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STRENGTHENING QUALITY CONTROL AND TESTING FACILITIES OF NON-ALCOHOLIC LIQUID FOODS INCLUDING FISH SAUCE AND SOY-BEAN SAUCE

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VIET NAM

Terminal report*

Prepared for the Government of Viet Nam
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

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* This document has not been edited.

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Summary

This project was established in January 1990 to strengthen the capability of the Department of Quality Control and Metrology (DTQC) of the Ministry of Trade, to control food quality in the domestic market and strengthen the competitiveness of state owned companies producing and distributing food for domestic consumption.

Its development objective was to increase the availability of good quality non-alcoholic liquid foods for domestic consumption through manpower training and the establishment of appropriate laboratories for food testing and inspection.

UNDP provided 693610 USD for manpower training, experts and equipment. The Vietnamese government provided 445,880,000 VND for the rennovation of existing facilities.

The major outputs of the project were four (4) food testing laboratories and thirty (30) trained DTQC officials and personnel with upgraded skills on food quality control, testing and inspection.

The food testing laboratories established were, a) chemical and instrumental analyses, b) microbiology, c) microanalysis and d) physical and sensory evaluation. These laboratories present a visible transformation of DTQC's physical facilities for food testing. The equipment supplied should be able to handle the important analytical tests required to assess the quality of food for the market.

Manpower training consisted of a study tour on food quality control for five (5) officials and international fellowships on chemical and instrumenta' analyses for six (6) DTQC analysts, on physical and sensory evaluation and microfilth

analyses for five (5) DTQC analysts and on microbiological testing of foods for three (3) DTQC analysts. In-country training programs in chemistry and in microbiology were attended by a total of 30 analysts including the above.

Upgrading of manpower capability was most significant in physical and sensory testing, microbiological evaluation and chemical analysis. These analyses can also be executed with increased productivity, reliability and safety.

Equipment, accessories, chemicals and books remain to be purchased and are listed in Annex 3. Projected excess funds are recommended for use in the purchase of basic equipment to upgrade the laboratories of the DTQC South Branch in Ho Chi Minh City as agreed at the first TPR Meeting.

The adoption by the government of the open market policy in trade after this project was conceived, had important effects on the food quality control functions of DTQC and thus on the attainment of the project's development objective of increasing the availability of good quality food for domestic consumption.

The new marketing policy increased private sector participation in the market and led to the emergence of fraud and adulteration as important problems in the marketing of food. It also led to the privatization of state owned companies in the Ministry of Trade which DTQC was supposed to help in this project and which provided the bulk of its testing activities.

Modification of DTQC's role in food quality control is essential to the full utilization of project inputs and the accomplishment of the projects development objective under the new institutional setting. Modification means that DTQC

should be given greater authority to regulate the quality of private sector food especially packaged foods, in the domestic market. As part of the Ministry of Trade, its food quality control program should be designed to bring about the rational growth of the food industry in an open market system by preventing unfair trade practices and encouraging the development of quality in food products. The laboratories built by the project are adequately equipped and should be able to support the quality control activities needed to achieve the above.

Due to the presence of different government agencies involved in food quality control in Vietnam, DTQC should help organize a food quality control network to facilitate exchange of information and its use in regulatory work. Networking will also minimize duplication in food control activities, optimize the use of expensive equipment and create the professional support to guide the growth in quality of the food industry in Vietnam.

The major difficulty encountered in project implementation was the delay in the supply of equipment accessories and inadequacies in some of the items purchased. Recommendations are made to avoid this in similar projects.

UPGRADING THE FOOD TESTING AND QUALITY CONTROL CAPABILITIES OF DTQC WITH SPECIAL EMPHASIS ON NON-ALCOHOLIC LIQUID PRODUCTS

1. Introduction

The project is located at the Department of Quality Control and Metrology (DTQC) at 76 Nguyen Truong To Street, Hanoi, Vietnam. It was established in January 1990 to strengthen the institutional capability of DTQC to conduct food inspection, testing and quality control.

DTQC is a government department under the Ministry of Trade with responsibility for the quality of food in the domestic market. It has branch laboratories at the central and southern portions of Vietnam and exercises professional supervision over the quality control laboratories of trading companies, collective firms and trade services in the Ministry of Domestic Trade (now the Ministry of Trade).

The development objective of the project was "to increase the availability of good quality non-alcoholic liquid foods and other food products for domestic consumption as well as for export". Its immediate objective was to upgrade the capabilities of DTQC to implement more effective quality control programs through manpower training and the establishment of appropriate laboratories for food testing and quality control.

A total of 693,610 USD was provided by UNDP for manpower training, experts and equipment. The government provided 445,880,000 VND for the renovation of existing facilities to accommodate project equipment and other inputs.

The project began in June 1990 and had its last major activity in March 1993. The last CTA mission on which this Report is based ended on February 22, 1993.

2. Project Management

The project was jointly managed by the Director of DTQC as the National Project Director (NPD), by the CTA and by the UNIDO Backstopping Officer in Vienna. The CTA had six split missions of 1 to 2 months duration. The UNIDO Office in Hanoi provided local assistance.

A 118 page document entitled "Details of Required Inputs for Project Implementation" was prepared by the CTA in August 1990 to help bring about the smooth coordination of project activities.

3. Project Activities

The major project activities and a comparison of their projected and actual dates of implementation are shown in Annex 1. The major project activities were:

a) The study tour, international fellowships and in-country training programs

b) The rennovation of the existing DTQC laboratories

c) The purchase of non-expendable and expendable equipment

4. Project Accomplishments

The major project accomplishments were the establishment of four (4) food testing laboratories and the upgrading of manpower capability for food testing and inspection. These accomplishments are described below:

4.1 Establishment of Food Testing Laboratories

Four (4) food testing laboratories were built namely:

1. Chemical and Instrumental Analysis Laboratory;
2. Microbiology Laboratory;
3. Physical and Sensory Evaluation Laboratory; and
4. Microanalysis Laboratory

In addition to the above, portable equipment for a proposed mobile laboratory were purchased.

The laboratories were built by rennovating the original DTQC food testing laboratories which were not in condition to accommodate new project equipment and to conduct new testing methods. The laboratories are now located next to one another and present a very visible transformation of DTQC's physical resources for food testing.

The total area occupied by laboratories was increased from 90 to 500 square meters. A storage and a training room were also constructed by renovating existing rooms next to the laboratories. The storage room was air conditioned and held chemicals, glasswares and other project inputs in an orderly and satisfactory manner. The layout of the laboratories and above rooms is shown in Annex 2.

UNIDO Vienna purchased almost all expendable and non-expendable equipment except for a few items which the CTA was requested to purchase towards the end of the project.

Eighty percent (80%) of the basic equipment was purchased after the first year of project implementation.* However accessories for their operation could not immediately be provided due to the American trade embargo, weaknesses in communication and problems in finding appropriate suppliers. In addition to the above, and as of February 1993, some items had not arrived (as the muffle furnace, the moisture oven, the E. coli water bath incubator, vortex shaker, can seam tester), others had not been purchased (as the wafer for the Wildman trap flask, chemical standards, books) and some were inadequate for their intended use (as the can vacuum gauge, compound microscope, analytical balance and general purpose incubators). Additional accessories were also ordered by the experts. Equipment, accessories and a variety of chemicals and books important to the conduct of needed tests thus remain to be purchased. The list of items shown in Annex 3 had been recommended for purchase during the last CTA mission.**

The following briefly describes the design and purpose of each of the laboratories, the equipment supplied, the status of implementation of testing activities and remaining needs.

4.1.1 The chemical and instrumental analyses laboratories

These laboratories were designed to conduct chemical analysis of foods and to house modern instruments for food analysis such as the gas chromatograph (GC), the atomic absorption spectrophotometer (AAS), and the UV-visible spectrophotometer (UV).

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* See CTA Report for the First TPR Meeting, July 15, 1991, Hanoi.
** See CTA Mission Report, February 6-22, 1993.

Equipment and chemicals purchased for these laboratories answer the following food testing needs at DTQC.

a) Rapid analysis of foods for composition such as 12 samples per day for nitrogen, 6 samples per day for fat, carbohydrates, sugars, and minerals as calcium, magnesium, potassium, iron, copper, sodium and zinc. Equipment for moisture and ash had not arrived.

b) Analysis of foods for additives such as colors and artificial sweeteners which previously could not be analyzed at DTQC.

c) Analysis of foods for contaminants such lead, mercury, cadmium and arsenic as well as pesticides and aflatoxins.

The layout of the laboratories is in Annex 4 and the list of equipment purchased in Annex 5. The list of items that remain to be purchased and those recommended by the Chemistry and Instrument Installation Experts are found in Annex 3.

The chemical analysis laboratory has been well used for implementing traditional food testing activities at DTQC. As many as 221 samples of food for example were analyzed in the first quarter of 1992 for nitrogen and sugars (see 1992 PPER Report). These analyses are now carried out more efficiently and safely due to better equipment and facilities.

New testing technologies as those for pesticide and heavy metals which make use of the gas chromatograph and the atomic absorption

spectrophotometer, were not implemented until close to the end of the project due to the lack of equipment accessories. As a result there was inadequate time to gain skill in the operation of the above instruments.

4.1.2 The Microbiology Laboratory

A microbiology laboratory existed at DTQC prior to the start of the project and one of the DTQC officials has many years of experience in this area. Microbiological testing is conducted at DTQC as an index of quality for such products as bottled mineral water, fish sauce and other sauces, canned meats and other foods.

The layout of the microbiology laboratory is in Annex 6 and the list of equipment purchased, in Annex 7.

The microbiology laboratory was upgraded to contain facilities, equipment and materials to test foods for bacteria, molds and microbial pathogens as follows: Aerobic Plate Count, Yeast and Mold Count, Thermophilic and Mesophilic Anaerobes, Coliforms/E. coli, Staphylococcus aureus, Salmonella, Vibrio cholera, Vibrio parahaemolyticus, Molds, and Howard Mold Count. The test for anaerobes was cancelled by project authorities due to the lesser importance of canned products in the food control responsibilities of DTQC. This was however later recommended for reinclusion by the Microbiology Expert and is listed in Annex 3.

Important foods to be analyzed for microbial contamination are: fish sauce, soy sauce and other sauces, soybeans, peanuts, ginger, garlic, dried spices, dried fruits and confectionery, fruit juices, condensed milk, cooked meat, canned meat, dried fish and bottled mineral water.

The laboratory was put into full operation during the in-country training course in microbiology. Major equipment in this laboratory was evaluated by the Expert and confirmed the need to replace items not adequately supplied to the project namely the compound microscope and the incubators. The list of equipment that remain to be purchased is in Annex 3.

4.1.3 The Physical and Sensory Evaluation Laboratory

Prior to the implementation of this project, DTQC was analyzing food for simple physical (e.g. net weights) and sensory properties. Since DTQC Inspectors have many years of experience in food inspection, they were able to detect spoilage and some forms of adulteration by simple sensory testing. The new equipment strengthens this expertise by facilitating visual and sensory inspection.

The layout of the laboratory is shown in Annex 8 and the list of equipment purchased is in Annex 9. An important reference material, the Munsell Book of Color for the objective description of color, has to be provided and is specified in Annex 3.

Equipment for physical and sensory evaluation has been put to good use in the identification of counterfeit labels, as in wines, and adulteration as in chocolate candies made of brown colored sugar instead of cocoa. Some equipment for testing the physical properties of food products as the viscosimeter, has not been used. DTQC analysts need time to correlate the results of tests using these equipment with those obtained from sensory evaluation and to establish their usefulness for routine testing.

4.1.4 The Microanalysis Laboratory for Filth and Extraneous Matter

This laboratory was provided to enable DTQC to monitor levels of sanitation in companies of the then Ministry of Domestic Trade. The analysis for microfilth and other extraneous matter in foods is also important in products for export. Microfilth in fish sauce, soy sauce and other sauces, dried fruits, noodles and biscuits are some of the test methods to be implemented. This laboratory occupies testing space in the microbiology and the physical and sensory testing laboratories.

The list of equipment purchased for microanalysis is in Annex 10.

Microanalytical testing of foods has been limited because the lenses needed to achieve the required magnification for the stereoscopic microscope as well as wafers for the Wildman trap flask, have to be provided. These requirements are listed in Annex 3.

4.1.5 The Mobile Laboratory

This laboratory was designed to test samples at the market. Various portable testing equipment as a portable microscope, moisture analyzer, weighing scales, magnifying lens, dissecting kits and others shown in Annex 11 were purchased.

A Toyota Hi Ace vehicle was to be fitted with table tops to conduct testing. However, the project authorities found it more practical to carry the portable equipment and to conduct sample testing at existing sites in the markets.

The vehicle with its portable testing equipment has increased the efficiency of field testing at DTQC as it facilitated inspection and enabled inspectors to cover more markets and to reach farther areas.

