rising cost of gasoline and restaurant meals has made it chic to entertain at home. "Food today is so expensive to begin with, why not pay a few dollars more and get the quality and value?" says Lynne Halpern, who runs a combination gourmet fast-food restaurant and grocery in Atlanta.

Those who sell gourmet foods say buyers must be convinced that the products are unique and high-quality but not intimidating. Godiva tries to create a quality image for its $17.50-a-pound chocolates by running ads that show them nestled in jewelry boxes.

GOURMET RETAILERS also have special approaches. At the Halpern store in a sleek, suburban Atlanta mall, patrons are seated at old English tables set with wine glasses while they select meats, seafoods, greens, pate or other prepared dishes on display. One recent Saturday, the store sold 120 pints of New Zealand raspberries for $2.50 each in only half an hour.

Despite forays by Nabisco Brands Inc. and Campbell Soup into the fancy-food market, few big food manufacturers have shown interest in it; Frost & Sullivan says the field still is too small for the giants. Most gourmet products are sold by small companies like Kimberly Wine Vinegar Works, a husband-and-wife concern in San Francisco; Community Coffee Co., a small Louisiana roaster that recently began marketing its coffee through a mail-order catalog, and the Halpern store, an outgrowth of proprietor Howard Halpern's wholesale food business. The number of such entrepreneurs is growing quickly; more than 1,500 promoted their wares, including cooking appliances, at a San Francisco trade show last weekend.

But big-name supermarkets are starting to show more interest in gourmet foods; often breaking up separate gourmet food sections and instead stocking regular shelves with gourmet offerings. Safeway Stores Inc., the largest U.S. food store chain, recently licensed the name of Bon Appetit, the magazine, for a group of gourmet stores in wealthy areas of San Francisco. After Safeway converted one of its conventional outlets in Tiburon, Calif., into a Bon Appetit, sales volume doubled.

Some insight into the American gourmet market is available through the following sources:

NASFT, The National Association
for the Specialty Food Trade
Jean Fram, Executive Secretary
1270 Avenue of the Americas
New York, NY 10020

Telefood Magazine
P.O. Box 156
Hinsdale, IL 60521

Mail Order

Another good growth segment, the mail order market for nori, is unknown. It is probable that ready-to-eat food products and seasoned nori products would have the greatest chance for success.

Traditionally, the mail order customer has been an affluent educated New Englander. Of late, the Alaskan market has become very active. The Alaskan exposure to the Japanese culture would suggest that it is a better target area than the East Coast.

Supermarkets

The supermarkets, being extremely competitive and low margin, offer opportunities for higher volume sales. A sales force to service the stores is necessary. This is most cost effective when a substantial line of products and demonstrated customer demand exist.

Considerable investment in consumer education will be required to accomplish the necessary market development. A prospective marketing budget should include:

- Market research
- Trade advertizing
- Magazine/radio advertizing
- Pre-/post-awareness studies
- Public relations
  - Spokesperson
  - Home economist
  - Recipe development
  - Publicity releases
  - Press Functions

Such a program developed for Alaska Seafood Company, for example, required an annual budget of one half million dollars, and covered the entire United States.

Aggressive marketing campaigns carried out by distributors cost 100 to 300 percent of gross revenues during introductory phases, and about 40 percent thereafter.

VII. OPERATIONAL ASSUMPTIONS AND REQUIREMENTS

Introduction

The profitability of nori production is affected significantly by the "economies of scale," as is typical of all processing operations. This factor must be carefully considered in evaluating the feasibility of a Washington state-based nori industry. Consequently, this evaluation considers an array of sizes for small-scale, owner-operated farms, as well as a single large-scale operation which will probably be organized as a corporation, a cooperative, or a partnership.

A series of operational assumptions for the various levels of production were made and are explained in this section, as well as the estimated requirements for equipment, facilities, and labor. The materials and utilities required are detailed in a series of notes related to the cash flow evaluations.

The baseline evaluation assumes that wetlands for nori production will be leased from the Department of Natural Resources at a set fee of $1,000 per acre per year. Other lease options are also considered, and various lease arrangements are evaluated with regard to their effects on the rate of return on equity.

Operational Assumptions

A number of extensive operational assumptions were made in order to evaluate the economic viability of a Porphyra industry in the Puget Sound region.

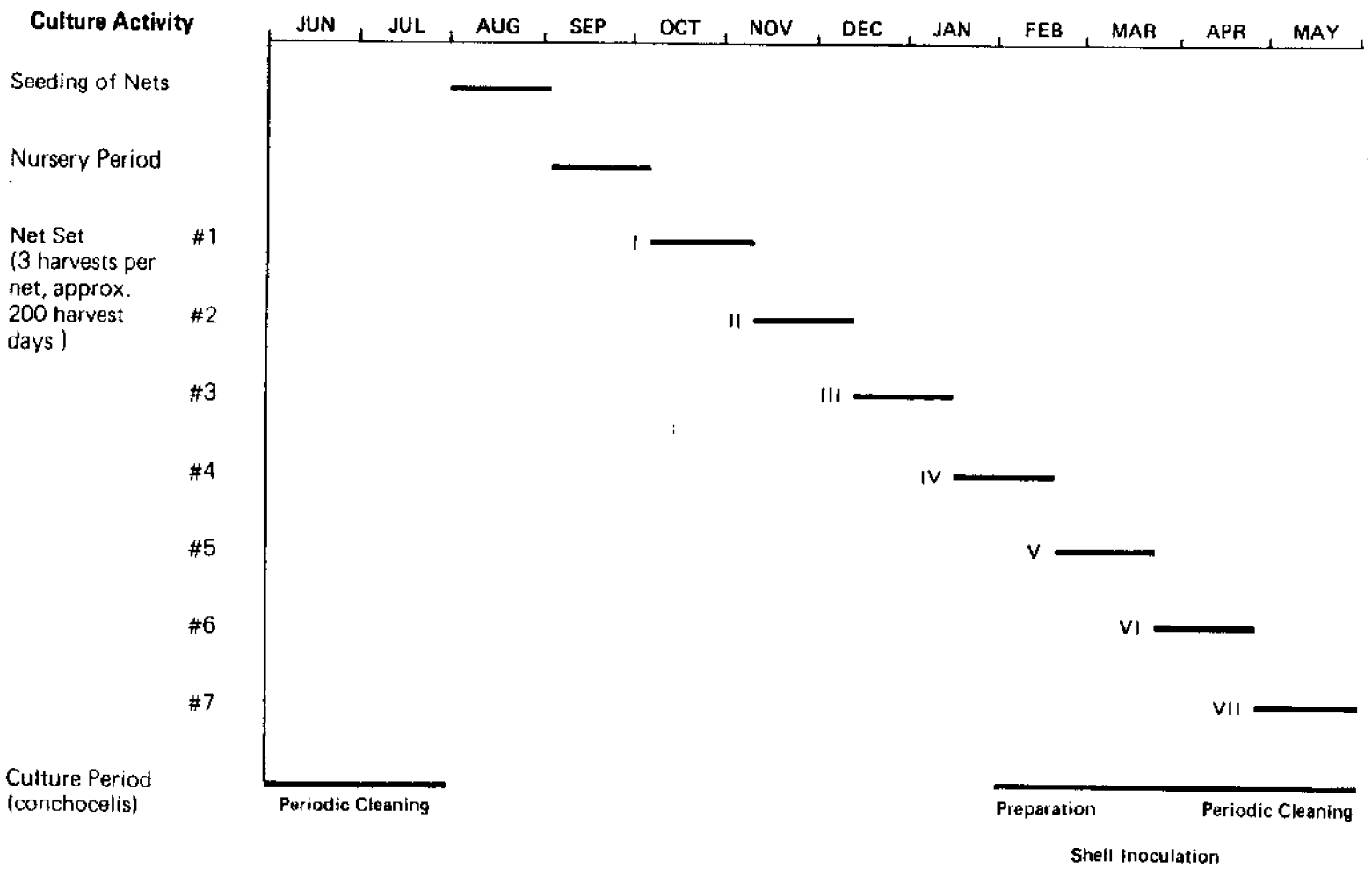
The assumptions were developed through numerous sources, and with the assistance of the Department of Natural Resources staff familiar with nori culture in Japan. These assumptions are based on a modification of the Japanese system. The projected annual cycle for the Pacific Northwest is shown diagrammatically in Figure 17. The assumptions were reviewed and adjusted as necessary during the course of the project as more information became available. The assumptions also reflected anticipated differences for the environmental conditions of Puget Sound. One major difference, for example, is the local utilization of 200 harvest days per season. This is twice the length of the harvest season in Japan (see Table 7, Section III), but is based on the longer period of potentially good growth conditions in the Puget Sound. This longer season could provide a major competitive edge to Washington nori growers. It essentially doubles the capacity utilization of any facilities investment. This in turn spreads the costs and reduces them on a per unit basis. While some resistance to the 200-day season may develop, especially in multiuse wetland areas, it would be to the benefit of any new industry if the longest growing season practicable was allowed. Certainly the longer season, and the other assumptions affecting expected yield, are critical to the accuracy of this economic evaluation. They must be carefully noted, tested, and adjusted during the planned pilot study.

Seeding Assumptions

The Japanese grower uses about six oyster shells (upon which the Porphyra spore, or the "conchocelis," has attached itself) per net during seeding. As the available oysters shells of Puget Sound are larger than those used in Japan, if it is assumed that three or four shells per net provide the equivalent surface area and produce the equivalent numbers of spore. The shells

FIGURE 17

Annual Cycle of a Culture Operation



will be strung to facilitate cleaning, and placed eight strings to a bar suspended over the seeding tanks. Ten bars, totaling 1,200 shells, fit over each four-foot tank. Thus, three tanks will be sufficient to produce seed for a 100-saku operation using 700 nets per season.

Production Assumptions

Production of Porphyra, based on artificial propagation, requires the seeding of seven sets of nets for each saku. The estimated 200 harvest days in Puget Sound, which does not include holidays and weekends, suggest about a 280-day season. The nets are harvested on a rotating 10-day cycle. This allows about 40 days of algal growth per net. The production period lasts nine months from the beginning of October to the end of June. In Puget Sound, the seeding time will therefore occur in August, and the nursery period in September.

A yield of 5,000 sheets per harvest day per 100 saku is assumed. Based on 500 sheets per net harvested at a rate of 10 nets per day for a 200-day harvest season, a 100-saku farm would produce one million sheets per season. This is higher than the Japanese average of 300 sheets per harvest, and is based on typical production levels. It does not include production failures and marginal operations, as does the average estimate. Nevertheless, the figure is substantially lower than that of 3,000 which was quoted by a visiting Japanese consultant (Mr. Inayoshi) after inspection of the Puget Sound area. This is impressive, considering the Japanese peak harvest is considered to be 1,000 sheets per net. As this assumption has an enormous impact on gross revenues, it is another key factor for testing with the pilot study.

The nets are set in frames of six, and harvested mechanically. Space requirements for the growing area are based on a rate of 1 unit of cultivated area for 12 units of farm area. Therefore, only about 1/12, or 8 percent, of the leased space is occupied by this arrangement. Limited availability of wetlands, or high user fee rates, could result in a more densely compacted net layout.

In summarizing, the general assumptions regarding Prophyra culture in Puget Sound are:

1) artificial propagation
2) 200-day harvest season
3) approximately 40-day growth per net
4) 10-day rotating harvest cycle
5) harvest from October 1 to June 30
6) August seeding
7) September nursery period
8) yield of approximately 500 sheets per harvest per net
9) 12 saku per acre of wetlands
10) 3 harvests per net

Processing Assumptions

It is assumed that the processing systems are based on the "one-man" fully automated sheet forming and drying equipment. This, and other specified processing equipment, are the most advanced items in modern nori processing facilities in Japan. All equipment is compatible for continuous-flow processing. Less fully automated processing equipment is available but requires increased labor and greater skill.

Operational and Facilities Requirements

Labor and Equipment

For the purposes of this analysis, it is assumed that a small nori farm employs one full- and one part-time laborer, as well as the salaried owner-operator. Furthermore, it uses the smallest (three-sheet) nori processing machine at 83 percent capacity for four hours a day (Table 21). Doubling the farm to 200 saku requires an eight-hour processing operation, and the labor requirements are doubled. A 2,000-saku operation uses four large (five-sheet) lines for two shifts per day (Table 22). Employment requirements for a 2,000-saku operation are given in Table 23.

During the initial year of operation, considerable training of the labor force will be required. Some labor costs incurred during this period will be eligible for reimbursement under the federal CETA programs. These are administered in Washington by the Private Industry Council (PIC), Seattle, Washington. Training programs could be run by the individual operator, or through an industrial organization such as the Northwest Nori Growers Association.

Facilities

The small-scale farm requires about 1,800 square feet of processing space (Table 24). The harvest is processed immediately and no inventory is maintained. Frozen storage capacity is purchased locally for seasonal storage of the seeded nets. Any harvested nori which cannot be processed the same day can be held in frozen storage and processed at a later date.

