Interaction of Agriculture with Food Science
Proceedings of an interdisciplinary symposium
Singapore, 22-24 February 1974

Editor: Reginald MacIntyre
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Sponsored by the International Development Research Centre
in cooperation with the
International Union of Food Science and Technology
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Quality Standards in Food Processing in Singapore

Lee Kum-Tatt
Chairman, Singapore Institute of Standards and Industrial Research, Singapore

Abstract The manufacturing sector contributed 23.5% to Singapore's GDP in 1972 and our food industries formed an important part of this sector. In the same year there were more than 250 establishments employing more than 13,500 workers or about 9% of the work force in the manufacturing sector. Its output in terms of Singapore dollars amounted to more than $720 million, representing 12% of the total output from the industrial sector. This is our third largest group of industries; the biggest group is petroleum, followed by the electronic and machinery groups. This shows how important our food industries are to Singapore's economy. The output from our food industries has been on the increase for many years and started levelling off in 1971. There is potential for further growth for this industry and there is need to constantly upgrade the quality standards of our food products to keep pace with the improvement of the quality of life in Singapore and in other countries in the region. This is something easier said than done.

Résumé Le secteur de la transformation a contribué pour 23.5% au Produit Intérieur Brut de Singapour en 1972, et les industries alimentaires constituent une partie importante de ce secteur. Au cours de cette même année, plus de 250 entreprises ont employé dans ce secteur plus de 13,500 ouvriers, c'est-à-dire environ 9% de la population active. En dollars de Singapour, leur production a dépassé $720 millions, soit 12% de la production totale du secteur industriel. Cette activité vient au troisième rang des groupes d'industries: le plus important est celui du pétrole, suivi de l'électronique et de la machinerie. Cela montre combien les industries alimentaires sont importantes pour l'économie de Singapour. La production des industries alimentaires a augmenté pendant de nombreuses années et a commencé à se stabiliser en 1971. Elles ont encore des possibilités de croissance, à condition de rehausser constamment les normes qualitatives des produits alimentaires, concurremment à l'amélioration des niveaux de vie à Singapour et dans les pays environnants. C'est cependant plus facile à dire qu'à faire.

Maintaining and upgrading quality is a continuous process and must be recognized and accepted as such by all concerned: the manufacturers, the workers, and the government (Tables 1 and 2). How to achieve this and remain competitive is always a problem. Individually, everyone knows what this quality and reliability in food products mean to him. He knows he is being protected from health hazards and is getting value for his hard-earned money. To the manufacturer, better consumer satisfaction means better sales.
and better profits. Workers who have contributed to the companies can expect to get better wages and rewards. Improved national production in terms of quality and reliability enhances trade and hence strengthens the national economy. This will result in a better life for all which must be the goal of all governments. Although everybody benefits from better standards and better quality products, not many companies or countries, especially the developing ones, have found a satisfactory formula to make their industries produce quality products as an accepted way of life. Generally industries, especially those in developing countries, cannot be expected to change or to improve unless there is a need to do so. Heavy government protection creates a seller's market. In a seller's market, anything can be sold. No quality control movement can succeed under such conditions. In Singapore, our manufacturers have to compete to survive. Possibly it is because of this that we have had some success in our quality drive over the last few years.

In this paper, I would like to relate some of our experiences at SISIR. I would stress that there are no rigid rules to follow. Much depends on the various factors we have to contend with in our own countries including: (a) the state of industrialization; (b) the im-

