



Potential for Sri Lankan
TOMATOES

In Selected Major World Markets

An SRD *Export Potential Brief*TM

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Project Design/Evaluation
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Enterprise Development/Management
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A. Executive Summary of Tomato Market Opportunities.

Figure 1 contains a list of the major world markets for Tomatoes. This report has selected four of those markets (underlined) as illustrative markets for in-depth analysis. The recent opening of Eastern European markets to open trade, the possible re-emergence of Iran and Iraq as important markets, and the opening of Korea are all market developments with direct relevance for Sri Lanka.

Though Asia and the Middle East are major markets, the superior size and recent growth of Europe make it a primary target. In the 1980's the Western European import market for vegetables expanded at roughly one-half billion US dollars each year. Though much of this expansion was supplied from inside the EC (Spain, Italy & Greece), Sri Lanka has sufficient seasonal "edge" to be a viable competitor.

Figure 2 presents an example of the type of supply and profitable demand graphs used by SRD to estimate market potentials. The graph presents the weekly supply of fresh tomatoes into Germany in 1990. It is SRD's estimate

EUROPE	ASIA/AMERICA	MIDDLE EAST
<u>Germany</u>	Japan	Saudi Arabia
France	Hong Kong	Yemen
<u>United Kingdom</u>	Singapore	Egypt
<u>Netherlands</u>	Australia	UAE
<u>Switzerland</u>	Korea	Bahrain
Belgium	United States	Kuwait
Italy	Canada	Oman
Sweden		

Figure 1: Major Export Markets

that the German market can absorb approximately 6,000-8,000 metric tons of tomatoes most weeks during the off season and still maintain prices which would be profitable to a

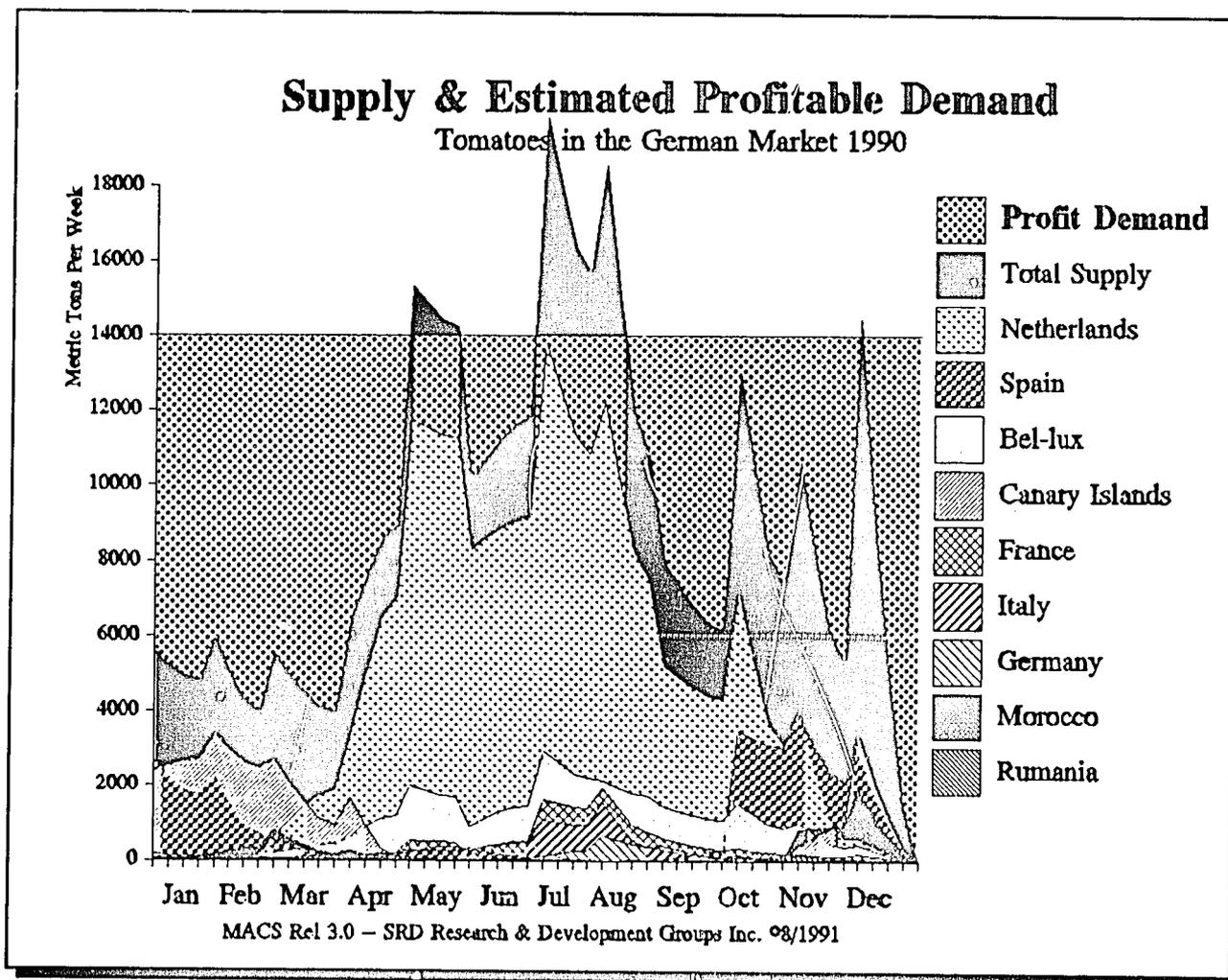


Figure 2: Example of a Weekly Supply & Profitable Demand™ Graph, Germany 1990

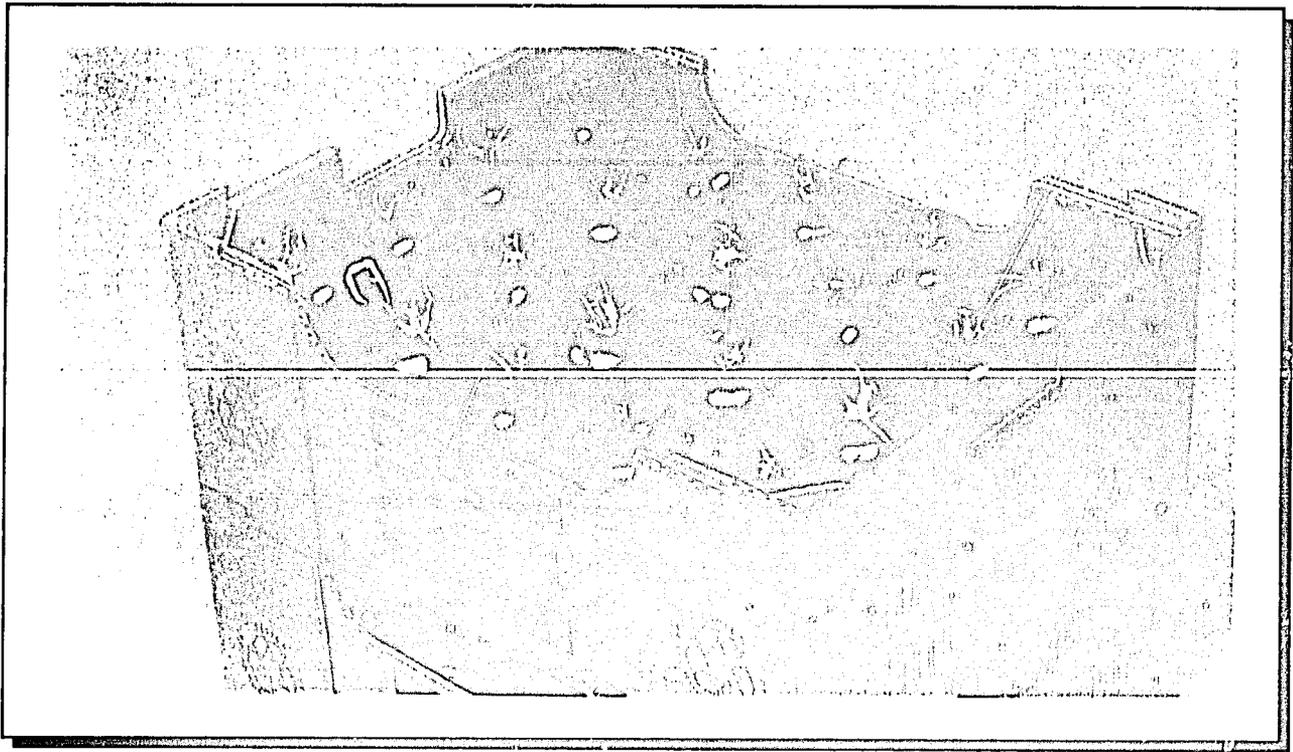


Figure 3: Example of Fresh Tomato Packaging

reasonably efficient Mahaweli producer. *Profitable Demand™* (the quantity which the market will purchase at or above prices profitable to an average grower/exporter located in the Mahaweli) is estimated by SRD at 14,000 metric tons per week. Figure 2 clearly illustrates that there exists a seasonal window. During this off-season period lasting from about January to May and most weeks from September through December, there appears to be 6-8 thousand tons of unsatisfied demand which could be profitable to Mahaweli grower/exporters. If unmet profitable tomato demand in Germany is added to the other Western European countries like Holland, Switzerland and Scandinavia, unmet profitable demand may be more than 20,000 MT/Wk. In annual terms this implies a total of almost 500,000 tons unmet demand per year.

Figure 4 is an example of a weekly wholesale and CIF price graph showing prices for tomatoes in 1990 varied from near \$.50/kg. in the Netherlands to above \$2.50/kg in Germany. (In the Netherlands and Switzerland C.I.F. prices are quoted. Wholesale prices for these markets would probably be \$.50-1.00/kg higher than those presented in the graphs).

SRD estimates that reasonably efficient Mahaweli located producers could deliver large

volume tomatoes to European markets at a cost of roughly \$.54/kg. Estimated delivered prices for high volume tomatoes imply potential profits which vary from near break-even (when marketing fees are included) to over \$2.00/kg.

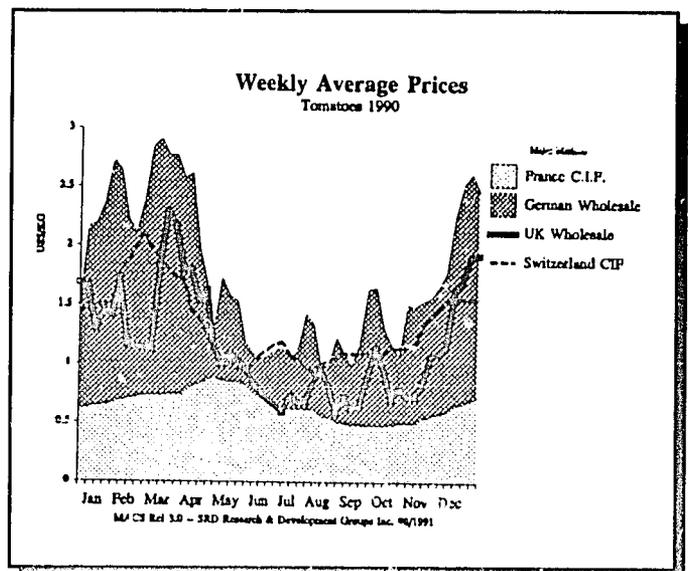


Figure 4: Weekly Wholesale Prices 1990

for Mahaweli located production.

Quality is the key in penetrating the very demanding West European markets. Figure 3 illustrates the type of packing and quality product required to penetrate the European markets. Product is normally marketed in 11 Kg. fiberboard boxes.

I. Introductory Topics

A. Illustrative Mahaweli Enterprise

This section outlines the economic characteristics of a hypothetical and purely illustrative tomato enterprise in the Mahaweli region. The figures presented here are very rough estimates and should not be used for the purposes of a feasibility study.

With efficient cooling facilities (described below) Mahaweli tomatoes can be sea-freighted in refrigerated containers to European markets. A minimum scale commercial export operation would need to pack the equivalent of at least one 40' container per week. Such an operation could be done for about 8 months and require a minimum weekly production of approximately 600 tons production which could be produced on roughly 20 Ha.

Tomatoes crops can be established by direct-seeding or transplanting. Most fresh-market tomato growers utilize transplants. The best containerized transplants are produced in the multi-cell or tray-pack system. Containerized transplants should be produced in a greenhouse where growing conditions can be carefully controlled. Tomatoes should be grown on raised beds. Bedding can be accomplished by various means including a bed press, bedding disk, or a double disk hiller. In areas where soil can be controlled and temperatures favor rapid germination, tomatoes are direct seeded, using precision seeders that place three to six seeds at regular spacing. Various types of mulches are available for use, depending on the season. Generally, black polyethylene is used, except for planting made in the fall when temperatures are high.