4.2 Upgrading of Manpower Capability for Food Inspection and Testing

Thirty (30) people received primary training in the project of which five (5) were officials who went on a study tour of food quality control systems of neighboring countries and fourteen (14) were DTQC analysts who received international as well as in-country training on new methods for food testing. Training equipment was purchased in the project and is listed Annex 12.

The choice of training institutions and the solicitation of unofficial agreements to accept trainees from DTQC were done by the CTA whereas the officialization of training contracts was carried out by UNIDO Vienna.

The timely implementation of the international training programs was noteworthy and underscored the importance of close coordination between the parties involved in project management, in the successful execution of a project activity. The effectiveness of this coordination resulted in a clear understanding of project needs and therefore in the satisfactory provision of the required inputs.

There was an in-country training program in microbiology and one in Chemistry. Both programs were delayed by more than one year due to the delayed arrival of equipment accessories. The CTA recommended the Expert in Microbiology and UNIDO Vienna, the Experts in Chemistry and Instrument Installation.

The nature and accomplishments of the training programs as well as the remaining needs for manpower training at DTQC are discussed below.

4.2.1 Study tour on food quality control systems in the region

Four (4) DTQC officials and one (1) official from the State Committee on Science went on a study tour of food quality control organizations in Thailand, Australia and the Philippines. These are countries active in food trade in the region and at different stages of economic development and levels of organization of food quality control. The program included visits to institutions responsible for food control regulations, food standards and food testing. It introduced DTQC officials to food quality control programs in a free market economy and created valuable professional contacts. pThe study tour program and participants is in Annex 13.

4.2.2 International fellowships on food testing

Fourteen (14) analysts went on training for three months on methods of food testing in Australia and the Philippines, as follows:

- Six (6) DTQC analyts, on chemical and instrumental methods for the analysis of food composition, additives and contaminants, at the University of Western Sydney in Australia. The course program is shown in Annex 14.

- Five (5) DTQC analysts, on methods for the physical and sensory evaluation of food and on microfilth analysis at the Food Development Center in the Philippines. The course program is shown in Annex 15.

- One (1) DTQC analyst and two (2) DTQC officials, on methods for the microbiological evaluation of foods particularly the analyses of pathogens, at the Food Development Center in the Philippines. The course program is shown in Annex 16.

The list of participants is shown in Annex 17.

DTQC analysts readily gained understanding and skill in the conduct of internationally accepted methods for physical and sensory evaluation, microfilth and microbiological evaluation of foods at the Food Development Center in the Philippines. The course on food chemical and instrumental analysis at the University of Western Sydney in Australia was likewise intensive and covered the areas important to

food testing at DTQC. The analysts were introduced to the skills required for instrumental and chromatographic methods of food analysis, particularly the use of the AAS and the gas chromatograph.

New knowledge gained on conventional test methods previously used at DTQC (such as in the chemical analysis of proteins, sugars and food colors, the microbiological evaluation of *E. coli* and *Salmonella* and the physical inspection of foods), were immediately applied when the trainees returned to Hanoi. These were used in surveys of food quality in the market (PPER Report, 1992). New knowledge on instrumental food analysis could not be immediately applied due to the delay in arrival of needed accessories for basic equipment.

4.2.3 In-Country Training on Microbiology and Chemistry

In-country training programs in microbiology and chemistry were implemented to develop the skills required to use new project equipment for testing the quality of local foods.

Thirteen (13) of the fourteen analysts who went on international training also participated in the in-country training program. In addition eleven (11) other food testing personnel participated, or a total of twenty four (24) participants. The program topics are shown in Annex 18.

The in-country training course in microbiology complemented the international training course in the same area in the Philippines. For participants who were in both courses, this reinforced the development of

skills and expanded knowledge in microbiological testing. Participants were trained on good laboratory practices on rapid methods of microbial analysis applicable to Vietnamese conditions and on the isolation and identification of spoilage and mycotoxin producing molds.

A seminar on Food Quality Control with emphasis on microbiology and mycotoxins was also implemented by the Microbiology Expert. It provided information on relevant new approaches to microbiological testing and useful information on the control of aflatoxins.

The in-country training course in chemistry transferred knowledge and laboratory techniques on the following methods of food analyses: organochlorine pesticides (lindane, DDT, DDE and aldrin) by gas chromatography; heavy metals (mercury, lead, cadmium) by atomic absorption spectrophotometry; aflatoxins by thin layer chromatography and food colors. Training on the installation, calibration and operation of the GC and AAS and other instruments was also provided.

It will be necessary for participants to continue training supervised on new testing technologies using the GC and to a lesser extent the AAS and UV, to attain the level of competence required for food testing work. A national expert in Chemistry is provided for in the project for this purpose and should be hired as soon as possible.

Expertise in the management of a laboratory for food control work should also be strengthened. This expertise is required in insuring good laboratory practices and reliable test results.

5. Evaluation of Project Accomplishments and Activities

5.1 Evaluation of Project Accomplishments

DTQC facilities for food testing were substantially and visibly upgraded by the new project inputs. Tests are carried out with increased productivity, reliability and safety. The most important analytical tests to assess the wholesomeness of food for marketing can be implemented out assuming that the remaining purchases listed in Annex 3 will be adequately supplied.

Upgrading of manpower capability was most significant for physical and sensory testing, microbiological evaluation and chemical analysis. Market inspectors also became more productive due to the availability of simple tools for inspection and a vehicle to reach markets located outside Hanoi. This upgraded capability was put to substantive use in surveys of the quality of food in the market which DTQC conducted in 1992.

Manpower capability to use other project inputs however was not adequately developed within the time frame of the project in instrumental food analysis, microanalytical (filth) evaluation and some objective methods for food testing.

The laboratory and instrumental analysis skills that had to be gained in chemistry were complex relative to the experience of DTQC analysts. Individual analysts who were trained to use the AAS and the GC in Australia, did not have adequate time during the project to train on the use of these instruments due to the late arrival of accessories

and the breakdown of the AAS. Tests for the isolation and identification of filth elements could not applied due to the lack of needed equipment. The usefulness of simple equipment as the viscosimeter was also not demonstrated due to the unexpected shortening of CTA time at the close of the project.

Weaknesses in the above areas of food testing have to be corrected if DTQC is to assure the quality of food for the market. The following recommendations are made to overcome these difficulties and insure the accomplishment of the project's development objective.

a. The remaining items for purchase in Annex 3 consisting of equipment, equipment accessories, books and chemicals, should be purchased.

b. Skill in the use of the GC and other instrumental methods of food analysis should be strengthened by assigning a local expert in chemistry for one man-month to the project using available project funds.

c. The operation of the UV visible spectrophotometer, AAS and GC should be placed under the responsibility of one instrument operator so that its proper operation, calibration and maintenance can be given due attention. An analyst with an aptitude for instrumentation at DTQC was among those trained in the project and could undoubtedly play this role.

d. Time should be alloted to develop useful applications for equipment on objective methods for testing the physical properties of foods

as the viscosimeter, penetrometer and others. Skill in microfilth evaluation should be established as soon as needed equipment accessories arrive. Trained analysts are available at DTGC to accomplish the above.

e. The organization and management of the laboratory should be strengthened. This should be made commensurate with its new capabilities. Effective management is needed to insure the accuracy of test results and the implementation of good laboratory practices. It will also help insure that project inputs are appropriately applied and used to their full potential to achieve the project's development objective.

5.2 Evaluation of Project Activities

The implementation of the project proceeded smoothly until problems in equipment purchase became evident. In particular critical accessories did not arrive with the basic equipment and some purchases were inadequate for their intended use. The American trade embargo, the inability of suppliers to complete the supply of needed items and communication problems were the major causes for the difficulties encountered. This might have been avoided, if as has reportedly been done with other UNDP projects, the finalization of equipment specifications was done by local project authorities and the CTA in Vienna. This could have facilitated adjustments in equipment specifications which had to be done to conform with the available supply and budget. With the system adapted, it took time to communicate adjustments in equipment specifications when needed.

It was also difficult to prioritize purchases as an accurate estimate of available funds for equipment could not be made at the time required. This difficulty was very evident at the close of the project when CTA time was cut from a planned 2 man-months to 17 days due to an unexpected lack of funds to complete remaining equipment purchases. However, before the CTA mission was completed, available funds was found to be in excess of project needs. These excess funds were recommended for use in the purchase of basic equipment for the DTQC South Branch at Ho Chi Minh City. The need to upgrade the DTQC South Branch was identified during the second CTA Mission and a decision to reallocate funds for this purpose if available, was made at the first TPR meeting. The list of equipment proposed for DTQC Ho Chi Minh City is in Annex 19.

The following recommendations are made to prevent the difficulties encountered in project implementation.

a. Finalization of equipment specifications should be a joint activity between UNIDO Vienna, the CTA and the NPD working together at the most appropriate location. Since the preparation of PO's and the canvass of available suppliers is done in Vienna, this critical activity should be jointly carried out at the UNIDO Headquarters.

b. Authority over project management should belong to only one party to avoid loss of time in seeking a consensus on the action to be taken when problems arise. The 3-way management of this project prevented a quick resolution of problems in equipment procurement.

6. Changes in the Project's Institutional Setting

An important factor that will affect the attainment of the project's development objective to insure the availability of good quality food for domestic consumption, is the opening of the market to the private sector and the need to make DTQC's mandate and food quality control program relevant to the markets new problems and needs.

At the time this project was conceived, food products were produced and distributed by state owned companies in the Ministry of Domestic Trade. DTQC operated a food quality control network that was mandated to test and inspect food in the market and to supervise the quality control activities of state owned companies. Critical problems in food quality had to do with improper facilities for food processing (e.g. arsenic in fish sauce), improper processing, and/or handling and distribution of food (e.g. spoilage of fish sauce at state owned stores, aflatoxin contamination of ground nuts and soybeans), and contamination of fruits and vegetables with agricultural chemicals (e..g. pesticides).

Upgrading of DTQC's capabilities was requested to enable it to control the above problems, upgrade the quality of food products and strengthen the competitiveness of state owned companies producing and distributing food for domestic consumption.

The opening of the market to the private sector however resulted in the closure and/or privatization of the state-owned firms DTQC was expected to assist. It also led to a higher volume of private sector goods in the market over which DTQC had little authority, and to the emergence of fraud and adulteration as important problems in the market.

In order to achieve the project's development objective, it is evident that DTQC's quality control program has to be made relevant to the problems and requirements created by the new marketing system.

The CTA was requested to present a paper to project authorities and concerned government agencies on the organization of food quality control in a free market economy and following this, to make recommendations on the role DTQC can play in the control of food quality for domestic consumption. Due to the shortening of CTA time at the close of the project the implementation of this seminar was not carried out. In the interest of providing guidance to DTQC however, the important features of food quality control and its organization in a free market economy are discussed below and recommendations made on how best DTQC can use its new capabilities to play an effective role in food quality control in Vietnam and thus achieve the projects development objective under the new institutional setting.

7. The Role of Government in Food Quality Control

The government's role in food quality control is both regulatory and developmental. Its regulatory role involves formulating and implementing regulations to protect consumer health and promote fair trade. Its developmental role involves assisting the industry to meet the requirements of regulations usually through technical services, research and development and market promotion.

The extent to which government plays a role in controlling food quality varies between different countries depending among others on its financial resources, the level of development of its food industries and consumer

awareness and concepts on food safety and health. In many countries in this region, the control of food quality is a challenge due to many small and medium scale industries, the low level of automation of food processing, inadequate water quality, poor management of environmental sanitation and weak linkages between government and industry. The approach to food quality control requires careful identification of the most urgent problems and practical solutions and a readiness to make the program evolve with socio-economic change and with the status of knowledge on food safety and health.

The following will discuss the regulatory as well as developmental roles which governments take in controlling food quality and following this, the role which DTQC can play in the new open market system in Vietnam. It aims to serve as a guide in adapting DTQC's food quality control program to the needs of the new marketing system.

7.1 The Regulatory Role of Government in Food Quality Control

The regulatory role of government in food quality control consists of the formulation of basic laws and regulations and the implementation of activities as licensing, registration, testing and inspection, to insure compliance with these regulations.

Laws and Regulations

Basic food laws give governments the authority to formulate specific regulations to control food quality. Specific regulations define the requirements for insuring food safety, promoting fair trade practices and preventing consumer deception in food marketing. Specific

regulations vary between countries and are generally influenced by national perceptions on food safety and corollary attitudes towards the taking of risks.

A food will always fail to meet the requirements of regulations if it is unfit or potentially harmful for human consumption, if it is not of the quality expected or specified and if it is produced, handled and sold under conditions that violate good manufacturing practices in the handling of human food.

