

Cambodia Market Study – Potential Food Vehicles for Micronutrient Fortification



Prepared by:
Craig MacKay
On behalf of Academy for
Educational Development (AED)
and USAID's A2Z Micronutrient and
Child Blindness Project.
June 2007

Table of Contents

| | |
|---|-----------|
| 1.0 EXECUTIVE SUMMARY..... | 4 |
| 1.1 OBSERVATIONS/RECOMMENDATIONS | |
| 2.0 DATA SOURCES AND LIMITATIONS OF STUDY..... | 6 |
| 2.1 DATA SOURCES | |
| 2.2 LIMITATIONS | |
| 3.0 THE FISH SAUCE MARKET..... | 9 |
| 3.1 OVERVIEW | |
| 3.2 PRODUCTION/PROCESSING | |
| 3.2.1 INFRASTRUCTURE/EQUIPMENT | |
| 3.2.2 INGREDIENTS/INPUTS | |
| 3.2.3 PROCESSING METHODS | |
| 3.2.4 QUALITY CONTROL | |
| 3.3 MARKET STRUCTURE | |
| 3.3.1 PRODUCERS | |
| 3.3.2 MAJOR BRANDS/GRADES/PRICING | |
| 3.3.3 LABELING: EXAMPLES FROM MAJOR PRODUCERS | |
| 3.3.4 CONSUMERS | |
| 3.3.5 DISTRIBUTION | |
| 3.3.6 TRADE | |
| 3.3.7 GOVERNMENT REGULATION/QUALITY CONTROL | |
| 3.4 PROFILE: IRON FORTIFIED FISH SAUCE PRODUCTION – A PUBLIC/PRIVATE SECTOR PARTNERSHIP BETWEEN RACHA AND I CHE-NGOUV HENG FISH SAUCE PRODUCTION | |
| 3.5 MARKET CONSIDERATIONS/RECOMMENDATIONS - FORTIFICATION | |
| 4.0 THE SOY SAUCE MARKET..... | 22 |
| 4.1 OVERVIEW | |
| 4.2 PRODUCTION/PROCESSING | |
| 4.2.1 INGREDIENTS/INPUTS | |
| 4.2.2 PROCESSING METHODS | |
| 4.2.3 QUALITY CONTROL | |
| 4.3 MARKET STRUCTURE | |
| 4.3.1 PRODUCERS | |
| 4.3.2 MAJOR BRANDS/GRADES/PRICING | |
| 4.3.3 LABELING: EXAMPLES FROM MAJOR PRODUCERS | |
| 4.3.4 CONSUMERS | |
| 4.3.5 DISTRIBUTION | |
| 4.3.6 TRADE | |
| 4.3.7 GOVERNMENT REGULATION/QUALITY CONTROL | |
| 4.4 MARKET CONSIDERATIONS/RECOMMENDATIONS - FORTIFICATION | |
| 5.0 THE INSTANT NOODLE MARKET..... | 26 |
| 5.1 OVERVIEW | |
| 5.2 PRODUCTION/PROCESSING | |
| 5.2.1 INGREDIENTS/INPUTS | |
| 5.2.2 PROCESSING METHODS | |

| | | |
|-------|--|--|
| 5.2.3 | QUALITY CONTROL | |
| 5.3 | MARKET STRUCTURE | |
| 5.3.1 | PRODUCERS | |
| 5.3.2 | MAJOR BRANDS/GRADES/PRICING | |
| 5.3.3 | LABELING: EXAMPLES FROM MAJOR PRODUCERS | |
| 5.3.4 | CONSUMERS | |
| 5.3.5 | DISTRIBUTION | |
| 5.3.6 | TRADE | |
| 5.3.7 | GOVERNMENT REGULATION/QUALITY CONTROL | |
| 5.4 | PROFILE – INTERNATIONAL RELIEF AND DEVELOPMENT CAMBODIA’S <i>MEE DARA</i> FORTIFIED INSTANT NOODLES | |
| 5.5 | MARKET CONSIDERATIONS/RECOMMENDATIONS - FORTIFICATION | |

6.0 THE WHEAT FLOUR MARKET..... 32

| | | |
|-------|--|--|
| 6.1 | OVERVIEW | |
| 6.2 | PRODUCTION | |
| 6.2.1 | INGREDIENTS/INPUTS | |
| 6.2.2 | PROCESSING METHODS | |
| 6.2.3 | QUALITY CONTROL | |
| 6.3 | MARKET STRUCTURE | |
| 6.3.1 | PRODUCERS | |
| 6.3.2 | MAJOR BRANDS/GRADES/PRICING | |
| 6.3.3 | CONSUMERS | |
| 6.3.4 | DISTRIBUTION | |
| 6.3.5 | TRADE | |
| 6.3.6 | GOVERNMENT REGULATION/QUALITY CONTROL | |
| 6.4 | PROFILE – MEN SARUN FLOUR MILL PILOT FLOUR FORTIFICATION PROGRAM | |
| 6.5 | MARKET CONSIDERATIONS/RECOMMENDATIONS - FORTIFICATION | |

7.0 THE VEGETABLE OIL MARKET.....35

8.0 THE SUGAR MARKET.....36

9.0 ATTACHMENTS

ATTACHMENT – 1: FISH SAUCE SAMPLE BULLETIN OF ANALYSIS – MINISTRY OF INDUSTRY, MINES AND ENERGY

ATTACHMENT – 2: SOY SAUCE SAMPLE BULLETIN OF ANALYSIS – MINISTRY OF INDUSTRY, MINES AND ENERGY

ATTACHMENT – 3: CAMBODIA COUNTRY REPORT OF FOOD SAFETY – FAO/WHO REGIONAL CONFERENCE ON FOOD SAFETY FOR ASIA AND THE PACIFIC SEREMBAN, MALAYSIA, 24 – 27 MAY, 2004

1.0 Executive Summary

This study has been conducted over a ten day period (June, 2007) on behalf of the Academy of Educational Development (AED) and USAID's A2Z Micronutrient and Child Blindness Project. The A2Z project is designed to implement and strengthen micronutrient programs to improve the nutrition and health of vulnerable populations, provide global technical leadership in micronutrients, and support organizations which work to prevent child blindness.

The purpose of the study is to provide a detailed market analysis of six staple processed foods widely consumed in Cambodia to assist in determining appropriate vehicles for micronutrient fortification. Each food type has been chosen due to its potential of being utilized as vehicle for micronutrient fortification on an industrial scale. "Industrial scale" refers to factory-based production and focuses on the largest local producers of a given processed food in the market. Working with large producers facilitates the development, implementation and monitoring of commercially-based fortification initiatives targeted to a wide population.

The study focuses on three areas: (a) Market structure: producers and consumers, branding, grades and pricing, distribution, and trade (b) Industrial capacity: production/processing methods, inputs/ingredients, infrastructure/equipment and quality control (c) Government regulations and regulatory environment for the food processing industry. The study also profiles some fortification initiatives that are currently being implemented by NGOs in partnership with the private sector in Cambodia.

The main observations/recommendations of the study are summarized below. One overall impression that the author wishes to communicate is that organizations should not be focusing on one solution or one product as the panacea with regards to food fortification in Cambodia. Organizations have a unique opportunity to develop initiatives and assist in setting standards in partnership with a local food processing industry that is young, weak, growing, and in its early stages of development. Organizations can also play an important role in working with and assisting the national government in building capacity to regulate and enforce food safety measures.

1.1 Observations/Recommendations:

- 1) A detailed consumption study of potential fortification vehicles should be conducted in order to provide more accurate per capita urban and rural consumption patterns.
- 2) Both fish and soy sauces have the greatest potential of all staple foods analyzed in this report to develop into successful vehicles for fortification. Fish sauce fortification would reach a wider population – particularly rural populations - as soy sauce is considered a food consumed predominantly in urban areas. Thus, a large-scale iron fortification initiative of fish/soy sauces should be considered. Initially, organizations should work with large producers to develop a program that initially targets lower grades of sauces to benefit low-income consumers.

Additionally, in partnership with producers, NGOs and Government of Cambodia National Council for Nutrition/National Sub-Committee for Iron Deficiency Anemia (IDA), a fish/soy

sauce producers association should be developed/mobilized allowing wide participation by stakeholders.

3) In spite of a low per capita rate of consumption (about 14 x 60-80 gram packages per person per annum), and competition from Vietnamese imports, local instant noodle production and consumption in Cambodia is growing substantially. The country's only local producer, President Foods Cambodia, has increased production by 100% since 2002 and will be again increasing production by 80 – 100% this year. Organizations should consider working with PFC to:

(a) Produce a low-cost fortified instant noodle (along the same lines as International Relief and Development's USDA-funded "Mee Dara" noodle program). This could be developed through a social marketing program and would involve subsidizing the production until the brand could achieve sustainability. (b) Work with PFC to fortify the current production of Mama noodles – micronutrients could be added to the sachets.

4) Cambodia is a net-importer of vegetable oils - there are currently no industrial producers for domestic market consumption nor are there any refining facilities in the country. The only local producer, Mong Reththy Group, exports crude palm oil and is not planning on building refining facilities in the foreseeable future. Therefore, any fortification initiatives utilizing vegetable oils must be initiated in source countries (Indonesia and Malaysia)

5) Cambodia is a net-importer of refined sugar – there are no industrial producers nor refining facilities in the country. However, Mong Reththy Group is planning to build a \$50 million sugar refinery to begin operations in December 2008. Thus, it would be constructive to initiate discussions with the company concerning the potential of sugar fortification. If planned production figures are accurate, Cambodia could, in future, meet about 40% of its consumption requirements through local production.