<table>
<thead>
<tr>
<th>Industry Group</th>
<th>No. of establishments</th>
<th>No. of workers</th>
<th>Output S$'000</th>
<th>% Output</th>
<th>Value added S$'000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food, beverages &amp; tobacco</td>
<td>257</td>
<td>13,552</td>
<td>727,996</td>
<td>11.9</td>
<td>162,297</td>
</tr>
<tr>
<td>Petrol &amp; chemical</td>
<td>104</td>
<td>6,851</td>
<td>1,845,457</td>
<td>30.1</td>
<td>355,279</td>
</tr>
<tr>
<td>Textile &amp; garments</td>
<td>248</td>
<td>30,539</td>
<td>399,658</td>
<td>6.5</td>
<td>124,391</td>
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<tr>
<td>Sawmills &amp; wood</td>
<td>213</td>
<td>14,338</td>
<td>289,995</td>
<td>4.7</td>
<td>90,025</td>
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<tr>
<td>Paper products &amp; printing</td>
<td>245</td>
<td>10,648</td>
<td>203,723</td>
<td>3.4</td>
<td>104,575</td>
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<tr>
<td>Gum, rubber, plastics, foodwear &amp; leather</td>
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<td>9,044</td>
<td>167,180</td>
<td>2.7</td>
<td>65,363</td>
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<tr>
<td>Ceramics, glass &amp; nonmetal building materials</td>
<td>44</td>
<td>3,083</td>
<td>102,365</td>
<td>1.7</td>
<td>35,781</td>
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<tr>
<td>Metal &amp; non-metallic numeral products</td>
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<td>12,678</td>
<td>370,657</td>
<td>6.0</td>
<td>133,700</td>
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<td>Machinery, electrical &amp; non-electrical</td>
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<td>36,831</td>
<td>868,926</td>
<td>14.1</td>
<td>386,523</td>
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<tr>
<td>Transport equipment</td>
<td>98</td>
<td>22,546</td>
<td>553,499</td>
<td>9.0</td>
<td>269,749</td>
</tr>
<tr>
<td>Scientific, photographic goods &amp; others</td>
<td>122</td>
<td>10,242</td>
<td>192,770</td>
<td>3.2</td>
<td>54,597</td>
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<tr>
<td>Rubber processing, granite quarries &amp; others</td>
<td>40</td>
<td>4,889</td>
<td>404,485</td>
<td>6.6</td>
<td>38,207</td>
</tr>
<tr>
<td>Total:</td>
<td>1,971</td>
<td>175,241</td>
<td>6,126,709</td>
<td>100.0</td>
<td>1,820,484</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Year ending 1969</th>
<th>Output</th>
<th>Value added</th>
<th>Direct exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food manufacturing</td>
<td>401,248</td>
<td>67,530</td>
<td>146,075</td>
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<tr>
<td>Beverage industries</td>
<td>59,406</td>
<td>32,059</td>
<td>10,956</td>
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<td>Year ending 1970</td>
<td>Output</td>
<td>Value added</td>
<td>Direct exports</td>
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<tr>
<td>Food manufacturing</td>
<td>551,361</td>
<td>76,380</td>
<td>185,674</td>
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<tr>
<td>Beverage industries</td>
<td>66,431</td>
<td>34,899</td>
<td>13,127</td>
</tr>
<tr>
<td>Year ending 1971</td>
<td>Output</td>
<td>Value added</td>
<td>Direct exports</td>
</tr>
<tr>
<td>Food manufacturing</td>
<td>577,621</td>
<td>92,091</td>
<td>183,406</td>
</tr>
<tr>
<td>Beverage industries</td>
<td>70,069</td>
<td>35,053</td>
<td>12,408</td>
</tr>
<tr>
<td>Year ending 1972</td>
<td>Output</td>
<td>Value added</td>
<td>Direct exports</td>
</tr>
<tr>
<td>Food manufacturing</td>
<td>552,016</td>
<td>103,436</td>
<td>158,484</td>
</tr>
<tr>
<td>Beverage industries</td>
<td>73,306</td>
<td>33,034</td>
<td>14,579</td>
</tr>
</tbody>
</table>
portance of the industries to the national economy; (c) the economic, social, and educational framework of the country; and (d) the individuals involved.

We have taken advantage of other people's experiences and used them as general guidelines from which we develop our infrastructure, organization, policies, programs, and strategies in order to achieve our objectives.

**Types of Food Factories in Singapore**

The types of food industries in Singapore can be classified into the following broad categories: (a) soft drinks and cordials; (b) alcoholic beverages; (c) edible oils and fats; (d) dairy products (milk, butter, etc.); (e) flour, flour confectionery, and flour products; (f) meat and meat products; (g) fish and fish products; (h) sauces (soya bean, chilli, etc.); (i) sugar; (j) sugar confectionery, chocolate, jams; and (k) fruits, vegetable and agricultural products.

Singapore has an active animal husbandry industry and is self-sufficient in pigs and poultry. All the other raw materials required by the local food industries have to be imported for refining and processing. Most of these raw materials, other than fruits and vegetables, are fairly stable commodities (e.g. flour, sugar, dairy products, soya beans, etc.) available in the world market at competitive prices. Unlike agricultural products like fruits and vegetables which are perishable, the quality of the other raw materials can be controlled and hence the development and maintenance of high quality standards in Singapore's food products is not as difficult as was first envisaged. It is true that processing of fruits and vegetables presents more problems, but this group of factories is relatively small. Because of their size and minimal requirements, they manage to obtain the supplies and the quality they need.