Spoiled fish sauce is unfit for human consumption. The presence of pathogens in bottled mineral water or unallowed levels of pesticide residues in fruits and vegetables make these foods potentially harmful and thus unfit for human consumption. The use of brown colored sugar to replace cocoa in chocolate candies would not represent the expected nature of this product and would thus be violative. Manufacturers processing food under insanitary conditions are violating regulations on Good Manufacturing Practices (GMP), whether or not the food they produce is found defective.

Food regulations are established by central and local governments and are based on policies established by national authorities, professional experts, consumers and representatives of the industry.

Implementing Activities

Government generally implements food regulations through the following activities:

a. Licensing - A license is a permit given to companies to engage in food processing after they are found to have facilities adequate to produce safe and wholesome food products.

b. Registration – Registration is the process of allowing the production and sale of specific food products. The product is registered after information is obtained that the process used in its manufacture is adequate, the label claims are not misleading and that the raw materials and ingredients comply with food regulations.

c. Certification is an assurance given by government that certain products meet established quality standards.

d. Label and product inspection – Labelling represents a manufacturers commitment to the quality and quantity of the product inside the package. Thus it should be accurate, should not be misleading and should allow consumer choice. Generally, a physical and visual inspection of the product accompanies label inspection. Labelling of nutrient composition is mandatory in some countries as the United States and/or for some products as infant foods.

e. Plant and process inspection – inspection of food plants to verify proper maintenance of facilities and equipment, compliance of personnel with good manufacturing practices (GMP) and implementation of quality control procedures in the operations. This is the best ways to insure the production of wholesome food products.

f. Laboratory analyses – Laboratory analysis verify (although not insure) if food products comply with standards for quality and safety and if they have been produced under GMP. Products for laboratory testing are sampled at processing plants, storage areas and/or at markets. To be meaningful, end product testing should be carried out with adequate sampling plans and using capable laboratories.

Government Agencies Involved in Food Quality Control

Every country has its simple or complex web of regulatory agencies, the number depending on the way the government is organized. A simplified classification is discussed below to highlight the basic nature of the quality control activities that are involved.

The following are the types of government agencies involved in food control:

- The Ministry of Agriculture or its equivalent for the control of food quality during production.
- The Ministry of Health or its equivalent for the control of food quality during processing, storage and distribution.
- The Ministry of Trade or its equivalent for the control of food quality during marketing.

a) The Ministry of Agriculture is responsible for the safety and quality of food raw materials. It has to assure that foods are not produced in a manner that is injurious to health. Thus among its important responsibilities is to regulate the proper use of chemicals as antibiotics, pesticides and fertilizers by farmers so that undesirable levels of residues are not left in food and water.

The Ministry of Agriculture also controls the health of animals, thus the quality of animal meat used as food and the levels of hygiene and sanitation in the slaughterhouses where these animals are converted to meat.

b) The Ministry of Health is responsible for the health of the consumer. Thus, it has to insure that foods made available to the public are safe and wholesome and that the handling and preparation areas where these foods are prepared, packaged and processed, are sanitary.

c) The Ministry of Trade is responsible for the quality of food in the marketplace and for controlling unfair trade practices. It has to protect the consumer against adulteration and fraud and the business community, against regulations that serve as technical barriers to trade. The Ministry is also responsible for programs that promote the development of quality in food products.

Table 1. Regulatory Role of Government Agencies in Food Control

Government Agencies	Activities			
	Regulations Implemented	Licensing, Registration, Label Check Certificiation	Inspection of Food and Food Handling Areas	Laboratory Analysis
Agriculture	Ag.* chemicals Animal health Slaughterhouse Operations	Licensing of Ag chemicals Certification of slaughterhouse	Slaughterhouses Animal health	Residues as pesticides and antibiotic
Health and/or Environment	Sanitation Additives Contaminants Labelling	Plant license to operate Product registration Ingredients registration	Food plants and processes Food Markets Restaurants	Pathogens Additives Contaminants
Trade	Weights Adulteration Mislabelling Misbranding Product Standards of Identity Packaging	Quality Certification Product Standards Mark Inspection of Labels	Food plants and processes Food at markets	Pathogens Additives Contaminants Other Adulterants

* Agricultural chemicals

The types of regulations and activities implemented by these three government agencies is summarized in Table 1. The table shows that there can be some overlap in the regulatory activities of different government agencies. This is due to the need to regulate similar activities for different objectives. Thus the government Department of Health may inspect labels in the market to insure the use of regulated ingredients while the Department of Trade may do the same to check the accuracy of weight declarations. The Department of Agriculture may analyze for pesticides in farm produce after harvest to monitor the proper use of chemicals while the Department of Health might do the same to check the safety of food products.

Food analysis may also be carried out in different types of laboratories as pesticide and other residue laboratories, microbiology laboratories, and general food testing laboratories. Many of the major items of equipment used in these laboratories are similar. In some countries, the laboratory analysis of products is centralized in one government analytical laboratory. Since food analysis requires the use of complex equipment and of analysts with strong basic training in analytical work, such centralization can reduce cost and strengthen effectiveness.

Due to the varied nature of the responsibility of government agencies, it is not generally feasible to centralize authority over the similarly varied aspects of food quality in one agency. Regulatory and inspection work are usually the responsibility of several agencies and testing work, that of one or several laboratories. Effectiveness is dependent on proper delineation of authority between agencies, the exchange of information and cooperation in the implementation of needed tasks.

7.2 The Developmental Role of Government in Food Quality Control

To comply with government regulations, the industry should know that they exist and should have the technical capability to comply. In many countries, this situation holds true. Food industries have their quality control programs, develop codes of practice and interact with government in formulating product standards.

In other countries however especially where many small and medium scale industries exist, there is a serious lack of awareness of food regulations and a weak capability to comply with its technical requirements. The implementation of food quality control in this type of situation is basically more difficult and requires government assistance.

Government can assist industry to comply with regulations in the following ways:

a) Dissemination of information and interpretation of food laws and regulations

b) Implementation of training programs on good manufacturing practices, quality control and proper food handling.

c) Assistance in establishing quality control programs and in product testing

d) Development of appropriate technologies to solve industry's problems in complying with regulations and/or in producing quality products

e) Market promotion through product marking or other schemes that inform the consumer that certain products are produced under conditions of good manufacturing practices or that they meet required quality standards. This type of developmental program for food quality can encourage compliance with regulations and strengthen quality control practices in food plants.

The government agencies that formulate the food control regulations should be responsible for the dissemination of clear information on the requirements of these regulations and on how they can be met. Training programs, product testing, establishment of quality control programs and research and development could be roles played by agencies other than those involved in regulations, as universities and research institutions.

The regulatory and developmental roles of government in food quality control need not be implemented within the same agencies. However, it is important that these roles are well linked. The objectives of regulation can be better met if industry is given the assistance to comply. The output of development activities on the other hand become more relevant when based on actual problems that affect the marketing of industry's products. An effective linkage of the regulatory and developmental roles of the government creates a strong food quality control system.

8. The Role of DTQC in Food Quality Control

DTQC is one of several government agencies involved in food quality control in Vietnam. Among its tasks is to assure the quality of food sold in the market through product inspection and laboratory testing. The recent

adoption by the government of the open market policy in trade has affected DTQC's food quality control functions. State owned companies which in the past, sold most of the food products in the market and which provided the bulk of DTQC's food testing activities were privatized. This has reduced the volume of food products tested at DTQC and as the latter has no authority over the private sector, it has also reduced DTQC's control over food quality in the market.

The new open market policy has also increased the overall level of private sector owned food products in the market and has led to the emergence of fraud and adulteration in the marketing of food.

The above changes indicate that the food quality control program at DTQC should be modified so that this can be made relevant to the conditions of the new marketing system. This modification will be important to assuring the full utilization of new project inputs and the attainment of the projects development objective under the new economic setting. The laboratories built by the project are adequately equipped and given the right programs, should be useful for the quality control needs of the new marketing system.

Following is a discussion of the regulatory and developmental roles which DTQC can play in the control of food quality under the new economic setting.

8.1 The Regulatory Role of DTQC in Food Quality Control

As part of the Ministry of Trade, DTQC's regulatory role in the control of food quality should focus on preventing food fraud and adulteration and protecting the consumer against unfair trade practices. These problems are

most common in packaged foods and should thus be the major type of food product whose quality DTQC should regulate.

Among the important packaged foods in Hanoi are bottled products as fish sauce and soy sauce which are consumed in large volumes in the domestic market and others as bottled mineral water, beer and wines which are gaining importance due to the influx of foreigners into the country. Fruit flavored beverages, confectionery and biscuits are other packaged foods in the market which DTQC has found adulterated. Canned meats, canned milk, spices and condiments would also belong to this classification. In order for DTQC to effectively regulate the quality of the above foods in the open market, the following are necessary:

a) It should have greater authority over private sector food products.

b) it should have authority to inspect food plants, in addition to that of food products in the market.

c) It should assure the existence of adequate regulations on labelling, the use of food additives, good manufacturing practices and total quality control.

d) It should strengthen manpower capability for laboratory analyses and management.

a. Greater authority over private sector food products

Existing regulations for food control do not give DTQC authority over private sector food products. Since these products now form the bulk of food items sold in the market, DTQC should be able to test and inspect these products and to speedily penalize their sales if found violative.

b. Authority to inspect food processing plants

It would be useful to consider giving DTQC authority to inspect food processing plants for adherence to good manufacturing practices (GMP). This would enable DTQC to better prevent food fraud and adulteration than the random testing of product samples in the market which it presently carries out. The existence of only one government agency inspecting food products at the processing plants and at the market will also simplify the inspection system, reduce its total cost and allow for more effective utilization of findings.

Presently, the government agency responsible for the quality of food in the market (in this case DTQC) is separate from the agency responsible for insuring that the food is properly processed. These two activities however are closely interrelated and would thus be better implemented in only one government agency.

c. Assure adequacy of regulations on labelling, food additives, GMP and total quality control

Appropriate regulations on food labelling, the use of food additives, the presence of harmful substances in food and minimum requirements for good manufacturing practices should be established. If already existing, these regulations may have to be modified to facilitate their implementation under existing market conditions.

d. Strengthen manpower capability in laboratory analysis and management

In regulating food quality in the open market value judgments often have to made between perceived risks and the certainty of financial loss when a food

product is penalized. This decision is difficult to make especially when the risk to public health is not well established. Very often laboratory testing is the only way to ascertain the safety of a food and for this reason a strong laboratory organization is indispensable to food control work.

If DTQC were to take an active role in the regulation of food quality in the market, its new expertise in modern food testing will have to be strengthened. Analysts have to gain confidence in instrumental food analyses, an aptitude for developing new methods when required and more experience in adopting internationally accepted testing methods to Vietnamese problems and needs. Protocols on good laboratory practices to insure accuracy of results have to be prepared and proper management of laboratory procedures has to be established. All these can be achieved by DTQC given adequate time and additional manpower. However the process may have to be accelerated due to the problems already existing in the market. This can only be feasible if professional guidance through local experts is provided.

8.2 The Developmental Role of DTQC in Food Quality Control

As part of the Ministry of Trade, DTQC should also play a developmental role in food quality control by implementing programs that will stimulate growth in the quality of packaged foods. Quality marking schemes and training and information dissemination activities are examples of programs it would have the capability to implement.

a) Quality marking

DTQC can encourage the development of quality in food products by establishing a quality marking scheme for products of good quality. The scheme could make good use DTQC's new testing facilities to evaluate product quality and its long experience in food quality control, to inspect food plants and assist entrepreneurs interested in a quality mark. The program can initially be tested on commodities for domestic consumption and if successful, can likewise be used for promoting specific products for export.

A quality mark on a product label signifies government's assurance that the product is produced under GMP and/or that it meets specified standards for quality and wholesomeness.

Quality marking can help develop consumer confidence in packaged foods and can be used by potential investors to identify products for market development. These end objectives can strengthen the market for packaged foods in Hanoi, many of which are in need of a strong quality image.

Quality marking schemes range in complexity and type. DTQC should start with a scheme to simply identify products produced under good manufacturing practices. The testing and inspection activities that will be required for this type of quality mark is within DTQC's existing manpower capability and would be complementary to its regulatory role in food quality control. If given the overall mandate

to regulate food quality, DTQC can use quality marking programs to reward manufacturers who consistently practice GMP and produce good quality products. Used in this manner, it may be feasible to put quality marks on products at lower cost.

DTQC has the laboratories to test product quality and the manpower to inspect food processing plants to establish quality marks for GMP. The manpower required will be dependent on the number of industry types that will be included in the program. This will initially have to be small due to the need to gain expertise in the implementation of the program. However, the program can eventually expand and cover as many industries as required.

b) Training and information dissemination

DTQC can assist the food industry to produce good quality products by conducting seminars on good manufacturing practices, plant hygiene and sanitation, use of food additives, food standards, food labelling, food regulations and other important topics.