TABLE 21

ITEMIZED EQUIPMENT LIST - 100-SAKU FARM

	100-Saku Number	Estimated Cost	Freight/Handling and Insurance		Duty Rate	Duty Amount	Total Cost
Hatchery							
Seeding bags "Hanzubo Sheet" at 50.00 each	8	300	39.00	(13%)*	25%*	75.00	414.00
Tanks 4-foot by 4-foot at $160.00 each	3	480	—	--	--	—	480.00
Miscellaneous (including brushes) at 20%		156	—	—	--	--	156.00
Production							
Boat-Yamaha, 8m by 2m at 4,500	1	4,500	4,100.00	(91%)	1.9%	85.50	8,685.50
Motors							
40 hp at 1,500	1	1,500	—	--	--	—	1,500.00
25 hp at 1,300	1	1,300	—	--	--	—	1,300.00
Nursery frames "Inayochi" at 150.00 each	32	4,800	2,250.00	(47%)	8.1%	372.00	7,222.60
Nets at 14.00 each	700	9,800	1,250.00	(13%)	25%	2,450.00	13,500.00
Anchors - 45 kg (100 pound)	100	1,100	—	—	--	--	1,100.00
Ropes							
12 mm at	24,000	1,400	182.00	(13%)*	25%*	350.00	1,932.00
10 mm at	12,960	700	91.00	(13%)*	25%*	350.00	986.00
4 mm at	1,800	60	7.80	(13%)*	25%)*	15.00	82.80
Spreader poles (15/set) at $3.00 each	240	720	—	—	--	--	720.00
Baskets at $10.00 each	20	200	—	—	—	—	200.00
Net bags at $4.00 each	40	160	20.80	(13%)*	25%)*	40.00	260.80
Harvester "Narusai" at $1,400	1	1,400	440.00	(31%)*	4.7%	65.80	1,905.80
Motor - Honda 6150-LPO at 750	1	750	60	(8%)	3%	22.50	832.50
Washer-Watanbe WB3 at 2,100	1	2,100	250.00	(21%)	5%	105.00	2,455.00
Centrifuge (nets("Separator" at 1,900	2	3,800	240.00	(6%)	5.1%	152.00	3,392.00
Miscellaneous at 10%		2,929	—	—	--	--	2,929.00
Processing							
Chopper/Rinser/Apportioner Watanabe SK at $5,000	1	5,000	1,500.00	(30%)*	5%*	250.00	6,750.00
Dryer/Processor "One Man" 35 Nichimo at $55,000	1	55,000	16,500.00	(30%)*	5%*	2,750.00	74,250.00
Slurry Pump Watanabe BZ at $2,500	1	2,500	750.00	(30%)*	5%*	125.00	3,375.00
Miscellaneous at 10%		6,250	—	—	—	—	6,250.00
							140,658.40

TABLE 22

ITEMIZED EQUIPMENT LIST - 2000 SAKU

	100-Saku Number	Estimated Cost	Freight/Handling and Insurance		Duty Rate	Duty Amount	Total Cost
Hatchery							
Seeding bags "Hanzubo Sheet" at 50.00 each	120	6,000	780.00	13%	25%	1,500.00	8,280.00
Tanks 4-foot by 4-foot at $160.00 each	6	960	—	--	--	—	960.00
Miscellaneous (including brushes) at 20%		696	—	--	--	—	696.00
Laboratory Equipment	—	10,000	—	—	--	—	10,000.00
Production							
Boat-Yamaha, 8m by 2m at 4,500	4	18,000	—	--	—	—	18,000
Motors							
40 hp at 1,500	4	6,000	—	--	--	—	6,000.00
25 hp at 1,300	4	5,200	—	--	--	—	5,200.00
Nursery frames "Inayochi" at 150.00 each	840	96,000	45,120	47%	8.1%	7,776.00	148,896.00
Nets at 14.00 each	14,000	182,000	23,660.00	13%	25%	45,500.00	251,160.00
Anchors - 45 kg (100 pound)	2,000	—	—	—	--	—	22,000.00
Ropes							
12 mm at	480,000	28,000	3,640.00	14%	25%	7,000.00	38,640.00
10 mm at	159,000	14,000	1,820.00	13%	25%	3,500.00	19,320.00
4 mm at	36,000	1,200	156.00	13%	25%	300.00	1,656.00
Spreader poles (15/set) at $3.00 each	4,800	14,400	—	--	—	—	14,400.00
Baskets at $10.00 each	400	4,000	—	--	—	—	4,000.00
Net bags at $4.00 each	800	3,200	416.00	13%	25%	800.00	4,416.00
Harvester "Narusei" at $1,400	4	5,200	1,612.00	31%	4.7%	244.00	7,056.00
Motor - Honda G150-LPO at 750	4	3,000	240.00	8%	3.0%	90.00	3,330.00
Washer-Watanbe WB3 at 2,100	8	16,800	2,016.00	12%	5%	840.00	19,656.00
Centrifuge (Nets) Separator	8	15,200	912.00	6%	5.1%	775.20	16,887.00
Miscellaneous	—	41,220	—	—	--	—	41,220.00
Processing Chopper/Rinser/Apportioner Watanabe SK at $5,000	4	20,000	6,000.00	30%	5%	1,000.00	27,000.00
Dryer/Processor "One Man" Model "5" Nichimo at 65,000	4	260,000	78,000.00	30%	5%	13,000.00	351,000.00
Slurry Pump Watanabe B2 at $2,500	4	10,000	3,000.00	30%	5%	500.00	13,500
Miscellaneous at 10%	--	29,000	--	--	—	—	29,000.00
							1,062,273.

TABLE 23

2,000-SAKU LABOR ESTIMATE

Station	No.	Rate per hour	Monthly wage
Per dock	2	$6.00	$2,112
Washer/chopper	2	6.00	2,112
Packager	4	6.00	4,224
Warehouse/shipping	1	6.00	1,056
Supervisor	1	10.00	1,760
Field supervisor	2	8.00	2,816
Field crews	10	6.00	10,560
	24		24,640 x 1.20% = 29,568

	Annual salary	Monthly salary
General manager	$36,000	$3,000
Production manager	24,000	2,000
Secretary	12,000	1,000
Technical	18,000	1,500
		$7,500 x 1.20% = $9,000

TABLE 24

CAPITAL COSTS ESTIMATE

	100-Saku	200-Saku	300-Saku
Total equipment	$140,700.00	$190,700.00	$240,000.00
Equipment installation	14,100.00	19,070.00	24,000.00
Truck (used)	5,000.00	5,000.00	5,000.00
Building, 1,800 square feet at $35/square foot	63,000.00	63,000.00	63,000.00
Site - 1/2 acre	10,000.00	10,000.00	10,000.00
Installation utilities electrical at 5%	3,150.00	3,150.00	3,150.00
Mechanical at 20%	9,450.00	9,450.00	9,450.00
Total equity investment	$245,400.00	$300,370.00	$354,600.00
Sales tax at 6.1% (deferred)	14,970.00	18,320.00	21,630.00
Initial working capital required	$ 50,000.00	$ 60,000.00	$ 70,000.00

For the large 2,000-saku operation, processing space of 15,000 square feet is specified (Table 25). This area provides space for holding tanks with circulating sea water to store harvested nori prior to processing. Space is also provided for the laboratory and hatchery operation, and an office.

TABLE 25

2,000-SAKU - CAPITAL COST ESTIMATE

Total equipment	$1,062,273
Equipment installation	106,227
Forklift	2,000
Trucks, 2 at $5,000 each	10,000
Building, 15,000 square feet at $26/square foot	390,000
Cold storage, 3,600 square feet at $100/square foot	360,000
Saltwater circulation system and holding tanks	50,000
1-acre site - waterfront with dock	150,000
Installation of utilities	
Electrical at 5% building cost	19,500
Mechanical at 15%	58,500
	$2,208,500
State sales tax at 6.1%	$ 134,718
Working capital required at 18%	$ 600,000

The four processing lines run parallel and are operated in pairs, with a shared packaging area between each pair. These areas can accommodate additional packaging equipment, but only bulk packaging is considered to be practical initially.

Specifications for equipment made by Japanese manufacturers have been used to estimate production capacity, as well as utilities and space requirements.

Revenues and variable and fixed cost items have been estimated for the necessary facilities, and detailed in the following notes which are keyed to the proforma cost flow sheets (Appendix A). The dryer fuel and water use rates have been provided by the Department of Natural Resources. Many of these assumptions are based on information provided by the Investment Climate in Washington State, a publication of the Economic Development Council of Puget Sound. This nonprofit organization provides assistance at no cost to individuals or groups considering specific business ventures .

Cost Items

Variable Costs

- Labor: Minimal labor costs are allowed for the small-scale farm operations, as the owner-operator will participate heavily. A labor rate of $6 per hour is assumed, with benefits adding another 20 percent to the labor costs. The 100-, 200-, and 300-saku farms have 1-1/4, 2-1/2, and 3-1/2 full-time labors, respectively. Labor costs for the 2,000-saku farm are provided in Table 23.

- Fuel Costs: Fule costs are for the nori dryer. Fuel demand is estimated at a rate of one gallon of fuel per 340 sheets of nori, a rate which has been provided by DNR sources. A price of $1.00 per gallon is used for fuel cost and is incurred during the nine-month processing season. Boat fuel costs are based on an assumed consumption rate of six gallons per day per 100 saku during the nine-month harvest season. Increased handling during the September nursery period (see Figure 17) is assumed to double that rate.

- Electricity: The equipment for the small processing line demands 9.5 kW of electricity and the large line demands 13 kW of electricity. Electricity costs are estimated at 3 cents per per kWh. The small line is rated at 1,500 to 1,800 sheets of nori per hour while the large line handles 3,000 to 3,400 sheets per hour.

Size (saku)	100	200	300	2,000
KW usage	9.5	9.5	13	52
Sheets per day	5,000	10,000	15,000	100,000
Hours per day	4	8	5	8
Days per month	22	22	22	22
KWh per month	836	1,672	1,430	9,152
$ per month ($)	25	50	43	275

- Water: The usage rate provided by DNR is 0.7 liters per sheet. A rate of $0.30 per 100 cubic feet (748 gallons) of water is used plus meter fees. Costs are based on City of Seattle commercial rates.

Size (saku)	100	200	300	2,000
Sheets per day	5,000	10,000	15,000	100,000
Liters per day	3,500	7,000	10,500	70,000
Gallons per month	20,341	40,682	61,024	406,826
$ per month	10	20	40	200
Meter fee	10	20	30	200

- Sewer: A rate of $1.05 per month per 100 cubic feet (748 gallons) consumed is based on Seattle sewer rates.

Size (saku)	100	200	300	2,000
$ per month	30	60	90	600
Water/sewer combined total	50	100	150	1,000

A factor of 1.5 x this rate has been used to allow for higher rural rates, and a minimal cost was included for nonprocessing months.

- Packaging Costs: Bulk packaging costs are estimated at $2.00 per box of 1,000 sheets.

- Cold Storage: Costs are based on SeaPro/SeaFreeze, Inc. rates for units less than 100 pounds in weight:

  $1.95 per 100 wt for initial handling and 1 month storage

  $0.65 per 100 wt for each additional month of storage

  Nets are assumed to weigh 18 pounds each.

- Miscellaneous: These costs total about 10 percent of variable costs and include maintenance and repairs.

Fixed Costs

- Salary: The small farms are assumed to be run by a hard-working, owner-operator who will draw $24,000 per year. Personal benefits are calculated at 20 percent of this for a total salary cost of $28,800 annually. Salary costs for the 2,000-saku farm are provided in Table 23.

- Accounting and Legal: These expenses are estimated at $100 per month for the small farms and $1,500 per month for the large operation.

- Supplies/Telephone: Office expenses are estimated at $60 per month for small farms and $150 per month for the larger operation.

- Transportation: Truck use is estimated at 50 miles per day for the small farms at a cost of 30 cents per mile. The large farm is allowed 100 miles per day. While the small farmers must transport nets to cold storage located off the premises, the

larger operation has cold storage facilities. The mileage costs therefore account for distribution to a more diversified wholesale market.

- Electricity: Electricity consumption is based on a rate of 47 cents per square foot per year. This equals $70.50 per month for the small operation, and $587.50 per month for the 2,000-saku facility. These costs are incurred year round.

- Insurance: Insurance costs are variable, depending on the extent of coverage provided. For this study, costs of $50 per month for the small facility and $5,000 per month for the large facility which reflects increased concern for risk management the corporate level.

  Nori farmers in Puget Sound will be eligible for 'crop' or 'stock' insurance. Although specific insurance premiums are not available for this analysis, typical catastrophe coverage for the loss of stock is about three percent of the value of the average stock on hand. This premium is payable on a specific schedule.

  A farmer seeking stock insurance will first obtain an Insurance Inspection evaluation for which he will be charged a fee. This is most important for offshore systems depending on anchorages for support. The farmer will be requested to compute his highest value for stock on hand at any time in the year. His premium is based on this value. He is subsequently required to report monthly on his stock on hand.

In the event of loss of all or part of the crop, the farmer has the option for recovery of the value of his costs incurred to date, or the market value.

- Interest Payments: Interest payments are based on the assumption that working capital is borrowed at a rate of 18 percent simple interest. This is discussed further in the following section on finance. Borrowed principal is reduced as internal returns accumulate.

Size (saku)	100	200	300	2,000
Initial working capital	$50,000	$60,000	$70,000	$600,000

- Property Taxes: Property taxes are assessed at an estimated rate of $12.00 per $1,000 of true and fair market value, which is assumed to be equal to the equity investment for this analysis.

Financial Requirements

Financing cost estimates have been calculated using an 18 percent interest rate. Interest rates for small business borrowers are usually 2 or 2-1/2 percent over the prime rate. If the current (April 1982) prime rates of around 16 percent are maintained, then an interest rate of 18 or 18-1/2 percent is anticipated.

The capital required for the acquisition of the facility and equipment is assumed to be provided by equity investment. As a new industry, this operation would be considered "high risk" and conventional financing would be difficult to obtain. Therefore the financing costs included are for working capital only. The initial capital cost is determined by the maximum cash flow requirements for each operation and is reduced as revenues are generated internally when possible. In summary the financial requirements for the ventures are as follows:

Size (saku)	100	200	300	2,000
Initial working capital ($1,000)	50.0	60.0	70.0	600.0
Equity ($1,000)	253.7	303.7	353.0	2,208.5

Itemized equipment and facilities costs are provided in Tables 26 through 29 (in Section VIII) for the 100- and 2,000-saku farms. The 200- and 300-saku farms require additional equipment valued at $50,000 and $100,000, respectively; otherwise costs are the same as for the 100-saku farm. Specifically both require an incremental increase in field equipment. A 200-saku processing facility needs an additional boat and harvester. The 300-saku facility utilizes the five-sheet "one man" processor which increases its capacity by 40 percent over the three-sheet model.

VIII. ECONOMICS OF THE PROPOSED NORI INDUSTRY

Introduction

From the assumptions and costs developed in the previous section, a series of proforma sheets were generated for the 100-, 200-, 300-, and 2,000-saku operations. This section will summarize the proforma sheet data with a more detailed financial analysis of these results provided in Section IX.

Proforma Cash Flows

Two sets of cash flows are provided for each size of operation. One includes the DNR wetlands lease fee of $1,000 per acre, paid on a quarterly basis; the other omits this fee and is used for determining the effects of basing fees on a percent of revenues.

Gross revenues are based on a first wholesale price of 11.5 cents per sheet (see Section V, the Domestic Market, for further discussion of pricing). Inventory shrinkage of 5 percent is allowed, which also must cover returned merchandise, unpaid debits, and discounted sales. No inventory buildup is anticipated. In the scenario developed in these proformas, the revenues increase gradually during the first year, allowing for an initial "learning" period. This learning or startup period could be reduced by using experienced Japanese nori growers as consultants.

Small Farm

From the data developed in Appendix A, Tables A-1 through A-3, the 100-saku farm in Puget Sound does not appear to be economically viable. This reflects the real farm situation in Japan at the present time on which the

bulk of the data is based. The small nori farmer in Japan (e.g., 110 saku) is marginally successful in using fully automated equipment economically for his operation.