Tomatoes are delicate and perishable and should be packed and cooled soon after harvest. They should be moved to a nearby cooling facility and field heat

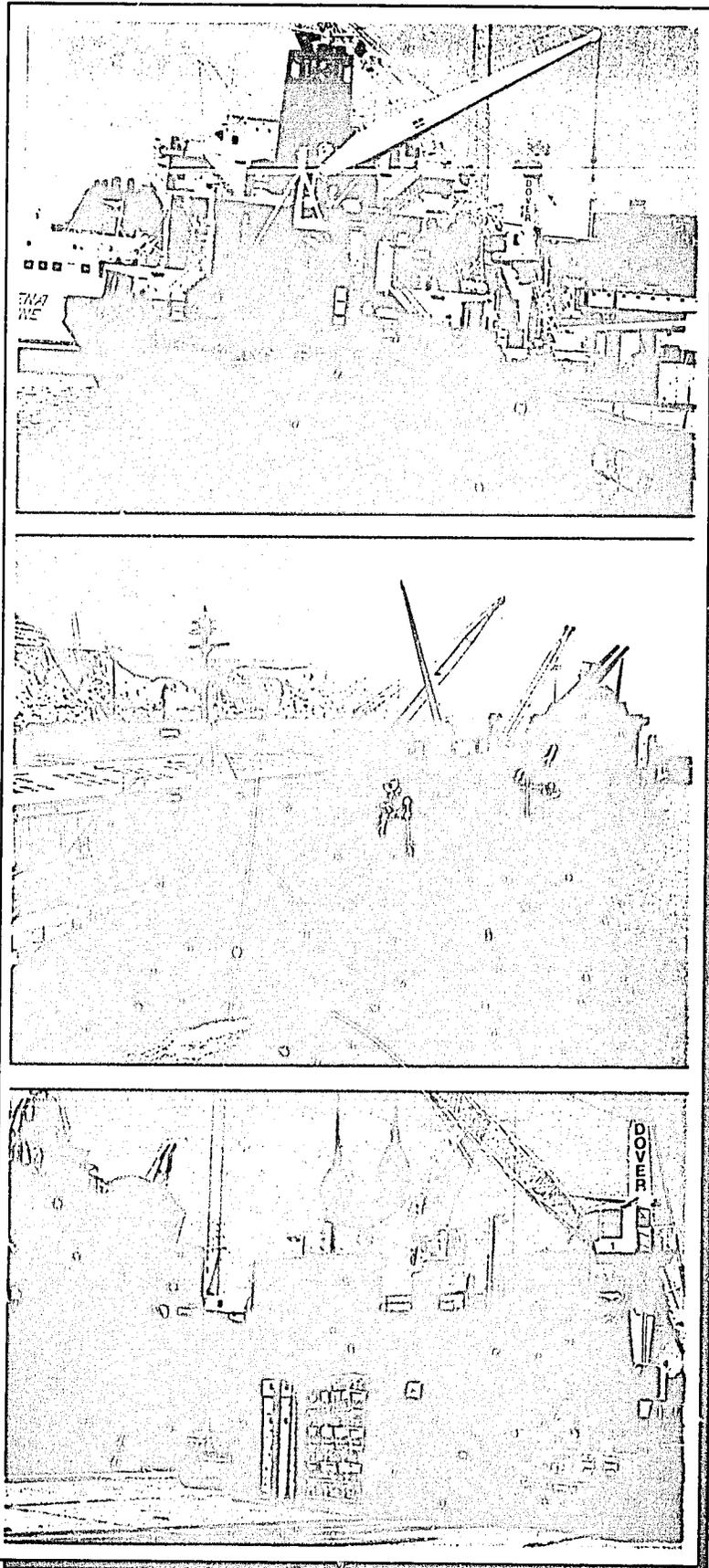


Figure 5 Example of a Fresh Produce Export Reefer (From, Fresh Produce Journal, Jan. 1992)

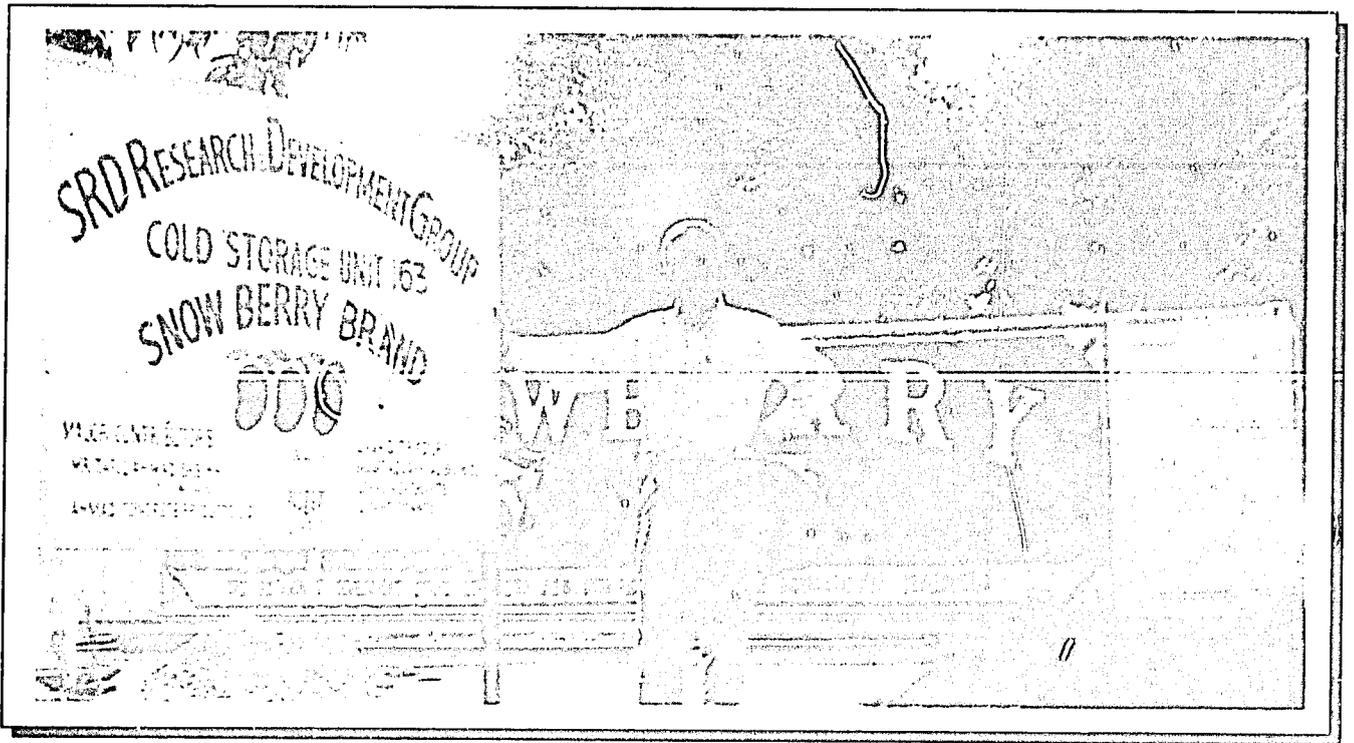


Figure 6: SRD Small Scale Cooling Plant & Adapted Reefer Container ©SRD 1990

should be removed in a hydrocooler. the common type of package/favored for tomatoes is a fiberboard container shown in Figure 3. Palletized loads are now usually demanded in most import markets.

Fixed Investment. The small scale cooling packing plant and the refrigerated transport containers illustrated in Figures 6 and 7 are examples of the facilities required to support a minimum commercial scale tomato export operation on roughly 20 hectares. The fixed investment cost of this building is estimated at \$40,000-50,000. Construction time would be 60-90 days. The investment cost of transport containers or trailers should not be included in the enterprise budget but is a part of the transport cost.

The minimum scale cooling/packing illustrated here is called SRD's "15 horsepower" plant since it is powered by a 15 horsepower compressor. The equipment required also includes the hydrocooling equipment, pallet handling jacks, and air circulation fans. The equipment for the minimum scale facility would cost

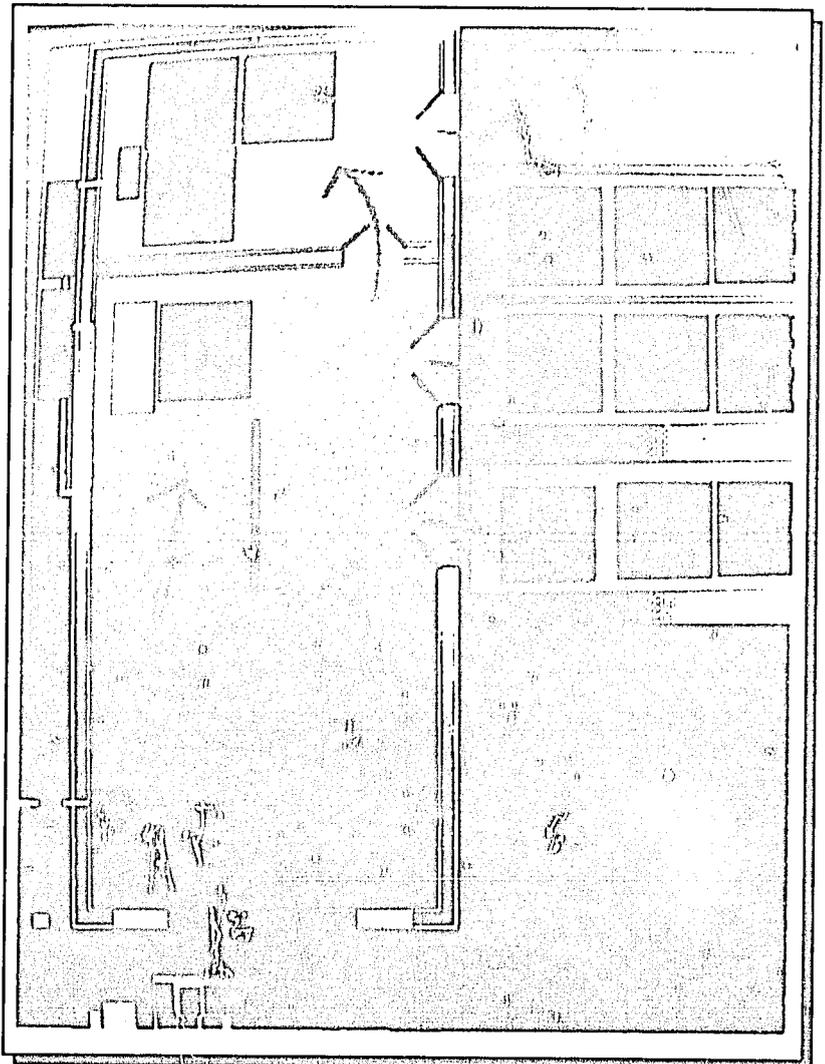


Figure 7: Schematic of SRD Plant & Reefers ©SRD 1990

approximately \$50,000. The investment in the total facility would be roughly \$100,000.

Field investment costs can vary depending on the type of open-field or row-cover systems employed. Including irrigation and row cover or greenhouse installations, the cost would range from \$5,000-50,000 per hectare. For a 200 hectare operation, the field investments could range \$1,000,000-10,000,000. Field equipment such as tractors, trailers and a bus for worker transport could require an additional \$100,000. Assuming one third open-field, one third high row covers, and one third low row covers, the total field and field equipment investment would be about \$3 million. It is important to note that the cooling/packing facility and equipment is only 3% of the total

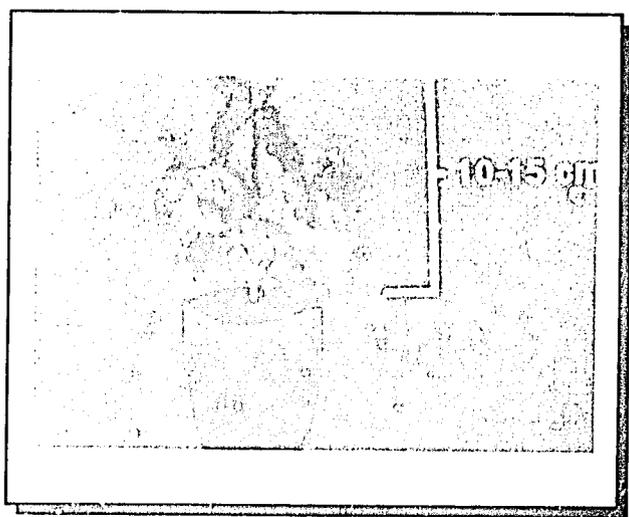


Figure 8: Containerized Tomato Transplant

\$3.1 million fixed investment.

Variable Costs. The variable costs for open-field production and packing are approximately \$.22/kg. This estimate also includes the interest cost of operating capital and amortization of the fixed investment costs. Delivered costs including transport, handling and tariffs to European markets are about \$.54/kg.

Wholesale Prices. Wholesale prices for Mahaweli tomatoes during the market period should range roughly from \$1.00 to over \$2.50/kg in Europe.

Potential Profit Margins. Profit margins for reasonably efficient tomato enterprises in the Mahaweli could range from near break-even up to \$2.00/kg.

Enterprise Financial Potential A 20

Ha. enterprise or group of farms could net roughly \$2,000 per Ha. or a total of \$400,000 per year. It would probably take two or three years to establish a financially viable enterprise because of the amount of time needed before an export quality product can be placed on the market. A tomato export enterprise is a demanding management challenge because of the perishable nature of the product.