Materials for most of these topics have been recommended for purchase in the project and will form a useful basis for developing the teaching materials required for various types of personnel in the industry.

Food quality control cannot be achieved if the industry does not have the capability to comply with its requirements. Education and training is one of the most important ways for giving the industry this

capability. This is especially important in countries where there are small and medium scale industries, where there are indigenous products with inadequate technologies for large scale production and where food processing is used as a common means of livelihood. In many cases, this situation applies to Vietnam.

DTQC being in the forefront of food quality evaluation at the market should in time gain a clear understanding of the processing and packaging problems of Vietnamese foods and thus be able to develop the industry training programs required to remedy these.

There is presently limited manpower at DTQC to develop this program in the scale that may be required. It is important however to start implementing training and information programs at this time because of the relative infancy of food processing industries in Hanoi. This would create the needed awareness in the industry of the importance of quality in the preparation and sale of food. Cooperation between universities and food research and control institutions can help reduce the cost and effort that would be required.

9. Organization of a Network on Food Quality Control and Development

It is in the nature of food quality that its control by government is always a multiagency effort. The situation in Vietnam is no exception. Food quality is monitored by at least four government agencies (Health,

Agriculture, Trade and Science) at the city and provincial levels. There are reportedly 30-40 food testing laboratories in the country.*

DTQC is only one of several government agencies testing and inspecting foods and food products for quality. The General Department for Metrology, Standardization and Quality Control (GDSMQC), licenses food plants and registers food products, the Ministry of Health analyzes foods for additives and pathogens, the Ministry of Agriculture, analyzes pesticides in fresh foods and Vinacontrol of the Ministry of Trade, analyzes and certifies the quality of exported and imported foods. GDSMQC, the Ministry of Agriculture and Vinacontrol all have modern food testing laboratories. These laboratories have similar equipment and are analyzing the same food products but for different objectives in food control. A food quality control network should be organized to coordinate the activities of the above institutions. Coordination will facilitate the exchange of information and optimize its use in regulatory work. Exchange of experiences in testing and analysis will also improve testing methods and reduce overlapping of analytical programs. DTQC and the institutions involved could thus benefit greatly from networking.

DTQC also has an important branch laboratory, the DTQC South Branch in Ho Chi Minh City, (HCMC) which monitors the quality of food in the southern region of the country. A visit made by the CTA in 1991, highlighted the important role which this this laboratory plays in the control of food quality in Vietnam.*

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* CTA Report on Visit to the DTQC South Branch HCMC. July 22-28, 1991

Excess funds from this project which were recommended for the purchase of equipment for the DTQC South Branch will however not upgrade its food testing capabilities to the level achieved for DTQC Hanoi. Chemical tests for food requiring instruments as the AAS and GC will thus have to be carried out in Hanoi for the DTQC South Branch, using the existing network system between the two Branch laboratories.

A network between institutions involved in assuring the safety of food has an important role to play in harnessing institutional expertise in food quality control and in optimizing the use of expensive laboratory equipment. The organization of the network in Vietnam would be timely considering the lack of experience among the institutions in controlling food quality in an open market system. Such a network should eventually play a guiding role in insuring that food quality control will always be relevant to consumer needs, industry capabilities and new knowledge on food safety and processing.

10. Conclusions and Recommendations

The following are the major outputs of the project.

a) Establishment of chemical and instrumental analysis, microbiology and microanalysis, and physical and sensory evaluation laboratories for food testing and quality control. It also established a capability to do food testing at the field.

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* CTA report on Visit to the DTQC South Branch HCMC July 22-28, 1991.

b) Upgrading of manpower capability for food testing and quality control. Food analysis can be implemented in the laboratories at varying levels of manpower skill; the strongest being in chemical analysis for composition, microbiological evaluation and physical and sensory testing; the weakest being in instrumental food analysis.

The weakness in instrumental food analysis will affect the attainment of the projects development objective. Its correction is thus strongly recommended through the hiring of a local expert for 1 man month using project funds allocated for this purpose.

The adoption of the open market policy by the government has important effects on DTQC's food testing and quality control program. This is because the new policy increased private sector goods in the market, led to the privatization of state owned companies DTQC was supposed to assist in this project and saw the emergence of fraud and adulteration in the market.

DTQC's food quality control program should be made relevant to the problems and needs of the new marketing system. This is essential to the effective utilization of project inputs and to the attainment of the project's development objective under the new institutional setting. As part of the Ministry of Trade, this program should be designed to direct the rational growth of the food industry in the open market by preventing unfair trade practices and encouraging the development of quality in food products.

To achieve the above, DTQC should be given adequate authority to regulate the quality of food especially packaged foods, in the domestic market. It should also encourage the development of quality in food products through

appropriate programs as quality marking and training. The laboratories built by the project are adequately equipped to support the testing activities needed in the above programs.

Finally, DTQC should help organize a food quality control network among government agencies involved in food quality control to promote cooperation in the exchange of information and in the implementation of needed tasks. This will minimize duplication in food control activities, optimize the use of expensive equipment and create the professional support to guide the growth of quality in the food industry in Vietnam.

Problems in equipment procurement was the major difficulty encountered in project implementation. Equipment items, accessories, chemicals and books which remain to be purchased are critical to the implementation of testing and training activities, and should thus be supplied. Excess funds if available are recommended for use in the purchase of basic equipment for the DTQC South Branch at Ho Chi Minh City.

The following are the recommendations made on this project:

1. Equipment, accessories, chemicals and books remaining to be purchased as listed in Annex 3 should be supplied to the project as specified. Excess funds if available, should be used to purchase equipment for the DTQC South Branch in Ho Chi Minh City as listed in Annex 19.

2. A local expert should be hired for 1 man month to strengthen skills in the use of modern instruments as the gas chromatograph, and to establish protocols for good laboratory practices and management.

3. Laboratory management should be strengthened and made commensurate with DTQC's new facilities for food testing and its mandate for food quality control. The operation of modern equipment as the GC, UV and AAS should be assigned under one operator to insure proper operation maintenance and calibration. Analysts should develop an aptitude for modifying testing methods to suit Vietnamese problems and needs.

4. Skills should continue to be upgraded in microfilth analysis, objective methods for testing the physical properties of foods and instrumental analysis as soon as all the items listed in Annex 3 are purchased.

5. DTQC's regulatory role in food quality control should be made relevant to the open market system. As part of the Ministry of Trade, this should focus on the prevention of unfair trade practices as fraud and adulteration in packaged foods and the development of quality in food products.

6. To effectively play above role, DTQC should have more authority over private sector goods, authority to inspect food plants and to assess the appropriateness of regulations to safeguard food quality for domestic consumption.

7. DTQC should also implement developmental programs as quality marking schemes and training and information dissemination in order to assist the food industry to comply with regulations and develop the quality of its products.

8. DTQC should organize a food quality control network among government agencies involved in food quality control. This will facilitate information exchange, optimize use of equipment, strengthen food quality control and create institutional support for the growth of food packaging and processing industries.

9. Preparation of equipment specifications should be a joint activity between UNIDO Vienna, the CTA and NPD working together at the most approriate location, to enable quick adjustments in equipment specifications when required.

10. Authority over project management should be more strongly centralized to avoid loss of time in the resolution of problems.

Acknowledgements

Many Vietnamese, UNDP and UNIDO officials and personnel were important sources of insight and assistance in the implementation of this project. Its accomplishments are due in no small way to the role which they played in the execution of project activities. It is not feasible to list the names of everyone. To all of them however, I wish to extend my deepest thanks.

The people I officially met to whom acknowledgements are due, is shown in Annex 20.

ANNEX 1

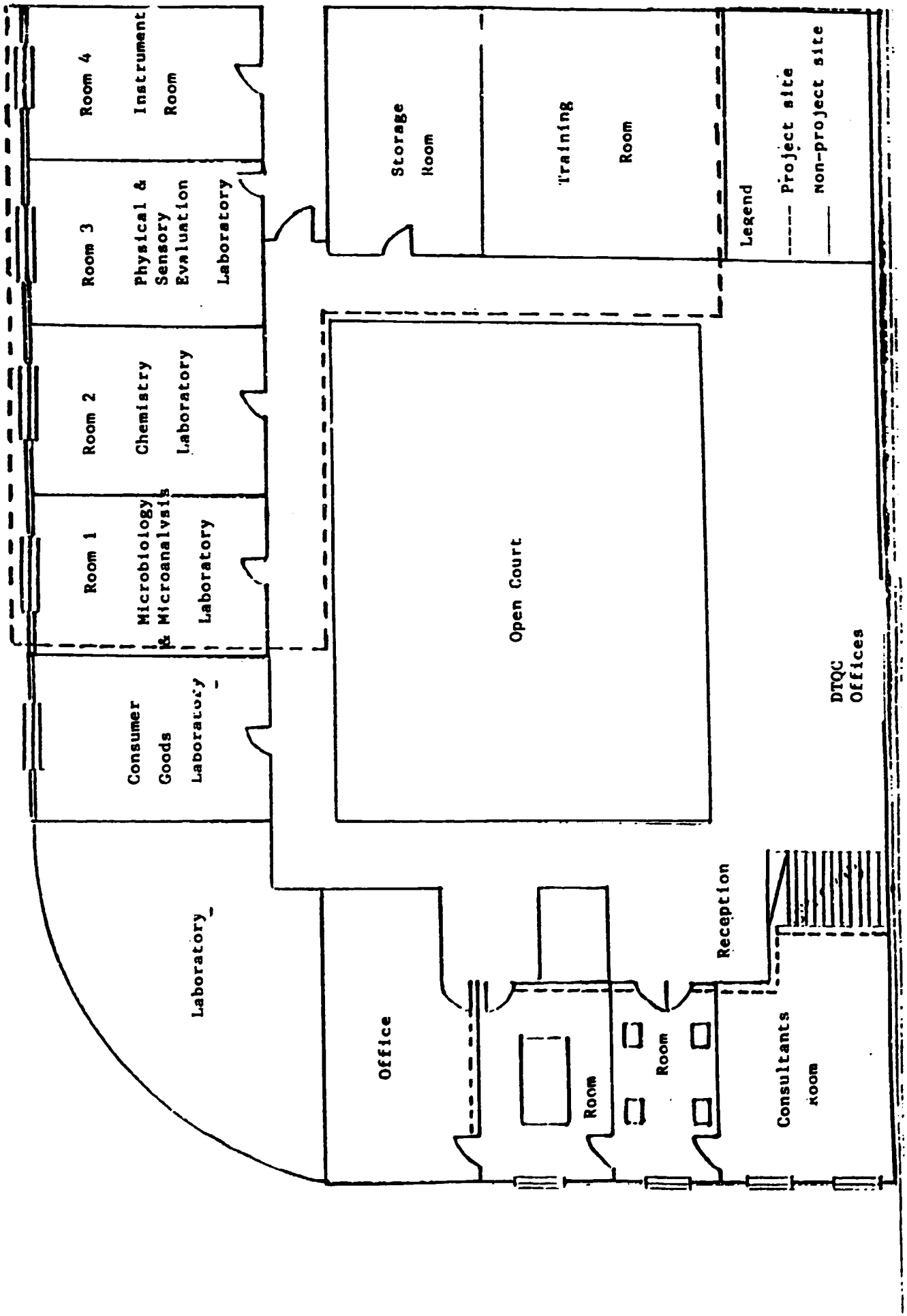
Projected and Actual Dates of Implementation of Major Project Activities

Major Project Activities	Projected Date of Implementation*	Actual Dates of Implementation**
1. Study Tour	January 1991	December 1-30, 1990
2. International Fellowships		
a) Chemistry	March to May 1991	April to June 1991
b) Microbiology	March to May 1991	June to August 1991
c) Physical and Sensory Evaluation	March to May 1991	March to May 1991
3. In-Country Training		
a) Microbiology	June 1991 to August 1991	October 1992 to November 1992
b) Chemistry	June 1991 to August 1991	February 1993 to March 1993
4. Purchase of Equipment, Chemicals Glasswares, Books		
a) Preparation of Specifications	June 1990 to July 1990	July 1990
b) Purchase and Delivery	January 1991 to June 1991	January 1991 to present ***
c) Installation and Testing	June 1991 to July 1991	July 1991 to February 1993
5. Renovation of the DTQC Laboratories, Entrance and Garage	January 1991 to June 1991	January 1991 to June 1991
6. Implementation of QC Activities Using New Facilities	June 1991 to May 1992	January 1992 to present

* Based on Project Document
** Based on Mission Reports
*** Items remain to be purchased and delivered.