6) Although the per capita consumption rate of wheat flour is low (about 4 kgs per capita per annum), flour production is growing at an estimated 5% per year. The two local flour mills provide 70% of Cambodian market share. Considering the interest of Men Sarun Flour mills in providing fortified flour to its Cambodian consumers, it would be constructive to engage the second mill, Asia Flour Mills, to develop a voluntary fortification program. This would provide another vehicle which can be combined with other strategies to increase micronutrient levels in the Cambodian diet.

2.0 Data Sources and Study Limitations

2.1 Data Sources

The author would like to thank the following individuals who agreed to be interviewed for this study:

Mr. Mam Borath - Deputy Director of Social Planning Department - Ministry of Planning – Government of Cambodia - National Council for Nutrition (NCN)
Dr. Chamnan Chhoun – Deputy Director - IFReDI (Inland Fisheries Research and Development Institute, Department of Fisheries, Government of Cambodia)
Mr. Chea Dara – Deputy Director - Department of Medium and Small Industry, Ministry of Industry, Mines and Energy, Government of Cambodia
Mr. Mey Dararith - International Business Manager - Men Sarun Import/Export Company
Ms. Ligaya Diaz – Food Technologist – International Relief and Development Cambodia
Mr. David (Manager) – New Ruby Inc.
Ms. Mary Dunbar – Resident Advisor - A2Z Program - AED Cambodia
Ms. Adriana Guinand – Director – International Relief and Development Cambodia
Mr. Heng Sok Ros – Managing Director – Heng Heang Enterprises
Mr. Thai Hongkheat – Owner – Thai Hongkheat Fish Sauce Production
Mr. Henri Igor – Chairman - Asia Flour Mills
Mr. Peter Kaufmann - CIM Advisor for Food Security and Rural Livelihoods - Council of Agricultural and Rural Development – CARD Cambodia
Ms. Ly Keang – Director - Pheng Ly Soy Sauce Enterprise
Mrs. Lim Kheat - Co-owner - You Heng Fish Sauce Production
Mr. Cheng Lykang – Manager - President Foods Cambodia Co. Ltd
Mr. Suras Mahatanarat - Vice-President - Mong Reththy Group
Technician – Meng Sun Fish Sauce Production (Owner: Mr. Ea Mengsun not available)
Ms. Keo Mom – Director - LYLY Food Industries
Mr In Sambo – Deputy Director – General Department of Industry, Industrial Laboratory Center of Cambodia (ILCC), Ministry of Industry, Mines and Energy, Government of Cambodia
Mr. Loch Sareth – President - Tigaroda (Cambodia)
Mr. Chan Shitha - Owner - I Che-Ngouv Heng Fish Sauce Production
Mr. Nhoem Sokim – Manager – Thieng Seng Fish Sauce Production
Mr. Seak Sophat – Department of Environmental Science - Royal University of Phnom Penh
Mr. Sek Sopheanarith - Development Assistance Specialist, Child Health and Nutrition, Office of Public Health - USAID Cambodia
Mr. Thor Sensereyvorth – Statistics Officer – Department of Fisheries – Ministry of Agriculture, Forestry and Fisheries, Government of Cambodia
Dr. Sol Sowath - Provincial Coordinator – Racha Kampot – RACHA Cambodia

The following documents were consulted:

An Intervention Trial of Iron Fortified Fish Sauce
in Iron Deficiency Anemic (IDA) School Children
Aged 6 to 21 Years In Kampot, CAMBODIA
FSNPSP - GTZ

Longfils P, Monchy D, Weinheimer H, Schümann K

Cambodia's Fish Processing and Marketing and Distribution
of Fish and Fishery Products, focusing on Market Opportunities
and Export Potentials – Department of Fisheries,
Ministry of Agriculture, Forestry and Fisheries,
Cambodia - February, 2001

Cambodia Post-Harvest Fisheries Overview
Community Fisheries Development Office,
Department of Fisheries,
Ministry of Agriculture, Forestry and Fisheries,
Government of Cambodia 2005

General Population Census of Cambodia 1998 – National Institute of Statistics, Ministry of
Planning, Government of Cambodia

Micronutrient Fortification For Countries in Western Pacific Region – Report Prepared for WHO
Western Pacific Regional Office. Rosalind S. Gibson.

Nodal Study 8 - Fish Sauce Production and its Role in Employment and Food Security Under the
Support of Cambodia Post-Harvest Fisheries Livelihood Project –
Seak Sophat
Department of Environmental Science
Royal University of Phnom Penh

Private Sector Assessment for the Kingdom of Cambodia
MIME - TA Report for the Asian
Development Bank TA No. 4030 - Dec. 2003

Production and Quality Assurance
For Iron Fortified Fish Sauce and Soy Sauce
RACHA and ILSI CHP Japan
Power point presentation – 2006

Report of Mission
Opportunities for Micronutrient Fortification of Foods in Cambodia
September 24 to October 5, 2001
Peter Ranum - Consultant to UNICEF, Cambodia

Second Annual Progress Report of the Five-Year Cambodia Nutrition Investment Plan (CNIP/2003-2007) - Ministry of Planning/National Council of Nutrition. Government of Cambodia

Socio-economic Assessment of Freshwater Capture Fisheries of Cambodia: Report on a household survey. Ahmed, M., N. Hap, V. Ly and M. Tiongco, 1998.. Mekong River Commission. Phnom Penh, Cambodia.

Other Data Sources

UN Food and Agriculture Organization (FAO)
Ministry of Commerce, Government of Cambodia

2.1 Limitations

It will be evident to the reader that some sections of foods profiled in this report contain more information than others. This is based upon both time constraints and the fact that there is little secondary information available on the food processing industry in Cambodia. A majority of the information gathered was through interviews with private sector stake-holders. Time constraints speak to the fact that the duration of the study was ten days in total. Vegetable oil and sugar industries were examined in a cursory way as Cambodia is a large net importer of both products in a refined state and therefore any fortification initiative would need to be developed in source countries of production. At this time of writing, the author has yet to receive import statistics for wheat, vegetable oil and sugar from the Department of Customs and Excise, Government of Cambodia. Therefore, import volumes are based upon FAO statistical information.

The greatest difficulty encountered in conducting this study was accessing accurate consumption statistics/information. There is minimal secondary source information on consumption levels or demographics of consumption, and a detailed consumption study is beyond the scope of this study. As well, distributors were found to be unwilling to provide (and in most cases to discuss) information particularly related to end distribution points of products/quantities.

3.0 The Fish Sauce Market

3.1 Overview

The fisheries sector plays a vital role in both economy and food security in Cambodia. For many Cambodians, fish accounts for more than 75% of their protein intake. Cambodians consume on average 67 kg of fish annually in fishing dependent communities and 13 kg per capita/year based upon the national average.¹ An important component of fish consumption is processed fish products which consist of fish paste (*Prahok*), smoked fish, sun-dried/salt dried fish and fish sauce. Both fish paste and fish sauce are considered “preferred foods” and are consumed as condiments on a daily basis by both urban and rural Cambodians. At meal times, fish sauce is usually placed in a small dish on the table mixed with garlic and chili. It is generally consumed with baked fish, beef or chicken, and rice.

Fish sauce in Cambodia is produced from both in-land (fresh water) fish and marine (ocean) fish. Freshwater fish sauce is produced in the 13 provinces surrounding the Tonle Sap Great Lake and along the Mekong river systems. Marine fish sauce is produced in three coastal provinces-municipalities (Koh Kong, Kampot and Sihanoukville). In-land fish sauce processing facilities are situated close to Dai fisheries² and freshwater fishing lots along the Tonle Sap river in Phnom Penh and Kandal province, while marine production is located close to landing sites in Sihanouk Ville and Kampot where anchovy landings are abundant.

There are three size classifications of fish sauce production in Cambodia - large, medium and small. Large scale production was reportedly introduced from Vietnam in 1940 and involves substantial investment costs, labour and the processing of large quantities of fish by a hydrolysis method. The large scale fish sauce producers are mostly found in Phnom Penh and Kandal province along the Tonle Sap and Basac rivers, and along the coast in Kampot and Sihanoukville. Medium and small-scale processing is practiced around the Tonle Sap Great Lake, along the Mekong River and the coast. Medium scale production is predominantly family-based processing and sauce production is used for both home consumption and is sold commercially in local markets. Due to competition from large scale producers and economies of scale, there is very little medium scale production in the inland fishery areas

Prakas (declaration) No. 0002 Bro Kor-Kor Sor Kor 1989 of MAFF³ provides some guidance re: size classifications of fish sauce production:

1) Large scale: The annual fish input is always more than 50 metric tons. Sauce is produced for relatively high operational costs. Operation requires a license from MIME.

¹ Seak Sophat – *Nodal Study (Working Paper 8) – Fish Sauce Production and its Role in Employment and Food Security*. Ministry of Agriculture, Forestry and Fisheries – Department of Fisheries – Government of Cambodia

² DAI fisheries – the term dai describes a form of anchored bag net or stationary trawl fishing technique to capture fish migrating downstream through the Tonle Sap River. See *An Economic Analysis of Fish Production in Dai Fisheries in Phnom Penh and Kandal Province, Cambodia*. Hap Navy and Ngor Peng Bun – Department of Fisheries – Government of Cambodia.