B. Agronomic Feasibility of Tomato Cultivation in Mahaweli Areas

TOMATO: *Lycopersicon esculentum* Mill.

INTRODUCTION

Tomato ranks as an important and popular crop amongst nearly 50 kinds of vegetables grown in Sri Lanka. It also constitutes an important raw material for the processing industry and is widely grown throughout Sri Lanka, except in the up country wet zone of Nuwara Eliya, where climatic conditions do not favour the crop. The mid and low country wet zones have a very serious constraint to extensive tomato cultivation, due to the disease bacterial wilt caused by *Pseudomonas solanacearum*. Tomato cultivation is ideally suited to the dry zone areas during the yala season with supplementary irrigation, provided the soils are free from bacterial wilt infection. In the Jaffna district, tomatoes are generally grown during the cooler maha season. Fruit setting appears unsatisfactory during the hot yala season in coastal areas (Although there are two new varieties that set fruit under high temperatures, SolarSet-Asgrow Seed Co. and Heat Wave of Petroseed Co). There is a definite glut period of fruit production in tomato during February/March and August/September, which can be gainfully utilized, if processed.

CLIMATIC REQUIREMENTS

Tomato is a warm season crop and grows best where mean temperatures are between 68 to 79F or 20°C to 26°C. Higher temperatures cause poor or no fruit set or a

reduced yield due to malformed flowering and sterile pollen. Fruits rarely ripen, if the humidity is very high.

SOILS

The crop grows in nearly all types of soil, but performs best on a well drained clay loam, with a pH of around 5.5 to 7. A good supply of soil moisture is imperative for high yield, but could also result in excessive foliage development and a reduction in yield if combined with high soil fertility.

ROTATION

Tomatoes should not be grown on the same land more than once in every 3 years, to prevent build up of soil borne diseases, nor should it be rotated with other solanaceous crops. In bacterial wilt infected areas, tomato can be grown with some success only when rotated with paddy in the rice fields, as seen in the up country dry zone areas like Welimada, Bandarawela, Boralanda, etc.,. This is because the organism causing the disease is unable to survive under semi-aquatic conditions prevailing in paddy fields.

VARIETIES

Varieties vary from erect to bushy, with a fairly thick, solid stem, supporting many long, lateral branches. There are also trailing and semi climbing types with thinner stems, usually needing some support. Varieties producing floral clusters at every third internode of their main axis are termed indeterminate, according to their growth habit. Such varieties continue to grow, as long as environmental conditions permit. Varieties producing inflorescences more frequently, sometimes at each internode, until a terminal one is formed and elongation of that particular branch ceases, are called determinate or self pruning. The advantage of a determinate type is a much greater number of flowers within a given length of the vine, resulting in a shorter period for fruit maturity.

Deputy Director Research, Mahailupallama (1972) reported the introduction and screening of 90 tomato varieties for their general performance, out of which 9 were selected as being promising. Maximum yield was given by the variety Chico, 89,766 lbs/ac. The lowest yield for the 9 varieties selected was recorded by the variety 80 - Sun - Rice with 62,269 lbs/ac. Yield data of all varieties is given.

Deputy Director Research, Gannoruwa (1975/76) indicated that in a tomato varietal testing program with 17 varieties, the AVRDC line C-30-4-4-18-0, gave the maximum yield of 16,874 kg/ha; while AVRDC line C-32-0-1-2-0, recorded 14,366 kg/ha. The local selection, variety Biansz was third with 14,166 kg/ha.

Klaus (1976) reporting on varietal screening of tomato in Sri Lanka, stated that 135 varieties were tested in 4 locations from 1972 to 1975. Arising from the research data the author recommends the following varieties for the dry zone areas namely, Paker; VF-99; Roma and Napoli VF of the Roma type varieties and from the larger sized fruits, Marglobe; Biansz and de Marmande Eilon F. The author emphasizes that only bacterial wilt resistant or tolerant varieties had any chance of survival in the mid country wet zone and he recommends two of the local selections namely, Biansz and Katugastota W R.

In the central low country dry zone, the research data from Mahailupallama reveals that the best time for planting tomatoes is during yala, with the hardy Roma types, which are high yielders and good for transport as well.

In the Jaffna district and along the coast line, the optimum time of planting is late December to March, when temperatures are lowest and humidity is less. The author recommends, the Roma type varieties, although the larger fruited varieties indicated earlier can also be grown.

For the low country wet zone, only varieties resistant or tolerant to bacterial wilt disease are recommended. The author gives details of all introduced varieties, varietal trials carried out and relevant data.

Deputy Director Research, Gannoruwa, (1976-77) reported that from selection of tomato

varieties showing a high degree of resistance to bacterial wilt, the following showed promise namely, Biansz; Katugastota W R. and a few AVRDC lines. Presence of different biotypes of the wilt organism is reported, from the different responses seen at different locations.

The research report for 1977/78 from the above station stated that in varietal screening trial for resistance to bacterial wilt, the most successful varieties were Biansz; Katugastota W R; Sel. line 1-61 and AVRDC Sel 153.

Subsequently, 27 new introduced varieties of tomato, together with the selections from the earlier trial were included in a varietal testing program for resistance to bacterial wilt. All 27 introduced varieties were highly susceptible to the disease, while the local selections Biansz ; Katugastota W R and Sel. line 1-61, were totally free of bacterial wilt infection. AVRDC line no 146, recorded 14% bacterial wilt infection

Deputy Director Research, Bandarawela (1977/78) reported that tomato screening trials with 30 introduced varieties, together with local selections for bacterial wilt resistance, showed that only 4 varieties had some resistance to the disease namely, C-32-0-1-20; Biansz; Katugastota W R and Intermech. All other varieties succumbed to the disease.

The research report from Thirunevelly, indicated that 32 tomato varieties from Italy and Taiwan were included in a screening trial for general performance. Seven of these varieties gave yields of over 45,000 lbs/ac. The check varieties, Marglobe, Roma and Katugatota W R recorded yields of about 30,000 lbs/ac. An introduced variety, AT-70 besides giving the maximum yield of 54,000 lbs/ac., also showed resistance to most of the common pests and diseases and had big, round fruits.

Deputy Director Research, Mahailupallama (1978/79) indicated that 14 varieties of tomato were tested in observational rows. A German variety Hanbnes, gave the maximum yield of 13,207 kg/ha. However its fruit size was small, between 30-40g. Only 2 of the local selections included in this trial namely, Biansz and T-179 gave large fruits weighing between 50-70g.

Deputy Director Research, Gannoruwa (1980) reporting on the highlights of research, indicated that the tomato variety T-146 from Taiwan has given an outstanding performance in all experimental stations where it was tested, although it was susceptible to bacterial wilt. A new cultivar, 78-B-21 has been identified as showing resistance to bacterial wilt disease.

The report further states that heat stress is a serious limiting factor for successful tomato production during yala in the northern dry zone. Roma and Marglobe, the currently recommended varieties, show heavy flower drop during this season. The following AVRDC selections have been identified as showing heat tolerance namely, AVRDC SEL: 41;62;66;75;79;82;88 & 93.

Deputy Director Research, Giradurukotte (1984/85) indicated that 32 varieties of tomatoes were tested in observational plots for their general performance. Results indicated that the variety L-245 gave the highest yield, but its fruit size was small. However, the varieties Biansz; Walter F.S. & Tobol had much larger fruit.

Deputy Director Research, Mahailupallama (1985) mentioned that 3 open pollinated varieties of tomato introduced from Taiwan namely, TK-70; TN-2 & ST-1492 were compared to the recently released tomato variety T-146 which showed resistance to bacterial wilt. Results indicated that all 3 introduced varieties succumbed to the disease.

Deputy Director Research, Giradurukotte, (1985/86) reported that 62 tomato varieties were tested for their general performance in observational rows. Data indicated that the variety CL-5915-93-1-0-4, gave the highest yield of 6466 kg/ha. Details of fruit shape, size and resistance to disease are mentioned.

FLOWERING AND FRUITING

Doerfler, (1976) reported that flowers are usually self pollinated, but a small percentage of crossing may occur, specially when bumble bees are present.

Fruits are green, fleshy berries of variable shape, size and colour. They contain flat,

slightly curved, hairy, light brown seeds varying in number from 150 to 300 or more per fruit, depending on the variety, size of fruit and other factors.

Deputy Director Research, Giradurukotte (1987/88) reported that studies on flowering and fruit setting behaviour of tomato were conducted on 5 varieties namely, T-245; T-146; Roma; Marglobe and Katugastota WR. Planting was done from end of October to end of March, at monthly intervals. Data showed significantly higher yields from plantings done at the end of November and December. Katugastota WR; T-245 and T-146 gave significantly higher yields over Roma and Marglobe. The plantings done during February and March produced no fruits at all.

BREEDING

Deputy Director Research, Gannoruwa (1976/77) reported that selected pure fixed lines of tomato from AVRDC, Taiwan, were crossed with local selections namely, Biansz and Katugastota WR, with a view to obtain bacterial wilt resistance; high yield; non-cracking; good attractive colour; firmness of fruit and uniform ripening. The report also mentions that a breeding programme is underway for cooking type of tomato.

In the research report of 1977/78 from the above station, it mentions about the tomato breeding program for the above indicated traits. The report concludes that promising selections have been made in the F₂ generation.

De Vaz, C.R. (The Consultant) working on a breeding programme to find a tomato variety resistant to bacterial wilt, was successful in releasing a resistant variety which was officially accepted by the Department of Agriculture and released in 1982. The programme was initiated at the Agricultural Research Station, Boralanda and the variety Marglobe was crossed with a breeding line from Hawaii namely, 7560. The breeder named the new variety as "Biansz" in memory of his dead brother. This variety is specially recommended for the up country dry zone of Sri Lanka, where average fruit yields of 50,000 kg/ha can be expected.

The variety Biansz produces a medium sized fruit; high round shaped; orange-red in colour; thick pericarp; generally 3-4 locules with a small number of seeds, absence of fruit cracking and uniform ripening.

The other popular wilt resistant variety namely, Katugastota WR bred by the Botanist's division of the CARI, Gannoruwa, is also a widely grown variety due to its wilt resistant quality.

DISEASES

Tomato diseases are of two general categories namely, parasitic and non-parasitic. Parasitic diseases are caused by bacteria, fungi, nematodes and viruses which are responsible for most of the common and serious tomato diseases. Non-parasitic diseases are caused by unfavourable environmental conditions, such as excessive moisture or drought, extremes of temperature and lack or excess of certain mineral elements in soil.

Klaus, (1976) reporting on the disease bacterial wilt in trials conducted at Gannoruwa stated that the varieties Biansz; 1-61; T-96 and Katugastota WR were less susceptible to the disease, while all other varieties tested died of the disease.

Deputy Director Research, Bandarawela (1977/78) indicating about the initiating of trials on the effect of time and frequency of spraying Dithane M-45, for the control of late blight disease in tomato on the variety Katugastota WR, stated that effective control of the disease and increased yield is possible with frequent spraying. At 3 day intervals between sprayings a mean percentage infection of 0.73 was recorded, as against 25.12 at 7 days and 37.5 at 10 days. The unsprayed control had 100% infection.

Deputy Director Research, Gannoruwa (1977/78) reported that trials were done at Pallekelle (mid country wet zone) to assess the efficacy of four nematocides on controlling root knot nematode and increasing the yield in tomato. Furudan, Terracur, Nema-cur granules and D.D. soil fumigant were used. All treatments

reduced nematode population to less than 2% of their pre-treatment count on the day of planting, while over 30% increase in population was detected in the untreated control.

Barksdale et al. (1972) describe the several diseases affecting tomato caused by bacteria, fungi, viruses, nematodes and some non-parasitic diseases. They are;

- | | |
|-----------------------|--------------------------|
| (a) Fusarium wilt | (b) Gray mold |
| (c) Verticillium wilt | (d) Septoria leaf spot |
| (e) Bacterial wilt | (f) Anthracnose |
| (g) Bacterial cranker | (h) Soil rot |
| (i) Stem rot | (j) Tobacco mosaic virus |
| (k) Damping off | (l) Double virus streak |
| (m) Late blight | (n) Potato Y virus |
| (o) Early blight | (p) Nematodes |

The non-parasitic diseases are;

- | | |
|--------------------------|-------------------|
| (a) Blossom-end rot | (b) Sun scald |
| (c) Pockets or puffiness | (d) Growth cracks |
| (e) Blossom drop | (f) Cat face |

The control of diseases by the use of resistant varieties is the most effective and economical means. Specially for soil borne organisms, this appears the only feasible method for their control. Resistant varieties in tomato have been bred for fusarium wilt, verticillium wilt and late blight diseases.

INSECTS

Deputy Director Research, Gannoruwa (1975/76) reporting on insect population studies on 5 tomato varieties, stated that the most predominant pests were thrips, aphids, white flies, leaf eating caterpillar and a green coloured mirid bug (unidentified).