ANNEX 2

LAYOUT OF THE DTQC FOOD TESTING LABORATORIES



ANNEX 3

ITEMS TO BE PURCHASED FOR DTQC HANOI
(1/3/93)

Item	USD
A. Equipment*	
1. Wafer for the Wildman Trap Flask (2 units)	200
2. Percolator, glass (2 pieces)	232
3. Anaerobic system	850
4. Water Bath (Incubator Bath for *E. coli*)	247
5. Compound Microscope	1641
6. Incubators (2 units)	1170
7. Forced Draft Oven	1600
8. Muffle Furnace	1500
9. Can seam tester	200
10. Vacuum gauge for cans	50
11. Capillary GC megabore column for organochlorine pesticides	330
12. Megabore adapters for long bore capillary columns	60
13. GC standard packing material	
3% carbowax 1500 n on chromosorb WHP	55
5% SE 30 on chromosorb WHP 80/100	55
0.5% OV 210 + 0.65% OV 17 on ultrabond 20 M 100/120	162
14. High pressure oxytrap (2 units)	110
15. Supelclean LC-18 SPE tubes	95
16. Single pen chart recorder	1000
17. Tool kit	-
18. Ocular lens for the stereoscopic microscope. Item C.2 on PO 15-0-1018 P	-

* See CTA Mission Report, February 6-22, 1993 for purchase specifications

19.	Silica glass cells for the Milton Roy Spectronic 21. Item A.3 on PO 15-0-1019 P	-	
20.	Analytical Balance (for field purchase)	2800	
21.	Refrigerator Freezer (for local purchase)	500	
22.	Tables and chairs for AAS and GC (for local purchase)	400	
23.	Hach Rapid Test Equipment	5400	(2nd priority)
	Sub-total for equipment	18657	

B. Chemicals (see enclosed for specifications)

Sub-total for chemicals	2000	(estimate)

C. Books (see enclosed for specifications)

Sub-total for books	1500	(estimate)
Total for A, B and C (equipment, chemicals and books) =	22157	

SPECIFICATIONS AND PRICES OF CHEMICALS TO BE PURCHASED FOR DTQC HANOI

1. Standard colors (smallest unit available)
   - Methyl yellow
   - Acid magenta
   - Rosaniline

2. Artificial sweeteners (smallest unit available)
   - Saccharin
   - Dulcin
   - Cyclamate

3. Aflatoxin Standards from
   Supelco catalog 25, Supelco Ch
   du Lavasson 2-1196, Gland Switzerland

	Unit Price USD	USD
B_1 (1 mL) 3 ug/mL Cat. No. 46323	32 x 5 mL =	175
B_2 (1 mL) 3 ug/mL Cat. No. 46324	32 x 5 mL =	175
G_1 (1 mL) 3 ug/mL Cat. No. 46325	32 x 5 mL =	175
G_2 (1 mL) 3 ug/mL Cat. No. 46326	32 x 5 mL =	175
M_1 (1 mL) 10 ug/mL in acetonitrile	175 x 2 mL =	250
	303	1050

Also available from: Dr. RM Horak,
Division of Food Science and Technology
CSIR PO Box 395 Pretoria, South Africa
Fax: Int. + 2712841-2185
Tel: Int. + 2712841-2670

	USD
B_1 (10 mg)	35
B_2 (10 mg)	55
G_1 (10 mg)	45
G_2 (10 mg)	55
M_1 (1 mg)	1260
	1450

Also available from: Sigma Chemical Company
P.O. Box 14508 St. Louis Missoure
63178 USA

	USD
B_1 (1 mg)	10.45
B_2 (1 mg)	17.90
G_1 (1 mg)	12.10
G_2 (1 mg)	19.70
	60.15

4. Diphenylamine 100 gms
5. Cyclohexane 5 liters
6. Liquid paraffin 5 liters
7. White wool (smallest unit available)
8. Dithizone-Diphenylthiocarbazone (50 gms) 60 USD
9. APDC-Ammonium 1-Pyrrolidinecarbothioate (100 gms) 45 USD
10. MIBK-Methyl Isobutyl Ketone (5 liters) 20 USD

LIST OF BOOKS TO BE PURCHASED FOR DTQC HANOI

1. Official Methods of Analysis of the Association of Official Analytical Chemists AOAC, 15th edition 1990. 350 USD

   Volume 1. Agricultural Chemicals, Contaminants and Drugs.

   Volume 2. Food Composition, Additives, Natural Contaminants.

   Published by AOAC Inc. Suite 400.2200 Wilson Boulevard Arlington Virginia 22201, USA.

2. Bacteriological Analytical Manual, Division of Microbiology Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration. Published and distributed by the AOAC. 1111 North 19th Street, Suite 210 Arlington Virginia 22209 USA. 125 USD

3. The Pesticide Analytical Manual, Food and Drug Administration, 200 'C' St., Washington D.C., USA

4. Munsell Book of Color

   Macbeth
   A Division of Kollmorgen Corporation
   2441 N. Calvert Street
   Baltimore, Maryland 21218
   Tel. No. (301) 243-2171
   Fax No. (301) 243-0028

5. Laboratory Techniques in Food Analysis
   Pearson, D., Butterworth, London

6. Instrumental Methods of Chemical Analysis
   Galen W. Ewing, 4th Ed. Mc. Graw Hill

7. Manuals of Food Quality Control. Paper series no. 14. Food and Agriculture Organization, Rome, 1979.

   14/1 The Food Control Laboratory
   14/2 Additives, Contaminants, Techniques
   14/3 Commodities
   14/4 Microbiological Analysis
   14/5 Food Inspection
   14/6 Food for Export
   14/7 Food analysis: general techniques, additives, contaminants and composition
   14/8 Food analysis: quality adulteration and tests of identity 1986

8. "Microorganisms in Foods 1". Their significance and methods of enumeration, Second edition. ICMSF University of Toronto press, Toronto/Buffalo/London 1982.

9. "Microorganisms in Foods 2" Sampling for Microbiological Analysis, Principles and Specific Applications. Second edition. ICMSF. University of Toronto Press, Toronto/Buffalo/London. 1986. Available from Blackwell Scientific Publications. 8 John Street London WC 1N 2ES.

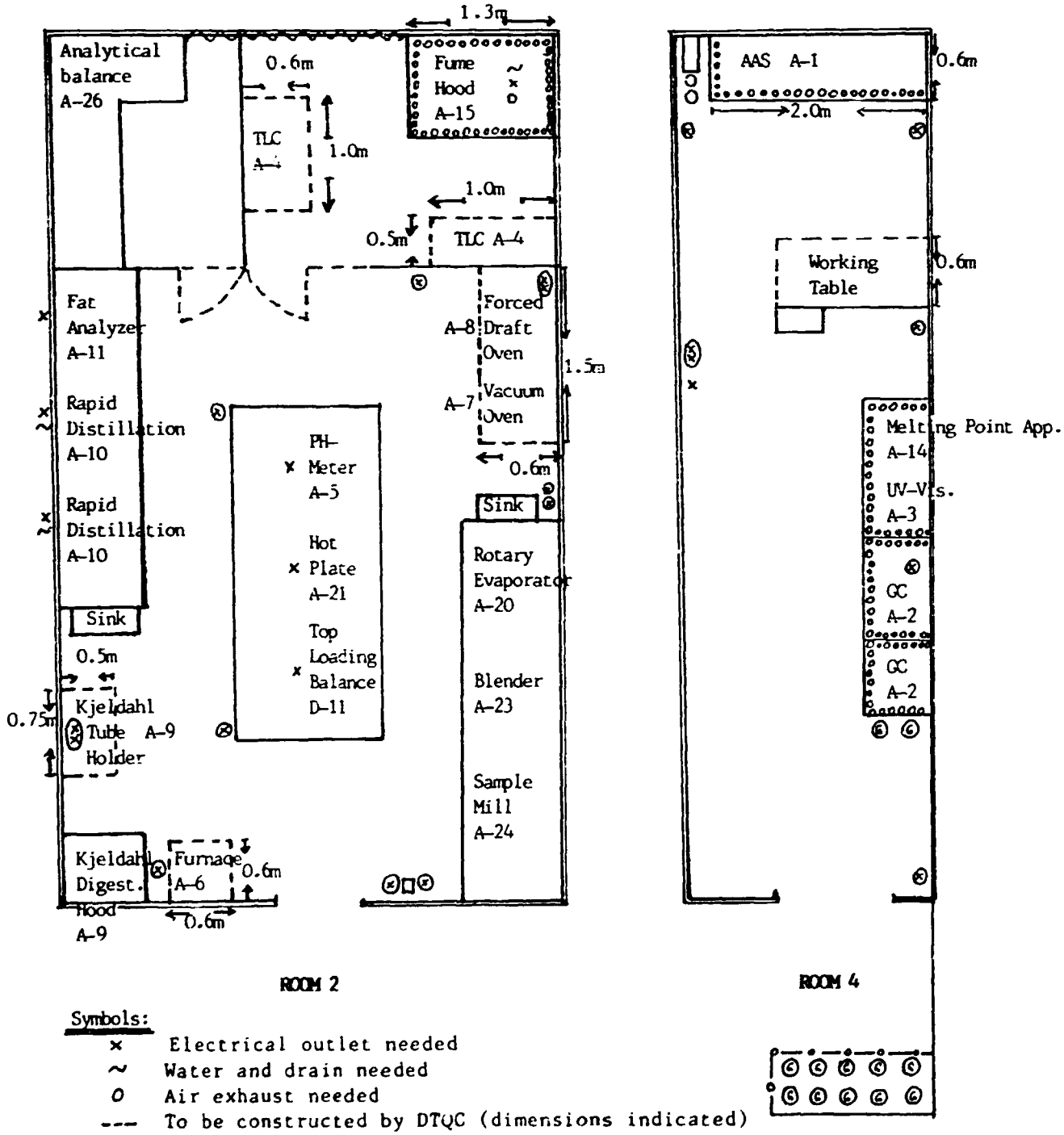
10. "Microorganisms in Foods. Vol 4. Application of the hazard analysis critical control point (HACCP) system to ensure microbiological safety and quality. ICMSF Blackwell Scientific Publications 1988. 8 John Street, London WC 1N 2ES.

11. Training Manual for Analytical Entomology in the Food Industry. FDA Technical Bulletind No. 2. USFDA. Washington DC 20204. Published by the AOAC, Box 540 Benjamin Franklin Station. Washington D.C. 20044.

12. CODEX Publications (see next page)

ANNEX 4

LAYOUT OF THE CHEMICAL AND INSTRUMENTAL ANALYSIS LABORATORY



Symbols:

- × Electrical outlet needed
- ~ Water and drain needed
- O Air exhaust needed
- --- To be constructed by DTQC (dimensions indicated)
- ▯▯▯ To be installed as UNIDO input
- A-no. / B-no. / C-no. } Equipment number in the list of equipment