³ Source: Ministry of Agriculture, Forestry and Fisheries – Government of Cambodia

2) Medium scale: The annual fish input is less than 50 metric tons. Sauce is produced using a boiling process mainly for commercial purposes. Investment is much lower in equipment, raw materials and labour compared to large scale production. A license to run the business is also required and is issued by either provincial or central government institutions (Department of Fisheries and MIME).

3) Small scale: The annual fish input is less than one ton. Production is done using a boiling process usually by a household. The sauce is used for home consumption and exchanged for food and other basic supplies. No license is required.

Generally, three to five grades of fish sauce are produced by large-scale factories. High income consumers from urban areas prefer the premium grades made from marine species, while the lower grades (inland and marine) are consumed by the poor in both urban and rural areas.

There is no fish sauce producers association in Cambodia although some of the large producers are members of Phnom Penh Small and Medium Industry Association and Kampot Small and Medium Enterprise Association

3.2 Production/Processing⁴

3.2.1 Infrastructure/Equipment

The factory building is generally constructed of concrete with an iron sheet roof with an area ranging from 3,000 to 5,000 m². The factory houses tanks used to ferment fish for sauce production and other assorted equipment. The factories use both concrete tanks and wooden drums, but preference is for concrete tanks which have a greater storage capacity, and there is a lower risk of spoilage or breakage. On average, a concrete tank has a capacity of between 30 to 50 metric tons of fish, while wooden drums have an average capacity of 10 tons. Some processors use a combination of concrete tanks and wooden drums. A factory usually has from 20 to 70 tanks and from 20 to 40 wooden drums. Typical equipment used for fish sauce production includes bamboo and plastic baskets, filter mats, bamboo stick beam filters, wood planks for compressing, pumps, jars, generators, and plastic tubing/piping.



Concrete production tanks



Wooden drums

⁴ For a more detailed account of fish sauce production and processing methods, see Seak Sophat – *Nodal Study (Working Paper 8)* which is the source of the information presented here.

3.2.2 Ingredients/Inputs

Fish

Fish is the most important raw material for production of fish sauce, followed by salt. Fish is legally classified into three grades (No. 1, 2 and 3) by the fisheries administration. The grades are determined according to commercial value and size. Third grade fish is small in size ranging from 6-7 cm in length. For freshwater fish sauce production, only third grade and non-grade (fish which is not graded into either 2 or 3 grades) fish is used. The fish species commonly utilized for fish sauce are those of Trey Riel, Trey Linh, and Trey Khnawng Veng. Marine fish sauce producers utilize anchovy.

Inland fish sauce producers buy fish from Dai fisheries and fishing lot operators during the peak fishing season of January and February. Fish sauce producers must compete with large traders who purchase fish for export to Vietnam and from provincial buyers who process fish. Large scale processors purchase about 100 – 1000 MT per year.

Salt

All fish sauce producers interviewed purchase salt from the Salt Producers Community of Kampot and Kep in Kampot province, a monopoly salt producer in the country. As per Cambodian law, the marketed salt must be iodized. Common practice in fish sauce processing is a fish to salt ratio of about 3:1. The salt concentration is increased to a 1:1 ratio as salt water is added from 4 to 6 times during processing to extract additional fish juices.

Other Ingredients/Additives

Sugar, MSG and caramel (colouring agent) are complementary ingredients added to fish sauce prior to bottling. The quantity of these ingredients used is variable depending on the grade of fish sauce and the practices of the processor.

3.2.3 Processing Methods

Processing methods for fish sauce production are almost identical for each factory visited. The key stages in processing are controlled by fermentation of the fish using salt and then extraction of soluble protein from the fish salt mixture using salt water. The circulation time for inland fish sauce production takes up to 6 months from February till June or July, while for marine production it is up to 12 months from January until December.

Preparation of filters located in storage tanks varies slightly from factory to factory. Some factories place horizontal filters at the bottom of the tank/drum and others place filters vertically, extending to the surface. Some factories use bamboo sticks or plastic Styrofoam, pieces of broken jar or stone and reed mats to make the filter. Filters are installed to facilitate sufficient flow of liquid to obtain a fine juice. The tank is drilled with a number of holes (10 to 20 cm in

diameter) in the bottom and these are fitted with plastic taps to regulate the flow of soluble extract. The bottom of the concrete tank is covered with pieces of broken jar or gravel (about 70 kg), and then a reed mat followed by a layer of salt

Fish is stored in the tanks and salted at the ratio of 3:1 fish to salt. A layer of fish is covered with a layer of salt. The fish are not cleaned, scaled or gutted. The top of the tank/drum is covered with a layer of salt 10 cm thick to prevent flies laying eggs. Finally, pieces of mats and wood planks are laid on top of the salt layer. The wood planks are used to compress the fish mass and to avoid an overflow of soluble fish extract when it is being fermented.

After the compression work is finished, the fish salt mixture is left to ferment and the tap is opened to let the fish juice or extract flow into the small collecting tank/drum attached. Once it is full, the first juice is pumped back and added into the fermenting fish tank/drum. The juice is re-circulated for at least 4-5 months to obtain fine fish juice. The duration of this process can be up to a year or more for marine fish sauce production. During the circulation process, the fat or oil from the fish separates out and floats on the surface of the tank. The fat is skimmed out. Every two months, the mats are removed and cleaned of fat. For marine fish sauce production, fat is not taken out as anchovy does not contain a high level of fat, however the mats are regularly cleaned.

After the circulation of fish juice over a period of 4-5 months, the first extracted juice is transferred to the tank/jar stored and kept in sunlight. The first extract is considered the highest quality fish sauce and is not sold. It is mixed with the second extract of juice to produce the first fish sauce, the third extract to make the second sauce and so on.

Once the first extract is completed, the remaining fish residue is turned over and pre-prepared brine is added or a mixture of salt and water at a ratio of 1:3 is added. The mixture is left to become transparent and then is pumped onto the fish residue in extracting tanks. Re-circulating of the second extract is generally conducted for 10 days to one month. The second extract is transferred to a storage tank. This is the first grade fish sauce. The extraction by adding salt water to the fish residue is normally repeated five or more times, until the extracted juice becomes transparent and identical to brine.

After the extraction process has been completed, the second to fifth extracted juice is mixed with the first extracted juice to produce the first, second, third, and fourth grade fish sauce respectively. These sauces are cured in the sun to improve the smell and taste. This stage of the process varies from factory to factory. Some processors cure all the extracted juice in the sun prior to mixing with the first extract to produce several grades of sauce.

Prior to bottling, all grades of fish sauce have sodium glutamate added, sugar and colouring agents (caramel or scorched sugar). Amounts of additives used depend on the fish sauce grade and practice of processors.

After storage in tanks/jars exposed to the sun, the sauce is bottled. Plastic and glass bottles are purchased through local markets and waste collectors and cleaned at factory prior to bottling of sauce. First and second grade sauce is packaged in transparent glass or plastic bottles of 750 ml.

Grades 3 – 5 are bottled in either 750 ml glass/plastic or 20 – 30 liter plastic jugs or cans. After labels are put on bottles, 6 bottles are tied together with plastic rope ready for distribution



Bottling - Thieng Seng fish Sauce Production

3.2.4 Quality Control

None of the processors interviewed had any sort of laboratory or lab testing equipment to test their products. Quality control is primitive – and essentially a “good” fish sauce is judged based upon sight and taste by the factory owner.

From the government side, fish sauce products from large producers are tested every three months by officials from the Ministry of Industry, Mines and Energy (MIME). MIME officials visit factories to take samples of each fish sauce brand/grade marketed. Sampling costs producers between \$15-30 per sample. After samples have been analyzed and approved, MIME sends the producer a certificate of approval. A sample analysis certificate from MIME for fish sauce can be found in attachment 1 of this report.

MIME has its own laboratory in Phnom Penh and tests fish sauces for the following:

Table 1: MIME Standards for Fish Sauce

| Properties | MIME Standard – Permissible level |
|--------------------|--|
| pH | 4.0 – 8.0 |
| Density | 1.150 – 1.250 g/cm ³ |
| Acid (Acetic Acid) | 2 – 7.8 g/l |
| Salt | > 200 g/l |
| Total Nitrogen | > 10 g/l |

MIME also publishes a book of standards for fish sauce.

3.3 Market Structure

3.3.1 Producers

The Department of Fisheries (DoF) reported that fish sauce production in 2005 was estimated at 12,260,000 litres (10.38 million litres from freshwater fisheries and 1.88 million litres from marine fisheries). Of provinces producing fish sauce, Phnom Penh is estimated to produce about 4 million litres, Kampong Cham province 2 million litres, Kandal province 1.6 million liters, Kampot 785,000 liters and Sihanoukville 1.08 million litres (DoF, 2005).

In general terms, 4 kg of fresh fish can produce 1 litre of first extract juice which is mixed with subsequent extracts to produce the desired grades of fish sauce.⁵ A factory which processes 100 tons of fish produces about 400,000 litres of fish sauce per production cycle. As listed in the table below, the three largest fresh water fish sauce producers in the country are Thieng Seng , Chroy Chongva and Thai Hongkheat. Each of these producers is located in Phnom Penh/Kandal and utilize over 500 - 1000 MT of fish per year. The largest marine fish sauce producers are I Che-Ngouv (Kampot) and Tomnub Rolok (Sihanoukville). It is estimated that the largest marine producers are utilize 300 – 500 MT of fish per year.