Analysed data indicated that thrips show greater preference to the variety Katugastota WR than to Roma. The infestation of thrips and aphids on tomato was significantly greater at 33 and 48 days after planting, which was also associated with the dry weather. Less infection was observed at 20 days after planting and least infection at 78 days after planting. Details of flowering and fruiting are given.

Deputy Director Research, Giradurukotte (1987/88) reporting on studies to assess the insect population on 5 tomato varieties indicated that the most prominent pests observed throughout the season were whitefly (*S.litura*); aphids; mirid bugs; thrips (*Heliothis* sp.), plant hoppers and leaf hopper species. Occasional infestation by the following were observed namely, *Plusia* sp.; *Dsydercus* sp.; *Empoasca* sp.; *Aulocophora* sp. and *Lencinoides orbonalis*. Data was collected fortnightly from randomly selected 10 plants per plot.

RECOMMENDATIONS

(a) Bacterial wilt disease is the most serious constraint and limiting factor for successful and extensive cultivation of quality tomatoes in Sri Lanka. Data from 19 research institutes in Sri Lanka reveal that about 12.8% of the total of scientist's time is utilized in tomato research. However, the review of literature by the Consultant, clearly indicates the paucity of convincing research data on this aspect. It is therefore imperative, that priority be given for a selection and breeding programme with locally selected and introduced varieties to remedy this serious drawback for expanded acreage of quality tomatoes in Sri Lanka.

(b) Although for processing, varieties like Marglobe, Biansz, Roma etc., are preferred in Sri Lanka, the quantities available are very limited and also confined to a short period of time. Tomato research in Sri Lanka over the years has mainly tackled the problems of yield and bacterial wilt resistance. No serious attempts have been made to select varieties suitable for the processing industry. The need therefore for an ambitious varietal screening programme to select processing types with some degree of resistance to bacterial wilt is undoubtedly urgent and meaningful. It is unfortunate that considering past research data critically, no long term programmes have been initiated to follow up on selected varieties over a period of time to obtain conclusive data. For any con-

vincing research findings, the same tomato varieties must be repeated in identical trials for at least 3 consecutive seasons. This unfortunately has not been the practice in Sri Lanka.

(c) A short term policy would be to exploit the rice based cropping system for tomato production like in the up country dry zone areas of Welimada, Bandarawela, Boralanda etc., where currently some of the finest tomatoes are produced with supplementary irrigation in the paddy fields. The water logged conditions prevailing in these fields for about 5 months are unfavourable for the survival of the bacterial wilt organism, which is aerobic. Consequently, the crop which follows paddy is able to circumvent this serious disease and produce quality tomatoes. Trials in the Mahaweli region based on this proven practice to overcome bacterial wilt, should be meaningful for commercial production of quality tomatoes. This is same principle currently exploited by the farmers in the up country dry zone areas to produce successful crops of commercial potatoes which also succumb to this dreaded disease.

(d) The Mahaweli Authority can make a substantial contribution by introducing recommended tomatoes varieties from national and international institutes in India, Hawaii, Philippines, Thailand, Malaysia, Taiwan etc., and follow up the research programmes till the objectives are achieved. Some of these varieties would be the AVRDC (TAIWAN) selections against bacterial wilt. Direct correspondence with the tomato breeder of this institute will bring positive results to obtain new and current recommendations. A local recommended variety, Biansz will also be a useful addition in the varietal screening programme, as it is a good processing variety. Other currently popular local varieties like Marglobe and Roma can also be included if grown under bacterial wilt free conditions, like in a paddy based rotation, as described in (c).

(e) The Consultant strongly encourages the collaboration of local universities to obtain quick and meaningful results. Currently, univer-

sity agriculture students have to embark on short term research projects, and screening of varieties for resistance to bacterial wilt would be a useful study. The Professor in charge of this programme can continue the research over the years with new batches of students. As the students have to present a seminar and also write a research paper on such projects, they would undoubtedly take on this programme very seriously.

(f) As tomato grows satisfactorily in nearly all types of soil, with good soil management practices like the use of organic matter, green manuring and good drainage to prevent water logging conditions, the judicious selection of suitable areas in the Mahaveli System B should produce good crops of tomato, provided the land is not infected with bacterial wilt.

I. Enterprise Development & Marketing Strategies

A. Enterprise Organization Patterns

1. Vertical Integration & Channel Captains.

The development of successful enterprises for perishables export into the demanding market environment of Europe requires coordination and management control over the many stages of production and marketing from varietal selection, production, packing, transport and marketing. When new markets or new products are involved there is a critical element of pioneering required of the early enterprises. SRD's view is that for these new product or market situations a single "mind" must be able to visualize the process from seeding to supermarket and be able to exert enough management and quality control over the complete chain to make successful market penetration. There may be one or more of these entrepreneurs who have the vertically integrated vision of the business, but frequently it starts with a single such person who becomes, in effect, a "channel captain". During the early phases of the development of the production technology and transport/marketing chain, this "channel captain" serves as a major link infusing information and opening contacts for all participants.

The idea of vertical integration is simply that the export business needs to have an intimate management connection between the various "vertical" elements in the production-to-market chain. These businesses will not likely succeed if producers are independently selecting varieties, producing according to their own schedules, selling in local wholesale markets etc. The achievement of quality production sufficient to confront the challenges of the European marketplace is not likely without vertical integration. The key is to have management control and coordination from the top end of the chain (markets) to the bottom (production). This can be achieved through

various different ownership and management formats as discussed below.

2. Vertically Owned & Operated Enterprise Formats.

Perhaps the most obvious vertical integration format is an enterprise which owns and operates all of the production, transport and marketing elements in the chain. The classic example of the *vertical ownership* format are the multinational banana companies which own and operate the banana plantations, the refrigerated vessels that transport the product, and the storage and marketing companies that wholesale market and distribute the product in the consuming countries.

In the case of bananas this format requires massive capital and economies of scale and is largely impractical for start-up industries. However, in some cases it may be the best format, and it may be financially practical where 8-10 refrigerated trucks could constitute the complete transport network required. While a vertically integrated banana operation would take hundreds of millions of dollars of investment to get started, many vertically owned enterprises for Sri Lanka would take only approximately two million dollars of investment capital including the investment in refrigerated trucks. The management reach achieved by full vertical ownership provides the best conceptual format for quality control.

3. Contract Production & Mixed Enterprise Formats.

A wide variety of mixed ownership and coordinated management enterprise formats are viable alternatives to the vertically owned model. The most successful of these formats involve a high degree of management coordination and even control over

the separately owned enterprises which comprise the production-to-market chain. Figure 9 is a copy of an advertisement by a mixed format enterprise describing the full range of their activities. While Glass Glover has its own farms, the largest part of their business involves management and marketing coordination with independent growers under contract and technical assistance agreements. The services they provide to growers, as noted in their advertisement, includes crop planning, agronomic advice, packaging, storage, distribution and marketing. As the industry matures it becomes more and more possible to achieve adequate quality control and management trust between independently owned enterprises.

4. Small Farmer Grower/Exporter Associations.

Small farmers have successfully been organized into grower/exporter associations in several countries. Small scale packing and cooling plants may be successfully owned and operated by such an association, frequently using a management contract for the plant.

GROW WITH GLASS GLOVER

GLASS GLOVER ARE LARGE GROWERS IN THEIR OWN RIGHT AND HAVE INVESTED MILLIONS IN PRODUCTION, HARVESTING AND PACKING EQUIPMENT.

WE HAVE UTILISED THE LATEST TECHNOLOGY TO BECOME SPECIALIST PRODUCERS AND UNRIVALLED MARKET LEADERS IN OUR CHOSEN SECTORS.

THROUGH OUR SPECIALIST MARKETING TEAMS, AMONGST THE MOST PROFESSIONAL IN THE INDUSTRY, WE HAVE ACCESS TO THE WIDEST RANGE OF CUSTOMERS FROM THE MAJOR MULTIPLES TO PROCESSORS.

OUR WORLDWIDE PROCUREMENT GIVES US AN UNRIVALLED UNDERSTANDING OF COMMODITY TRENDS AND OPPORTUNITIES.

GLASS GLOVER OFFER A COMPREHENSIVE MARKETING SERVICE TO OUR FRUIT, SALAD AND VEGETABLE GROWERS WHICH INCLUDES SPECIALIST HELP IN:

- CROP PLANNING
- AGRONOMIC ADVICE
- PACKAGING, STORAGE AND DISTRIBUTION
- QUALITY ASSURANCE
- SALES AND MARKETING.

WE HAVE A SUCCESSFUL TRACK RECORD WITH OVER 100 GROWERS ALREADY AND OFFER A PROFITABLE PARTNERSHIP FOR ALL COMMITTED GROWERS.



Join us and grow with Glass Glover

GLASS GLOVER PRODUCE LTD
COLDHARBOUR ROAD, HARLOW, ESSEX
TEL: 0279 35422 FAX: 0279 441509 TELEX: 817921

Figure 9: An Example of A Mixed Vertical Integration Format from the U.K.

(From, *Fresh Produce Journal*, 20 October 1990, p. 7)

B. European Marketing Channel Options for Sri Lankan Grower/Exporters

This section describes the basic structure of fruit and vegetable marketing channels in Europe and evaluates their potential for Sri Lankan grower/exporters. The figures are intended to give Sri Lankan growers and potential exporters a visual feel for each of these marketing entity types. For ease of description we have divided marketing entities into somewhat artificial categories, most entities perform functions classified in more than one category. The marketing channels may be divided into wholesale and retail levels. The wholesale segment involves importers, wholesalers and vertically integrated suppliers called prepackers. Retail channels include specialty grocers and supermarkets. It is SRD's judgement that it is better for a grower/exporter to connect as far "down" this chain in the retail direction as possible. The easiest and least demanding connection, however, will likely be at the top end of the chain. Only large volume and proven high quality suppliers can connect directly to supermarkets.

1. Importers.

The least complicated of the marketing channel institutions are those who act narrowly as importers and do not have storage, marketing, packing or other facilities. Importers market only in the sense of a broker or agent handling the paperwork related to import clearances and arrangements. Their "marketing" function is to make contacts and "place" the product in one of the forward marketing channels discussed below. Almost all of the "forward" marketing entities discussed below also handle the importing functions provided by importers combined with their other capabilities. Importers' capability to effectively make the forward marketing arrangements varies widely and may be very difficult for a newcomer to evaluate. Some importers have extensive and effective contacts and forward marketing arrangements, and many of them have at least the facilities implied by a stand in a major wholesale market. Some have developed and recognized brand associations and pay for advertising. Figure 10 is an example ad by a significant importer, Lisons Ltd., which has diversified forward with marketing infrastructure and capability.

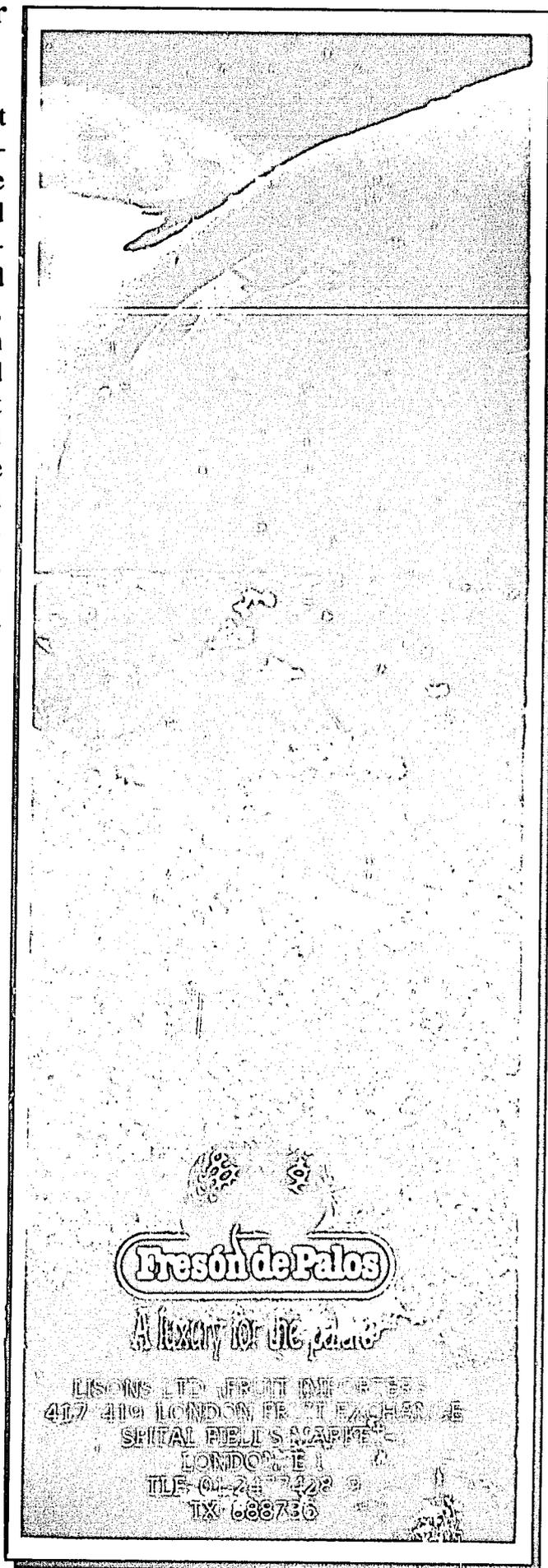


Figure 10: Lisons Ltd. Ad (Eurofruit Nov. 88 p.69)

2. Wholesale Agents & Markets

Figure 11 illustrates the make-up of an example wholesale agent stand and market in a medium size European city (Cardiff). At the top is Ray Bishop of WR Bishop, an independent wholesaler. His business occupies one "stand" in the market which consists of roughly 50 square meters on one of the corridors which can be seen in the middle of the figure. Behind his stand most wholesalers have a storage room and loading dock where produce is received and dispatched on waiting trucks. The bottom of the figure in an overhead view of the wholesale market from the outside showing the loading docks. Buyers from retail grocers, supermarkets, restaurants etc. can be seen in the center of the figure moving down one of the corridors inspecting the fruit and making deals. Except for Holland, where formal auctions are used for wholesale distribution, the market structure in Figure 11 dominates in the rest of Europe.