ANNEX 5

EQUIPMENT PURCHASED FOR THE CHEMICAL AND INSTRUMENTAL ANALYSIS LABORATORY

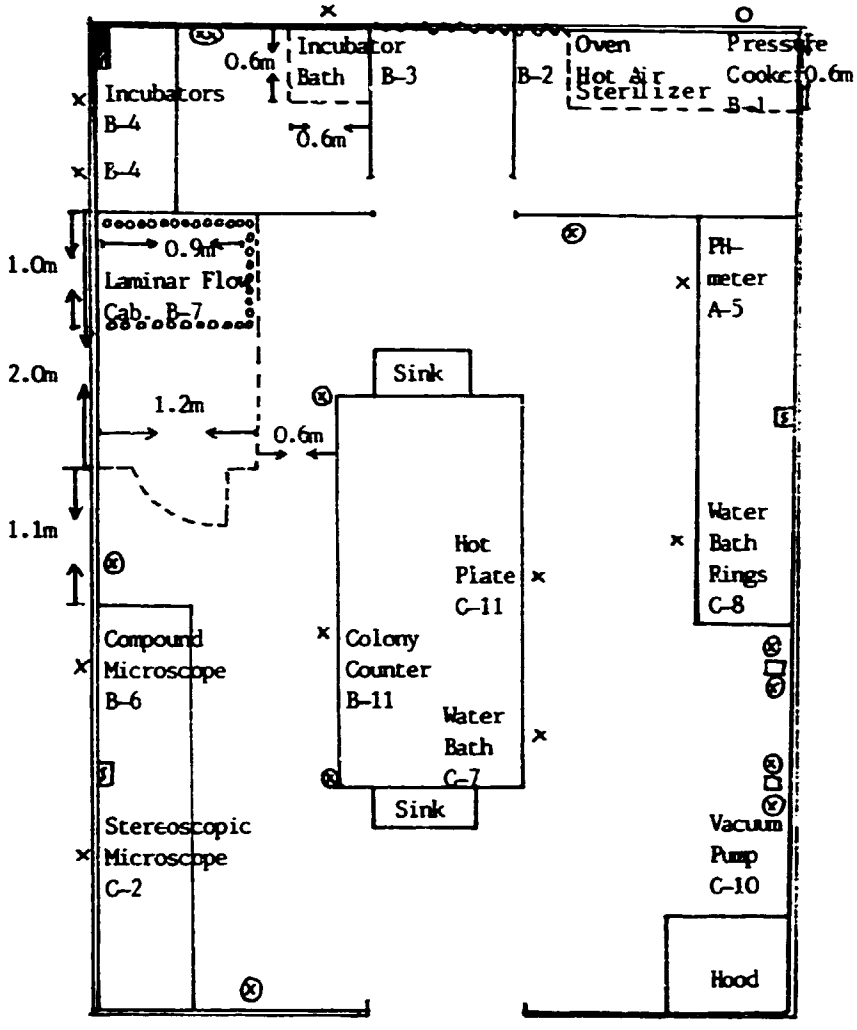
Item No.	Item	PO No.
A - 1	Atomic Absorption Spectrophotometer PU9100X04 S/N GE 410806 Continous Flow Vapor System 9423 393 60404 PU9360X/04 Hallow Cathode Lamps Ca, Mg, K, Fe, Cu, Na, Zn, Pb, Hg, Cd, Sn, As.	15-0-1024 P
	Air Compressor 9423 390 03021-PU 9003	15-2-0949 P
	Acetylene Flashback Arrester 9423 393 46061	
	Cylinder Wall Bracket for acetylene cylinder	
	Voltage Line Conditioner 850 va Model: LVC500L (220v)	
	Fume Extraction Kit AAS-6	
	Acetylene Gas Cylinder 9 M/3 and Valve	
	Nitrous Oxide Gas Cylinder 35 kgs and Valve	
	Acetylene Gas Pressure Regulator 9423 352 43881	
A - 2	Gas Chromatograph (GC) Tracor Model 9000	15-0-1023 P
	GC Data Handling System	Local Subcontract
	Nitrogen generator	15-2-0577 P
	Spare parts - set of standard Accessories for GC. Kit consisting of additional colum gasket, glass insert, injection port rubber septa	
	Microsyringes 1 ul, 5 ul, 10 ul, 25 ul	
	Glass column 4 mm x 2 mm 4 mm x 3 mm	

Item No.	Item	PO No.
	Stainless steel column 3 mm x 4 mm	
	Column packing materials 10% DC-200 on Gas Chrom Q - 20 g Chromosorb WHP 80/100 - 150 g Gas Chrom Q 80/100 - 25 g	
	Voltage stabilizer Flowmeter All Tech 4043 25 ml and All Tech 4045 100 ml Leak check Stopwatch All Tech 4060	
A - 3	UV-Visible Spectrophotometer Karl Kolbe Single Beam Spectrophotometer 200-1000 nm	15-0-1019 P
A - 4	Thin Layer Chromatography Set-up All Tech Basic Thin Layer Chromatography TLC Equipment CAMAG	 15-0-1023 P 15-2-0628 P
A - 5	pH Meter (2 units) Griffin Model 60	15-0-1018 P
A - 6	Furnace Four 1100 Deg C 2 L Reg Manuelle	15-0-1020 P
A - 7	Vacuum Oven and Pump Digital vacuum oven and vacuum pump for oven	15-0-1023 P
A - 8	Forced Draft Oven Etuve Ventilee 63 litre	15-0-1020 P
A - 9	Kjeldahl Rapid Digestion System Macro kjeldahl twin-unit portable digestion rack	15-0-1023 P
A - 10	Rapid Distillation System Kjeldahl distillation assembly with 6-place heater	15-0-1018 P
A - 11	Crude Fat Analyzer Soxhlet with six places for sample	15-0-1025 P
A - 12	Mojonnier Fat Extraction Flask	Not purchased
A - 13	Precision Buret (2 units)	15-0-1018 P

Item No.	Item	PO No.
A - 14	Melting Point Apparatus Fisher Scientific	15-0-1022 P
A - 15	Fume Hood 750x650x1205 mm with fan	15-0-1019 P
A - 16	Distilled Water Apparatus Water distilling apparatus, fully automatic single stage, capacity 2 </H storage tank, stainless steel cap 4 LTR	15-0-1019 P
A - 17	Refractometer 0-50 26-62°1 Atago	15-0-1018 P 25-2-8517 W
A - 18	Micro Conway Diffusion Vessels	15-0-1022 P
A - 19	Carbon Dioxide Measuring Apparatus Gas Analysis Appratus Orsat Fischer with gas pipet and measuring buret	15-1-0370 P
A - 20	Rotary Evaporator Heidolph Model VV 2000 complete with V-1 glassware and waterbath	25-2-8617 W
A - 21	Stirrer Hot Plate Bibby Ceramic, magnetic Corning PC 320 with stirring bar and retriever	15-1-1018 P 25-2-8617 W
A - 22	Nesslers Tubes (2 sets) Tall form in wooden rack with glass plate	15-1-0370 P
A - 23	Warring Blender, high speed (2 units)	15-0-1019 P
A - 24	Sample Mill	For local purchas
A - 25	Voltage Regulator	For local purchas
A - 26	Analytical Balance Balance, electronic portable precision	15-0-1021 P

ANNEX 6

LAYOUT OF THE MICROBIOLOGY AND MICROANALYSIS LABORATORY



ROOM 1

Symbols: Please see Annex 4 (rooms 2 and 4)

ANNEX 7

EQUIPMENT PURCHASED FOR THE MICROBIOLOGY LABORATORY

Item No.	Item	PO No.
B - 1	Pressure Cooker Autoclave Automatic Prestige Medical Standard Body	15-0-1018 P
B - 2	Oven Hot Air Sterilizer ST6030 Cap 43 LTR.	15-0-1019 P
B - 3	Incubator Bath for *E. coli* Bain Marie Memmert 12 L	15-0-1020 P*
B - 4	Incubators general purpose (2 units) Incubator 80°C 300x290x280 mm Internal	15-0-1018 P**
B - 5	Membrane Filter Holders and Membranes	15-0-1021 P
B - 6	Compound Microscope AMB-73 Microscope Stereozoom	15-0-1022 P**
B - 7	Laminar Flow Cabinet TT Tabletop Workstation	15-0-1023 P
B - 8	Stomacher	15-1-1136 P
B - 9	Super Mixer Shaker Vortex Agitateur de Tubes Topmix 220 V	15-0-1020 P*
B - 10	Howard Mold Counting Chamber	15-0-1023 P
B - 11	Colony Counter Hand Held Electronic Colony Counter	15-0-1023 P
B - 12	Bacteriological Can Opener Can Opener MOD ED 12 Rable Manual Model for opening of tin cans ranging from 5 to 10 kg	15-1-0371 P

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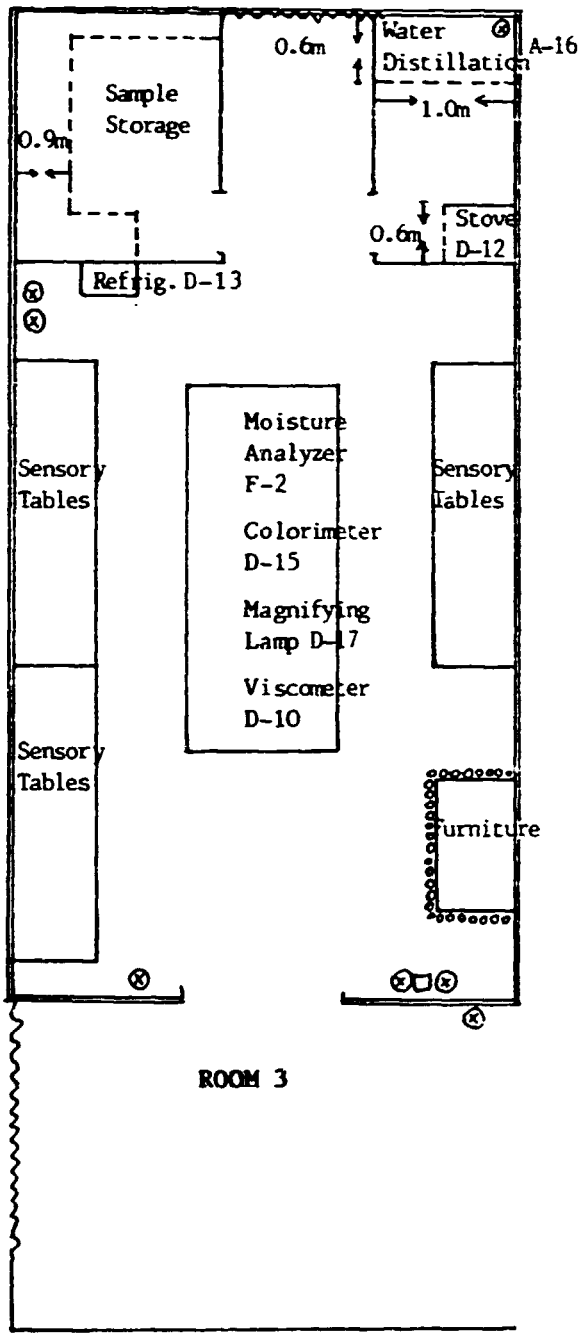
* These equipment had not yet arrived as of February 22, 1993.

** These equipment is for re-order due to inadequate temperature control, see Annex 3.

ANNEX 8

LAYOUT OF THE PHYSICAL AND SENSORY EVALUATION LABORATORY



Symbols: Please see Annex 4 (rooms 2 and 4)

ANNEX 9

EQUIPMENT PURCHASED FOR THE PHYSICAL AND SENSORY EVALUATION LABORATORY

Item No.	Item	PO No.
D - 1	Can Seam Test Kit Can tester for testing proper seaming Did not arrive	15-0-1025 P
D - 2	Vacuum Pressure Gauge for Cans Wrong purchase	15-0-1018 P
D - 3	Dial Caliper Measuring range 0.150 mm	15-0-1018 P
D - 4	Thickness Gauge	15-1-1136 P
D - 5	Thermometer Metallic Dial with focusing eyepiece and clip	15-0-1018 P
D - 6	Food Processor	15-1-1136 P
D - 7	Heat Sealer for Plastics	15-0-1018 P
D - 8	Penetrometer Portable fruit tester with 3 resistance heads	15-1-0371 P
D - 9	Bostwick Consistometer Kit Bostwick	15-1-0371 P
D - 10	Brookfield Dial Reading Viscometer	15-0-1023 P
D - 11	Top Loading Electronic Balance (2) Balance XD-2200	15-0-1022 P
D - 12	Electric Stove (for local purchase)	
D - 13	Refrigerator Freezer (for local purchase)	
D - 14	Turbidimeter Spectrophotometer spectronic mini 20 400-800 nm battery operated with battery charger Nephelometer Attachment	15-1-0369 P

ANNEX 10

EQUIPMENT PURCHASED FOR MICROANALYSIS

Item No.	Item	PO No.
C - 1	Magnifying Desk Lamp	15-0-1018 P
C - 2	Stereoscopic Microscope, Wide Field Gallenkamp Stereoscopic Microscope with long arm stand 240 V	15-0-1018 P*
C - 3	Wafer for Wildman Trap Flask	For purchase**
C - 4	Erlenmeyer Flasks 2000 mL	15-1-0371 P
C - 5	Percolator Glass 2 liters	15-1-0371 P**
C - 6	Water Aerator	15-2-1136 P
C - 7	Water Heater to 55-70°C	15-0-1019 P
c - 8	Water Bath Incubator with rings water bath 5-place aluminum	15-0-1018 P
C - 9	Sieves (8) 2.36 mm, 106 um, 63 um, 150 um, 850 um all 200 DIA and cover and receiver	15-0-1018 P
C - 10	Vacuum Pump Air pump P/V	15-0-1022 P
C - 11	Hot Plate Stirrer	

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* Ocular lens has to be provided, see Annex 3.