Table 2: Nationwide Production of Fish Sauces (2002 – 2005) in millions of liters⁶

| Year | 2002 | 2003 | 2004 | 2005 |
|-----------------------------------|------|-------|-------|-------|
| Fresh Water Fish Sauce Production | 7.4 | 9.37 | 9.21 | 10.38 |
| Marine Fish Sauce Production | 1.6 | 1.582 | 1.844 | 1.88 |

While producers were not forthcoming about exact production volumes, it is estimated that the largest producers are processing between 100,000 and 200,000 liters of fish sauce per month. Large scale producers employ 15 – 30 permanent workers which include 1- 2 production specialists.

⁵ Seak Sophat – *Nodal Study (Working Paper 8)*

⁶ Source: Ministry of Agriculture, Forestry and Fisheries – Department of Fisheries. NOTE: Fishery officials from the DoF suggested informally that these statistics may not represent the real production volumes and should be seen as estimates. The estimates are largely based on previous years' production and availability of the third grade fish catch. The findings are rarely discussed with processors. Indeed, it is clear from our discussions with processors that these production volumes are understated.

Table 3: Large Scale Fish Sauce Producers - Cambodia

| Producer | Location |
|--|---|
| Chroy Chongva Fish Sauce Production | Deimkor Village, Chroy Chongva Commune, Russey Keo District, PP |
| Thieng Seng Fish Sauce Production | Ouandoung Village, Prekbra Commune, Meanchay District, PP |
| Meng Sun Fish Sauce Production | #270, St.369, Chroy Basak, Prekbra Commune, Meanchey District, PP |
| Thai Hongkheat Fish Sauce Production | Duong Village, Prekphnauv Commune, Phunhealeu District, Kandal |
| Meng Biheng Fish Sauce Production | Duong Village, Prekphnauv Commune, Phunhealeu District, Kandal |
| Trey Dobmauy Fish Sauce Production | Meattapheap Village, Russey Keo Commune, Russey Keo District, PP |
| I Che-Ngouv Heng Fish Sauce Production | Taang Village, Tray Koh Village, Kampongbay District, Kompot |
| You Heng Fish Sauce Production | Thvi Khangtboung Village, Andoung Khmer Commune, Kampong Bay District, Kompot |
| Tomnub Rolok Fish Sauce Production | Group#20, Mondul I, Commune I, Mittapheab District, Sihanouk Ville |

3.3.2 Major Brands, Grades and Pricing

Based upon production processes, fish sauce products are essentially homogenous from factories visited. Sauces are divided into three to five grades depending upon the extraction process. While it is difficult to identify the grade by sight, grades can be chemically identified by testing the nitrogen content contained in the fish sauce. The higher the nitrogen content, the better quality and taste of the sauce. The first extracted juice can contain as much as 26g/l, first grade 16g/l, second grade 11.5g/l and third grade 9.2g/l of nitrogen.⁷ The selling price varies according to grades, ranging from 300 to 1,600 Riel per liter for inland produced sauce and from 300-5,000 Riel per liter for marine fish sauce.

The table below details market prices obtained from a sample of large processors and retailers in Phnom Penh and Kampot. Marine fish sauce is considerably higher in price than inland production particularly at the higher end of the market. This is due to the higher cost of ocean fish in comparison with fresh water varieties, and production time (a minimum of 12 months for marine sauces vs. 6 months for in-land products). Grades 4 and 5 listed above were found to be unique to marine fish sauce producers and packaged in 20 – 30 liter plastic containers. These are purchased by restaurants, food vendors and also retailers in markets. The retailers re-packaged the sauces into small 1-2 day servings to be sold to low-income consumers.

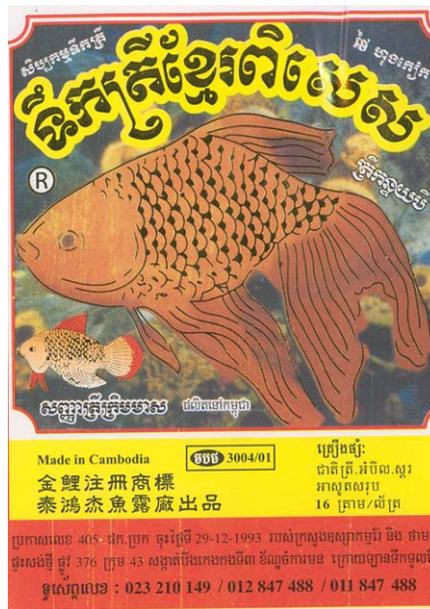
⁷ Seak Sophat – *Nodal Study (Working Paper 8)*

Table 4: Comparative Market Prices of Fish Sauces

| Grades of Fish Sauce | Price per 750 ml bottle in Riels (except grades 4/5 – per liter) \$1 US = 4100 Riels | |
|----------------------|--|-------------|
| | Inland | Marine |
| No. 1 | 1,600 | 4000 - 5000 |
| No. 2 | 1300 - 1400 | 2000 - 2500 |
| No. 3 | 450 - 500 | 1000 |
| No. 4 | NA | 500 - 800 |
| No. 5 | NA | 300 |

3.3.3 Labeling: Examples from Major Producers

Thai Hongkheat Fish Sauce Production



Thieng Seng Fish Sauce Production



Meng Sun Fish Sauce Production



3.3.4 Consumers

Middle and higher-end consumers particularly in urban areas will purchase Grade 1-2 fish sauces. For low-income consumers, the fish sauce market is highly price driven. While lower-income consumers appear to know what the “good” brands are, price is the deciding factor in making purchases. All the processors interviewed responded that the intermediate to low grades (grades 3, 4 and 5) of fish sauce were widely in demand particularly in the rural provinces. However, they prefer selling the higher grades since the profit margin from higher grades of sauce is better. Many of the lower grades are marketed only in 20 to 30 liter plastic containers at a cost of 300 – 500 riels per liter. It would not be possible for the producers to market these grades in 750 ml glass bottles since the cost of the bottle itself to the producer is between 200–300 Riels. Producers and retailers interviewed agreed that many low-income Cambodians, particularly in the rural areas, cannot afford to purchase full 750 ml bottles of fish sauce. Instead, they purchase smaller 1-2 day servings which are re-packaged by retailers into smaller bottles or plastic bags.

In absence of a detailed consumption study, this report can only estimate actual per capita fish sauce consumption levels based upon secondary sources. The following consumption information cited from secondary sources is detailed as follows:

1) Seak Sophat – *Nodal Study (Working Paper 8) – Fish Sauce Production and its Role in Employment and Food Security*. Ministry of Agriculture

(a) On average, each urban household (5-6 persons) consumed 1 liter of fish sauce per week (22 – 27 ml per person per day or 7.9 – 9.7 L per capita per year

(b) On average, rural village households consumed 2 liters per month (equivalent family size) or 11 – 14 ml per person per day or 3.96 – 5.04 L per capita per year.

Note: A higher rate of consumption takes place during ceremonial or festival events during the year

2) Ahmed, M., N. Hap, V. Ly and M. Tiongco, 1998. *Socio-economic Assessment of Freshwater Capture Fisheries of Cambodia: Report on a household survey*. Mekong River Commission. Phnom Penh, Cambodia.

(a) Based upon a socio-economic survey of 4.2 million people in central Cambodia, it was estimated that average fish sauce consumption was 5.6 liters/person per year

3) Fish Sauce Use Survey conducted by RACHA – Kampot Province

Survey: 200 families in 20 villages in 4 districts – Kampot Province

Results:

- All families use fish sauce on average 6 days a week/2.6 times per day.
- Average family size: 5.45 members
- Each family used 26 ml of FS per meal – 2.6 meals per day – equating to 68.5 ml per family per day. On this basis, individual fish sauce consumption of 12.6 ml per person per day
- 97% of children and 99% of pregnant women used FS
- 50% purchase FS at local store, 45% at district market, 4% produce their own

4) Rosalind S. Gibson. *Micronutrient Fortification For Countries in Western Pacific Region – Report Prepared for WHO Western Pacific Regional Office*.

Source cites study by V. Chavasit in 2001 (not available to author) which states fish sauce consumption in Cambodia: 15 – 45 ml per person/day.

5) Comparison: Vietnam – Cambodia. Vietnam, which has a similar diet to Cambodia, reportedly consumes 20 ml liters of fish sauce per person per day. Source: ILSI

3.3.5 Distribution

A majority of fish sauce producers interviewed work with several wholesalers in the major urban markets in Phnom Penh, Battambang, Pursat, Kampot, Kandal, Kampong Chhnang, Kampong Cham, Sihanoukville, Takeo, and Siem Reap. The provincial distributors come to the producers or arrange necessary transport to pick-up products from the factory or the factory's distribution site. Producers usually have a small number of trucks and will do local deliveries to markets or wholesalers. The commission rates paid to wholesalers range from 500 to 1000 Riel per dozen bottles. Retailers would add another 1000– 2000 Riels per dozen bottles. A detailed analysis of which brands of fish sauces are available in the most remote rural areas is beyond the scope of this study. However, some processors indicated that through provincial distributors their products were reaching remote areas.