The wholesale trade in fruits and vegetables through these markets is almost exclusively on a consignment basis. A Sri Lankan grower/exporter using one of these agents could expect to pay a fee of 8-12% of the sale price and receive the remittance within 10-30 days of sale. There is great variety in the capability and reliability of wholesale agents and there are frequent rumors about "nicking" or underestimating sale prices in order to keep back part of the sale. Reasonable care and reference checks will usually suffice to identify reliable agents.

Figure 12 describes Runjis Market, which serves Paris. Runjis covers 500 acres and houses 290 wholesalers and 150 importers and handles roughly 2.5 million tons of produce. The vast network of markets and wholesalers can provide relatively easy access for Sri Lankan grower/exporters to Europe.

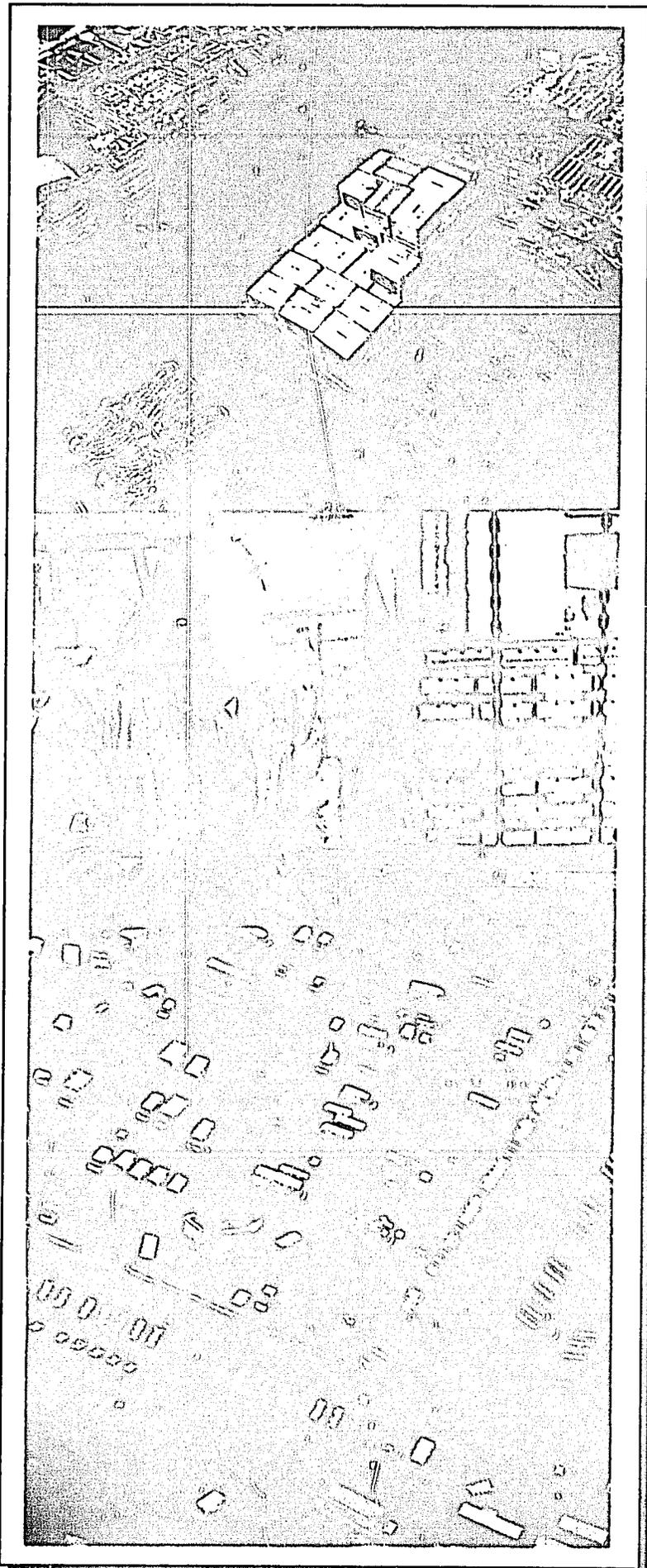


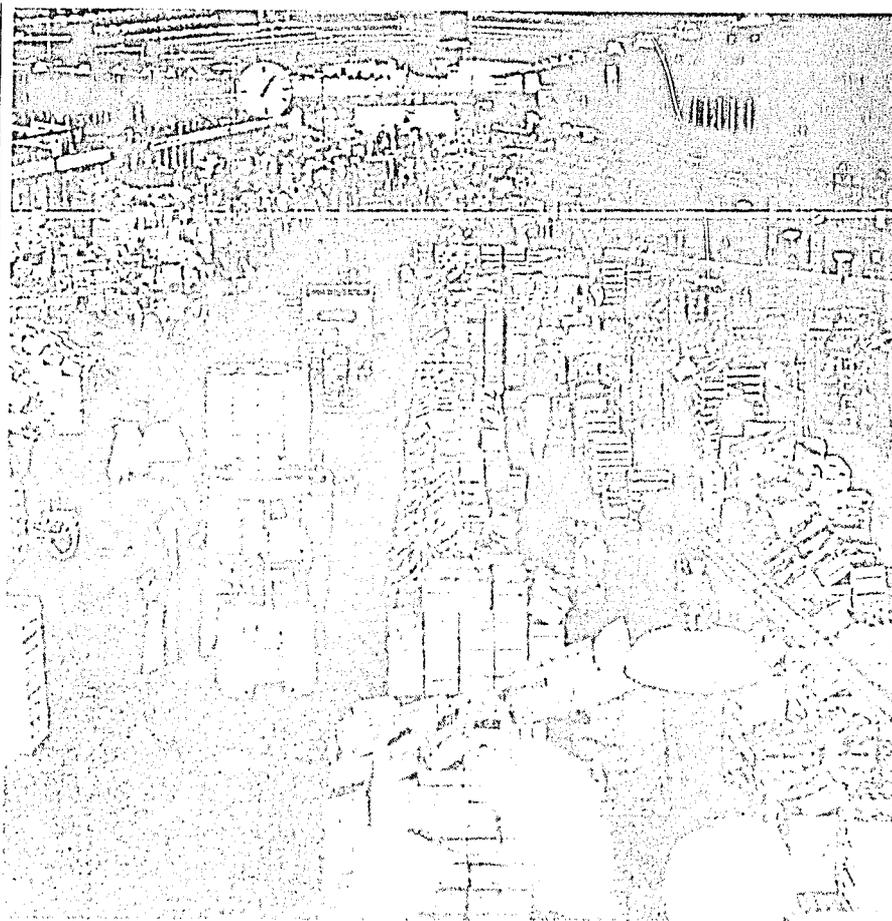
Figure 11: Wholesaler & Market (Fresh Produce Journal June 22, 1990 Supp.)

Rungis – from strength to strength

FRANCE'S largest wholesale market, Rungis, was set up in 1969 and is conveniently situated between Paris' two airports Orly and Roissy. The site covers some 200 hectares, 60 per cent of which is dedicated to fruit and vegetables, serving 150 importers and 290 wholesalers. The market itself is a very highly structured unit administered and regulated by an organisation known as the 'Semmaris' (Rungis Market Authority). The many on-site facilities include freight-forwarders, a press office, banks and catering services. There is also an administration office which, in liaison with the Ministry of Agriculture, is responsible for the quality control of produce.

The market at Rungis has an annual turnover of 2.5 million tonnes of fresh produce, with fruit and vegetables accounting for 1.5 million of this total and there are plans to extend the area allocated to fruit and vegetables. The space set aside for wholesalers at the market consists of three storey units for offices, sales floor and cold storage. Space is also allocated for small producers who come to sell their produce on a daily basis. This constitutes five per cent of the turnover.

The majority of sales continue to be made in the market itself, but 35 per cent is carried out by phone and the



The hustle and bustle inside one of the main halls

Figure 12: Eurofruit Article on Runjis Wholesale Market, Paris, (Eurofruit, Nov. 1988, p. 58)

Wholesale agents range from single stand and single market agents like the one pictured in Figure 12, to agents with 10 or more stands at many different city wholesale markets. Since they operate on consignment commissions, they are relatively easy to engage. Most of them can handle import formalities either on their own account as importers, or by arranging for an importer to handle it for them. Wholesale agents tend to be very flexible and are an obvious entry point for a grower/exporter unfamiliar with the market.

As a grower/exporter's volume and quality consistency stabilize, the business may outgrow the single market wholesale agent as principal distribution channel. The logical transition is to utilize a vertically integrated pre-packer who has wider access to other markets and to direct distribution to retail outlets including specialty produce stores and supermarkets. Even after the business has made such a transition in volume and quality, an agile wholesale agent can continue to be a useful channel. High quality gourmet restaurants and hotels frequently rely on the wholesale market to supply them with the very best and most exotic produce which seldom appears in supermarkets. A grower/exporter can frequently obtain a higher price premium on a small quantity of high quality product from such a wholesale agent than from a pre-packer. Wholesale agents are also able to salvage some price for low quality/damaged produce which would simply be rejected by prepackers. Thus at both high and low ends of the quality spectrum, wholesalers can be uniquely useful.

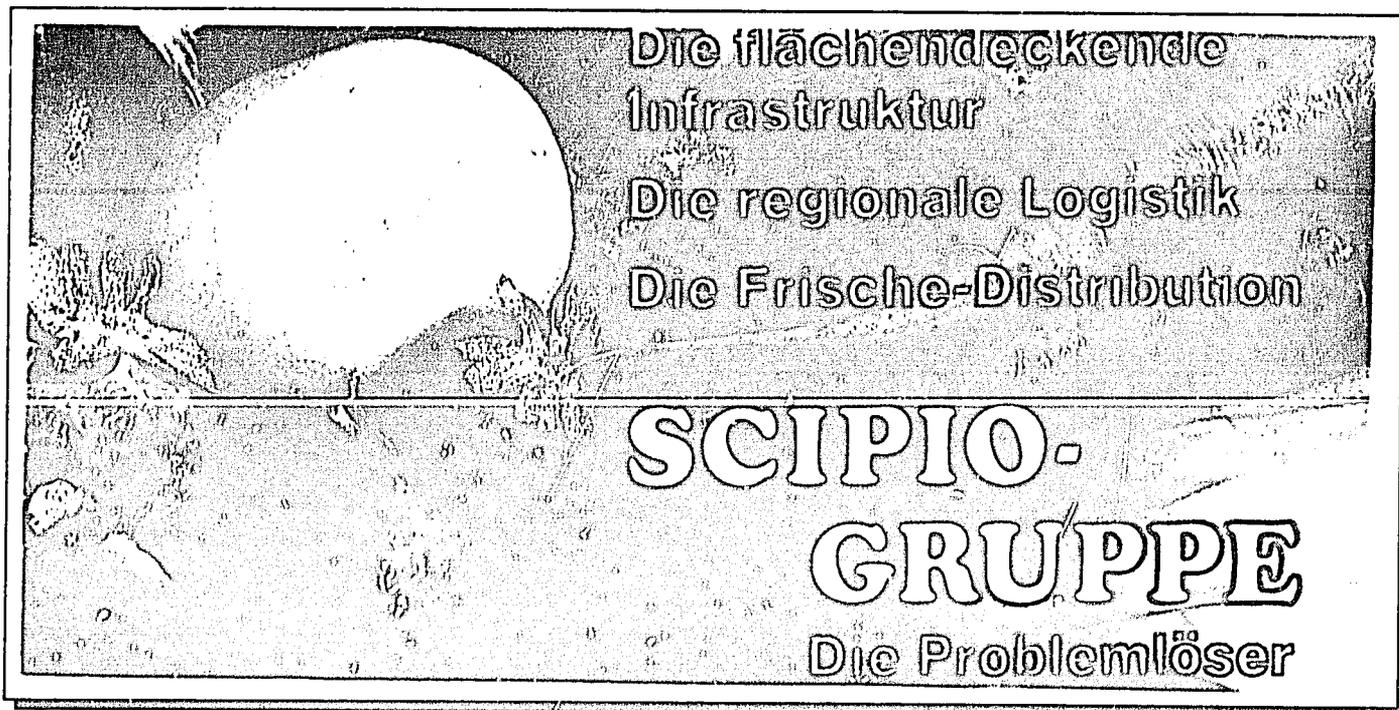


Figure 13: Scipio Group, A Major Vertically Integrated German Firm (Eurofruit Nov. 1988 p. 88)

3. Vertically Integrated Pre-Packers

Figures 13 & 14 present examples of the larger scale vertically integrated fruit and vegetable firms in Europe. These firms have large scale cold storage and packing facilities, fleets of refrigerated trucks, agricultural experts and, in some cases, farms of their own. Their main business is the direct supply of product to retail outlets based on direct imports or domestic grower contracts. In spite of their size, they are surprisingly accessible and willing to explore international marketing and joint venture possibilities.