** C-3 was not purchased, C-5 was an incorrect purchase.
Both items were re-listed in Annex 3.

ANNEX 11

EQUIPMENT PURCHASED FOR THE MOBILE LABORATORY

Item No.	Item	PO No.
G - 1	Simple Microscope Microscope Gamma 40	15-1-0369 P
G - 2	Moisture Analyzer Digital Grain Master Moisture Meter and Reader Key for Wheat and Barley	15-1-0369 P
G - 3	Portable Weighing Scale OHAUS portable electronic balance	15-1-0369 P
G - 4	Battery Operated UV light UV lamp multiband model UVGL 48 Hand/bench type 6 W	15-1-0369 P
G - 5	Gas stove for local purchase	-
G - 6	Portable Refrigerator Freezer for local purchase	
G - 7	Autofocus Camera	15-1-0369 P
G - 8	Knives for local purchase	-
G - 9	Dissecting Kit	15-1-0369 P
G - 10	Chemical Test Kits with Chemicals	-
G - 11	Thermometers	15-1-1136 P
G - 12	Refractometers Same as A-17	-
G - 13	Flour Spatula	15-1-0369 P
G - 14	Sieves Same as C-9	-
G - 15	Illuminated Magnifying Glass battery operated	15-1-0370 P
G - 16	Magnifying Lens Hand held lens 2.5x	15-1-1136 P
G - 17	Flashlight for local purchase	-
F - 1	Toyota: Landcruiser	15-1-0420 P
F - 2	Toyota Hi-Ace	15-1-1177 P

ANNEX 12

TRAINING EQUIPMENT PURCHASED

Item No.	Item	PO No.
E - 1	Overhead Projector Elmo HP	15-1-0441 P
E - 2	Slide Projector Kodak Carousel S-AV 1010 35 mm slide projector	15-1-0441 P
E - 3	Copier Ricoh M-100	15-1-0440 P
E - 4	Computer Sanyo MBC - 17 LX Personal PC HDD 20 20MB Hard Dish Drive with Card CTW-14 14" Dual Monitor PULSE UPS 500 R 500 VA UPS Epson LX-800 printer	15-1-0441 P

ANNEX 13

STUDY TOUR PROGRAM

Objectives

To gain familiarity with the organization and operation of food quality control systems in Australia, the Philippines and Thailand.

To obtain information on the development and implementation of food standards.

To gain understanding of the food safety and quality control problems of other countries.

To observe the operation and use of up-to-date equipment for food testing and inspection and to gain insight into the management of food testing laboratories.

Description

The Study Tour will consist of discussions with appropriate officials on food quality control, testing and inspection; and visits to food analysis laboratories.

It will involve a study of the objectives and structural network of the food control system in the country.

Information will be expected on the Food Control Law, the procedure for enacting implementing regulations, the process for establishing and updating food standards, the number and types of standards, the role of various agencies in implementing food standards and regulations, and the uses of quality or trade marks and other schemes to promote quality in the marketing of food.

Information will also be expected on the major food safety and quality control problems, the major fresh and processed foods being inspected, the system for sampling and surveillance, the procedure for import and export inspection and the program for training and strengthening the capability of food inspectors.

The visit to food laboratories should include an opportunity to observe and discuss the management of activities of laboratories conducting the following food analyses: chemical contaminants as aflatoxin, pesticides and toxic metals; food constituents as nitrogen, fats, sugars etc, food additives as colours and preservatives; microbiological contaminants as molds and pathogenic bacteria; extraneous matter as filth; physical and sensory evaluation of foods and food products, relevant rapid methods for food analysis, field inspections and the use of mobile laboratories.

Types Of Food Laboratories To Be Visited

Laboratory for the analysis of food for proximate composition and other constituents.

Laboratory for the analysis of food additives and contaminants, as food colours, preservatives, artificial sweeteners, pesticides, heavy metals and aflatoxin.

Laboratory for the identification of molds as aspergillus and penicillium etc. and for the evaluation of microbial pathogens as Salmonella, Shigella, Staph. aureus, Vibrio cholera, E. coli and food spoilage microorganisms.

Laboratory for the analysis of filth and other extraneous matter.

Laboratory for the physical and sensory evaluation of foods and their packaging materials.

Foods Of Interest To Participants

Fish sauce, soy sauce and other sauces, vinegar and other condiments, canned meats, canned milk and milk products, salt, sugar, dried fruits, spices, noodles, soybeans, peanuts and fresh fruits and vegetables.

Countries And Institutions For The Study Tour And Duration Of Visit

7.1 AUSTRALIA - 8 days

a. Commonwealth Scientific and Industrial Research Organization (CSIRO). Division of Food Processing
Delhi Road, North Ryde, NSW P.O. Box 52

For Discussion Topics 3.1, 3.2 and 3.3
and Laboratory Visits 5.1, 5.2, 5.3, 5.4 and 5.5

b. University of Western Sydney Hawkesbury, Bourke St.
Richmond, NSW 2753, Australia FAX (045) 783979
Attention: Dr. Paul Baumgartner

For Discussion Topics 3.1 and 3.2
and Laboratory Visits 5.1, 5.4 and 5.5

c. Health Department of Western Australia 77-79
Stirline St. Perth 6000 Western Australia
FAX (09) 2279813
Attention: Mr. Wayne Jolly

For Discussion Topics 3.1 and 3.2
and Laboratory Vists 5.1, 5.2 and 5.3

Recommended Coordinator, Dr. Paul Baumgartner.
University of Western Sydney Hawkesbury, Bourke St.
Richmond, NSW 2753, Australia FAX (045) 783979

PHILIPPINES - 7 days

a. Food Development Center, National Food Authority

For Discussion Topics 3.1, 3.2 and 3.3
and Laboratory Visits 5.1, 5.2, 5.3, 5.4 and 5.5

b. Food and Drug Administration, Department of Health
South Superhighway, Alabang, Muntinlupa Metro Manila

For Discussion Topics 3.1, 3.2 and 3.3
and Laboratory Visits 5.1, 5.2, 5.3 and 5.4

c. Bureau of Product Standards, Department of Trade
361 Senator Gil Puyat Avenue, Makati, Manila

For Discussion Topics 3.1 and 3.2

d. Philippine Institute of Pure and Applied Chemistry (PIPAC).
Ateneo de Manila University, Loyola Heights, Quezon City

For Discussion Topic 3.3
and Laboratory Visits 5.1 and 5.2

Recommended Coordinator: FDC (above)

THAILAND - 5 days

a. Department of Scientific Services, Ministry of Science
and Technology

For Discussion Topic 3.3
and Laboratory Visit 5.1 and 5.2

b. Thailand Institute of Scientific and Technological Research
Ministry of Science and Technology

For Laboratory Visits 5.1, 5.2 and 5.3

c. Department of Medical Science, Ministry of Health

For Discussion Topic 3.3
and Laboratory Visit 5.2 and 5.3

d. Food and Drug Administration, Ministry of Health

For Discussion Topics 3.1, 3.2 and 3.3

f. Institute for Food Research and Product Development (IFRPD)
Kasetsart University

For Discussion Topics 3.1 and 3.2
and Laboratory Visit 5.1, 5.3, 5.4 and 5.5

Recommended Coordinator: IFRPD (above)

Participants

No.	Name	Age	Sex	Education	Position at DTDC
1	Pham Duc Thang	52	M	Food Industry University Bulgaria Doctor	Director, DTDC
2	Ngo Dinh Co	53	M	Polytechnic University Hanoi Engineer: Food Engineering	Head of Division for Food Testing and Quality Control
3	Phan Duoc Dong	53	M	Pharmaceutical University Hanoi Pharmacist, Control Testing Specialist	Chief of Laboratory
4	Pham Thi Be Nam	50	F	Canned Food Technical College Russia Doctor - Food Chemistry	Director, South Branch DTDC
5	Vu Van Trieu	44	M	Technische Hochshule Germany Ph.D. - Chemistry	Official, State Committee for Science and Technology

Mr. Phan Duc Thang will be the Study Tour Leader. Mr. Vu Van Trieu will be the official interpreter. In addition, Mr. Van Trieu who has a PhD in Chemistry, will participate in the implementation of the in-country training workshops of the Project as National Expert, per the official recommendation of the Director, DTDC dated June 18, 1990.

PROGRAM FOR THE INTERNATIONAL TRAINING COURSE IN CHEMISTRY
University of Western Sydney, Australia

1. Theoretical :

1.1. Thin Layer Chromatography Method

1.2. Gas Chromatography Method .

1.3. Spectrophotometry Methods

- Atomic Absorption Spectrophotometry
- Flame Emission Spectrophotometry
- UV-Visible Spectrophotometry

1.4. Aflatoxins

2. Practical :

2.1. Determination of moisture by using 4 methods .

- Oven and Vacuum oven method .
- Dean and Stark method (using metter moisture balance) .
- Infrared methods on two samples : soya flour , hazelnut .

2.2. Determination of Kjeldahl nitrogen using the Kjeltec system on two samples : soya flour and hazelnut .

2.3. The examination of Can double seams .

2.4. Determination of fat content in foods by using soxhlet method, on two samples : soya flour and hazelnut .

2.5. Determination of the saponification value of fat and oil on 3 samples : olive oil , sunflower , groundnut .

2.6. Determination of acid value of fat and oil on 3 samples : groundnut , sunflower , olive oil (Virgin) .

2.7. Measuring viscosity using the " Brookfield Synchrolectric

Viscosimeter " on 2 samples : Nestle Condensed Milk and Honey .

2.8. Determination of water activity by using Novasina water activitymeter on 3 samples : Salami sample , Cabanossi , manufactured meat .

2.9. Determination of texture using instron food testing instrument practical on 6 samples : Gala apples , Natsu apples , Jonathan apples , Salami , Devon , Manufactured meat .

2.10. Colour measurement by using NIPPON DENSHOKU colourmeter model ND 20DP . Practical determination on 6 samples : Romano cheese , Dutch gouda , low cholesterol plain ,Salami , Cabanossi , Manufactured meat .

2.11. pH-measurement : determination pH on 4 samples : apple juice , Ginger beer , mineral water , washing water .

2.12. Titration techniques using potentiometric indication pH on 3 samples : HCl , OIH apple juice , coca cola .

2.13. Ion selective electrodes . Determination of 4 samples : apple juice , beer , nature springs , cake .

2.14. Spectrometers UV-VIS instrumentation for determining 2 elements : CO^{2+} , Cr^{3+} .

2.15. Thin layer chromatography practical : determination of aflatoxin B_1 , B_2 , G_1 , G_2 on 2 samples : peanut,maise.

2.16. Gas chromatography . Determination of pesticides in fluit and vegetables on 5 samples : lecture , Broccoli , Asparagus , Navel orange , tomatoes .
Organophosphorus and organochlorene .(2-BHC,8 BHC,BBHC , Heptachlor , 2 Endosede Dieldrin , Pyrethrins , Metalaxyl)

Extraction technique of pesticides residue sample from vegetables and fruits .

Cleaning up techniques.
Paked column method .

2.17. Determination of sulphur dioxide - (SO_2) Iodometric method using the instrument KJETEC SYSTEM on 2 samples : dried apple and wine .

2.18. Determination of sugar : acid ratio using refractometer .

2.19. Pigments are plant materials using TLC on 3 samples : red pepper , red capsicum , tomato paste .

2.20. Determination of ethanol in wine by gas chromatography on 4 samples : big red , lite lager , Tawny Port , Wine Rhine-golde .

2.21. Analysis of breakfast cereal and tea . Determination : iron, calcium , sodium by spectrophotometric method .

2.22. ERROR and statistical methods of date treatment .

2.23. Determination of sodium chloride in cheese using an argento-metric method on 1 sample : creamed cottage cheese .

2.24. Determination of phosphorus in animal food by colorimetry . Sample : animal food " go cat " .

2.25. Quantitative determination of protein in beer (photometric method) . Practiced on 2 samples : beer A and beer B .

2.26. Enzyme determination of glucose on 4 samples : orange juice, sherry , aqueous jam , jam by using photometric method .

2.27. Determination of phosphorus nitrate - nitrate by using the instrument of Hach company U.S.A .

2.28. Determination of mercury in fish by using atomic absorption spectrophotometer .

NSW Dairy Corporation Laboratory .
Chemistry Quality Assurance Laboratory .

1 . Laboratory of Quality Assurance and Safety .

2 . Determination of fat and protein using the MILKO-SCAN .

3 . Determination of fat in milk using the MILKO TESTER .

4 . Determination protein in milk using the PROMILK MKII

5 . Phosphatase test .

6 . Freezing point determination of milk .

7 . Solids - Not - Fat .

8 . Instructional techniques

9 . Summary of standards and quality control procedures .