3.3.6 Trade

All the processors interviewed stated that their fish sauce was consumed in Cambodia. Some also expressed interest in exporting fish sauce. According to the Phnom Penh Small and Medium Industry Association, some market research has been done on exporting to Japan but processing facilities do not meet Japanese standards for sanitation, equipment, packaging and other facilities.

Imported fish sauces from countries such as Vietnam and Thailand are seen in markets, but they are mainly for higher end consumers and represent a very small percentage of the overall fish sauce market in Cambodia.

3.3.7 Government Regulation/Quality Control

Three Cambodian Government ministries have some involvement in the large scale production of fish sauces. These are Ministries of Industry, Mine and Energy (MIME); Environment (MOE); Commerce (MOC); and Economy and Finance (MEF). MIME is solely responsible for the issuance of licenses to large and medium scale fish sauce producers, and for testing fish sauce quality; MOC issue permits for trade marks that are valid for ten years; the MOE deals with waste management and pollution control; and the MEF collects taxes.

As indicated in the Quality Control section above, fish sauce products are tested every three months by MIME officials for which samples are taken from the factories to the MIME laboratory. The processor must pay USD\$15 - \$30 for each test.

3.4 Profile: Iron Fortified Fish Sauce Production - a Public/Private sector partnership between RACHA and I Che-Ngouv Heng Fish Sauce Production

In 2004, in partnership with GTZ and ILSI Japan (International Life Sciences Institute), RACHA Cambodia conducted a Fish Sauce Use Survey and IFFS (Iron Fortified Fish Sauce) trial among school children in Kampot province. Results of the study and trial found that fish sauce fortified with either Ferrous Sulphate/Citric Acid or NaFe-EDTA was an effective vehicle for iron fortification in addressing IDA. In 2005, RACHA began working with I Che-Ngouv Heng Fish Sauce Production in Kampot to fortify fish sauce with iron. The factory produces 5 grades of marine fish sauces – lowest grades (3-5) are the best sellers. Grade 3, which is purchased by both low and middle income consumers, was chosen as the vehicle for fortification. RACHA/ILSA supplied mixing tanks and fortificant NaFe-EDTA to the factory and also provided technical training to factory staff. The program also includes health education and promotion of IFFS through advertisements, local radio and television. The factory is planning to fortify 300,000 liters of fish sauce in 2007.

The program is also building capacity with the Ministry of Industry, Mines and Energy.

RACHA/ILSA has donated a spectrophotometer, an electric scale and other lab materials to MIME's food analysis laboratory in Phnom Penh in order to facilitate the analysis of NaFe-EDTA in fish sauce samples.



Mixing tank for NaFe-EDTA –I Che-Ngouv Heng Fish Sauce Production

Some observations on the program from the owner of the fish sauce factory – Mr. Chan Shitha:

- 1) Mr. Shitha is sold on the importance of fortifying fish sauce to assist in fighting IDA. He thinks the program needs more publicity – people need to know more about anemia and the benefits of iron fortification
- 2) Cambodians are generally suspicious about chemicals added to foods – if they see NaFe-EDTA as a chemical and are not educated about its benefits, they will not purchase IFFS.
- 3) Some purchasers of IFFS have complained that when they cook with it, it becomes black in colour.
- 4) The IFFS that the factory is producing must be bottled in dark bottles due to the light-sensitivity of the fortificant – otherwise the sauce will turn black. His other fish sauces are bottled in clear glass of 750 ml. IFFS is bottled in 650 ml bottles.⁸ Some buyers complain about the trade-in value of the IFFS bottles: when they trade in the clear glass bottles, they receive about 200 Riels (from bottle traders.). When they trade in the dark IFFS bottles, they receive only 50 Riels.

⁸ These bottles are formerly beer bottles (Angkor Brewery).



Label for RACHA's IFFS. Iron fortification logo is located at top center

3.5 Market Considerations/Recommendations - Fortification

- 1) Fish sauce has the greatest potential of all staple foods analyzed in this report to develop into a successful vehicle for fortification. Industrial production is concentrated among a small number of producers. It would be constructive to work with large producers to develop a program that initially targets the fortification of lower grades of fish sauce to benefit low-income consumers. Cambodia should follow Vietnam's lead in planning large-scale fortification of fish sauce with iron.
- 2) In partnership with producers, NGOs and Government of Cambodia National Council for Nutrition/National Sub-Committee for IDA, a fish/soy sauce producers association should be developed/mobilized allowing wide participation by stake-holders. Producers need to be educated about the importance of fortification and what support other stake-holders can provide to implement fortification activities.
- 3) RACHA/ILSA has provided small-scale model of how a public-private sector partnership can be developed to successfully fortify fish sauce. Their model, experiences and lessons learned should be studied by other organizations pursuing fortification initiatives involving the private sector.

4.0 The Soy Sauce Market

4.1 Overview

Soy sauce is produced on an industrial scale in Cambodia and is both produced and consumed in smaller quantities than fish sauce. It is most popular in urban areas and is used in cooking and for dipping with roast beef, chicken and baked fish. Lower income Cambodians will also sprinkle soy sauce on rice as a meal in itself. Both soy and fish sauces are similar in pricing, however, soy bottle sizes come mainly in 450ml in comparison with the 750 ml fish sauce bottle. Consequently, soy sauce is viewed as being more expensive than fish sauce.

4.2 Production/Processing

4.2.1 Inputs

Producers advised that production time varies from between one day to one week. The ingredients of the most popular brand in the market – “Cow” brand produced by Pheng Ly Soy Sauce Enterprises are as follows:

Soybeans: 37%

Water: 35%

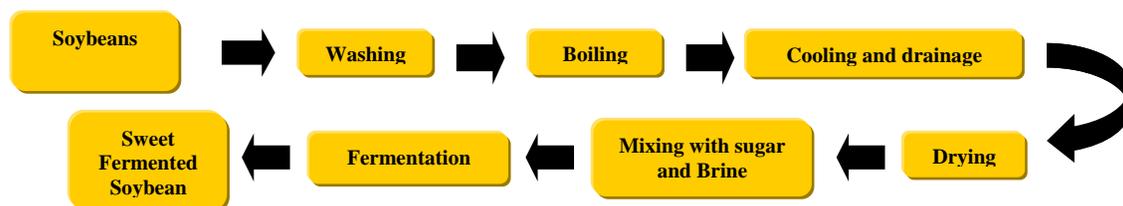
Salt: 19%

Sugar: 9%

Information on percentages of additives such as caramel and MSG were not available.

4.2.2 Processing Methods

Sweet Fermented Soybean Sauce Production



4.2.3 Quality Control

None of the processors interviewed had any laboratory or lab testing equipment to test their products. As encountered with fish sauce producers, quality control is primitive – and essentially a “good” soy sauce is judged based upon sight and taste by the factory owner.

From the government side, soy sauce products from large producers are tested every three months by officials from the Ministry of Industry, Mines and Energy (MIME). MIME officials visit factories to take samples of soy sauce brand/grade marketed. Sampling costs producers between \$15-30 per sample. After samples have been analyzed and approved, MIME sends the producer a certificate of approval. A sample analysis certificate from MIME for soy sauce can be found in attachment 1 of this report.

MIME has its own laboratory in Phnom Penh and tests soy sauces for the following:

Table 5: MIME Standards for Soy Sauce

| Properties | MIME Standard – Permissible levels |
|--------------------|---|
| pH | 4.6 – 5.5 |
| Density | 1.110 – 1.250 g/cm ³ |
| Acid (Acetic Acid) | 2 – 8 g/l |
| Salt | > 150 g/l |
| Total Nitrogen | > 9.5 g/l |

MIME also publishes a book of standards for soy sauce.

4.3 Market Structure

4.3.1 Producers

The Ministry of Industry lists 11 large to medium sized soy sauce producers in Cambodia. The largest producers comprise four companies listed below that are producing over 20,000 x 450 ml bottles per week. The largest producer in the country, Pheng Ly Soy Sauce Enterprises, produces 50,000 bottles per week utilizing 1 MT of soybeans per day in production. Some large processors also produce fish sauces (for example, Thai Hongkheat and Heng Heang). The two largest producers (Pheng Ly and Nguon Heng Ly), however, are strictly in the soy sauce business. Pheng Ly Soy Sauce Enterprises estimates that they control about 60% of the total Cambodian market. Other major producers are listed below:

Table 6: Major Producers of Soy Sauce
(each producer is located in the Phnom Penh area)

| |
|--------------------------------------|
| Pheng Ly Soy Sauce Enterprises |
| Nguon Heng Ly Soy Sauce Enterprises |
| Thai Hongkheat Fish Sauce Production |
| Heng Heang Enterprise |

4.3.2 Major Brands, Grades and Pricing

The main soy sauce producers bottle 2 – 3 grades of sauces. High and low grades are the best sellers, with Pheng Ly’s Grade 2 Cow brand being the most popular brand in the market. There was a consensus among producers that “medium” grades do not sell well. The most popular low-grade brand found in the Phnom Penh markets is the “Two-Headed Cow” brand produced by Heng Heang Enterprise.