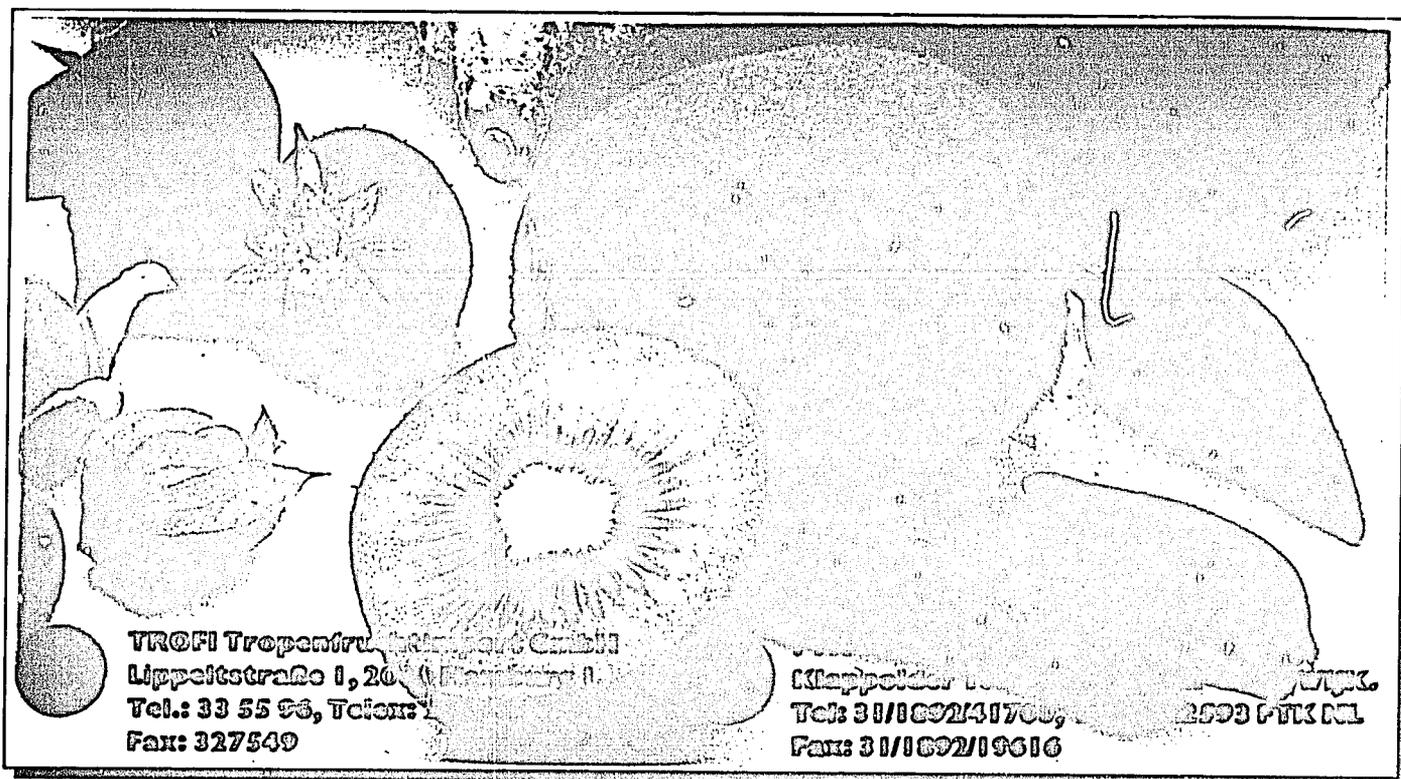


Figure 14: FTK Holland BV, A Major Vertically Integrated Dutch Firm (Eurofruit Nov. 1988 p. 17)

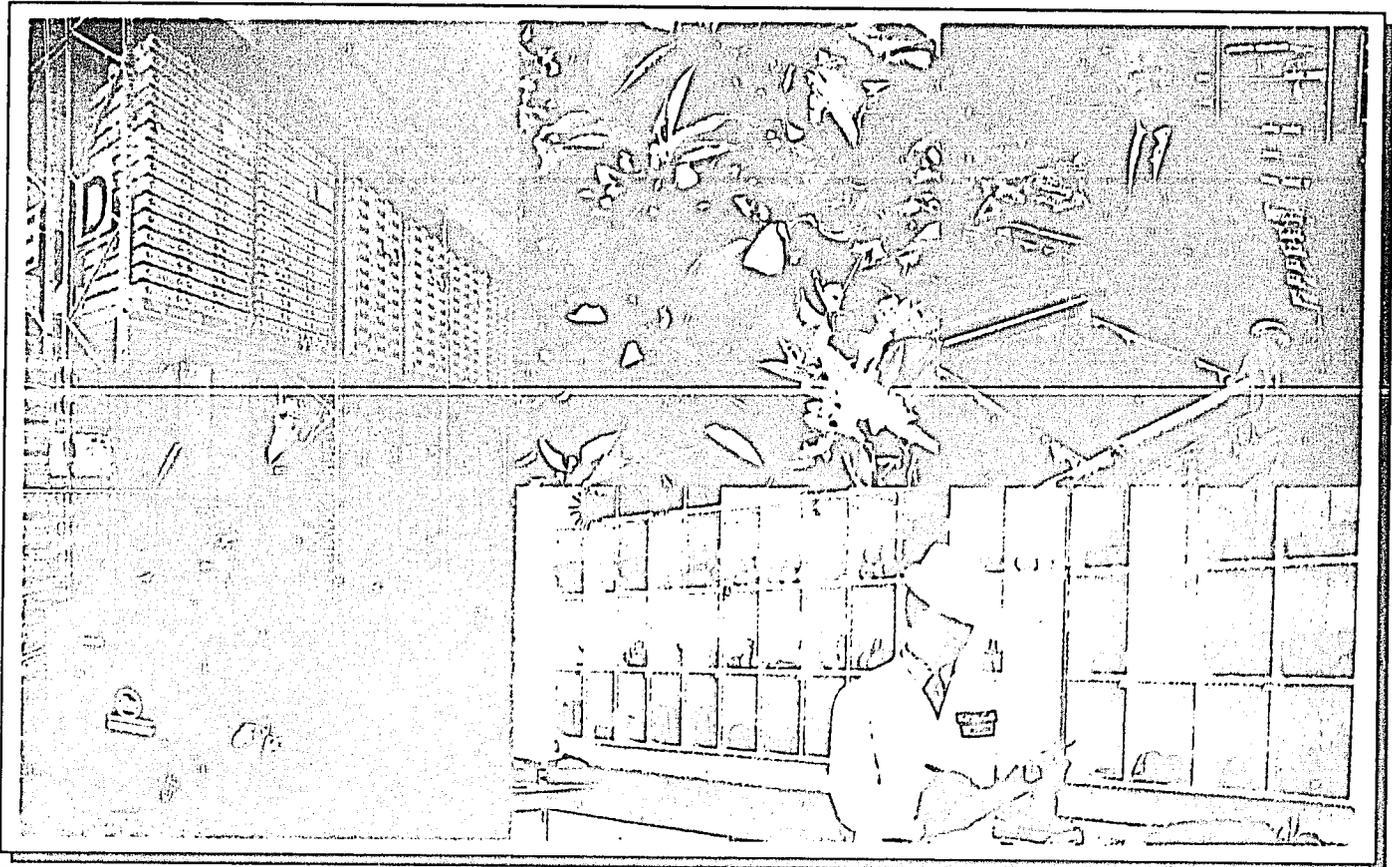


Figure 15: Mack Ltd.: Example Facilities of a Vertically Integrated U.K. Prepacker (Eurofruit Oct. 1990 p. 42)

Prepackers can work in a wide variety of different marketing modes. Since most prepackers have multiple stands at wholesale markets, they are capable of operating in low volume consignment mode. More importantly, they are able to work on high volume fixed price supply contracts which they will place with supermarkets and/or their wide clientele of specialty grocers. A prepacker contract or joint venture can bring considerable stability and risk protection to a grower.

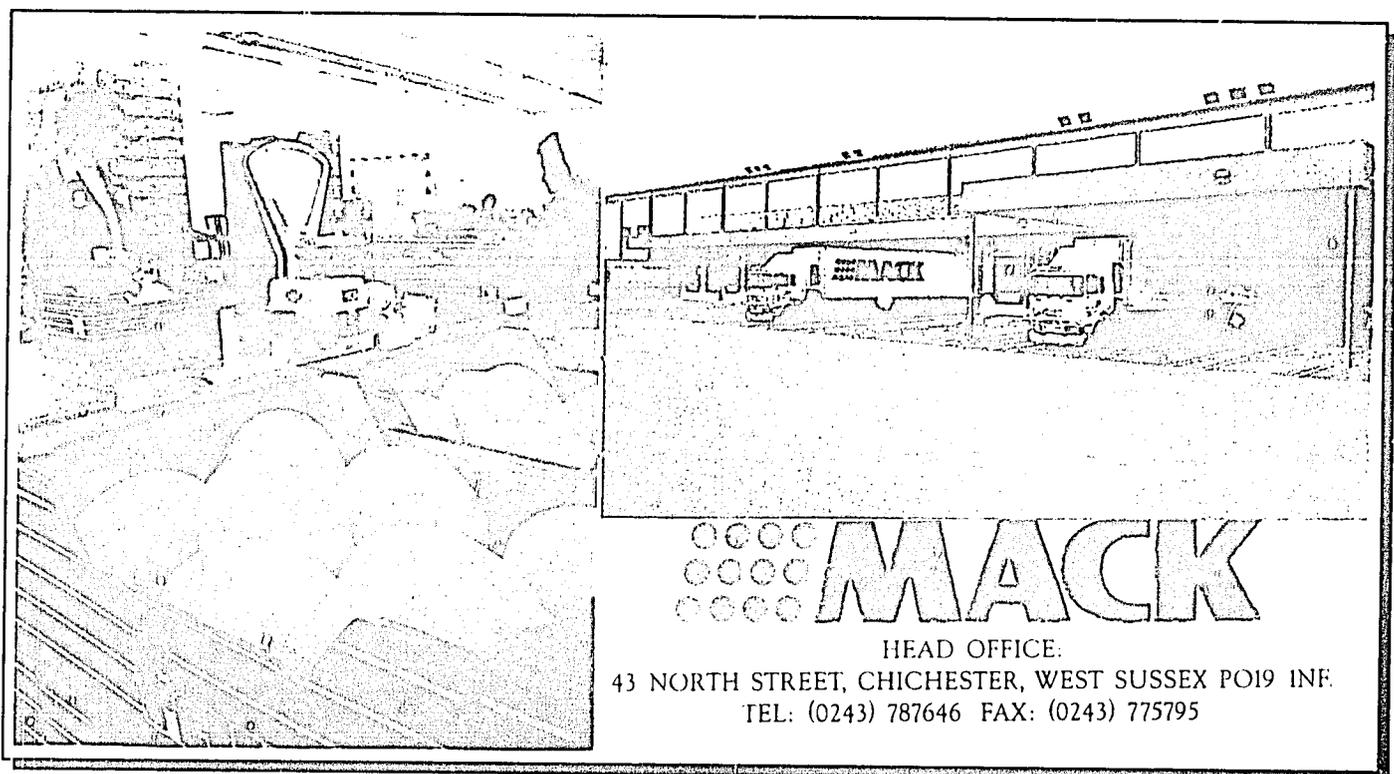


Figure 16: Example Packing and Storage Facilities of a Prepacker (Mack Ltd.) (Eurofruit Oct. 1990 p.41 & 43)

4. Retail Specialty Grocers

Unlike the United States, specialty grocers still represent a large proportion of fruit and vegetable sales in Europe. Supermarkets (known in the U.K. frequently as "Multiples") are gaining market share, but grocers still handle 40-60% of fruit and vegetable sales depending on the region in Europe. Figure 17 illustrates a typical specialty grocer shop. Grocers supply themselves through a variety of wholesale channels including importers, wholesale agents and prepackers, but they never interact contractually in a direct way with overseas