The larger (200- and 300-saku) farms (Appendix A, Tables A-4 through A-9) use the same basic facilities as a 100-saku operation. Field equipment costs are, however, increased by $50,000. These two farms should make money by the second year of operation.

Large Farm

The economics of a large farm, developed in Appendix A, Tables A-10 through A-12 considered processing to the bulk product stage. The size of the processing operation, however, implies that a secondary processing function is necessary. This is discussed in Section VI, Marketing Plan Analysis, in more detail. The added costs of secondary processing benefit from higher market value of the finished product. Therefore, these added costs will not decrease overall profitability, but will be more than offset by the increased product value.

Nevertheless, it is likely that a large farming operation will be initially limited to bulk products. As the business develops, it will be able to generate revenues internally to acquire the secondary processing equipment and support the necessary expanded marketing functions.

Proforma Income Statements

Using the data generated from the proforma cash flows (Appendix A) the Income Statements have been generated. Depreciation schedules itemizing

individual pieces of equipment are available in Tables 26 and 27. Depreciation schedules for all expenses appear in Tables 28 and 29. These are utilized in the proforma Income Summary Sheets in Tables A-13 and A-16 in Appendix A, for the 100-, 200-, 300-, and 2,000-saku farms. A second set of Cash Flow Sheets is found in Appendix B (Tables B-1 through B-12); these describe the operation without the DNR wetlands flat rate fee. A summary of the after-tax profit/loss figures follows those cash flow sheets (B-13).

Income taxes were scheduled for the various operations based on the following federal tax summary.

Taxable Income	Tax
0 - 25,000	16% of taxable income
25 - 50,000	$ 4,000 + 19% over $ 25,000
50 - 75,000	$ 8,750 + 30% over $ 50,000
75 - 100,000	$16,250 + 40% over $ 75,000
over 100,000	$26,250 + 46% over $100,000

To summarize and compare the various operations, profit (or loss) totals for the first three years are as follows:

	Profit (or loss) x 1,000 constant 1982 dollars		
Size/Year	1	2	3
100 saku	-64,821	-4,124	-4,124
200 saku	-67,738	43,809	43,809
300 saku	-63,413	79,573	82,975
2,000 saku	-385,694	466,977	466,977

TABLE 26

ITEMIZED EQUIPMENT DEPRECIATION SCHEDULE - 100 SAKU

	Useful Life	ACRS Years	ACRS Year 1	ACRS Year 2	ACRS Year 3	ACRS Straight Line	Useful Life
Seeding bags "Hanzubo Sheet" at $50.00 each	3	3	$ 103.50	$ 157.32	$ 153.18	$ 138.00	$ 138.00
Tanks 4-foot by 4-foot at $160.00 each	10	3	120.00	182.40	177.60	160.00	48.00
Miscellaneous (including brushes) at 20%	3	3	39.00	59.28	57.72	52.00	52.00
Production							
Boat-Yamaha, 6m by 2m at $4,500	10	5	1,302.63	1,910.81	1,823.96	1,737.10	868.55
Motors							
40 hp at $1,500	2	2	750.00	750.00	750.00*	750.00	750.00
25 hp at $1,300	2	2	650.00	650.00	650.00*	650.00	650.00
Nursery frames "Inayoshi" at $150.00 each	7	5	1,083.38	1,588.97	1,516.75	1,444.52	1,031.80
Nets at $14.00 each	3	3	3,375.00	5,130.00	4,995.00	4,500.00	4,500.00
Anchors - 45 kg (100 pounds) at $1.10/pound	10	5	165.00	242.00	231.00	220.00	110.00
Ropes							
12 mm at	3	3	483.00	734.16	714.84	644.00	644.00
10 mm at	3	3	241.50	367.08	357.42	322.00	322.00
4 mm at	3	3	20.70	31.48	30.64	27.60	27.60
Spreader poles (15/set) at $3.00 each	7	5	108.00	158.40	151.20	144.00	102.86
Baskets at $10.00 each	3	3	50.00	76.00	74.00	66.67	66.67
Net bags at $4.00 each	3	3	85.20	99.10	96.50	86.93	86.93
Harvester "Narusei" at $1,400	7	5	285.87	419.28	400.22	381.16	272.26
Motor - Honda 6150-LPO at $750	2	2	416.25	416.25	416.25	416.25	416.25
Washer-Watanabe WB3 at $2,100	7	5	368.25	540.10	515.55	491.00	350.71
Centrifuge (nets) "Separator" at $1,900	7	5	508.80	746.24	712.32	678.40	484.57
Miscellaneous at 10%	3	3	732.25	1,113.02	1,083.73	976.33	976.33
Processing							
Chopper/Rinser/Apportioner Watanabe SK at $5,000	7	5	1,012.50	1,485.00	1,417.50	1,350.00	964.29
Dryer/Processor "One Man" JS Nishimo at $35,000	7	5	11,137.50	16,335.00	15,592.50	14,850.00	10,607.14
Slurry pump Watanabe BZ at $2,500	7	5	506.25	742.50	708.75	675.00	482.14
Miscellaneous at 10%	3	3	1,562.50	2,375.00	2,312.50	2,083.33	2,083.33
ACRS % In-Service 1981-1984							
Property							
3-year			25%	38%	37%		
5-year			15%	22%	21%		
10-year			8%	14%	12%		
TOTAL EQUIPMENT DEPRECIATION:							
1. ACRS method within service date 1981-1984 (except for motors which are straight line for 2 years)			$25,087.29	$36,149.37	$34,939.13		$26,273.43
2. Straight line ACRS Election						$32,844.29/year	

TABLE 27

ITEMIZED EQUIPMENT DEPRECIATION SCHEDULE - 2,000 SAKU

	Useful Life	ACRS Years	ACRS Year 1	ACRS Year 2	ACRS Year 3	ACRS Straight Line	Useful Life
Seeding bags "Hanzubo Sheet" at $50.00 each	3	3	$ 2,070.00	$ 3,146.00	$ 3,084.00	$ 2,760.00	$ 2,760.00
Tanks 4-foot by 4-foot at $160.00 each	10	3	240.00	365.00	355.60	320.00	96.00
Miscellaneous (including brushes) at 20%	3	3	174.00	265.00	258.00	232.00	232.00
Laboratory Equipment	5	3	2,500.00	3,800.00	3,700.00	3,333.00	2,000.00
Production							
Boat-Yamaha, 8m by 2m at $4,500 (U.S. Replica)	10	5	2,700.00	3,960.00	3,780.00	3,600.00	1,800.00
Motors							
40 hp at $1,500	2	2(SL)	3,000.00	3,000.00	3,000.00	3,000.00	3,000.00
25 hp at $1,300	2	2(SL)	2,600.00	2,600.00	2,600.00	2,600.00	2,600.00
Nursery frames "Inayochi" at $150.00 each	7	5	22,334.00	32,757.00	31,268.00	29,779.00	21,270.86
Nets at $14.00 each	3	3	62,790.00	95,441.00	92,929.00	83,720.00	83,720.00
Anchors - 45 kg (100 pounds) at $1.10/pound	10	5	--	--	--	4,400.00	2,200.00
Ropes							
12 mm at	3	3	9,660.00	14,683.00	14,297.00	12,880.00	12,880.00
10 mm at	3	3	4,830.00	7,342.00	7,148.00	6,440.00	6,440.00
4 mm at	3	3	414.00	629.00	613.00	552.00	552.00
Spreader poles (15/set) at $3.00 each	7	5	2,160.00	3,168.00	3,024.00	2,880.00	10,285.71
Baskets at $10.00 each	3	3	1,000.00	1,520.00	1,480.00	1,333.00	1,333.00
Net bags at $4.00 each	3	3	1,104.00	1,676.00	1,634.00	1,472.00	1,472.00
Harvester "Narusei" at $1,400	7	5	1,058.00	1,552.00	1,482.00	1,411.00	1,008.00
Motor - Honda 6150-LPO at $750	2	2(SL)	1,665.00	1,665.00	1,665.00	1,665.00	1,665.00
Washer-Watanabe WB3 at $2,100	7	5	2,948.00	4,324.00	4,128.00	3,931.00	2,808.00
Centrifuge (nets) "Separator" at $1,900	7	5	2,533.00	3,715.00	3,546.00	3,377.00	2,412.43
Miscellaneous	3	3	10,305.00	15,664.00	15,251.00	13,740.00	13,740.00
Processing							
Chopper/Rinser/Apportioner Watanabe SK at $5,000	7	5	4,050.00	5,940.00	5,670.00	5,400.00	3,857.14
Dryer/Processor "One Man" Model "5" Nichimo at $65,000	7	5	52,650.00	77,220.00	73,710.00	70,200.00	50,142.86
Slurry pump Watanabe B2 at $2,500	7	5	2,025.00	2,970.00	2,835.00	2,700.00	1,928.57
Miscellaneous at 10%	3	3	7,250.00	11,020.00	10,730.00	9,667.00	9,667.00
TOTAL			$201,460.00	$298,424.00	$288,167.00	$271,392.00	$239,870.57

TABLE 28
DEPRECIATION SCHEDULE - 100 SAKU

Item	ACRS method (year) (1)	(2)	(3)	ACRS Straight line election	Useful life
Equipment (see itemized list)	$25,087.29	$36,145.37	$34,939.13	$32,844.29	$26,273.43
Truck (3 years) (5 years useful life)	1,250.00	1,900.00	1,850.00	1,667.00	1,000.00
Building (10 years) (20 years useful life)	5,040.00	8,820.00	7,560.00	6,300.00	3,150.00
	$31,377.29	$46,865.37	$44,349.13	$40,811.29	$30,423.43

TABLE 29
DEPRECIATION SCHEDULE - 2,000 SAKU

Item	ACRS by year (1)	(2)	(3)	Straight line election	Useful life
Equipment (see itemized list)	$201,460	$298,424	$288,167	$271,392	$239,870
Forklift (3 years) (5 years useful life)	500	760	740	667	400
Trucks (3 years) (5 years useful life)	2,500	3,800	3,700	3,333	2,000
Building (10 years) (20 years useful life)	31,200	54,600	46,800	39,000	19,500
Cold Storage (10 years) (20 years useful life)	28,800	50,400	43,200	36,000	18,000
Saltwater Circulation System (5 years) (7 years useful life)	7,500	11,000	10,500	10,000	7,143
	$271,960	$418,984	$393,107	$360,392	$286,913

*In service between 1981 - 1984

IX. PRELIMINARY FINANCIAL ANALYSIS

Unit Cost Analysis

Unit costs per sheet for the various production units are shown in Figure 18. As expected, variable costs (VC) per sheet are higher for the 2,000-saku farm, but fixed costs (FC) per unit are significantly lower. Total costs (TC) per sheet decline rapidly from the 100- to 300-saku units, reflecting the ability of the larger farms to realize some economies of scale and to use equipment more efficiently. The small increase in unit costs for the 2,000-saku over 300-saku farm is a result of the fact that the 300-saku farm utilizes its machinery fully, while the larger equipment in the 2,000-saku farm has some spare capacity at assumed output values.

The cost data suggest that a farm of 300 saku will realize most of the available economies of scale and will be competitive with a larger corporate farm as far as production costs are concerned. The latter would, however, probably develop secondary processing capability at a later stage, while the 300-saku farm would not have enough output to do so.

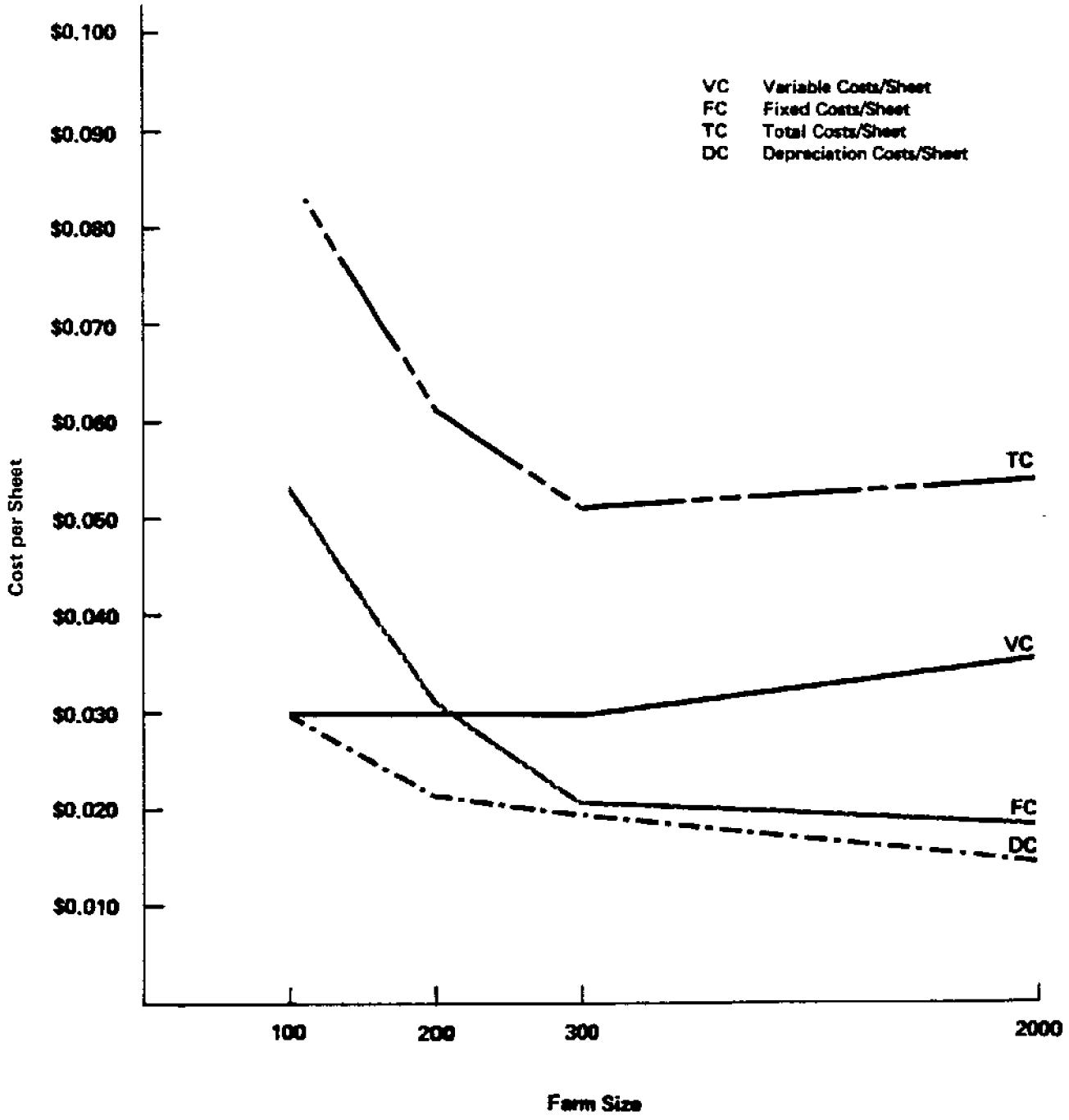
Net Present Value

The 100-saku operation is clearly unfeasible under reasonable assumptions of prices of final products. Net present values are negative, and a farm of this size could not show an accounting profit if owner-operator wages are included as costs.