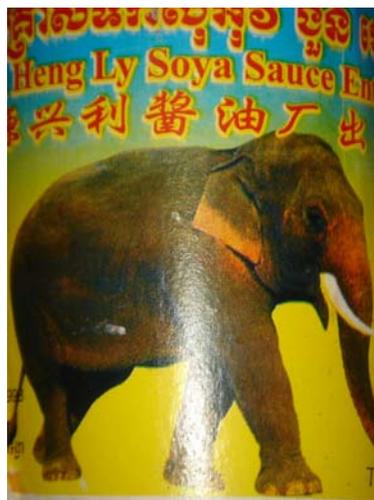
Table 7: Comparative Market Prices of Soy Sauce

| Grades of Soy Sauce | Price per 450 ml bottle in Riels \$1 US = 4100 Riels |
|----------------------|---|
| No. 1 (Export Grade) | 4000 |
| No. 2 | 1300 – 1400 |
| No. 3 | 1000 |
| No. 4 | 600 |

4.3.3 Labeling: Examples from Major Producers



Cow Brand Soy Sauce - Pheng Ly Soy Sauce Enterprises



Lower grade brands - Nguon Heng Ly Soy Sauce Enterprises



4.3.4 Consumers

In all interviews conducted in relation to the soy sauce industry, respondents advised that soy sauce is predominantly consumed in urban areas. For low-income consumers, the soy sauce market is highly price and brand driven even though there is little difference between the qualities particularly between the low-grade brands. The author could find no secondary source information on per capita consumption levels of soy sauce. As well, there are no sources of information concerning the actual size of the Cambodian market – that is, what the total monthly/annual production amounts to as there are no statistics available on soy sauce production. In informal discussions with consumers in urban markets, a family of 5-6 persons consumes approximately 2 bottles (450 ml) or approximately one liter per month.

4.3.5 Distribution

Soy sauce producers work with several wholesalers in the major urban markets in Phnom Penh, Pursat, Kandal, Takeo, Battambang, Kampong Cham, Svey Rieng, and Siem Reap. The provincial distributors come to the producers or arrange necessary transport to pick-up products from the factory or the factory's distribution site. Producers usually have a small number of trucks and will do local deliveries to markets or wholesalers.

4.3.6 Trade

The main inputs of soy sauce production – soybeans, salt and water are all sourced in Cambodia. Additives such as caramel and MSG are imported. Producers advised that soybeans are purchased mainly through wholesalers in Kampong Cham and Battambang provinces. Imported soy sauces from China, Japan and Vietnam are available in the market but generally prices are higher than locally-produced sauces.

4.3.7 Government Regulations/Quality Control

Three Cambodian Government ministries are noted to have some involvement in the large scale production of soy sauces. These are Ministries of Industry, Mine and Energy (MIME); Environment (MOE); Commerce (MOC); and Economy and Finance (MEF). MIME is solely responsible for the issuance of licenses to large and medium scale soy sauce producers, and for testing fish sauce quality; MOC issue permits for trade marks that are valid for ten years; the MOE deals with waste management and pollution control; and the MEF collects taxes.

As indicated in the Quality Control section above, soy sauce products are tested every three months by MIME officials for which samples are taken from the factories to the MIME laboratory. The processor must pay USD\$15 - \$30 for each test.

4.4 Market Considerations/Recommendations – Fortification

Soy sauce proves to be a good potential fortification vehicle. It would be constructive to work with large producers to develop a program that initially targets the fortification of lower grades of soy sauce to benefit low-income urban consumers. Unlike fish sauce, there is no issue of discoloration from adding iron to soy sauce and thus producers can utilize normal clear bottles currently used in commercial production – which is a benefit to both producers and consumers. A detailed consumption study is key to establish national/urban/rural soy sauce consumption levels.

5.0 The Instant Noodle Market

5.1 Overview

Despite the predominance of rice production and consumption, both fresh and instant noodles are growing in importance to the Cambodian diet. Fresh noodles are produced mainly from rice and bean flours and are produced in the home or through small-scale production. They are delivered on a daily basis to traditional markets and consumed soon after purchase due to limited shelf-life. Instant noodles are produced on an industrial scale and are ubiquitous in both rural and urban markets. Instant noodles are packaged in 60 – 80 gram servings consisting of precooked wheat noodles and two seasoning packets – one consisting of powdered seasonings, the other palm oil with seasonings. Instant noodles are simple to prepare and are particularly popular in urban areas consumed as a breakfast meal and also as a snack later in the day. Instant noodles are purchased in rural villages but sales growth is slower due to affordability. One packet of noodles can feed 1-2 persons. During the rainy season when rice becomes more expensive, instant noodle sales generally increase.

5.2 Production/Processing

5.2.1 Inputs (President Foods Cambodia – Phnom Penh)

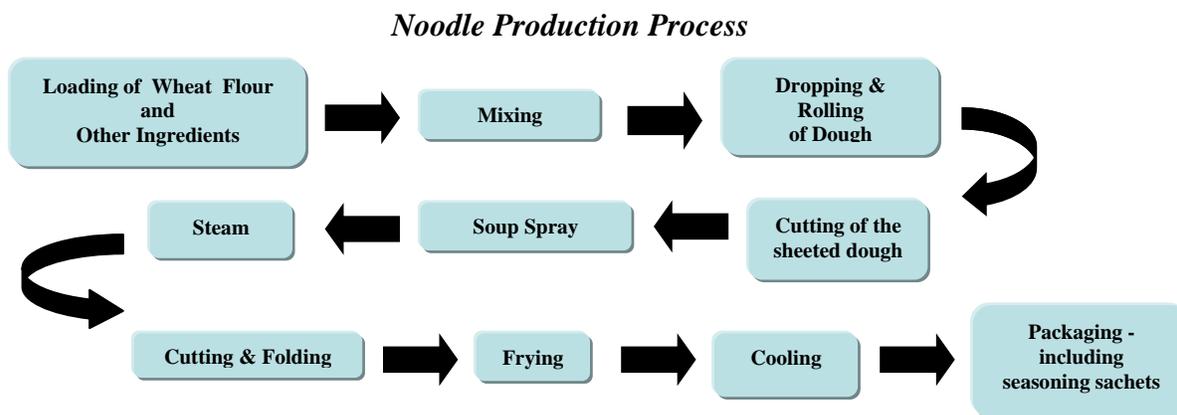
- 1) Wheat flour (300 MT per month) – imported from Vietnam
- 2) Packaging: (product wrappers) – imported from Thailand
- 3) Packing: cartons – imported from Thailand
- 4) Palm oil (100 MT per month) – imported from Malaysia
- 5) Seasoning and oil sachets – imported from Thailand*
- 6) Salt – purchased in Cambodia
- 7) Sugar – purchased in Cambodia (imported)

* Sachets contain:

(a) Seasoning sachet: flavoring (seasoning), MSG, salt, sugar, spices, iodine (25 micrograms or 16.67% Thai RDI)

(b) Oil Sachet: Palm oil, onions + other spices (seasoning), vitamin A (446.67 IU or 16.76% Thai RDI) and iron 2.5 mg (or 16.67% Thai RDI)

5.2.2 Processing Methods:



5.2.3 Quality Control

The following quality control measures are conducted by President Foods Cambodia during the production process:

- 1) Flour quality is analyzed in terms of moisture content, level of protein, ash content and physical appearance
- 2) Flour and water quantities, uniformity of mix, consistency of dough
- 3) Dough quality and thickness
- 4) Thickness and uniformity of noodle strands
- 5) Size of noodle squares, uniformity of curls, weighing of steamed and cut noodle cake
- 6) Temperature of fryer, quality of oil, color of noodle cakes and oil absorption, weighing of noodle cake
- 7) Uniformity of noodle cakes, color check
- 8) Seam quality, position of package, weighing of net package

5.3 Market Structure

5.3.1 Producers

Cambodia's single industrial producer of instant noodles – President Foods Cambodia (PFC) - is a subsidiary of Thai President Foods Group of Thailand. Thai President Foods Group is the largest producer of noodles in Thailand and is considered a large food processor in the country. President Foods Cambodia began production in 2002 and houses a modern production facility in Phnom Penh. The company employs 220 workers – 75% female. The factory is currently running at almost full capacity (6 days per week – 24 hours – one production line) and produces 50,000 – 55,000 cartons of noodles per week (there are 6 boxes of 30 x 60 gram packages per carton for a total of 180 packages per carton). This equates to a total of 9 million – 9.9 million x 60 gram

packages per week. The company produces 5 varieties of noodles (different flavours). Since 2002, PFC has increased production by 100% reflecting the demand for noodles as a staple in the country. Further evidence of the increasing demand for noodles is reflected in that they will be adding a new production line in summer/fall of 2007 in order to ramp up production to 80,000 – 100,000 cartons per week (14.4 million – 18 million). PFC Cambodia currently has about 40 – 45% market share in Cambodia.

The greatest market share – particularly for the low-end consumer market – is dominated by imported noodles from Vietnam. Vietnamese imports command a total market share of about 60%. The main brand is *Vi-Foods* followed by *Good* noodles. *Vi-Foods* commands a total market share of 40 – 50% while *Good's* share is about 10 – 20%. It is not an exaggeration to say that *Vi-Foods* are seen in all food markets in Cambodia – and they have the largest market share due to price. The remaining market share of about 5% comprises Thai/Koran/Japanese brands which are generally targeted to wealthier consumers in urban areas. It is estimated that of the 60% market share which Vietnamese noodles command, 30% are smuggled through the porous borders between the two countries. “Smuggled” does not necessarily mean that importers do not pay any duty. Reportedly, deals are made between customs authorities and importers so full duty is not paid. While PFC Cambodia is expanding production in response to increasing market demand in Cambodia, competition from Vietnam is fierce. Vietnam has approximately 40 industrial instant noodle producers capable of producing 2.5 billion packages per year.