10. Determination of fat by MILKO-TESTER MK III

11. Determination of fat , protein and lactose by MILKO-SCAN 104

12. Determination of protein by PROMILK MKII

13. Determination of Solids - Not - Fat by Hydrometry .

14. Phosphatase test (Aschaffenburg-Mullen Methods) .

15. Determination of freezing point .

16. Determination of fat by Babcock Method .

ANNEX 15

INTERNATIONAL TRAINING COURSE ON PHYSICAL AND SENSORY EVALUATION OF FOODS

Food Development Center, Manila, Philippines

Part I. Physical Evaluation of Foods

Lecture No. 1 - Physical Indices of Food Quality

2 - Containers and Closures for Canned Foods

3 - Regulations Governing Food Additives

4 - Food Colorimetry

Practical No. 1 - Determination of Gross Weight, Net Weight, Drained Weight, Vacuum, Headspace, Fill and Water Capacity of Container

2 - Can Seam Inspection, Measurement and Evaluation

3 - Identification and Evaluation of Defects in Bottled Foods

4 - Identification and Evaluation of Defects in Bottled Foods

5 - Identification and Evaluation of Defects of Food Packed in Plastic

6 - Testing of Flexible Packaging Material

7 - Testing of Paper and Paper Board

8 - Testing of Bottles and Metal Closures

9 - Testing of Cans

10 - Label Evaluation

11 - Net Weight Determination of Frozen, Peeled and Headless Shell-on Shrimp

12 - Measurement of Size of Frozen, Peeled and Headless Shell-on Shrimps

13 - Exercise on Determination of Granulation of Wheat Flour

14 - Measurement of Color and Color Difference of Food Samples

15 - Consistency Measurement Using Bostwick Consistometer

Part II. Sensory Evaluation of Foods

Table of Contents

Part III. Microanalytical (Filth) Analysis

Lecture No. 1 - Filth in Foods

2 - The Use and Maintenance of Basic Microanalytical Equipment for Filth Analysis

3 - Basic Information on Insects: Structure and Life Cycle

4 - Taxonomy of Insects

5 - Examination of Foods for Microscopic Filth

6 - Format for Reporting Filth Elements

7 - Basic Steps and Procedures in Microscopic Filth Analysis

8 - Hair Structure and Identification

Practical No. 1 - Familiarization with the Parts, Functions and Method of Use of a Magnifying Desk Lamp, a Stereomicroscopic and a Compound Microscope

2 - Familiarization with Insects and Their Parts at Different Growth Stages

3 - Macroscopic Analysis of Filth in Packaged Foods

4 - Microscopic Filth Analysis of Spiked Samples and Preparation of Spikes

5 - Filth Analysis in Various Spiked Food Samples

6 - Preparation of Reference Specimens of Insects and Mites

7 - Identification of Unknown Insects and their Fragments

8 - Identification of Different Kinds of Hair Important in the Analysis of Filth in Foods

9 - Analysis of Food Products for Macroscopic and Microscopic Filth

ANNEX 16

INTERNATIONAL TRAINING COURSE ON MICROBIOLOGICAL EVALUATION OF FOODS

Food Development Center, Manila, Philippines

Lecture No. 1 - The Food Microbiology Laboratory

2 - Basic Laboratory Procedures in the Microbiological Analysis of Foods

3 - Characteristics of Bacteria, Molds and Yeasts

4 - Basic Steps and Techniques in the Microbiological Analysis of Foods

5 - Indicator, Pathogenic and Spoilage Microorganisms in Foods

6 - The Sampling of Food for Microbiological Analysis

7 - Quality Control of Microbial Testing

Practical No. 1 - Cleaning and Disinfection of the Microbiology Laboratory

2 - Evaluating Cleanliness in a Food Microbiology Laboratory

3 - Preparation and Sterilization of Culture Media for Bacteria, Molds and Yeasts

4 - Familiarization with the Use of a Microscope Parts, Functions and Maintenance

5 - Describing Yeasts, Molds and Bacteria under the Microscope

6 - Microscopic Identification of Bacteria

7 - Identification of Yeasts

8 - Identification of Molds

9 - Basic Microbiological Techniques

Exercise 1 - Transferring of Cultures

2 - Techniques for Counting Microorganisms

Daily Schedule for the Microbiological Evaluation of Foods

Types of Foods and Tests for Microbiological Evaluation of Foods

Microbiological Standards for Selected Food Samples

Practical No. 10 - Aerobic Plate Count

11 - Coliforms and E. Coli

12 - Microbiological Examination of Canned Foods

13 - Yeast and Mold Count

14 - Howard Mold Count

15 - Mold Analysis and Identification

Exercise No. 1 - Enumeration and Identification of Aspergillus flavus and Aspergillus parasiticus

Exercise No. 2 - Analysis and Identification of Yeast and Mold in Basic Food Commodities

Exercise No. 3 - Enumeration and Identification of Osmophilic Yeasts

16 - Isolation and Identification of Salmonella Species

17 - Isolation and Identification of *Staphylococcus aureus*

18 - Isolation and Identification of *Vibrio cholerae*

19 - Isolation and Identification of *Vibrio parahaemolyticus*

20 - Enumeration and Identification of *Clostridium perfringens*

21 - Microbiological Analysis of *Bacillus cereus*

22 - Canned Food Spoilage Analysis

23 - Examination of Spoilage in Fruit Juices

Casework No. 1-6 Casework on Microbiological Evaluation of Selected Foods

7 Microbiological Evaluation of Soy Sauce and Fish Sauce

8 Microbiological Evaluation of Fresh Fish and Shellfish

LIST OF PARTICIPANTS TO INTERNATIONAL TRAINING COURSES

No.	Name	Age	Sex	Education	Position at DTQC
A. Chemical and Instrumental Analysis					
1	Nguyen Quang Tuan	35	M	Physics - Hanoi University Postgrad- Hanoi Polytechnic University	Metrological Engineer
2	Nguyen Thi Tinh	41	F	Food Dept. Hanoi Polytechnic University	Chemical Analyst
3	Nguyen Thi Dung	41	F	Chemistry Department Hanoi Polytechnic University	Chemical Analyst
4	Hoang Thi Vinh	42	F	Hygienic Chemistry Hanoi Trade College	Chemical Analyst
5	Ngo Thi Minh Hue	40	F	Food Industry Dept. Hanoi Polytechnic University	Chemical Analyst
6	Ly Thi Dung	40	F	Food Manufacturing Techno. Hanoi Polytechnic University	Chemical Analyst
B. Microbiology					
7	Le Xuan Dich	52	M	Food Department Hanoi Trade College	Technical Advisor of DTQC
8	Mr. Le Tan Thanh	35	M	Biology Department Hue University	Head of Testing Lab.
9	Mrs. Huynh Le Tan	36	F	Technology of Food Dept. Hanoi Polytechnic University	Microbiological Analyst
C. Microanalysis and Physical and Sensory Evaluation					
10	Phan Ngoc Thu	51	M	Food Department Hanoi Polytechnic	Chief Inspector
11	Nguyen Thi Hanh	42	F	Food Department Hanoi Trade College	Food Analyst
12	Nguyen Thi Van Anh	41	F	Food Manufacturing Tech. Hanoi Polytechnic Univ.	Analyst of Food
13	Lai Van-Ty	39	M	Foodstuff Department Hanoi Polytechnic	Food Inspector
14	Thai Thi Tuat	43	F	Hanoi Trade College Commercial Food Department	Food Quality Controller

ANNEX 18

Topics, Number of Participants and Experts for the In-Country Training Program

a) In-Country Training in Microbiology

i. Isolation and identification of fungi and their recognition and enumeration. 18 September to 3 October, 1992.

ii. Isolation and identification of food spoilage and pathogenic bacteria, 5-31 October, 1992.

Number of Participants: Five participants and seven observers

Expert: Mr. Allan Reilly
Head, Food Safety Section
Natural Resources Institute, London

b) In-Country Training in Chemistry

i. Analysis of Pesticides by Gas Liquid Chromatography (GLC) and Thin Layer Chromatography (TLC), 9 to 20 February, 1993.

ii. Analyses of Trace Elements - Heavy Metals by Atomic Absorption Spectroscopy (AAS), 22 to 26 February, 1993.

iii. Mycotoxin Analysis by Thin Layer Chromatography in Food and Feedstuffs, 1 to 13 March 1993.

iv. Analysis of Food Additives, 15 to 25 March 1993.

Number of Participants: 12

Expert: Dr. Edward Kaminski
Professor Dr. of Food Technology Institute
The University of Agriculture
Poznan, Poland

c) In-Country Training in Instrumentation

Expert: Dr. Dusan Kordich

ANNEX 19

ITEMS TO BE PURCHASED FOR DTGC HQMC
(1/3/93)

Equipment

		USD
1.	Kjeldahl distillation assembly	1400
2.	Macro Kjeldahl twin unit with portable digestion rack	2105
3.	pH meter (with 2 spare electrodes)	450
4.	Refractometers (3 ranges)	700
5.	Magnifier lamp	45
6.	TLC Starter Kit and TLC Sheets	500
7.	Single Beam Spectrophotometer	5200
8.	Forced draft oven	1900
9.	Compound microscope	1641
10.	Water bath	247
11.	Anaerobic system	850
12.	Incubators (2 units)	1170
13.	Colony counter hand held	250
14.	Autoclave 10 gallons (local purchase)	200
	TOTAL	16658

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* Specifications for the above equipment are in the CTA Mission Report February 6-22, 1993.

ANNEX 20

LIST OF PEOPLE MET

DTQC and Food QC and Research Institutions

1.	Mr. Phan Duc Thang	- National Project Director Director, DTQC
2.	Mr. Ngo Dinh Co	- Project Secretary Head, Division of Food Testing and Quality Control, DTQC
3.	Mr. Phan Quoc Dong	- Chief of Laboratory, DTQC
4.	Mr. Le Xuan Dich	- Deputy Director, DTQC
5.	Mr. Phan Ngoc Thu	- Head of the Consumer Goods Section, DTQC
6.	Analysts and Inspectors of the Food Section	- DTQC, Hanoi
7.	Dr. Pham Thi Be Nam	- Director, DTQC South Branch HCMC
8.	Mr. Le Minh Tam	- Deputy Director, DTQC South Branch HCMC
9.	Dr. Ing. Nguyen Huu Thien	- Director, Regional Center for Standardization, Metrology and Quality Control, GDSMQC Center III, HCMC
10.	Dipl. Eng. Le Cam Nhung	- Vice Director, Regional Center for Standardization, Metrology and Quality Control, GDSMQC Center III
11.	Dr. Ngo Thi Mai	- Director, Food Industry Research Institute

Government Officials

12.	Minister Le Xuan Trinh	- Chairman, Council of Ministers
13.	Prof. Nguyen Quang Quynh	- Vice Minister, Min. of Trade & Tourism
14.	Dr. Pham Gia Khiem	- Vice Minister State Planning Committee
15.	Dr. Vu Van Trieu	- Officer of the State Committee of Science

UNDP/UNIDO Officials

16.	Mr. Michel P. Gautier	- Deputy Resident Representative, UNDP
17.	Mr. Jean Marc Bonnamy	- UNIDO Country Director, 1990-1992
18.	Mr. Michael J. Meixner	- UNIDO Country Director, 1992-1993
19.	Mr. Preben Hjortlund	- UNIDO Field Officer, Deputy to the Country Director
20.	Ms. Sandra Unegbu	- Program Officer, UNIDO
21.	Mr. Tran Trong Phung	- Program Officer, UNIDO
22.	Ms. Karina Immonen	- Program Officer, UNIDO
23.	Ms. Anja C. Latacz	- Program Officer, UNIDO
24.	Dr. Dusan Kordich	- Project Expert in Instrumentation
25.	Prof./Dr. Edward Kaminski	- Project Expert in Chemistry

ANNEX 21

COMMENTS BY THE PROJECT BACKSTOPPING OFFICER

Ms. A. Lustre, as the project CTA (Chief Technical Adviser), was recruited to coordinate all the project activities including the supply, installation and test performances of the equipment as well as the implementation of the training programmes and productive use of the new laboratory facilities for testing and quality control activities.

She has achieved her tasks through 8 split missions from 1990 to 1993 in coordination with the national counterpart, the Department of Quality Control and Metrology (DTQC) at the Ministry of Trade, and three international experts.

The implementation activities of the project have encountered a lot of difficulties, mainly caused by the American trade embargo, the inability of some suppliers to deliver the needed items and communication problems. In spite of these facts the project objectives have been achieved in a satisfactory manner, which resulted in a substantial improvement of DTQC's facilities for food testing. The tests are now carried out with increased productivity, reliability and safety.

Ms. Lustre's report shows, however, also some deficiencies of the project:

- Some equipment items, chemicals and books are still missing (a list is annexed to the report) and should be purchased;

- The skills of the DTQC staff in the use of the GC and in international food analysis methods should still be strengthened more;

- The organization and management of the DTQC laboratory should be improved;

- The DTQC South Branch in Ho Chi Minh City should be upgraded.

Moreover, she gives an excellent description of the role of the Government in quality control of food and precious recommendations on how the DTQC can make the best use of its new capabilities to play an effective role in food quality control in Vietnam, i.e. how the project objectives can be achieved under the new institutional setting.

Obviously, Ms. Lustre's report calls for a project follow-up, not only to correct the deficiencies raised above, but mainly to make the DTQC's quality control programme relevant to the problems and requirements created by the new marketing system. This, of course, could be done only within the framework of a food quality control network involving all the institutions, Government agencies and laboratories dealing with food quality control in Vietnam.

It goes without saying that Ms. Lustre's excellent project terminal report is acceptable to UNIDO's Agro-based Industries Branch, it is an important contribution to the strengthening of food quality control in Vietnam.