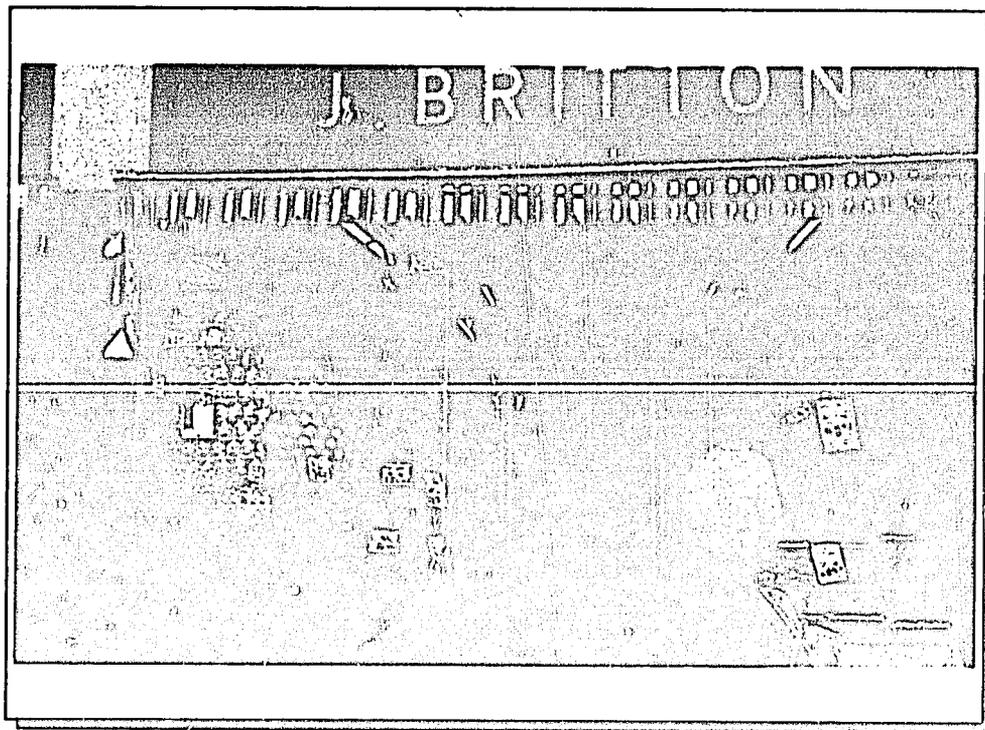


Figure 17: J. Britton; U.K. Specialty Grocer (*Fresh Produce Journal*, Sept. 14, 1990, p. 10.)

grower/exporters. The quality demands of grocers varies widely with some catering to high priced and gourmet clients, others located in lower income or rural areas with a lower quality requirement. Supermarkets tend to concentrate in the center of this range, demanding a consistent but usually median priced quality product.

5. Supermarkets & Multiple Outlet Grocers.

Figure 18 illustrates the high volume produce business transacted in supermarkets in Europe. Supermarkets are themselves vertically integrated produce enterprises with a wide variety of procurement formats. Some supermarkets such as Marks & Spencers in the U.K. have their own product brand names and require packing facilities to utilize their packaging. Many supermarkets procure directly from international growers in countries like Spain and Italy, and act as importers on their own account. The final maturity stage for a grower/exporter or association is to deal directly with supermarkets on fixed price and quantity supply contracts. The supermarkets deal only with the most reliable and high volume suppliers, and while their prices are generally lower than wholesale channels, their willingness to remit payments immediately, or even in advance, and their capacity to absorb vast quantities make them the premier clients in the industry. Supermarkets are notoriously demanding when it comes to quality and usually reject supplies they deem not to qualify without discussion or allowance. Suppliers with supermarket contracts must be prepared to absorb these rejections and insure that they are infrequent occurrences. Grower/exporters new to the market generally pursue high-price low-volume marketing arrangements and fail to see their long run interest in low-price high-volume deals. This failure in vision leads them to ignore the importance of early supermarket contacts.

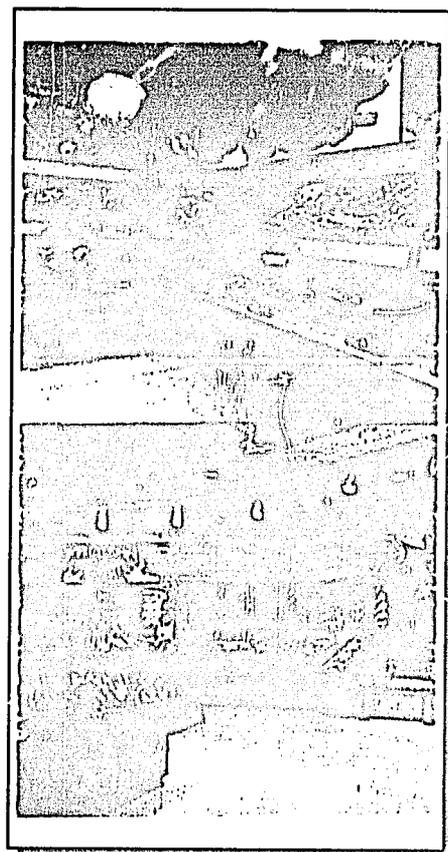


Figure 18: Supermarket (*Fruit Produce Journal*, Sept. 7, 1990, p. 25 by Thompark)

C. Trade Associations

There are many benefits to organizing trade associations among the firms engaged in growing and exporting produce. This section outlines these functions and potential positive results for the general growth and viability of the industry.

1. Marketing & Technology Development

Trade associations have been major factors in the success of produce export industries in many countries. Figure 19 is an advertisement by one such association, the New Zealand Apple and Pear Marketing Board. The development of the Kiwi market and the establishment of New Zealand grower/exporters as the leading players in that market was largely the result of work by the Board. Associations can provide market intelligence, fund market promotion, and provide member growers with technological assistance. In addition



Figure 19: New Zealand Marketing Board Ad (Fresh Produce Journal, June 22, 1990, p. 21)

to providing assistance in marketing, a trade association can dictate quality standards which protect all growers from the bad market reputation of a small number of irresponsible grower/exporters.

Figure 20 is an example of the type of market information which an association can monitor and communicate to growers.

The EEC has a complex set of seasonal

Commission applies first new STM limitations on Spanish strawberries

SPANISH strawberries exported to other EEC member states in the two weeks after Easter will be subject to control by Supplementary Trade Mechanism (STM) export documents, while volume ceilings have also been set by the EEC Commission.

This is the first time the Commission will have applied this measure since the new Regulation (776/90) came into effect, on March 29, 1990.

As Les Norris, EEC consultant to the National Federation, explains, this will mean Spanish senders wishing to export their strawberries



This merchandising banner was placed on display on New Covent Garden this Monday

"All the administration and issuing of export documents takes place at the Spanish

can continue to flow."

It is understood that last week's Commission meeting also decided to maintain Period I of the STM (a monitoring exercise) on tomatoes, lettuce, broad-leaf endives, carrots, artichokes, table grape and melons, though it is reported by Eucofel that the committee involved would prepare the application of STM to apricots and peaches.

The news of this action coincided with a promotional effort for Spanish strawberries in the UK by Foods from Spain, involving a combination of consumer advertising on a national basis in a

number of daily national and Sunday newspapers, plus a major merchandising effort on 16 wholesale markets. This latter aspect featured the hanging of large colourful banners featuring Spanish strawberries on 275 traders' pitches.

Commenting on the situation, FFS UK director Patrick Gough expressed disappointment at the Commission's decision, adding that it is difficult enough to gear up and promote if volume restrictions apply, and even worse if this is combined with administrative restrictions.

end, which will no doubt regulate sendings carefully so as to ensure supplies

Figure 20: Example of EEC Regulation (Fresh Produce Journal, April 13, 1990, p. 3)

regulations on the import of major EEC products, while most minor fruits and vegetables are open. However, the regulatory structure allows the EEC to impose special limitations and controls on a temporary basis as they see fit. Monitoring these unpredictable changes in the regulations requires constant monitoring and is best done not by individual growers but by an association. Market price monitoring and tracking competitor developments and plans are both functions which an association can ably discharge.

SRD's experience with associations in many countries suggests that commodity specific associations have the best chance of making concrete and practical contributions in the short run. General trade associations can serve many useful functions outlined below, but they are too broad to provide commodity focused marketing and technology help which is always crop specific.

2. Transport Development.

Transport development is the critical link between the grower and the market. Individual growers will find it relatively easy to negotiate transport arrangements where adequate carrier availability exists on well established transport routes. It is very difficult, if not impossible, however, for an individual grower/exporter to have the volume or finances necessary to open new transport routes or increase carrier availability. In the case of Sri Lanka this is important in opening sea transport routes, and in expanding carrier availability for air-freight. An association of growers, whether it is commodity specific or general in nature, could be a major influence in solving these transport bottlenecks. Groups of grower/exporters can have sufficient joint volume to attract charter aircraft, and to attract reefer trailer companies from Europe. Joint association/carrier agreements can also guard individual members against capacity shortfalls and unfair pricing.

3. Policy Leverage.

Another important function of trade associations is to exert group leverage on trade policy. The administrative controls on the export trade should be developed and administered in such a way as to favor the expansion and effective development of export activity. An association of grower/exporters can provide the group leverage necessary to have an influential input into the structure of export policy and the administrative procedures which are used to implement it.

D. Financing and Joint Ventures

Bank finance is difficult to obtain on normal agriculture finance terms. The problem is that there is usually insufficient value in the fixed assets to provide collateral or security for

the required level of finance. Export horticulture creates a very large and expensive business on a very small area of land. This means that a bank cannot find sufficient value in the land or equipment to secure the necessary level of lending.

The underlying difficulty is that the value in an export horticulture enterprise is in the perishable produce itself and banks without experience in the trade are reluctant to use a lien on a perishable product as security for a large loan.

BANCO EXTERIOR U.K.
The Spanish Bank

Active in the U.K.
Fruit & Vegetable Markets
for 37 years

Head Office: 9 King Street, London EC2V 8HB. Telephone: 01-796 4100 Telex: 886820 Facsimile: 01-796 3898	Branches: City Covent Garden Vauxhall
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Figure 21

One solution is to assist local banks to develop this experience, or work with experienced banks like the one advertising in Figure 21. The second alternative is to finance through a joint marketing and technology venture with an experienced outside firm such as a vertically integrated prepacker of the type described above. These firms have access to finance and have proven track-records with banks who are acquainted with produce finance.

III. Market Intelligence Profile Overview

This section is a brief overview of the information contained in the second part of this report. The Market Intelligence Profile™(M.I.P.) is a analysis of potential market countries who already exhibit a strong tendency to importing fruits and vegetables. For the Mahaweli development project, four countries have been identified and analyzed as possible export markets. These countries include three in Europe(the United Kingdom, the Netherlands, and Germany) and one in Asia(Japan). The M.I.P. uses prices, domestic production, import supply, tariff, handling, and cost data to analyze the market structures and trends in each of these countries. The individual sections which make up the M.I.P. are summarized briefly.

A. General Fruit Consumption.

During the decade of the 80's consumers in the major importing countries in Europe and North America have become more conscious about nutrition and physical fitness. This trend has been gaining strength and is now beginning to exhibit itself strongly in the marketplace in the form of a shift in consumption in favor of fruits and vegetables and away from processed food products. Figure 22 illustrates the recent effects of the "fresh trend" in the imports of the two largest importing regions, W.Europe and the U.S. during the 80's. One can see even in these macro level data, a fairly even trend for both processed and fresh vegetables imports, and then a sharp up-turn in fresh imports while processed ones increase only slightly. This trend strengthened during the later part of the 80's and is expected to continue during the foreseeable future. Though this trend affects most processed forms of fruit and vegetables, it does not appear to have negatively affected those processed forms which are thought of as "additive free" such as frozen and fresh juices. Both fruit juices and frozen products have shown continuing strong demand. Fresh fruits and vegetables have been transported thousands of miles from Southern located winter production sites to Northern consumption sites for more than one hundred years in the U.S. and Europe. In the distant past, however, this trade has been of limited dimension tapping only a few very high income households. Since World War II, the fresh trend has become a major industry and recent data indicate that it is strengthening over time.