5.3.2 Major Brands and Pricing

PFC *Mama* brand noodles are produced in 5 flavours: duck, beef, tom yum, shrimp and pork (local production). PF Thailand produces vermicelli in different variants, broad noodles in different variants, cup noodles (Tom Yum varieties and pork) which are marketed to higher-end consumers and are imported. All Vietnamese noodles are imported – the major brands are *Vifood* *Red Bear* brand produced by Asia Food Industry and *Good* brand produced by Vifon-Acecook in both chicken and beef flavours. In surveying local markets in provinces and Phnom Penh, 60 gram packages of *Mama* noodles were priced at 500 Riels. 75 gram packages of *Good* brand noodles were priced at 3 – 400 Riels per package and 80 gram packages of *Vifoods* were similarly 300 – 400 Riels per package.

5.3.3 Labeling: Examples of locally produced and imported noodles



Locally-produced PFC “Mama” brand instant noodles



Vietnamese imports: Good instant noodles



Vifood instant noodles

5.3.4 Consumers

There are no available statistics on the size of the instant noodle market in Cambodia. The government does not track production/import statistics and due to the large volume of instant noodle smuggling, import statistics would be of little value. The largest distributor of instant noodles in the country – New Ruby Inc. – estimated that total consumption on a monthly basis is about 1000 MT per month. On this basis, in per capita terms, Cambodians consume about 857 gr. per year of instant noodles. This equates to approximately 14 packages per person per year. Without a detailed consumption study, it is not possible to provide accurate consumption figures – particularly in determining the per capita volume of fresh noodle production vs. instant noodle production nor rural vs. urban consumption patterns. The market is price driven – *Mama* noodles at 500 Riels per 60 gram package are targeted to middle and upper-income Cambodians. Vietnamese noodles at 300-400 Riels per 80 gram package⁹ are targeted to lower-income Cambodians.

5.3.5 Distribution

PFC Cambodia sells all production to one distributor – New Ruby Inc. New Ruby, in turn, works with several wholesalers in each main provincial city – transport from New Ruby’s warehouse to wholesalers in the province are usually coordinated by wholesalers. In turn, retailers in rural areas purchase directly from wholesalers in the provincial cities. Distribution of Vietnamese noodles is more decentralized. Noodles are exported directly from Vietnam to the Cambodian border where transportation is arranged through agents directly to wholesalers in provinces and Phnom Penh.

5.3.6 Trade

PFC’s *Mama* noodles produced in Cambodia are consumed in-country and not exported. As indicated above, the largest market share belongs to imported Vietnamese noodles of which it is estimated that 50% are smuggled into Cambodia. The official Cambodia import duty for instant

⁹ Note: some random weight tests done on Vi-Foods noodles have shown that contents are below 80 grams.

noodles is 7% + 10% VAT. Over the past five years, PFC has received a duty-exemption on all imported production inputs. However, this has now expired and they must pay a flat 7% on all imported production inputs

5.3.7 Government Regulation/Quality Control

According to PFC, MIME takes samples of noodle packages every three months which are weighed but not chemically analyzed. With respect to imported noodles, based upon *Sub-Decree NO 54 (22/09/97) – Sub-Decree on the Organization and Functioning of the Ministry of Commerce*, the Ministry of Commerce assigns duty to the Department of Cambodia Import and Export Inspection and Fraud Repression (CAMCONTROL) as follows:

- a) Inspecting and repressing goods with fraudulent quality while being in circulation at markets.
- b) Analyzing the quality of both foodstuff and consumer goods.
- c) Inspecting and certifying conformity with the national standards on the quality, safety, and labeling of food and consumer goods (except medical products, medical equipment and cosmetics).
- d) Inspecting both imported and exported products.

Other government regulations and ministries involved: MOC issue permits for trade marks that are valid for ten years; the MOE deals with waste management and pollution control; and the MEF collects taxes.

5.4 Profile – International Relief and Development Cambodia’s *Mee Dara* fortified instant noodles

International Relief and Development’s (IRD) *Better Foods For Better Lives* is a three –year project (2004–2007) funded through the United States Department of Agriculture’s (USDA) *Food For Progress* program. The purpose of the *Food For Progress* program is to promote both agricultural and private sector development in developing countries.

The focus of *Better Foods For Better Lives* is to promote private sector economic growth in Cambodia through the development and distribution of low cost value-added food products. The program aims to: strengthen private-sector noodle producers, bakeries, snack and soy milk manufacturers; create sustainable employment opportunities; promote production and consumption of value-added locally produced foods; and improve the nutritional status of low-income households and school children.

Working with Men Sarun flour mill and President’s Foods Cambodia, IRD has created a low-cost fortified instant noodle: *Mee Dara*. Since May 2005, over 19 million packages of *Mee Dara* have been marketed and targeted to low-income consumers through existing private sector

marketing/distribution channels. As well, organizations such as CARE, the Cambodia Red Cross, Vietnam Veterans International, CESVI, Cambodian Children’s Fund and the Swiss Red Cross have used *Mee Dara* in their feeding and nutritional initiatives. The price of Mee Dara, at 300 Riels per package, provides the opportunity for a local producer to compete with Vietnamese low-cost noodles and provides a fortified food to the sector of the population that needs it the most.

Better Foods For Better Lives is a good example of how the public and private sectors can partner to promote economic development and as well address micronutrient deficiencies. It should be noted that the USDA is not considering re-funding *Better Foods For Better Lives* after 2007 as Cambodia does not meet the requisite criteria of political rights/civil liberties as defined by the NGO Freedom House.



IRD Cambodia’s Mee Dara fortified instant noodles

Table 8: Micronutrient Composition – Mee Dara Noodles

| Micronutrients | %RDI | Micronutrients | %RDI |
|----------------|------|----------------|------|
| Iron | 40% | Vitamin B2 | 15% |
| Zinc | 24% | Vitamin B12 | 18% |
| Vitamin A | 34% | Folic Acid | 36% |
| Vitamin B1 | 18% | Iodine | 17% |

5.5 Market Considerations/Recommendations - Fortification

There are two issues with regards to using instant noodles as a fortification vehicle: the low per capita rate of consumption (less than 1 kg per person per annum) and the large market share of Vietnamese noodles. Cambodia’s consumption rates are growing but are currently below other countries in the region. Consumption of instant noodles per capita in Cambodia is approximately 14 packages per person per annum. Consumption in Vietnam is at 20 packages per capita/year, while the larger consumers in the region are Korea (79 packages), Japan (41 packages) , and Taiwan and Indonesia (40 packages per capita/year each country).

Since low-income Cambodians purchase a higher percentage of Vietnamese noodles than locally-produced *Mama* noodles, it would appear that any fortification initiatives to target the poor would have to be developed in Vietnam. However, taking into consideration the substantial growth rates of noodle consumption in Cambodia, the significant expansion of President Foods Cambodia's production, and the success of the Mee Dara program, it would be constructive to consider working with PFC to: (1) Produce a low-cost fortified instant noodle (along the same lines as "Mee Dara"). This could be developed through a social marketing program and would involve subsidizing the production until the brand could achieve sustainability. (2) Work with PFC to fortify the current production of *Mama* noodles - micronutrients could be added to the sachets.

6.0 The Wheat Flour Market

6.1 Overview

Wheat flour is consumed by Cambodians in bread, cakes, biscuits and instant/fresh noodles. About 70% of wheat flour consumption originates through the industrial production of two local mills located in Phnom Penh. The remaining 30% is imported both legally and illegally predominantly from Vietnam. There are some small-scale rice flour producers, however, the industrial market is dominated by the production of wheat flour.

6.2 Production

6.2.1 Ingredients/Inputs

Wheat, predominantly hard varieties, is imported from Australia, Argentina, Canada, India, and the USA. Other milling inputs include flour improvers such as bleach (27% benzoyl peroxide) and enzyme (5000 SKB/g fungal alpha amylase), Bromco (Bromate substance), alfamol (amylase).

6.2.2 Processing methods

Asia Flour Mills runs a vertical mill utilizing Buhler milling equipment with three ingredient feeders while Men Sarun uses used equipment from China which comprises 2 two milling lines located side by side in a warehouse. Both mills have ingredient feeders that could be utilized for micronutrient fortification.

6.2.3 Quality Control

Men Sarun flour mill has a basic laboratory that tests for wet gluten, ash, moisture and sieving. Asia flour mill also has a laboratory and it is assumed that their testing process is equivalent to the Men Sarun mill.

6.3 Market Structure

6.3.1 Producers

There are two flour mills operating in Cambodia – Asia Flour Mills and Men Sarun Flour Factory Ltd. Asia Flour Mills is the larger facility with a milling capacity of 130 MT of wheat (100 MT of flour) per day, currently operating 16 hours per day, 6 days a week, running at 65% capacity. Men Sarun has a milling capacity of 120 MT (91 MT of flour) per day, currently operating 10 hours per day, 6 days a week, and is running at about 60% capacity.

Combined local production is estimated at 3000 – 3500 MT per month, with Asia flour Mills producing about 25% - 40% more than Men Sarun. Estimates of total market consumption, including local production, plus both legal and illegal imports from Vietnam, is about 5000 MT per month. It is estimated that 20% of the market consists of illegal imports of flour from Vietnam. The millers combined import about 50,000 – 60,000 MT of wheat per year.