Net present values have been calculated for the 200-, 300-, and 2,000-saku farms on the basis of alternative discount rates (5, 10, and 15 percent) and

FIGURE 18

Cost Analysis per Sheet



alternative assumptions of project life (15 and 20 years). These are displayed in Table 30. The values given, following usual practice, are based on cash flows net of income taxes.

The calculations were made using the familiar formula:

$$NPV = F_o + \frac{F1}{(1+i)} + \frac{F2}{(1+i)^2} + \quad + \frac{Fn}{(1+i)^n} =$$

$$\sum_{t=o}^{n} \frac{Ft}{(1+i)^t}$$

Where F_o = initial investment

Ft = cash flow in period t

i = discount rate, expressed as a decimal

n = life of the investment.

Present worth factors have been taken from present value tables in Higgins Financial Management: Theory and Applications (1977).

It must be stressed that there is no specific set of criteria for selecting the appropriate discount rate and project life, both of which significantly affect the net present value of any investment. In general practice, the choice of project life is based on a reasoned estimate of the likely economic life of the proposed operation and differences in risk are accounted for by the choice of the rate at which future incomes and costs are discounted. Since the evaluations in this report are carried out in terms of constant dollars, the discount rates in this section are real rates (i.e., net of premiums for expected inflation).

TABLE 30

NET PRESENT VALUE

200-saku farm

Discount rate	Project life	
	15 years	20 years
5%	$487,477	$667,082
10%	253,346	331,427
15%	106,192	141,678

300-saku farm

Discount rate	Project life	
	15 years	20 years
5%	$966,325	$1,259,564
10%	581,731	709,741
15%	339,795	397,879

2,000-saku farm

Discount rate	Project life	
	15 years	20 years
5%	$4,667,054	$6,235,145
10%	2,619.754	3,304,285
15%	1,334.390	1,644,993

As Table 30 indicates, 200-, 300-, and 2,000-saku operations all yield a comfortable margin of gross present value over investment costs, even at the most conservative level of project life (15 years) and real discount rate (15 percent). The 300-saku farm, for example, will still show positive net present values even at prices 20 percent below those assumed in the previous sections.

Optional Bedlands Arrangements

The previous series of proformas uses a flat rate lease fee for the bedlands. Use of the flat rate fee has some disadvantages in that it places a heavy burden on the operations before any returns are realized. It also creates a pressure to crowd the culture operations. Crowding may increase susceptibility to disease, depending upon the specific site. To avoid these disadvantages, the use of percentages of gross revenues have been considered. Use of a percentage of profits provides some relief to the small-scale operation. This type of fee, however, is likely to be more difficult to administer.

A gross percentage lease fee, based on revenues, will also facilitate development of the various operations by reducing some of the initial expenses and it could be more easily administered. Cash flows generated for the three sizes of facilities without lease fees are found in Appendix B (Tables B-1 through B-12), together with the income summary (Table B-13). These are used in the following evaluation of fee strategies.

A comparison of various rates applied to gross and net revenues for the three farm sizes is presented in Table 31. To evaluate the effect of these lease rates on the profitability of the farms, the rates of return on equity have been calculated both with and without the various lease payments. For this comparison, the three-year and thereafter level of returns are divided by the capital and facilities costs. This assumes that all of these costs are covered by equity, which is probable in a new (i.e., high risk) operation such as nori processing. The results are presented in Table 32.

The industrial average for rate of Return on Equity provided by The Value Line Investment Survey (January 29, 1982 issue) for 1980 is 14.7 percent. In a recent report (reference) on the commercial mortgage market, Citicorp Real Estate, Inc. says that those lenders still in the market are looking for an 18 percent internal rate of return (IRR). This value equals the loan interest rate plus projected return on equity. This is comparable with those projected values. The two operations are therefore acceptable by these standards although venture capitalists generally have much higher expectations of return, for example, in the 30 to 40 percent range.

TABLE 31

ALTERNATIVE TIDELAND FEE SCHEDULE 7, REVENUES RENT PAYMENT

	100 saku			200 saku			300 saku			2,000 saku		
	Year 1	Year 2	Year 3 and after	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3	Year 1	Year 2	Year 3
Gross Revenues	$48,554	$109,251	$109,251	$97,108	$218,502	$218,502	$145,662	$327,753	$327,753	$971,111	$2,185,002	$2,185,002
% Gross												
10.0%	4,855	10,925	10,925	9,711	21,850	21,850	14,566	32,775	32,775	97,111	218,500	218,500
5.0%	2,428	5,463	5,463	4,855	10,925	10,925	7,283	16,388	16,388	48,555	109,250	109,250
2.5%	1,214	2,731	2,731	2,428	5,463	5,463	3,642	8,194	8,194	24,278	54,625	54,625
Net revenues (pretax)	-64,821	-4,124	-4,124	-67,738	53,656	53,656	-63,413	110,784	117,084	-493,694	756,197	828,197
% Net												
20.0%	-0-	-0-	-0-	-0-	10,731	10,731	-0-	22,157	23,417	-0-	151,239	165,639
15.0%	-0-	-0-	-0-	-0-	8,048	8,048	-0-	16,618	17,563	-0-	113,430	124,230
10.0%	-0-	-0-	-0-	-0-	5,366	5,366	-0-	11,078	11,708	-0-	75,620	82,820

TABLE 32

RATE OF RETURN ON EQUITY*

(Three Years and Thereafter)

	200-saku	300-saku	2,000-saku
No lease	18.1%	27.2%	25.1%
Flat rate	14.4%	22.9%	21.1%
Percent gross revenues			
10	13.0%	22.2%	19.7%
5	15.6%	24.7%	22.4%
2.5	16.9%	25.6%	23.7%
Percent net revenues			
20	15.6%	23.6%	21.0%
15	16.3%	24.5%	22.0%
10	16.9%	25.4%	23.0%
Equity ($1,000)	303.7	353.0	2,208.5

*Net profit (or loss) after taxes divided by equity capital investment.

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APPENDIX A

PROFORMA CASH FLOW TABLES

WITH DNR LAND LEASE PAYMENT

Table A-1

PROFORMA CASH FLOW--100 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	1,349	2,697	4,046	5,395	6,744	8,092	9,441	10,790
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584
Dryer Oil	0	0	0	330	330	330	330	330	330	330	330	330
Trans-boat	0	0	260	133	133	133	133	133	133	133	133	133
Electricity-equip	0	0	0	25	25	25	25	25	25	25	25	25
Water/Sewer	20	20	20	75	75	75	75	75	75	75	75	75
Packaging	0	0	0	200	200	200	200	200	200	200	200	200
Cold Storage	0	0	0	294	85	73	61	49	37	25	13	0
Misc.	250	250	250	250	250	250	250	250	250	250	250	250
	1,854	1,854	2,114	2,891	2,682	2,670	2,658	2,646	2,634	2,622	2,610	2,597
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Wetlands	2,000	0	0	2000	0	0	2000	0	0	2000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	750	750	750	750	750	750	750	750	750	750	750	750
Property Tax	0	0	0	1,524	0	0	0	0	0	1,524	0	0
Total Expenses	5,760	3,760	3,760	7,284	3,760	3,760	5,760	3,760	3,760	7,284	3,760	3,760
Monthly Cash Flow	-7,614	-5,614	-5,874	-10,175	-5,093	-3,733	-4,372	-1,011	350	-1,814	3,071	4,433
Cum. Cash Flow	-7,614	-13,228	-19,102	-29,277	-34,370	-38,103	-42,475	-43,486	-43,136	-44,950	-41,879	-37,446

Table A-2

PROFORMA CASH FLOW--100 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	12,139	0	0	0	12,139	12,139	12,139	12,139	12,139	12,139	12,139	12,139
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584
Dryer Oil	0	0	0	330	330	330	330	330	330	330	330	330
Trans-boat	0	0	260	133	133	133	133	133	133	133	133	133
Electricity-equip	0	0	0	25	25	25	25	25	25	25	25	25
Water/Sewer	20	20	20	75	75	75	75	75	75	75	75	75
Packaging	0	0	0	200	200	200	200	200	200	200	200	200
Cold Storage	0	0	0	294	85	73	61	49	37	25	13	0
Misc.	250	250	250	250	250	250	250	250	250	250	250	250
	1,854	1,854	2,114	2,891	2,682	2,670	2,658	2,646	2,634	2,622	2,610	2,597
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Wetlands	2,000	0	0	2000	0	0	2000	0	0	2000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Elect Build.	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	750	750	750	750	750	750	750	750	750	750	750	750
Property Tax	0	0	0	1,524	0	0	0	0	0	1,524	0	0
Total Expenses	5,760	3,760	3,760	7,284	3,760	3,760	5,760	3,760	3,760	7,284	3,760	3,760
Monthly Cash Flow	4,525	-5,614	-5,874	-10,175	5,697	5,709	3,721	5,733	5,745	2,233	5,769	5,782
Cum. Cash Flow	-32,921	-38,535	-44,409	-54,584	-48,887	-43,178	-39,457	-33,724	-27,979	-25,746	-19,977	-14,195

Table A-3

PROFORMA CASH FLOW--100 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Yr Three												
REVENUES	12,139	0	0	0	12,139	12,139	12,139	12,139	12,139	12,139	12,139	12,139
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584
Dryer Oil	0	0	0	330	330	330	330	330	330	330	330	330
Trans-boat	0	0	260	133	133	133	133	133	133	133	133	133
Electricity-equip	0	0	0	25	25	25	25	25	25	25	25	25
Water/Sewer	20	20	20	75	75	75	75	75	75	75	75	75
Packaging	0	0	0	200	200	200	200	200	200	200	200	200
Cold Storage	0	0	0	294	85	73	61	49	37	25	13	0
Misc.	250	250	250	250	250	250	250	250	250	250	250	250
	1,854	1,854	2,114	2,891	2,682	2,670	2,658	2,646	2,634	2,622	2,610	2,597
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Tidelands	2,000	0	0	2000	0	0	2000	0	0	2000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Elect Build.	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700	4,700
Property Tax	0	0	0	1,524	0	0	0	0	0	1,524	0	0
Total Expenses	9,710	7,710	7,710	11,234	7,710	7,710	9,710	7,710	7,710	11,234	7,710	7,710
Monthly Cash Flow	575	-9,564	-9,824	-14,125	1,747	1,759	-229	1,783	1,795	-1,717	1,819	1,832
Cum. Cash Flow	-13,620	-23,184	-33,008	-47,133	-45,386	-43,627	-43,856	-42,073	-40,278	-41,995	-40,176	-38,344

Table A-4

PROFORMA CASH FLOW--200 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	2,698	5,394	8,092	10,790	13,488	16,184	18,882	21,580
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168
Dryer Oil	0	0	0	660	660	660	660	660	660	660	660	660
Trans-boat	0	0	520	266	266	266	266	266	266	266	266	266
Electricity-equip	0	0	0	50	50	50	50	50	50	50	50	50
Water/Sewer	20	20	20	150	150	150	150	150	150	150	150	150
Packaging	0	0	0	400	400	400	400	400	400	400	400	400
Cold Storage	0	0	0	588	170	146	122	98	74	50	26	0
Misc.	500	500	500	500	500	500	500	500	500	500	500	500
	3,688	3,688	4,208	5,782	5,364	5,340	5,316	5,292	5,268	5,244	5,220	5,194
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Wetlands	4,000	0	0	4,000	0	0	4,000	0	0	4,000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	900	900	900	900	900	900	900	900	900	900	900	900
Property Tax	0	0	0	1,822	0	0	0	0	0	1,822	0	0
Total Expenses	7,910	3,910	3,910	9,732	3,910	3,910	7,910	3,910	3,910	9,732	3,910	3,910
Monthly Cash Flow	-11,598	-7,598	-8,118	-15,514	-6,576	-3,856	-5,134	1,588	4,310	1,208	9,752	12,476
Cum. Cash Flow	-11,598	-19,196	-27,314	-42,828	-49,404	-53,260	-58,394	-56,806	-52,496	-51,288	-41,536	-29,060

A-1

Table A-5

PROFORMA CASH FLOW--200 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	24,278	0	0	0	24,278	24,278	24,278	24,278	24,278	24,278	24,278	24,278
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168
Dryer Oil	0	0	0	660	660	660	660	660	660	660	660	660
Trans-boat	0	0	520	266	266	266	266	266	266	266	266	266
Electricity-equip	0	0	0	50	50	50	50	50	50	50	50	50
Water/Sewer	20	20	20	150	150	150	150	150	150	150	150	150
Packaging	0	0	0	400	400	400	400	400	400	400	400	400
Cold Storage	0	0	0	588	170	146	122	98	74	50	26	0
Misc.	500	500	500	500	500	500	500	500	500	500	500	500
	3,688	3,688	4,208	5,782	5,364	5,340	5,316	5,292	5,268	5,244	5,220	5,194
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Wetlands	4,000	0	0	4,000	0	0	4,000	0	0	4,000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	900	900	900	900	900	900	900	900	900	900	900	900
Property Tax	0	0	0	1,822	0	0	0	0	0	1,822	0	0
Total Expense	7,910	3,910	3,910	9,732	3,910	3,910	7,910	3,910	3,910	9,732	3,910	3,910
Monthly Cash Flow	12,680	-7,598	-8,118	-15,514	15,004	15,028	11,052	15,076	15,100	9,302	15,148	15,174
Cum. Cash Flow	-16,380	-23,978	-32,096	-47,610	-32,606	-17,578	-6,526	8,550	23,650	32,952	48,100	63,274