How can we help our food industries to improve (a) their quality, (b) their output, and (c) their exports? What has to be done to maintain, if not to increase, the rate of growth of the food industries, thus giving Singapore more and better products and savings in imports besides contributing to increases in exports and foreign exchange earnings for the Republic? Before one can answer these questions and find meaningful solutions, one must be able to identify, define the scope and priorities of the problems, and decide what infrastructure, degree of coordination, policies and strategies to be adopted to achieve these objectives.

**The Problems**

The most commonly met and most widely recognized problems which cause non-conformity to quality standards are technical ones. They include: (a) irregularities of supplies of imported raw materials and variations in their specifications; (b) lack of qualified quality control personnel; (c) lack of know-how; and (d) lack of proper equipment or spare parts.

These technical requirements of personnel, know-how, and equipment are important. Even if these are available, they by themselves are not sufficient to ensure the production and maintenance of quality products in factories. It is true that these facilities are lacking in many companies in developing countries. It is also true that there are some well-equipped laboratories with good buildings and technically qualified personnel both in government and in the private sector which are not very effective. Why? I would like to suggest that commitment and involvement of the individuals concerned is missing.

In a quality control program, we need commitment by government, manufacturers, and workers at the same time. Unless the three parties can work together, the national program can never succeed. Without the workers' cooperation, quality products cannot be produced. Without management's support no quality control program can be started in any company. The government's role is to formulate proper policies and to ensure that everyone plays by the accepted rules of the game. The consumer needs to be protected from those who want to make a fast profit at their expense. Those "fly-by-night" operators could not be allowed to damage the good name of
Singapore as a manufacturing nation, thereby jeopardizing the long-term interest of developing Singapore into an industrialized nation. How does an organization coordinate the activities of these various groups with conflicting interests?

**Infrastructure**

The Singapore government recognizes the importance and accepts the need to improve national production in terms of quality and reliability. To regulate and to assist the food industries, it has set up the following organizations with appropriate functions: (see below)

The responsibilities of the various departments and institutions are quite distinct. However, their activities toward establishment of quality standards in food are well coordinated. There is good communication and understanding between the staff of the various government agencies and the manufacturing sector. Staff from all these organizations and those from the industries are actively involved in the preparation of standards under the Standards Council of SISIR.

**Organizations**

(a) Economic Development Board (EDB)

(b) SISIR — The Singapore Institute of Standards and Industrial Research

(c) Commissioner of Public Health, Inspectorate and Licensing Division Ministry of the Environment

(d) Department of Chemistry, Ministry of Science and Technology

(e) Department of Primary Production, Ministry of National Development

(f) Department of Chemical Technology, Singapore Polytechnic

(g) Department of Chemistry, Department of Pharmacy, University of Singapore

**Types of Standards**

In food there are broadly two types of standards: (1) the mandatory type where consumer’s health and safety are involved. These standards are usually laid down in the Sale of Food Acts of most countries. These acts also include labelling requirements to prevent consumers from being cheated; and (2) the voluntary type. These types are usually difficult to define. Although standards are available for the most common and more basic types of food such as flour, sugar, condensed milk, etc., specifications are much more difficult to produce for the others because of the subjectiveness of individual and cultural tastes. Nevertheless, company or contractual specifications are usually available for such products.

Obviously there can be no compromise insofar as meeting statutory requirements is concerned. How closely food industries in a particular country observe these standards depends on how effective the law enforcement agencies are.

On the other hand, it is not possible to compel industries to adopt voluntary standards by

**Functions and Responsibilities**

(related to food industries)

To implement government policies related to industries, including food industries

(i) Drafting of standards for food

(ii) To promote growth of quality control circles and movements in Singapore

(iii) To assist food industries in upgrading quality standards

(i) Issue licenses to food industries

(ii) Enforcement of Sale of Food Act, including imported foodstuffs

(i) Assist Ministry of the Environment in enforcement of Sale of Food Act by offering testing and related services.

(i) Assist the development of animal husbandry (pig and poultry industry)

(ii) Runs the abattoir and ensure quality standards in meat and fish products and export

Training of technicians for food industries

Training of chemists and food technologists for Government and industries
Incentives and sometimes disincentives have to be used.