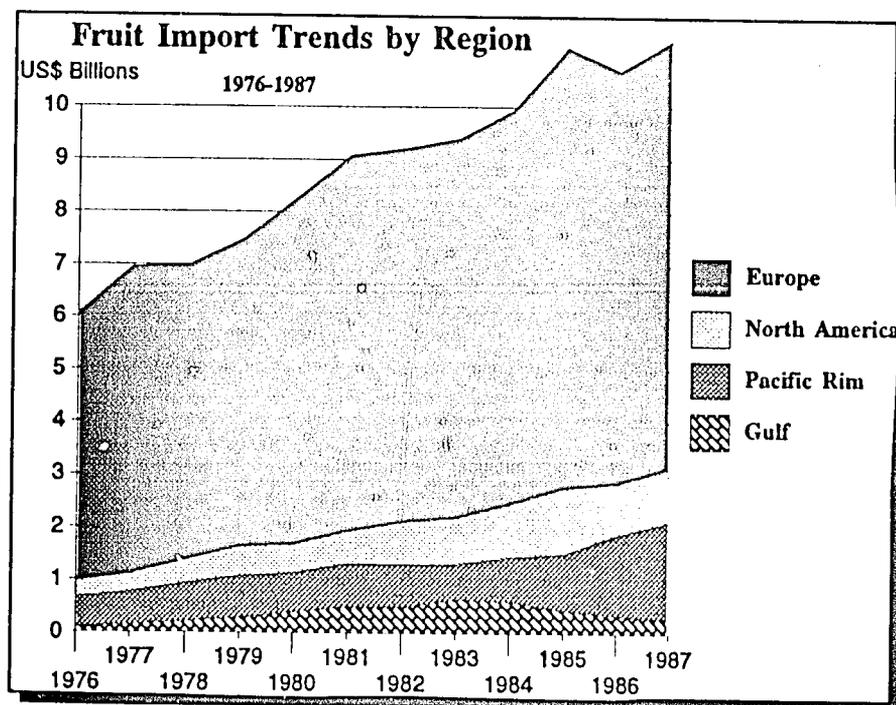


Figure 22 Major importing regions of the world

B. Timing & Depth of Market Windows for Tomatos in the M-ahaweli

To provide an in-depth market analysis of fresh tomatos, four European markets (Germany, the U.K. Switzerland and Netherlands), are used. Figure 23 indicates total tomatos supplies by week for 1990 in the four major markets in terms of tons entered per week. Netherlands is the major market in terms of total volume imported although some of this is probably transshipments. Germany is the next largest importer, reaching a weekly peak of almost 20,000

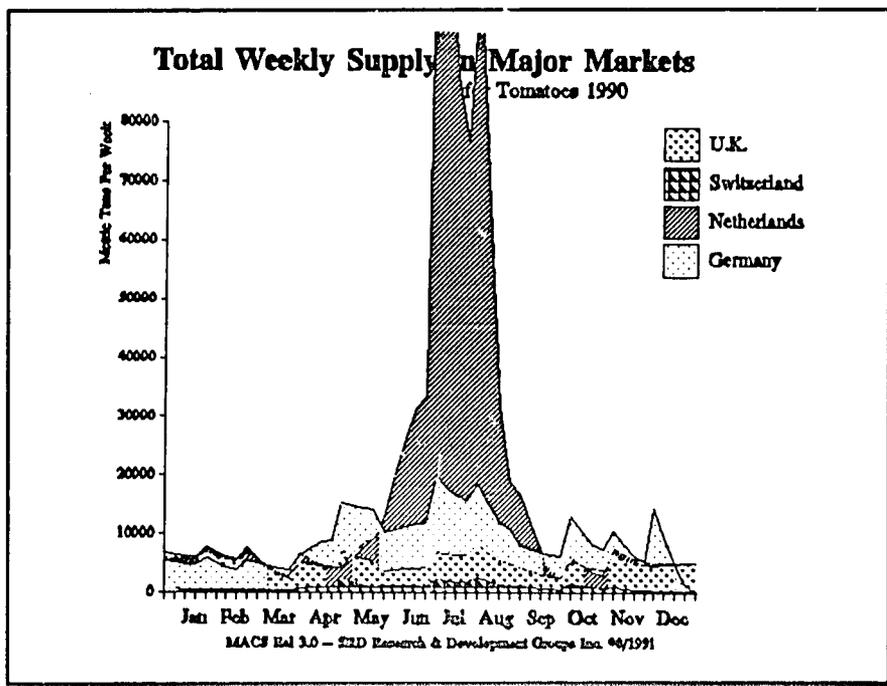


Figure 23 Fresh Tomatoes - Total Weekly Supply 1990

metric tons in the mid-summer. Major supply peaks are normally caused by coincidental arrivals of many boats during a particular customs data gathering period and do not indicate consumption peaks.

C. Competitive Suppliers & Comparative Costs

This section of the M.I.P. analyzes the costs of production for Sri Lanka and major world suppliers of tomatos. Figure 24 outlines SRD's estimates of the costs of production and packing for a reasonably efficient Sri Lankan producer along with selected competitor countries. Sri Lanka has a good competitive position because of it's low production costs.

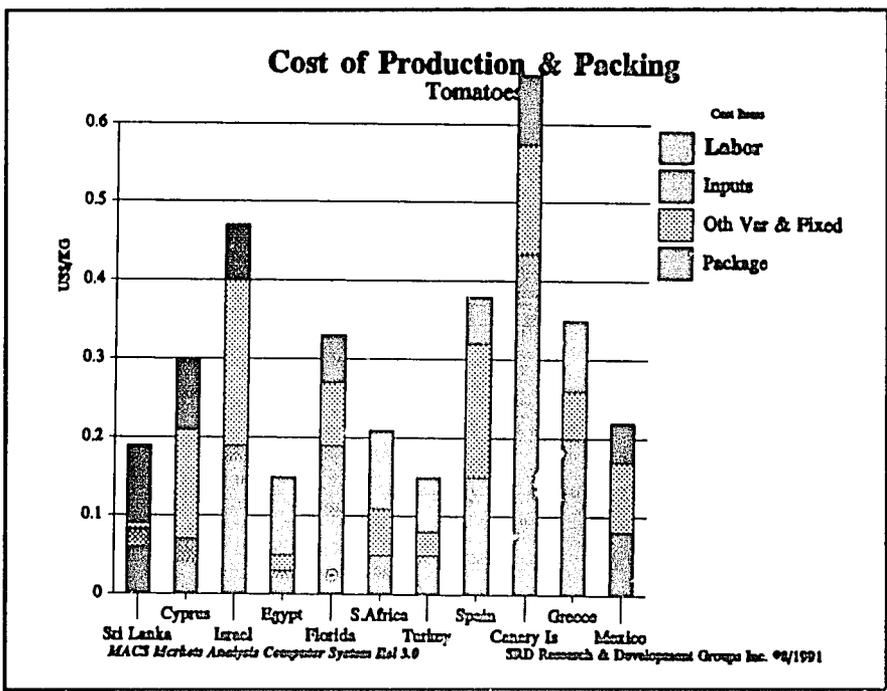


Figure 24 Tomatoes - Cost of Production & Packing

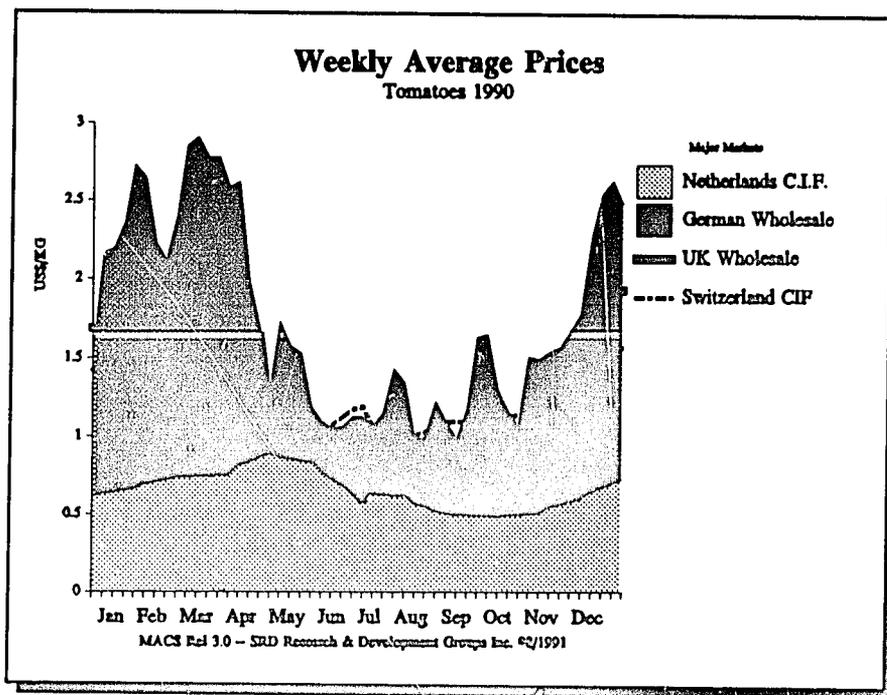


Figure 25 Tomatoes - Weekly Wholesale Prices 1990

Dutch prices are highest during the off-season months before and after the summer.

E. Seasonal Profit Potentials & Competition

The profit potential section of the M.I.P. demonstrates the weekly profitability potential of Sri Lankan tomato exports. The top dark area indicates the wholesale price level. The costs of production, packing, shipping, tariffs and handling are subtracted for the wholesale price to determine the level of profitability.

D. Weekly Wholesale Price Patterns

The wholesale price section looks at the trend in prices from one year to the next and also analyzes the price difference in the market countries. German wholesale prices are consistently the highest of the four markets. All markets presented except the Netherlands seem to experience the highest prices in the off-season winter and early spring months. The prices used for the Netherlands and France are reported C.I.F. prices which are generally lower than actual wholesale prices, but still useful for analyzing trends. Like Germany and the U.K.,

Because Sri Lanka can sea-freight tomatoes to the markets in Europe, the period in which Sri Lanka can be in a competitive position continues through most of the year. For example, in the German market Sri Lanka can be most profitable from about mid-November through April, but still obtain profits the rest of the year.

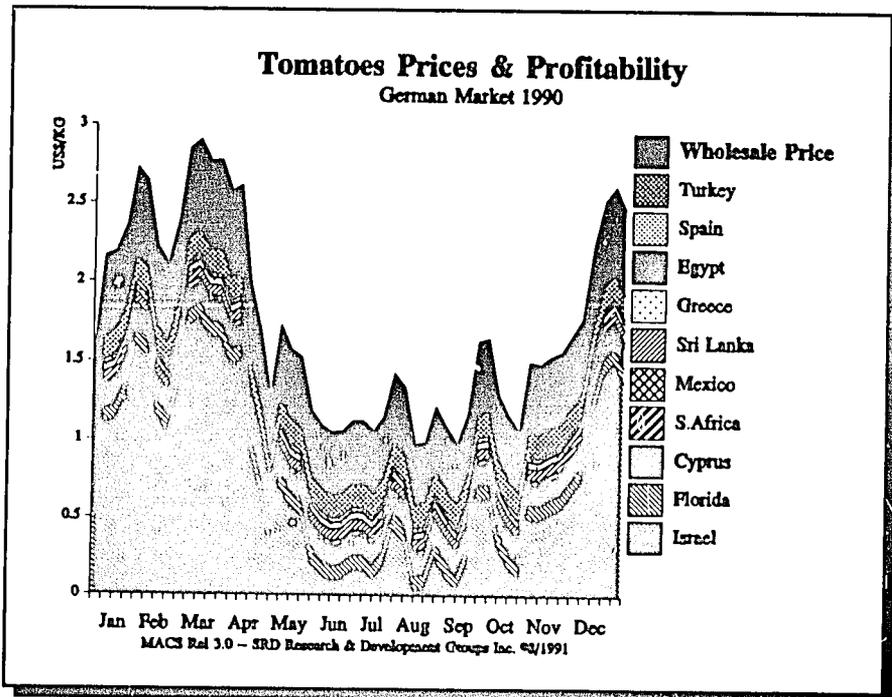


Figure 26 Tomato Profitability - German Market 1990

The Mahaweli Enterprise Development Project

The Government of Sri Lanka as well as the international donor community has given high priority over the last several decades to the development of the resources of the Mahaweli river basin. The Accelerated Mahaweli Development Program was launched in 1978. The first phase of this program, the construction of major capital infrastructure, is complete. The second phase, developing the land for settlement and forming an agricultural production base, is well under way. The third phase, just beginning, seeks to build on the agricultural base to create a diverse and dynamic regional economy, improving employment and income prospects for settlers and their families. It is in this phase that the private sector has to play a leading role in enterprise development.

The Mahaweli Enterprise Development Project (MED) is a five year USAID-supported initiative of the Mahaweli Authority of Sri Lanka(MASL) to foster private enterprise development in the Mahaweli areas. MED assists small, medium and large-scale investors to develop new ventures in the Mahaweli and expand existing ones. This is to be accomplished by a three-pronged approach: 1) investment promotion, technical assistance and marketing support to medium and large scale investors; 2) advisory services, training and improved access to credit for small scale enterprises; 3) policy assistance to improve access to resources, such as land and water, and the legal and institutional framework for enterprise development in the Mahaweli settlement areas.

The Employment, Investment and Enterprise Development Division of MASL is the MED implementing agency. The main technical consultancy is provided by a consortium led by the International Science and Technology Institute (ISTI), but marketing consulting is provided by the SRD Research Group Inc. Other firms in the MED consortium are Development Alternatives, Sparks Commodities, High Value Horticulture and Two Sri Lankan firms, Agroskills and Ernst and Young. This significant array of organizations and expertise is ready to assist private sector firms in the Mahaweli areas.

For further information please contact the Director of EIED (Tel: 502327/8/9), or James Finucane (Tel: 508683/4) the Chief of Party of MED, or K.Kodituwakku (Tel: 502327/9) the Local Representative of SRD.