Table A-6

PROFORMA CASH FLOW--200 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Three												
REVENUES	24,278	0	0	0	24,278	24,278	24,278	24,278	24,278	24,278	24,278	24,278
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168
Dryer Oil	0	0	0	660	660	660	660	660	660	660	660	660
Trans-boat	0	0	520	266	266	266	266	266	266	266	266	266
Electricity-equip	0	0	0	50	50	50	50	50	50	50	50	50
Water/Sewer	20	20	20	150	150	150	150	150	150	150	150	150
Packaging	0	0	0	400	400	400	400	400	400	400	400	400
Cold Storage	0	0	0	588	170	146	122	98	74	50	26	0
Misc.	500	500	500	500	500	500	500	500	500	500	500	500
	3,688	3,688	4,208	5,782	5,364	5,340	5,316	5,292	5,268	5,244	5,220	5,194
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Wetlands	4,000	0	0	4,000	0	0	4,000	0	0	4,000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	900	900	900	900	900	900	900	900	900	900	900	900
Property Tax	0	0	0	1,822	0	0	0	0	0	1,822	0	0
Total Expense	7,910	3,910	3,910	9,732	3,910	3,910	7,910	3,910	3,910	9,732	3,910	3,910
Monthly Cash Flow	12,680	-7,598	-8,118	-15,514	15,004	15,028	11,052	15,076	15,100	9,302	15,148	15,174
Cum. Cash Flow	75,954	68,356	60,238	44,724	59,728	74,756	85,808	100,884	115,984	125,286	140,434	155,608

Table A-7

PROFORMA CASH FLOW--300 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	4,047	8,091	12,138	16,185	20,232	24,276	28,323	32,370
VARIABLE EXPENSES												
Labor ($6/hr + 20%)	2,534	2,534	2,534	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068
Dryer Oil	0	0	0	990	990	990	990	990	990	990	990	990
Trans-boat	0	0	0	780	780	780	780	780	780	780	780	780
Electricity-equip	0	0	0	43	43	43	43	43	43	43	43	43
Water/Sewer	20	20	20	225	225	225	225	225	225	225	225	225
Packaging	0	0	0	600	600	600	600	600	600	600	600	600
Cold Storage	0	0	0	882	255	219	183	147	111	75	39	0
Misc.	750	750	750	750	750	750	750	750	750	750	750	750
	3,304	3,304	3,304	9,338	8,711	8,675	8,639	8,603	8,567	8,531	8,495	8,456
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DRN Wetlands	6,000	0	0	6,000	0	0	6,000	0	0	6,000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050
Property Tax	0	0	0	2,118	0	0	0	0	0	2,118	0	0
Total Expenses	10,060	4,060	4,060	12,178	4,060	4,060	10,060	4,060	4,060	12,178	4,060	4,060
Monthly Cash Flow	-13,364	-7,364	-7,364	-21,516	-8,724	-4,644	-6,561	3,522	7,605	3,567	15,768	19,854
Cum. Cash Flow	-13,364	-20,728	-28,092	-49,608	-58,332	-62,976	-69,537	-66,015	-58,410	-54,843	-39,075	-19,221

Table A-8

PROFORMA CASH FLOW--300 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	36,417	0	0	0	36,417	36,417	36,417	36,417	36,417	36,417	36,417	36,417
VARIABLE EXPENSES												
Labor ($6/hr + 20%)	2,534	2,534	2,534	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068
Dryer Oil	0	0	0	990	990	990	990	990	990	990	990	990
Trans-boat	0	0	0	780	780	780	780	780	780	780	780	780
Electricity-equip	0	0	0	43	43	43	43	43	43	43	43	43
Water/Sewer	20	20	20	225	225	225	225	225	225	225	225	225
Packaging	0	0	0	600	600	600	600	600	600	600	600	600
Cold Storage	0	0	0	882	255	219	183	147	111	75	39	0
Misc.	750	750	750	750	750	750	750	750	750	750	750	750
	3,304	3,304	3,304	9,427	8,800	8,764	8,728	8,692	8,656	8,620	8,584	8,545
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Wetlands	6,000	0	0	6,000	0	0	6,000	0	0	6,000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	525	525	525	525	525	525	525	525	525	525	525	525
Property Tax	0	0	0	2,118	0	0	0	0	0	2,118	0	0
Total Expenses	9,465	3,465	3,465	11,583	3,465	3,465	9,465	3,465	3,465	11,583	3,465	3,465
Monthly Cash Flow	23,648	-6,769	-6,769	-21,010	24,152	24,188	18,224	24,260	24,296	16,214	24,368	24,407
Cum. Cash Flow	4,427	-2,342	-9,111	-30,121	-5,969	18,219	36,443	60,703	84,999	101,213	125,581	149,988

Table A-9

PROFORMA CASH FLOW--300 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Yr Three												
REVENUES	36,417	0	0	0	36,417	36,417	36,417	36,417	36,417	36,417	36,417	36,417
VARIABLE EXPENSES												
Labor ($6/hr + 20%)	2,534	2,534	2,534	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068
Dryer Oil	0	0	0	990	990	990	990	990	990	990	990	990
Trans-boat	0	0	0	780	780	780	780	780	780	780	780	780
Electricity-equip	0	0	0	43	43	43	43	43	43	43	43	43
Water/Sewer	20	20	20	225	225	225	225	225	225	225	225	225
Packaging	0	0	0	600	600	600	600	600	600	600	600	600
Cold Storage	0	0	0	882	255	219	183	147	111	75	39	0
Misc.	750	750	750	750	750	750	750	750	750	750	750	750
	3,304	3,304	3,304	9,427	8,800	8,764	8,728	8,692	8,656	8,620	8,584	8,545
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
DNR Wetlands	6,000	0	0	6,000	0	0	6,000	0	0	6,000	0	0
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	0	0	0	0	0	0	0	0	0	0	0	0
Property Tax	0	0	0	2,118	0	0	0	0	0	2,118	0	0
Total Expenses	8,940	2,940	2,940	11,058	2,940	2,940	8,940	2,940	2,940	11,058	2,940	2,940
Monthly Cash Flow	24,173	-6,244	-6,244	-20,485	24,677	24,713	18,749	24,785	24,821	16,739	24,893	24,932
Cum. Cash Flow	174,161	167,917	161,673	141,188	165,865	190,578	209,327	234,112	258,933	275,672	300,565	325,497

Table A-10

PROFORMA CASH FLOW--2000 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	26,975	53,951	80,926	107,901	134,877	161,852	188,827	215,802
VARIABLE EXPENSES												
Labor (32)	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960
Dryer Oil	0	0	0	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209
Trans-boat	0	0	5,200	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660
Electricity-equip	0	0	0	275	275	275	275	275	275	275	275	275
Elect-Cold Stg	0	0	0	3000	3000	3000	2000	2000	2000	1000	1000	1000
Water/Sewer	200	200	200	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Packaging	0	0	0	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Misc.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	46,160	46,160	51,360	63,604	63,604	63,604	62,604	62,604	62,604	61,604	61,604	61,604
FIXED EXPENSES												
Salary + 20%	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
DNR Wetlands	40,000*	0	0	40,000	0	0	40,000	0	0	40,000	0	0
Acct & Legal	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Supp. & Tel.	150	150	150	150	150	150	150	150	150	150	150	150
Trans-truck	660	660	660	660	660	660	660	660	660	660	660	660
Electricity bldg	588	588	588	588	588	588	588	588	588	588	588	588
Insurance	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Intrst Pmt (@18%)	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Property Tax	0	0	0	13,251	0	0	0	0	0	13,251	0	0
Total Expenses	65,898	25,898	25,898	79,149	25,898	25,898	65,898	25,898	25,898	79,149	25,898	25,898
Monthly Cash Flow	-112,058	-72,058	-77,258	-142,753	-62,527	-35,551	-47,576	19,399	46,375	21,099	101,325	128,300
Cum. Cash Flow	-112,058	-184,116	-261,374	-404,127	-466,654	-502,205	-549,781	-530,382	-484,007	-462,908	-361,583	-233,283

Table A-11

PROFORMA CASH FLOW--2000 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	242,778	0	0	0	242,778	242,778	242,778	242,778	242,778	242,778	242,778	242,778
VARIABLE EXPENSES												
Labor (32)	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960
Dryer Oil	0	0	0	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209
Trans-boat	0	0	5,200	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660
Electricity-equip	0	0	0	275	275	275	275	275	275	275	275	275
Elect-Cold Stg	0	0	0	3000	3000	3000	2000	2000	2000	1000	1000	1000
Water/Sewer	200	200	200	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Packaging	0	0	0	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Misc.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	46,160	46,160	51,360	63,604	63,604	63,604	62,604	62,604	62,604	61,604	61,604	61,604
FIXED EXPENSES												
Salary + 20%	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
DNR Wetlands	40,000	0	0	40,000	0	0	40,000	0	0	40,000	0	0
Acct & Legal	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Supp. & Tel.	150	150	150	150	150	150	150	150	150	150	150	150
Trans-truck	660	660	660	660	660	660	660	660	660	660	660	660
Electricity bldg	588	588	588	588	588	588	588	588	588	588	588	588
Insurance	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Intrst Pmt (@18%)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Property Tax	0	0	0	13,251	0	0	0	0	0	13,251	0	0
Total Expenses	62,898	22,898	22,898	76,149	22,898	22,898	62,898	22,898	22,898	76,149	22,898	22,898
Monthly Cash Flow	133,720	-69,058	-74,258	-139,753	156,276	156,276	117,276	157,276	157,276	105,025	158,276	158,276
Cum. Cash Flow	-99,563	-168,621	-242,879	-382,632	-226,356	-70,080	47,196	204,472	361,748	466,773	625,049	783,325

Table A-12

PROFORMA CASH FLOW--2000 SAKU FARM

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Yr Three												
REVENUES	242,778	0	0	0	242,778	242,778	242,778	242,778	242,778	242,778	242,778	242,778
VARIABLE EXPENSES												
Labor (32)	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960	40,960
Dryer Oil	0	0	0	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209
Trans-boat	0	0	5,200	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660
Electricity-equip	0	0	0	275	275	275	275	275	275	275	275	275
Elect-Cold Stg	0	0	0	3000	3000	3000	2000	2000	2000	1000	1000	1000
Water/Sewer	200	200	200	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Packaging	0	0	0	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Misc.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	46,160	46,160	51,360	63,604	63,604	63,604	62,604	62,604	62,604	61,604	61,604	61,604
FIXED EXPENSES												
Salary + 20%	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
DNR Wetlands	40,000	0	0	40,000	0	0	40,000	0	0	40,000	0	0
Acct & Legal	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Supp. & Tel.	150	150	150	150	150	150	150	150	150	150	150	150
Trans-truck	660	660	660	660	660	660	660	660	660	660	660	660
Electricity bldg	588	588	588	588	588	588	588	588	588	588	588	588
Insurance	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Intrst Pmt (@18%)	0	0	0	0	0	0	0	0	0	0	0	0
Property Tax	0	0	0	13,251	0	0	0	0	0	13,251	0	0
Total Expenses	56,898	16,898	16,898	70,149	16,898	16,898	56,898	16,898	16,898	70,149	16,898	16,898
Monthly Cash Flow	139,720	-63,058	-68,258	-133,753	162,276	162,276	123,276	163,276	163,276	111,025	164,276	164,276
Cum. Cash Flow	923,045	859,987	791,729	657,976	820,252	982,528	1,105,804	1,269,080	1,432,356	1,543,381	1,707,657	1,871,933

Table A-13
SUMMARY SHEET
100 SAKU FARM

	Year 1	Year 2	Year 3
REVENUES	48,554	109,251	109,251
VARIABLE EXPENSES			
Labor (1 1/4) ($6/hr + 20%)	19,008	19,008	19,008
Dryer Oil	2,970	2,970	2,970
Trans-boat	1,457	1,457	1,457
Electricity-equip	225	225	225
Water/Sewer	735	735	735
Packaging	1,800	1,800	1,800
Cold Storage	637	637	637
Misc.	3,000	3,000	3,000
Total Var. Exp.	29,832	29,832	29,832
FIXED EXPENSES			
Salary + 20%	28,800	28,800	28,800
DNR Wetlands	8,000	8,000	8,000
Acct & Legal	1,200	1,200	1,200
Util & Truck	720	720	720
Trans-truck	3,960	3,960	3,960
Electricity bldg	840	840	840
Insurance	600	600	600
Intrst Pmt (@18%)	9,000	9,000	9,000
Total Fixed Exp.	53,120	53,120	53,120
Dpr-Useful Life (straight line)	30,423	30,423	30,423
Total Oper. Exp.	113,375	113,375	113,375
Pre-tax Profit (Loss)	-64,821	-4,124	-4,124
Tax	0	0	0
Net Profit (Loss)	-64,821	-4,124	-4,124

Table A-14
SUMMARY SHEET
200 SAKU FARM

	Year 1	Year 2	Year 3
REVENUES	97,108	218,502	218,502
VARIABLE EXPENSES			
Labor (1 1/4) ($6/hr + 20%)	38,016	38,016	38,016
Dryer Oil	5,940	5,940	5,940
Trans-boat	2,914	2,914	2,914
Electricity-equip	450	450	450
Water/Sewer	1,410	1,410	1,410
Packaging	3,600	3,600	3,600
Cold Storage	1,274	1,274	1,274
Misc.	6,000	6,000	6,000
Total Var. Exp.	59,604	59,604	59,604
FIXED EXPENSES			
Salary + 20%	28,800	28,800	28,800
DNR Wetlands	16,000	16,000	16,000
Acct & Legal	1,200	1,200	1,200
Util & Truck	720	720	720
Trans-truck	3,960	3,960	3,960
Electricity bldg	840	840	840
Insurance	600	600	600
Intrst Pmt (@18%)	10,800	10,800	10,800
Total Fixed Exp.	62,920	62,920	62,920
Dpr-Useful Life (straight line)	42,322	42,322	42,322
Total Oper. Exp.	164,846	164,846	164,846
Pre-tax Profit	-67,738	53,656	53,656
Tax	0	9,847	9,847
Net Profit (Loss)	-67,738	43,809	43,809

Table A-15
SUMMARY SHEET
300 SAKU FARM

	Year 1	Year 2	Year 3
REVENUES	145,662	327,753	327,753
VARIABLE EXPENSES			
Labor ($6/hr + 20%)	53,214	53,214	53,214
Dryer Oil	8,910	8,910	8,910
Trans-boat	7,020	7,020	7,020
Electricity-equip	387	387	387
Water/Sewer	2,085	2,085	2,085
Packaging	5,400	5,400	5,400
Cold Storage	1,911	1,911	1,911
Misc.	9,000	9,000	9,000
Total Var. Exp.	87,927	87,927	87,927
FIXED EXPENSES			
Salary + 20%	28,800	28,800	28,800
DNR Wetlands	24,000	24,000	24,000
Acct & Legal	1,200	1,200	1,200
Util & Truck	720	720	720
Trans-truck	3,960	3,960	3,960
Electricity bldg	840	840	840
Insurance	600	600	600
Intrst Pmt (@18%)	12,600	6,300	0
Property Tax	4,236	4,236	4,236
Total Fixed Exp.	76,956	70,656	64,356
Dpr-Useful Life (straight line)	58,005	58,005	58,005
Total Oper. Exp.	222,888	216,588	210,288
Pre-tax Profit (Loss)	-77,226	111,165	117,465
Tax	0	31,211	34,109
Net Profit (Loss)	-77,226	79,954	83,356