In order to get our industries to do what is good for them, we have adopted a “carrot and stick” approach to encourage and persuade our food industries to adopt strict quality control in the manufacture of their products.

**SISIR's Development and Its Program on Quality**

When Singapore first embarked on industrialization, efforts were mainly devoted to the development of the necessary infrastructure and essential facilities. Fiscal policy as a whole was directed toward the creation of a highly attractive investment climate for manufacturing industries.

The broadening of the industrial base and growing diversification of manufacturing activities led to increased demands for specialized technical services. To meet this demand, the Economic Development Board in 1964 established the following consultant units: the Light Industries Services, the Productivity and Training Unit, the Standards Unit and the Industrial Research Unit.

The Light Industries Services had a food industries section which gave advice to food industries to assist them to improve the quality of food products manufactured. The service grew into a food extension and demonstration service and its activities centred mainly on provision of advisory services on food processing techniques and the use of better equipment and machinery. Some R & D work was carried out on canned meat products, chilli sauce, tropical fruit concentrates, vegetables, soya sauce, etc. Quality standards and quality control work for the food industry did not receive much attention and support in the late 1950s and early 1960s. This was due to a large extent to early teething problems of industrialization. Protection, shortage of skilled labour and absence of competition did not help to encourage quality control and consciousness in the industries.

Recognition of the need to build up permanent standards and industrial organizations as Singapore proceeded to the next stage of its industrialization program, which would involve quality control, standardization, and product development, led to the formation of SISIR in 1965.

Under SISIR, standardization and quality control assumed greater prominence and through deliberate efforts and long-term programs, quality consciousness was inculcated into the nation's manufacturers, workers and consumers.

**The SISIR Program**

A national quality improvement program can be initiated either through legislation and regulatory measures or on a voluntary basis. SISIR decided against using legislative measures. Instead, it designed a program based on education and motivation to persuade manufacturers to subscribe to the quality concept. This approach to quality improvement — looking at a quality control program as an investment proposition for the long-term survival and prosperity of a company — seemed more likely to succeed for a country, which prior to industrialization, depended wholly on its entrepot trade and the business acumen of its people.

Today, 5 years after the establishment of SISIR, over 300 different brands and products manufactured in Singapore bear the SISIR Quality Mark, and this number is rapidly increasing. Training and educational courses have been conducted for more than 1000 workers from industry, and the institute has expanded more than three-fold in 5 years, and it is still growing.

The following is an outline of SISIR's program on quality control and standardization in Singapore, with particular reference to the food industries.

**Standardization**

As the Certification Scheme gained momentum, and more industries desired to participate, new standards had to be drawn up. Initially, we pursued a policy of adopting international standards for industrial products, but as local conditions and environments were
different, Singapore Standards had to be introduced.

The Certification Scheme would be of little value unless backed by standards which can be accepted on a global basis. Care had to be taken to ensure that Singapore Standards were not too low by international standards nor too high as to make compliance impossible. This task of striking the correct balance in standards promulgation fell on the Standards Council of Singapore, a body set up in 1969 to advise SISIR on standardization policies and goals. The Standards Council comprised representatives of the manufacturers, trading organizations, consumers, professional bodies, the universities, and government. During any one year, more than 300 volunteers are engaged in the preparation of Singapore Standards.

Fifteen to twenty per cent of standards published to date are on food and food products. As it is the Institute's policy to bring more of the daily necessities and basic commodities under the Certification Scheme, an increase in food products standardization and Codes of Practice can be expected over the next few years.

Technical Information

To keep the manufacturing industry informed of new industrial developments, manufacturing techniques and quality control developments, SISIR established an "Industrial Technical Information Service" two years ago. The service covers 26 different industrial areas of which food and beverages, and quality control are but two of them.

ITIS operates a Question and Answer Service and a Current Awareness Service. The Current Awareness Service is only confined to subscribing members. Out of the present 156 members, 20% are from the food industries.

Quality Certification

The need to upgrade the quality of Made-in-Singapore products to enable greater export participation in international markets was the main reason why SISIR introduced a Certification Scheme for Singapore industries in 1969.