Table A-16

SUMMARY SHEET
2000 SAKU FARM

	Year 1	Year 2	Year 3
REVENUES	971,111	2,185,002	2,185,002
VARIABLE EXPENSES			
Labor (32)	491,520	491,520	491,520
Dryer Oil (note 5)	55,881	55,881	55,881
Trans-boa	29,140	29,140	29,140
Electricity-equip	2,475	2,475	2,475
Water/Sewer	18,000	18,000	18,000
Packaging	14,100	14,100	14,100
Cold Storage	36,000	36,000	36,000
Misc.	60,000	60,000	60,000
Total Var. Exp.	707,116	707,116	707,116
FIXED EXPENSES			
Salary + 20%	108,000	108,000	108,000
DNR Wetlands	160,000	160,000	160,000
Acct & Legal	18,000	18,000	18,000
Util & Truck	1,800	1,800	1,800
Trans-truck	7,920	7,920	7,920
Electricity bldg	7,056	7,056	7,056
Insurance	60,000	60,000	60,000
Intrst Pmt (@18%)	108,000	72,000	0
Total Fixed Exp.	470,776	434,776	362,776
Dpr-Useful Life	286,913	286,913	286,913
Total Oper. Exp.	1,464,805	1,428,805	1,356,805
Pre-tax Profit	-493,694	756,197	828,197
Tax	0	328,100	361,220
Net Profit (Loss)	-493,694	428,097	466,977

APPENDIX B

PROFORMA CASH FLOW TABLES

WITHOUT DNR LAND LEASE PAYMENT

(OPTION A)

Table B-1

PROFORMA CASH FLOW--100 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	1,349	2,697	4,046	5,395	6,744	8,092	9,441	10,790
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584
Dryer Oil	0	0	0	330	330	330	330	330	330	330	330	330
Trans-boat	0	0	260	133	133	133	133	133	133	133	133	133
Electricity-equip	0	0	0	25	25	25	25	25	25	25	25	25
Water/Sewer	20	20	20	75	75	75	75	75	75	75	75	75
Packaging	0	0	0	200	200	200	200	200	200	200	200	200
Cold Storage	0	0	0	294	85	73	61	49	37	25	13	0
Misc.	250	250	250	250	250	250	250	250	250	250	250	250
	1,854	1,854	2,114	2,891	2,682	2,670	2,658	2,646	2,634	2,622	2,610	2,597
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Interst Pmt (@18%)	750	750	750	750	750	750	750	750	750	750	750	750
Property Tax	0	0	0	1,524	0	0	0	0	0	1,524	0	0
Total Expenses	3,760	3,760	3,760	5,284	3,760	3,760	3,760	3,760	3,760	5,284	3,760	3,760
Monthly Cash Flow	-5,614	-5,614	-5,874	-8,175	-5,093	-3,733	-2,372	-1,011	350	186	3,071	4,433
Cum. Cash Flow	-5,614	-11,228	-17,102	-25,277	-30,370	-34,103	-36,475	-37,486	-37,136	-36,950	-33,879	-29,446

Table B-2

PROFORMA CASH FLOW--100 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	12,139	0	0	0	12,139	12,139	12,139	12,139	12,139	12,139	12,139	12,139
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584
Dryer Oil (note 5)	0	0	0	330	330	330	330	330	330	330	330	330
Trans-boa	0	0	260	133	133	133	133	133	133	133	133	133
Electricity-equip	0	0	0	25	25	25	25	25	25	25	25	25
Water/Sewer	20	20	20	75	75	75	75	75	75	75	75	75
Packaging	0	0	0	200	200	200	200	200	200	200	200	200
Cold Storage	0	0	0	294	85	73	61	49	37	25	13	0
Misc.	250	250	250	250	250	250	250	250	250	250	250	250
	1,854	1,854	2,114	2,891	2,682	2,670	2,658	2,646	2,634	2,622	2,610	2,597
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Interst Pmt (@18%)	750	750	750	750	750	750	750	750	750	750	750	750
Property Tax	0	0	0	1,524	0	0	0	0	0	1,524	0	0
Total Expenses	3,760	3,760	3,760	5,284	3,760	3,760	3,760	3,760	3,760	5,284	3,760	3,760
Monthly Cash Flow	6,525	-5,614	-5,874	-8,175	5,697	5,709	5,721	5,733	5,745	4,233	5,769	5,782
Cum. Cash Flow	-22,921	-28,535	-34,409	-42,584	-36,887	-31,178	-25,457	-19,724	-13,979	-9,746	-3,977	1,805

Table B-3

PROFORMA CASH FLOW--100 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Three												
REVENUES	12,139	0	0	0	12,139	12,139	12,139	12,139	12,139	12,139	12,139	12,139
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584	1,584
Dryer Oil	0	0	0	330	330	330	330	330	330	330	330	330
Trans-boa	0	0	260	133	133	133	133	133	133	133	133	133
Electricity-equip	0	0	0	25	25	25	25	25	25	25	25	25
Water/Sewer	20	20	20	75	75	75	75	75	75	75	75	75
Packaging	0	0	0	200	200	200	200	200	200	200	200	200
Cold Storage	0	0	0	294	85	73	61	49	37	25	13	0
Misc.	250	250	250	250	250	250	250	250	250	250	250	250
	1,854	1,854	2,114	2,891	2,682	2,670	2,658	2,646	2,634	2,622	2,610	2,597
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Interst Pmt (@18%)	750	750	750	750	750	750	750	750	750	750	750	750
Property Tax	0	0	0	1,524	0	0	0	0	0	1,524	0	0
Total Expenses	3,760	3,760	3,760	5,284	3,760	3,760	3,760	3,760	3,760	5,284	3,760	3,760
Monthly Cash Flow	6,525	-5,614	-5,874	-8,175	5,697	5,709	5,721	5,733	5,745	4,233	5,769	5,782
Cum. Cash Flow	8,330	2,716	-3,158	-11,333	-5,636	73	5,794	11,527	17,272	21,505	27,274	33,056

Table B-4

PROFORMA CASH FLOW--200 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	2,698	5,394	8,092	10,790	13,488	16,184	18,882	21,580
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168
Dryer Oil	0	0	0	660	660	660	660	660	660	660	660	660
Trans-boat	0	0	520	266	266	266	266	266	266	266	266	266
Electricity-equip	0	0	0	50	50	50	50	50	50	50	50	50
Water/Sewer	20	20	20	150	150	150	150	150	150	150	150	150
Packaging	0	0	0	400	400	400	400	400	400	400	400	400
Cold Storage	0	0	0	588	170	146	122	98	74	50	26	0
Misc.	500	500	500	500	500	500	500	500	500	500	500	500
	3,688	3,688	4,208	5,782	5,364	5,340	5,316	5,292	5,268	5,244	5,220	5,194
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	900	900	900	900	900	900	900	900	900	900	900	900
Property Tax	0	0	0	1,822	0	0	0	0	0	1,822	0	0
Total Expenses	3,910	3,910	3,910	5,732	3,910	3,910	3,910	3,910	3,910	5,732	3,910	3,910
Monthly Cash Flow	-7,598	-7,598	-8,118	-11,514	-6,576	-3,856	-1,134	1,588	4,310	5,208	9,752	12,476
Cum. Cash Flow	-7,598	-15,196	-23,314	-34,828	-41,404	-45,260	-46,394	-44,806	-40,496	-35,288	-25,536	-13,060

Table B-5

PROFORMA CASH FLOW--200 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	24,278	0	0	0	24,278	24,278	24,278	24,278	24,278	24,278	24,278	24,278
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168
Dryer Oil	0	0	0	660	660	660	660	660	660	660	660	660
Trans-boat	0	0	520	266	266	266	266	266	266	266	266	266
Electricity-equip	0	0	0	50	50	50	50	50	50	50	50	50
Water/Sewer	20	20	20	150	150	150	150	150	150	150	150	150
Packaging	0	0	0	400	400	400	400	400	400	400	400	400
Cold Storage	0	0	0	588	170	146	122	98	74	50	26	0
Misc.	500	500	500	500	500	500	500	500	500	500	500	500
	3,688	3,688	4,208	5,782	5,364	5,340	5,316	5,292	5,268	5,244	5,220	5,194
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	900	900	900	900	900	900	900	900	900	900	900	900
Property Tax	0	0	0	1,822	0	0	0	0	0	1,822	0	0
Total Expense	3,910	3,910	3,910	5,732	3,910	3,910	3,910	3,910	3,910	5,732	3,910	3,910
Monthly Cash Flow	16,680	-7,598	-8,118	-11,514	15,004	15,028	15,052	15,076	15,100	13,302	15,148	15,174
Cum. Cash Flow	3,620	-3,978	-12,096	-23,610	-8,606	6,422	21,474	36,550	51,650	64,952	80,100	95,274

Table B-6

PROFORMA CASH FLOW--200 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Three												
REVENUES	24,278	0	0	0	24,278	24,278	24,278	24,278	24,278	24,278	24,278	24,278
VARIABLE EXPENSES												
Labor (1 1/4) ($6/hr + 20%)	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168	3,168
Dryer Oil	0	0	0	660	660	660	660	660	660	660	660	660
Trans-boat	0	0	520	266	266	266	266	266	266	266	266	266
Electricity-equip	0	0	0	88	88	88	88	88	88	88	88	88
Water/Sewer	20	20	20	150	150	150	150	150	150	150	150	150
Packaging	0	0	0	400	400	400	400	400	400	400	400	400
Cold Storage	0	0	0	588	170	146	122	98	74	50	26	0
Misc.	500	500	500	500	500	500	500	500	500	500	500	500
	3,688	3,688	4,208	5,820	5,402	5,378	5,354	5,330	5,306	5,282	5,258	5,232
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	900	900	900	900	900	900	900	900	900	900	900	900
Property Tax	0	0	0	1,822	0	0	0	0	0	1,822	0	0
Total Expense	3,910	3,910	3,910	5,732	3,910	3,910	3,910	3,910	3,910	5,732	3,910	3,910
Monthly Cash Flow	16,680	-7,598	-8,118	-11,552	14,966	14,990	15,014	15,038	15,062	13,264	15,110	15,136
Cum. Cash Flow	111,954	104,356	96,238	84,686	99,652	114,642	129,656	144,694	159,756	173,020	188,130	203,266

Table B-7

PROFORMA CASH FLOW--300 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	4,047	8,091	12,138	16,185	20,232	24,276	28,323	32,370
VARIABLE EXPENSES												
Labor ($6/hr + 20%)	2,534	2,534	2,534	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068
Dryer Oil	0	0	0	990	990	990	990	990	990	990	990	990
Trans-boat	0	0	0	780	780	780	780	780	780	780	780	780
Electricity-equip	0	0	0	43	43	43	43	43	43	43	43	43
Water/Sewer	20	20	20	225	225	225	225	225	225	225	225	225
Packaging	0	0	0	600	600	600	600	600	600	600	600	600
Cold Storage	0	0	0	882	255	219	183	147	111	75	39	0
Misc.	750	750	750	750	750	750	750	750	750	750	750	750
	3,304	3,304	3,304	9,338	8,711	8,675	8,639	8,603	8,567	8,531	8,495	8,456
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050	1,050
Property Tax	0	0	0	2,118	0	0	0	0	0	2,118	0	0
Total Expenses	4,060	4,060	4,060	6,178	4,060	4,060	4,060	4,060	4,060	6,178	4,060	4,060
Monthly Cash Flow	-7,364	-7,364	-7,364	-15,516	-8,724	-4,644	-561	3,522	7,605	9,567	15,768	19,854
Cum. Cash Flow	-7,364	-14,728	-22,092	-37,608	-46,332	-50,976	-51,537	-48,015	-40,410	-30,843	-15,075	4,779

Table B-8

PROFORMA CASH FLOW--300 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	36,417	0	0	0	36,417	36,417	36,417	36,417	36,417	36,417	36,417	36,417
VARIABLE EXPENSES												
Labor ($6/hr + 20%)	2,534	2,534	2,534	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068
Dryer Oil	0	0	0	990	990	990	990	990	990	990	990	990
Trans-boat	0	0	0	780	780	780	780	780	780	780	780	780
Electricity-equip	0	0	0	43	43	43	43	43	43	43	43	43
Water/Sewer	20	20	20	225	225	225	225	225	225	225	225	225
Packaging	0	0	0	600	600	600	600	600	600	600	600	600
Cold Storage	0	0	0	882	255	219	183	147	111	75	39	0
Misc.	750	750	750	750	750	750	750	750	750	750	750	750
	3,304	3,304	3,304	9,338	8,711	8,675	8,639	8,603	8,567	8,531	8,495	8,456
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tel.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	525	525	525	525	525	525	525	525	525	525	525	525
Property Tax	0	0	0	2,118	0	0	0	0	0	2,118	0	0
Total Expenses	3,535	3,535	3,535	5,653	3,535	3,535	3,535	3,535	3,535	5,653	3,535	3,535
Monthly Cash Flow	29,578	-6,839	-6,839	-14,991	24,171	24,207	24,243	24,279	24,315	22,233	24,387	24,426
Cum. Cash Flow	34,357	27,518	20,679	5,688	29,859	54,066	78,309	102,588	126,903	149,136	173,523	197,949

Table B-9

PROFORMA CASH FLOW--300 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Yr Three												
REVENUES	36,417	0	0	0	36,417	36,417	36,417	36,417	36,417	36,417	36,417	36,417
VARIABLE EXPENSES												
Labor ($6/hr + 20%)	2,534	2,534	2,534	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068	5,068
Dryer Oil	0	0	0	990	990	990	990	990	990	990	990	990
Trans-boat	0	0	0	780	780	780	780	780	780	780	780	780
Electricity-equip	0	0	0	43	43	43	43	43	43	43	43	43
Water/Sewer	20	20	20	225	225	225	225	225	225	225	225	225
Packaging	0	0	0	600	600	600	600	600	600	600	600	600
Cold Storage	0	0	0	882	255	219	183	147	111	75	39	0
Misc.	750	750	750	750	750	750	750	750	750	750	750	750
	3,304	3,304	3,304	9,338	8,711	8,675	8,639	8,603	8,567	8,531	8,495	8,456
FIXED EXPENSES												
Salary + 20%	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Acct & Legal	100	100	100	100	100	100	100	100	100	100	100	100
Supp. & Tol.	60	60	60	60	60	60	60	60	60	60	60	60
Trans-truck	330	330	330	330	330	330	330	330	330	330	330	330
Electricity bldg	70	70	70	70	70	70	70	70	70	70	70	70
Insurance	50	50	50	50	50	50	50	50	50	50	50	50
Intrst Pmt (@18%)	0	0	0	0	0	0	0	0	0	0	0	0
Property Tax	0	0	0	2,118	0	0	0	0	0	2,118	0	0
Total Expenses	3,010	3,010	3,010	5,128	3,010	3,010	3,010	3,010	3,010	5,128	3,010	3,010
Monthly Cash Flow	30,103	-6,314	-6,314	-14,466	24,696	24,732	24,768	24,804	24,840	22,758	24,912	24,951
Cum. Cash Flow	228,052	221,738	215,424	200,958	225,654	250,386	275,154	299,958	324,798	347,556	372,468	397,419

Table B-10

PROFORMA CASH FLOW--2000 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year One												
REVENUES	0	0	0	0	26,975	53,951	80,926	107,901	134,877	161,852	188,827	215,802
VARIABLE EXPENSES												
Labor (32)	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586
Dryer Oil	0	0	0	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209
Trans-boat	0	0	5,200	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660
Electricity-equip	0	0	0	275	275	275	275	275	275	275	275	275
Elect-Cold Stg	0	0	0	3000	3000	3000	2000	2000	2000	1000	1000	1000
Water/Sewer	200	200	200	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Packaging	0	0	0	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Misc.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	34,786	34,786	39,986	52,230	52,230	52,230	51,230	51,230	51,230	50,230	50,230	50,230
FIXED EXPENSES												
Salary + 20%	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Acct & legal	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Supp. & Tel.	150	150	150	150	150	150	150	150	150	150	150	150
Trans-truck	660	660	660	660	660	660	660	660	660	660	660	660
Electricity bldg	588	588	588	588	588	588	588	588	588	588	588	588
Insurance	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Intrst Pmt (@18%)	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Property Tax	0	0	0	13,251	0	0	0	0	0	13,251	0	0
Total Expenses	25,898	25,898	25,898	39,149	25,898	25,898	25,898	25,898	25,898	39,149	25,898	25,898
Monthly Cash Flow	-60,684	-60,684	-65,884	-91,379	-51,153	-24,177	3,798	30,773	57,749	72,473	112,699	139,674
Cum. Cash Flow	-60,684	-121,368	-187,252	-278,631	-329,784	-353,961	-350,163	-319,390	-261,641	-189,168	-76,469	63,205

Table B-11

PROFORMA CASH FLOW--2000 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Two												
REVENUES	242,778	0	0	0	242,778	242,778	242,778	242,778	242,778	242,778	242,778	242,778
VARIABLE EXPENSES												
Labor (32)	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586
Dryer Oil	0	0	0	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209
Trans-boat	0	0	5,200	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660
Electricity-equip	0	0	0	275	275	275	275	275	275	275	275	275
Elect-Cold Stg	0	0	0	3000	3000	3000	2000	2000	2000	1000	1000	1000
Water/Sewer	200	200	200	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Packaging	0	0	0	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Misc.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	34,786	34,786	39,986	52,230	52,230	52,230	51,230	51,230	51,230	50,230	50,230	50,230
FIXED EXPENSES												
Salary + 20%	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Acct & Legal	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Supp. & Tel.	150	150	150	150	150	150	150	150	150	150	150	150
Trans-truck	660	660	660	660	660	660	660	660	660	660	660	660
Electricity bldg	588	588	588	588	588	588	588	588	588	588	588	588
Insurance	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Intrst Pmt (@18%)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Property Tax	0	0	0	13,251	0	0	0	0	0	13,251	0	0
Total Expenses	22,898	22,898	22,898	36,149	22,898	22,898	22,898	22,898	22,898	36,149	22,898	22,898
Monthly Cash Flow	185,094	-57,684	-62,884	-88,379	167,650	167,650	168,650	168,650	168,650	156,399	169,650	169,650
Cum. Cash Flow	248,299	190,615	127,731	39,352	207,002	374,652	543,302	711,952	880,602	1,037,001	1,206,651	1,376,301

Table B-12

PROFORMA CASH FLOW--2000 SAKU FARM
OPTION A

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Year Three												
REVENUES	242,778	0	0	0	242,778	242,778	242,778	242,778	242,778	242,778	242,778	242,778
VARIABLE EXPENSES												
Labor (32)	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586	29,586
Dryer Oil	0	0	0	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209	6,209
Trans-boat	0	0	5,200	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660	2,660
Electricity-equip	0	0	0	275	275	275	275	275	275	275	275	275
Elect-Cold Stg	0	0	0	3000	3000	3000	2000	2000	2000	1000	1000	1000
Water/Sewer	200	200	200	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Packaging	0	0	0	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Misc.	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
	34,786	34,786	39,986	52,230	52,230	52,230	51,230	51,230	51,230	50,230	50,230	50,230
FIXED EXPENSES												
Salary + 20%	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000	9,000
Acct & Legal	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Supp. & Tel.	150	150	150	150	150	150	150	150	150	150	150	150
Trans-truck	660	660	660	660	660	660	660	660	660	660	660	660
Electricity bldg	588	588	588	588	588	588	588	588	588	588	588	588
Insurance	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Intrst Pmt (@18%)	0	0	0	0	0	0	0	0	0	0	0	0
Property Tax	0	0	0	13,251	0	0	0	0	0	13,251	0	0
Total Expenses	16,898	16,898	16,898	30,149	16,898	16,898	16,898	16,898	16,898	30,149	16,898	16,898
Monthly Cash Flow	191,094	-51,684	-56,884	-82,379	173,650	173,650	174,650	174,650	174,650	162,399	175,650	175,650
Cum. Cash Flow	1,567,395	1,515,711	1,458,827	1,376,448	1,550,098	1,723,748	1,898,398	2,073,048	2,247,698	2,410,097	2,585,747	2,761,397

Table B-13

NET PROFIT (OR LOSS) WITH PERCENTAGE REVENUE FEES

	200 Saku	300 Saku	2,000 Saku
% Gross			
10.0%	$39,472	$78,237	$435,386
5.0%	47,362	87,086	494,381
2.5%	51,185	91,511	523,879
% Net			
20.0%	47,498	83,290	463,931
15.0%	48,376	86,451	486,292
10.0%	51,253	89,613	508,654

APPENDIX C

TRANSLATIONS FROM NORI TIMES

Nori Times November 21, 1981

Digital Moisture and Temperature gauge Developed

Drying process is important stage in establishing quality. New tester can set moisture content at a minimum and maximum level. When moistures goes beyond set range, light flashes and buzzer sounds. Machine checks for moisture at two stages of the process.

Nori Times November 11, 1981

Test Case: Low quality nori as chicken feed

Kagawa Livestock Experimental Laboratory has been feeding chickens seaweed since 1980, primarily Ana-aosa. Interest in ana-aosa stemmed from unusually high production volumes as a result of ocean pollution. Chicken farmers have long been seeking an inexpensive protein source, and ana-aosa, dried and powdered, proved to be a good choice. It improves yolk color and makes a harder shell.

Experiments started using nori as of June 10 with 37 kilograms provided by Kagawa fishermen's cooperative. Results show a 3% mix of nori in the chicken feed produced superior eggs, though a blend of ana-aosa and nori seems easier for chickens to eat.

There is the possibility of nori image among consumers being tarnished by such uses of the product, though, on the other hand, this can be used as proof of nori's nutritious value. It also provides good use for surplus, low grade nori, though production strictly as a chicken feed does not make economic sense.

Nori Times November 11, 1981

Looking at the Watanabe-shiki Nori Curing Machine (jukuseiki)

A curing machine to improve the quality of nori by curing it before processing was developed some seven years ago and marketed five years ago. Some 3,000 of the machines are currently being used with another 700 on order for 1981. The process works best on "hard" nori (koshitsu) and helps prevent uneveness, and small holes from developing; desalts and removes algae (keimo). Nori quality is improved about one grade higher.

Curing is basically accomplished by soaking 3,000-4,000 sheets worth of nori in fresh water. The nori is introduced from the top and allowed to settle to the bottom of the tank. The nori is then pumped with water to the spreader. The process takes about 20-30 minutes and does not damage the leaves.

Nori Times November 11, 1981

Health and Media Exposition

Zen-Nori Coop participates in a Japan Economic Journal sponsored "Health and Medicine in the 1980's Exposition," held October 30 - November 3, 1981, as part of the fall campaign to boost consumption. This year is notable for stronger interest in health aspects of food, particularly foods and drinks containing alkali (no other details).

Nori Times November 1, 1981

A Situation Not Seen in Years

The Nori industry faces in the 1981 season as bad a situation as it has seen in years. The major reason for this has been that, though nori production since 1978 has been at the 8-9 billion sheet level, consumption has not grown in the face of slow economic growth and changing consumer habits. As a result, inventories are increasing and the balance between supply and demand has been disrupted.

Accordingly, nori prices in 1980 plummeted by 24% compared with the previous year and nori farmers, many who have purchased new, large-scale machinery, find their operations in severe straits.

Since April, distributors in Tokyo, Shizuoka and Mie prefectures have, in a domino effect, been going bankrupt. A large wholesaler in Yamaguchi prefecture went bankrupt in July. The situation hasn't been this bad since 1968.

Nori Times November 1, 1981

Planned Production for the 1981 Season

Estimated Price/Production Comparison for the 1981 Season

Production (billion sheets)	Production value (billion yen)	Average per sheet price (yen/sheet)
11	83.04	7.55
10	97.06	9.71
9	106.77	11.86
8	112.16	14.02
7.3	113.38	15.64
6	110.01	18.33
5	102.46	20.49
4	90.60	22.65

Movements in Nori Supply

	1979 (78)* (million sheets)	1980 (79)* (million sheets)	1981 (80)* (million sheets)	1982 (81)* (million sheets)
Production volume	9,000	8,800	8,300	7,500
Carryover	772	1,800	2,900	3,300
Korean nori	-0-	-0-	-0-	-0-
Total supply	9,772	10,600	11,200	10,800
Estimated consumption	8,000	7,700	7,900	
Over supply	1,772	2,900	3,300	

* ( ) indicates season, not calendar year.

Nori Times October 11, 1981

Use of large-scale machinery increases

Nori fishermen and cooperatives in Fukuoka prefecture (Ariake Sea region) have quickly adopted large-scale processing machinery into their businesses. Members in 23 out of 25 coops in the area have purchased 312 machines, with 29 being group or jointly owned. With 2,955 workers in nori aquaculture in this area, there are, therefore, 915 persons for each machine.

0.3% ownership of large-scale machines in Fukuoka-prefecture

1976	0.3%
1977	0.3%
1978	13.4%
1979	26.5%
1980	58.8%

Nori Times October 11, 1981

Going from 5 sheets/package to a 6 sheet minimum

Zen Nori and Zen Gyo Ren recommend that the industry-recommended 6 sheet/package minimum be adopted. Appeal made to nori processing cooperatives all over Japan. Despite recommendation, 5 sheets/package remains the standard.

Recommendation to go to 6 or more sheets per package, and to cut large sheets into 8 pieces instead of 12, is based on increasing demand for nori and that 80% of nori marketed is "processed" nori (sic).

Nori Times September 21, 1981

(Fukuoka Prefecture's Ariake Sea District)

Price of 40 Percent of Last Year's Production Below 10 Y/Sheet

Prices for Grade 3 and Above 13 Percent Stronger

Ariake Sea District's (Fukuoka) production has recently shown a marked decrease in quality nori production, with grade 2 and above product extremely scarce. Last year, over 40 percent of productions achieved less than 10 Y/sheet.

This year's prospects being no better than last, the situation is desperate. Break even price for this area must average above 18 Y/sheet. Every effort must be made to produce more high quality nori, market lower grades more effectively, and raise the average price.

Percentage of Total Production	Grades				
	1	2	3	4	5
1974	12.74%	20.17%	26.73%	24.70%	15.66%
1975	7.65	16.32	22.49	26.86	26.67
1976	5.14	12.34	15.92	23.18	43.42
1977	6.45	11.64	19.79	45.52	16.60
1978	10.06	12.01	17.02	42.33	18.57
1979	1.61	5.54	15.67	50.82	26.46
1980	0.88	3.25	9.43	21.82	64.62

Ariake-sen district

Fukuoka prefecture

Nori Times September 11, 1981

Nori Sprout Separator

Machine developed 8 years ago is useful in producing higher quality product by removing weaker sprouts. The machine is commonly used two or three times on each net. Result:

1) healthier sprouts

2) initial retardation of growth; increased growth rate after 2 weeks

3) sprouts are wider and larger leaves, raises production volume

4) stronger, firmer root attachment; fewer sprouts washed away

5) less disease; fewer dead cells, less deformation, fewer bacteria

6) higher quality

Nori Times September 11, 1981

Iodine-enriched chicken eggs result of mixing low quality Nori in feed.

One outcome of efforts to discover new uses for lower quality nori has been the experimental addition of nori into chicken feed. The experiments conducted by the fishermen's cooperative in Kagawa prefecture have revealed that the addition of 3% nori added to chicken feed: 1) makes the egg shell harder, 2) makes the egg yolk a deeper yellow, and 3) makes the yolk stronger. The eggs are also higher in calcium and in iodine content.

Nori Times September 1, 1981

Trends in Nori Consumption

1981 supply reached 11.2 billion sheets, a historic high (Table C-1). Consumption in 1980 (Table C-2) at 7.7 billion sheets fell compared with 1979, especially household and business consumption. Reasons for the drop include an extraordinarily cool summer and intensified consumer cautiousness. Combined with 1980's 4th largest production volume in history, the drop has produced a situation of serious over supply.

The problem is compounded by most high-grade Nori (200 to 230 per 10 sheet and above) having already been sold off; the inventories on hand are unpopular lower grades, some from the year before (2 years old). Of the 1980 production of 8.3 billion sheets, over 800 million sheets fetched less than Y5/sheet. Unless this proportion of poor quality Nori is cut, market probably will not improve.

One reason for the increase in production is the rapid adoption of large-scale machinery. Introduced in 1976, observers have been surprised at the speed with which machines have taken over: 15 percent of all nori farmers now use them.