Basically, the Scheme permits a manufacturer whose product, if manufactured under an efficient quality control system and regularly tested and found to conform to acceptable international standards, to be awarded a licence to use the SISIR mark on the product. The scheme provides a third party guarantee as licence to use the mark is only awarded if a product, after a series of intensive tests and inspections by SISIR, shows consistent conformance to the respective standard. Today some 150 companies with over 300 different brands and products are covered by the SISIR Certification Scheme. The food industry, traditionally the most conservative of industries, accounts for more than 60 brands and products. Many more factories and products are under testing and consideration for the award of SISIR's licences to use its mark.

Consultant and Retainer Scheme

SISIR offers consultancy services, especially to food industries, on a retainer basis. Under this Scheme, SISIR officers visit the factories regularly to assist the food industries solve their problems. A mobile training unit donated by the Canada Plus One project is extensively used for this purpose. This mobile laboratory is stationed for about 2 weeks in each factory during which time SISIR officers manning the laboratory give lectures, talks and demonstration on food hygiene and conduct on-site microbiological tests and examinations to impress on workers the danger of bacteria contamination, the importance of clean attire and the need to wash their hands etc.

This retainer scheme was started about 1½ years ago. Depending on the size of the factories, they are charged S$100–150 per month. At present, there are some 40 small and medium size food establishments on this Scheme. SISIR hopes to be able to assist them to qualify for the Good Housekeeping Scheme and ultimately award the SISIR Licence or quality certification on specific products.

National Quality and Reliability Campaign

To project the proper image of the quality and reliability of Made-in-Singapore goods
and also the skills and dependability of our workers, SISIR in conjunction with the National Trades Union Congress — representing organized labour in Singapore — and the Singapore Manufacturers’ Association — representing the manufacturers — organized a year-long nation-wide “Prosperity through Quality and Reliability (PQR) Campaign” in 1973 with the active participation of the Minister for Finance as the Patron.

The Campaign involved more than 200 companies and some 70,000 workers — representing 50% of the work force in the manufacturing sector — and included incentive awards and recognition for outstanding workers, group activities aimed at improving the work environment, elimination of defective products, prevention of errors, and improvement of yield in industry. The Campaign was also directed at the general public through their participation in such competitions as the PQR Stamp Selection Contest. A national Science & Industries Quiz was organized for the school children to make them aware of the importance of quality in industrial production. Seminars, talks and training courses were conducted for management and workers in industry.

Although the Campaign was not directed specifically at the food industries, nonetheless the Campaign sparked off sufficient interest from them and led to SISIR initiating a special program for food industries alone. This is the “Good Housekeeping” Scheme which is discussed below.

Good Housekeeping Scheme

In order to coordinate the efforts of Singapore’s food manufacturers in the maintenance of high sanitary standards in manufacturing practice, SISIR is embarking on a scheme where participants will subscribe to a Good Housekeeping Code.

The Code lays down health standards for the industry, conditions for food handling and hygiene practices for employees of food factories. An inspection program backed by chemical and microbiological testing will be undertaken by SISIR as part of the scheme. The mobile food laboratory will be used to provide on-the-spot laboratory testing facilities and also as a teaching laboratory for the factory workers. The scheme was launched early this year and operates with full cooperation from the Ministry of the Environment, the government agency responsible for food licensing in Singapore. It is expected that in the course of time only factories with the Good Housekeeping Certificate will be allowed to operate and to export processed food without export inspection.

Export Inspection

At the moment, SISIR carries out export inspection of products as and when requested by the importers or the manufacturers. So far, these requests have emanated mainly from the food industries.

In cases where Singapore’s good name as a manufacturing nation may be affected, the Government would not hesitate to make export inspection of certain types of goods compulsory, especially those which involve the health and safety of the consumers. Provision for this already exists in the SISIR Bill.

Government Support

In 1974–75 the Singapore government expects to spend about $54 million in the running of SISIR alone. This does not include the expenditure required to run the other establishments mentioned earlier. This reflects the importance the government attaches to the development of our food and other industries in Singapore.

Conclusion

The importance of quality standards in food processing cannot be over-emphasized. The need to be competitive, the lack of protection coupled with government’s active encouragement and support for better quality and technology in all industries have made many of Singapore’s industries, including the food processing industries, accept as a fact of life that their survival and prosperity depend entirely on their ability to produce quality
products at competitive prices. Given continued cooperation and understanding by all concerned — the workers, the manufacturers and the staff of government agencies — the food processing industries should continue to do well in Singapore in the years to come.