Nori Times September 1, 1981 (Continued)

TABLE C-1
ESTIMATED NORI SUPPLY
(units 1 million sheets)

	1976	1977	1978	1979	1980	1981
Production volume	7,150	7,146	7,050	9,000	8,800	8,300
Carry over	1,900	1,550	1,522	772	1,800	2,900
Korean imports	0	26	0	0	0	0
Total supply	9,050	8,722	8,572	9,772	10,600	11,200
Estimated consumption volume	7,500	7,200	7,800	8,000	7,700	
Excess (carried over)	1,550	1,522	772	1,772	2,900	

TABLE C-2
NORI CONSUMPTION BREAKDOWN

Sale types	1976	1977	1978	1979	1980	1980 Volume (billion sheets)
Household	60%	55%	45%	44%	43%	3.3
Business	10%	13%	27%	29%	27%	2.1
Gift	30%	32%	28%	27%	30%	2.3
Total	100%	100%	100%	100%	100%	7.7

TABLE C-3
COMPARISON OF PLANNED AND ACTUAL NORI PRODUCTION
(Units: million sheets)

	Planned production volume	Actual production	Over production	Co-op unit price Y
1973	— (highest production volume to date)	9,642	—	10.61
1976	6,800	7,146	346	14.16
1977	7,100	7,050	-50	18.41
1978	7,300	9,000	1,700	16.90
1979	8,000	8,800	800	18.68
1980	7,500	8,300	800	14.22

Nori Times August 11, 1981

American Style Nori Cooking

Recipes described in the Washington State's Department of Natural Resources brochure were prepared and sampled: Results:

Hawaiian Stuffed Nori: Judged unique and an excellent snack

Nori Relish: Best employed as an hors d'oeuvre

Laverbread: Needs more work

Nori and Onion Egg Flower Soup: Very good

Indian Creamed Corn: Tastes good and easily prepared at home

Considering American tastes differ from Japanese, these recipes were generally good and probably appropriate for Americans.

Nori Times June 21, 1981

Two Million Sheets of Korean Nori to be Imported

1977 was the last year Korea imported nori into Japan (26 million sheets). Problems with production and growing demand in Korea led to Korea's banning exports. This year, Korea has requested the resumption of exporting to Japan, which is expected to be approved.

Nori Times June 11, 1981

Japanese Cook Books have been Selling Well in the U.S.

Japanese Cooking: 63,000 sold Book of Sushi: To be Published Soon

May 11, 1981 Nori Times

Machine to assist in density/consistency control developed

The increased use of fully automatic nori processing machinery has increased the need for controlling consistency. A new device of compact size and utilizing a "micro-computer" has been developed and features a consistency sensor, added water input, and drain pump placed between the mixing and spreading sections of the new automatic processing machinery. Uneven consistency is reduced from 50 grams to approximately 10 grams. Abnormalities are quickly detected and allow the operator to respond immediately.

Nori Times March 21, 1981

New Product in Poultry Industry

Iodine-enriched eggs are said to reduce cholesterol levels and have other beneficial health attributes. Kelp is often used in chicken feed to add this element of iodine. Using nori has yet to prove cost effective.

Nori Times March 21, 1981

Exports of Nori (January - October, 1980)

Flavored; roasted nori exports valued at Y175,218,000

U.S.	54.0%
Taiwan	27.6&
Hong Kong	1.3%
Saudi Arabia	1.3%
South Africa	1.1%
Other	5.7%

Dried nori exports valued at Y410,699,000

Taiwan	41.0%
Korea	29.0%
U.S.	25.5%
Saudi Arabia	2.1%
Canada	.7%
Others	1.7%

Nori Times February 21, 1981

Survey by Zen-Nori Association of 31 Families

in seven prefectures reveals that production costs have largely stabilized over the last five years. Conducted in 1979 among upper middle-size production facilities in each prefecture, the survey showed family sizes getting smaller, efficiency relatively high and costs leveling out.

Cost/sheet in 1979: 13.95 yen

Cost/sheet in 1976: 13.1 yen

Cost/sheet in 1977: 12.89 yen

Nori Times February 1, 1981

Eleven families have gone in together to purchase four fully automatic processing machines. Each family will pay 4.5 yen per sheet produced as fee to pay for investment. The machines enable a production volume of 140,000 to 160,000 sheets/day. Machines are used from 5:00 AM to 8:30 PM each day. Plant employs 11 people.

Nori Times February 1, 1981

U.S. Experiencing Second Boom in Japanese Food

Survey conducted by the National Rice Distribution Cooperative in October 1980 in New York, Washington D.C., Los Angeles, and Denver questioned 1,000 Americans patronizing 20 different Japanese restaurants. Nori scored as the tenth most often eaten Japanese food (mentioned by 39% of the total).

Nori Times January 21, 1981

Nori Day Posters Released

This year's poster slogan, "Nori nutrition: from the clean ocean directly to you." To be posted in retail stores, co-ops and fisheries associations. Promotion focuses on nutrition, natural marine environment and freshness.

Nori Times January 11, 1981

Nori Day is February 6

Special activities planned:

- Charity activities in Ginza (fund raising).
- On-location appearances of the "Nori Girls".
- T.V. and radio announcements
- Posters
- Special sales - free giveaways

  Shopping bags

  Nori samples

  Tissues

  Pamphlets

  Matches

  Balloons

Nori Times January 1, 1981

Nori Fishermen in Japan's Inland Sea

Average income in 1979: ¥5,840,000/family (up 3.3% since 1978)

Far below average annual increase of 19% over last 5 years.

Nori Times January 1, 1981

Report on Korean Nori

According to reliable sources, the Korean Fisheries Agency is planing to invest 210 million won in purchasing some 10,000 freezer nori nets. Korea is also reportedly developing six new cultivation sites and encouraging the adoption of new processing machinery.

No other details.

Nori Times December 11, 1980

Gift giving season gets underway

Nori is again expected to top the list of items selected for Japan's winter gift-giving season. Among the reasons for this are: 1) Nori has long been a part of this old Japanese custom which shows no signs of changing, 2) - Practical gifts, primarily food items, are likely to be popular in these times of poor economic performance, 3) Nori is seen as an appropriate food for this time of the year, 4) Everyone likes it (sic), 5) Nori's price range (Y3,000-3,500) fits well with the average price spent for gifts by most consumers, and 6) Nori is light weight and easily mailed.

Nori Times December 1, 1980

Nori prices and consumer perceptions

The manager of direct sales for Zen Nori reports that consumers were highly skeptical and suspicious of nori recently sold at an open air market that was priced at cost, the proceeds to be donated to a charitable cause Many consumers had to taste the nori before buying to ensure that it was acceptable. Typical comments were, "Is it safe to eat?," "Are there really 10 sheets in this package?," etc.

This contrasts with items such as clothing, which in off-season sales or close outs are still perceived as being of high quality . . .

Nori Times November 21, 1980

Ministry of Forestry, Agriculture and Fisheries Bureau of Statistics released figures showing average income figures for a nori fisherman in 1979 was Y6,508,000/year, a slight drop compared with the previous year.

Nori Times October 21, 1980

Nori Featured in Nationwide Primary School Publication

Nori featured in special issue of "Kyushoku News", an elementary school newspaper distributed nationally to over 25,000 schools in Japan (October 18 issue), as part of Zen-Nori's fall campaign.

Nori Times October 11, 1980

Sushi "University" Opens in Tokyo

A sushi "university" has opened in Tokyo to train sushi chefs. The new school accepts people from all walks of life - bank employees, businessmen, etc., and can be seen as part of the sushi boom occurring in the U.S. and elsewhere. (Are these people expecting to go to U.S. as chefs? There is a hazy connection made.) Tuition is approximately Y700,000 (Y 230 equals $1).

Nori Times October 11, 1980

Nori Times with the cooperation of cooperatives, manufacturers and Zen Nori conducted a test of fully automatic processing machinery compared with standard processing machines. A sample of nori from Chiba, Kanagawa, Hyogo, Okayama, Tokushima and Kagawa was run the same day through standard machines (Furuta, Tezuka, Uchikawa and Takeshita brands) and through a Nichimo Zen-jido (fully automatic) model, producing 4,000 sheets in each.

	Standard machine (average)	Auto type (average)
Weight (g/sheet)	277-397 (324.3)	243-324 (284.7)
Water (%)	9.41-10.7 (9.90)	10.2-11.8 (10.90
Unrefined protein (%)	33.1-42.5 (38.20)	36.5-42.4 (40.75)
Salt (%)	0.3-1.33 (0.88)	0.24-1.39 (1.06)
Chlorophyll (mg/100 g)	501-701 (619)	579-748 (657)

Results are interpreted as not being significantly different. The fully automatic model was judged superior in producing a product of even consistency.

Nori Times September 21, 1980

Fall Nori Sales Campaign Kicks Off

three prolonged efforts to increase demand during the fall, which is a prime season for picnics, outdoor activities, and school athletic programs (undo-kai).

1. Promotion to educators and administrators in the school system through posters and bulletin board photos, newspapers emphasizing nutritious nature of Nori. This year's slogan: "The importance of the nutrition of nori during your growth and development years."

   Goes to 23,000 schools, 70 percent of the nation's primary schools.

3. Point of sales promotion:

   Participation in:

   - "Health and medical exhibition"
   - Moving market - open air markets promotional effort
   - Agricultural and fisheries fairs

3. Campaign to consumers - sponsored locally by distributors featuring shopping bags, posters, other free gifts, to kick off this new harvest product.

Nori Times August 11, 1980

Korean government decreased import duty on nori-related processing and harvesting machinery from 10% to 2%.

Nori Times July 11, 1980

Results of Zen-Nori Fact Finding Mission to U.S.A.

Second trip by Zen-Nori to U.S. (Seattle, San Francisco, Los Angeles, Honolulu, visits to supermarkets, natural food stores, sushi shops, etc.).

Results:

1. Compared with year earlier, poor quality Nori seemed to be less evident.

2. Overall, however, nori quality very poor with some Nori described as "not fit for human consumption," one "couldn't begin to eat it."

3. Japanese restaurants, especially sushi shops, are increasing quickly and being frequented both by black and white people, suggesting an increase in nori distribution.

4. America is extremely cholestrol and fat-conscious. Nori's nutritional value should be stressed.

5. Strong feeling that supermarket shelf space given to nori has increased since 1979.

6. To penetrate the household market (to attract average American consumers), guest effort and careful planning is necessary. Flavored nori should receive the main promotional effort.

Nori Times July 1, 1980

Spurring Consumption

July 6 through August 3 is the summer campaign period, aimed at increasing sales during the summer gift-giving season (Chugen) and summer vacation periods. The campaign includes posting advertisements in major rail stations nationally and special sales sponsored by local distributors. This year's slogan is "To the mountains and the ocean, together with delicious nori" (literal).

Other aspects of the campaign includes specially printed shopping bags, iron-on patches for children, and sudare (rattan mats for making Nori-Maki) as give-aways provided free to retainers . . . .

Nori Times June 21, 1980

American Perceptions of Nori Changing

In a paper presented by nutritionist Asako Tohata, of Ochanomizu Joshi University at the 6th Annual Food Culture Seminar (Tokyo Asahi Hall) on June 13, 1980, American perceptions of nori were described as having changed. In the paper, entitled "the current food revolution", Professor Tohata is quoted as saying, "Typically, 'Kaiso' (seaweed) is rendered in English as 'seaweed,' which has a poor connotation. Nowadays, however, knowledgable people refer to it as 'sea vegetables'. One hears people discuss what kind of Nori-Maki they pefer, etc."

Nori Times May 1, 1980

Fisheries White Paper reported to Diet

Among the results of a white paper using data through fiscal year 1978, is data on the decrease in small businesses engaged in sea culture. Although the report does not contain a separate listing for nori operations, the number of businesses are shown to have decreased by more then 1,200 between 1973 and 1978. (Farms of less than 5,000 m^2.) The decrease is especially apparent in operations smaller than 1,000 m^2.

Nori operators	1968	47,767
	1973	37,161
	1978	24,408

(no source)

Nori Times August 1, 1980

Making Nori an International Commodity

Conclusions of 15-man Zen-Nori fact finding delegation to the U.S. (from June 16, 1980, 25 days in Seattle, San Francisco, Los Angeles and Honolulu).

Description of Puget Sound:

- 6° in winter
- maximum 16° in summer
- tides of 6 meters
- fed by streams
- fast currents.
- high in nutritive value

Nori Times March 1, 1980

Large-Scale Machinery

On a national level, some 1,700 "large-scale" machines are in use (6 percent of businesses). Nichimo has recently developd a five-line, one-man operated model that has reduced the size of the frame apparatus and added an additional (fifth) line (most have only four). The new machine increases production speed by 25 percent. The greater processing speed enables more nori to be harvested on, for example, the day prior to anticipated bad weather. The new machine also improves on the method used to remove processed nori from the frame, has thermostatically-controlled energy saving devices, and other improvements.

hatcheries is on commodity fish (pink and chum) rather than on fish with an added recreational value (chinook and coho). The goal of Alaska's ocean-ranching program is two-fold: (1) to provide more fish for the common-property fishery and (2) to provide a means for hatcheries to pay for themselves (through income from harvesting) rather than depending on state supplements.

Ocean ranching in Alaska is just getting underway, but already policy guidelines have been developed to implement the law. These guidelines are concerned primarily with protecting wild or native stocks and ensuring that hatchery fish will be fit for marine survival.

The following are some of the major regulations:

- Private hatcheries must use stream systems that are depleted or are non-significant producers to avoid confounding hatchery and wild stocks.
- The state will continue to manage the rate of hatchery development in order to conserve wild stocks that may be mingled in.
- A review of a private hatchery for technical competence and financial stability is required before a permit is granted (as in Oregon's regulations).
- Fish transplants over long distances are restricted. In developing brood stocks, native or hybrid-native stocks are emphasized (as in Oregon).
- Genetic and disease controls have been established to ensure maximum fitness and variability in hatchery gene pools (as in Oregon).

OCEAN RANCHING IN OREGON

*Wallace F. Hublou**

The state of Oregon has permitted the private ocean ranching of chum salmon since 1971, but in 1973, the law was amended to include chinook and coho. The principal difference between the Alaska and Oregon laws is that in Oregon there is no definition of or restriction on profit by a private enterprise. The following concerns and suggestions about potential problem areas are based on Oregon's experience of more than 3 years in administering its policies on private ranching:

- To reduce the impact of private hatchery fish on other stocks, it is suggested that
  - --the minimum size and age of hatchery fish be regulated so that the fish will be ready for the ocean at the time of release and will migrate quickly through state waters.
  - --hatchery sites be in close proximity to the ocean.
- The relationship of private hatcheries to previously established public hatcheries should be clearly defined in the legislation, particularly in terms of the competition for stream or tributary rights.

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