6.3.2 Major Brands, Grades and Pricing

Both millers produce two grades of flour - grades 1 and 2. It is estimated that 80% of each miller's production is sold to the bakery industry (grade 1). The remaining flour (grade 2) is sold to the fresh noodle industry and biscuit manufacturers. Due to world wheat market prices and increases in transportation costs, current wheat flour prices have increased by 25% over the past two years and are considered high at \$500 - \$510/MT for first grade and \$470 - \$480 for second grade.

6.3.3 Consumers

Locally produced flour is not sold in consumer packages – it is all packaged and sold in 25 kilo bags. The main flour purchasers are the approximately 60 bakeries in the country (20 bakeries are located in Phnom Penh) that produce baguette-type breads, cakes and biscuits. There are generally 2 – 3 bakeries per province – one bakery is large with up to 15 employees while the other 1-2 provincial bakeries are much smaller. The large bakery produces about 80% of the bread supplied in the province and all bakeries are located in the main provincial cities. It is difficult to ascertain what volumes of bread are not consumed in the provincial cities – certainly some bread is delivered to and consumed in the villages but the majority is consumed in the cities. Based upon flour consumption rates of approximately 5000 MT per month, Cambodians consume 4 kgs per capita per annum or 12 grams/capita/day.

Prices of bread are as follows:

100 gr. – 200 Riels

130 gr. – 300 Riels

180 gr. – 400 Riels

Due to the price inflation of the world wheat market, and subsequently flour, bakeries are not increasing prices but producing smaller pieces/loaves of bread. Therefore, it is estimated that the actual weights of the above-mentioned breads have decreased by 20% - 25%.

6.3.4 Distribution

Millers sell to distributors/wholesalers both in Phnom Penh and in the provinces. Men Sarun flour mills works with 4 wholesalers in Phnom Penh and 1-2 wholesalers in each province. Mills sell directly to large bakeries. Bakeries in Phnom Penh, Kampong Cham, Kandal, Takeo, Siem Reap and Battambang are the largest end points for distribution of flour in Cambodia.

6.3.5 Trade

Approximate legal and illegal imports of flour into Cambodia are 1500 MT per month. Cambodian duties on imported flour are high at 45% which, in turn, may encourage smuggling. Millers do not pay any import duty on imported wheat. Imported wheat is transported in bulk via Ho Chi Minh City, Vietnam, and then transported via the Mekong river to the mills' dockside unloading facilities in Phnom Penh.

6.3.6 Government Regulations/Quality Control

According to the millers, there are no government quality control measures in place neither for imported wheat nor for marketed flour. Other government regulations and ministries involved: MOC issue permits for trade marks that are valid for ten years; the MOE deals with waste management and pollution control; and the MEF collects taxes.

6.4 Profile – Men Sarun flour mills' pilot flour fortification program

In partnership with International Relief and Development Cambodia, Men Sarun Flour Mill has agreed to participate in a voluntary flour fortification pilot program. Under IRD's *Better Foods For Better Lives* program, the mill fortifies flour used in the production of *Mee Dara* noodles. The mill is now piloting a voluntary fortification program for its commercial production which is sold to bakeries, biscuit and fresh noodle manufacturers. The mill has imported pre-mix from Muhlenchemie GmbH in Germany which will be used in a trial fortification of 5000 MT of flour. The chemical, physical and microbiological properties of the pre-mix listed in table 9 below includes Vitamins A, B1, and B2, folic acid, iron and zinc. The costs of pre-mix and trial have been assumed by the mill. The mill has shown interest in fortifying their entire production on a voluntary basis.

Table 9: Chemical, Physical and Microbiological Properties of trial pre-mix – ELCOvit¹⁰

| Property | Method | Dimension | Target | Min – Max. |
|----------------|---------------|-----------|-----------------|------------|
| Appearance | | | Brownish powder | |
| Odour | | | Typical | |
| Loss on Drying | 3 h/105 deg C | g/100g | < 10 | |
| Thiamine | | g/100g | | 0.84 - 1 |
| Riboflavin | | g/100g | | 1.34 – 1.6 |
| Folic Acid | | g/100g | | 0.67 – 0.9 |
| Iron | | g/100g | | 16.7 - 18 |
| Zinc | | g/100g | | 10 - 11 |

6.5 Market Considerations/Recommendations - Fortification

Although per capita consumption rate of wheat flour is low, according to Men Sarun flour mills, production is growing at an estimated 5% per year. Considering the interest of the Men Sarun mill in providing fortified flour to its Cambodian consumers, it would be constructive to both expand the pilot program as started by IRD Cambodia as well as engage the second mill, Asia Flour Mills, in developing a voluntary fortification program. This would provide another vehicle which can be combined with other strategies to increase micronutrient levels in the Cambodian diet.

7.0 The Vegetable Oil Market

Based upon FAO statistics, Cambodia consumes approximately 3 kgs per capita per annum or 8 grams per day of vegetable oils based upon imports of about 26,000 MT and production of 20,000 MT.¹¹ This does not take into consideration oils smuggled into the country for consumption, but it is not possible to estimate these volumes. There are no industrial producers of vegetable oils for domestic market consumption nor are there any refining facilities in the country. As a net importer of vegetable oils, Cambodia imports predominantly refined palm oil sourced from Malaysia and Indonesia. Soybean oil is sold in the market but is generally more expensive and targeted to higher-end consumers. Smaller quantities of sunflower, maize and coconut oils are also imported. The bulk of imported palm oils are packaged in 17 kg tins. Importers sell to wholesalers who in turn sell to retailers. In markets, retailers repack the oil in smaller bottles and bags in order to make it affordable for Cambodians to purchase small quantities.

Currently there is one industrial producer of crude palm oil (CPO) in the country – Mong Reththy Group. The company has a land concession from the Cambodian government for 10,000 hectares located about 160 kilometers south of Phnom Penh (National road #4). Presently, only 5000 hectares are in production. All of the CPO produced – estimated at 30-40,000 MT per year – is exported. Current export markets are India, Switzerland, Vietnam and China. The company has studied the feasibility of building an oil refinery but advises that it is not economically viable

¹⁰ Source: Muhlenchemie GmbH - Germany

¹¹ This is based on FAO's Food Balance Sheet for Cambodia – 2003. This is the most up-to-date FBS that provides all parameters for vegetable oil consumption

unless they can produce 100,000 MT of CPO. Thus, not until all of their land is in production will they re-visit the possibility of building a refinery, which will reportedly not be for at least ten years. If the company does build a refinery at some point in the future, Cambodia could achieve self-sufficiency in vegetable oil production at which time it would be constructive to look at fortifying the industrial production.

8.0 The Sugar Market

Based upon FAO statistics, Cambodians consume approximately 9 kgs of sugar (raw sugar equivalent) per annum or 25 grams per capita per day.¹² Cambodia is a net importer of sugar predominantly in refined form from Thailand. In 2005, Cambodia produced 118,164 MT of sugar cane¹³ for a raw sugar equivalent of about 21, 270 MT. There is no industrial sugar production in Cambodia. Both sugar cane and palm sugar are consumed in rural areas as a substitute for refined sugar. Sugar palm juice is traditionally processed into three types of sugar: liquid sugar (sugar palm syrup), crystalline palm sugar and block sugar. The most common type consumed in rural areas is sugar palm syrup

In 2005, FAO lists Cambodia as importing 246, 424 MT of refined sugar. It is likely that 40 – 50% of this product was destined for Vietnam through “smuggling” channels. According to distributors, most of the smuggled sugar finds its Vietnamese home in the Mekong River provinces of An Giang, Kien Giang and Long An.

In partnership with TCC group of Thailand, Phnom Penh based Mong Reththy Group is planning on building a \$50 million sugar refinery estimated to begin operation in December, 2008. The company has received land concessions from the government for 10,000 hectares in Koh Kong province where they will grow and process sugar cane into refined sugar for the domestic market. Production is targeted at 30,000 – 50,000 MT.

With its impending foray into the sugar production business, it would be constructive to initiate discussions with Mong Reththy group concerning the potential of sugar fortification. If planned production is accurate, Cambodia could in future meet about 40% of its consumption requirements. As Thailand is the major source of Cambodian sugar imports, fortification initiatives should be initiated in the source country.

¹² Source: FAO Food Balance Sheet for Cambodia – 2003

¹³ As per FAO guidelines, Sugar cane – raw sugar equivalent is approximately 18%

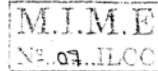
ATTACHMENT – 1: FISH SAUCE SAMPLE BULLETIN OF ANALYSIS – MINISTRY OF INDUSTRY, MINES AND ENERGY (MIME)



ក្រសួងឧស្សាហកម្ម រ៉ែ និង ថាមពល
 Ministry of Industry, Mines and Energy
អគ្គនាយកដ្ឋានឧស្សាហកម្ម
 General Department of Industry(GDI)
មជ្ឈមណ្ឌលស្រាវជ្រាវឧស្សាហកម្មកម្ពុជា (ម.ម.ឧ.ក.ក)
 Industrial Laboratory Center of Cambodia (ILCC)
 លេខ (N°): 337-២០១៧

ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ
Kingdom of Cambodia
Nation Religion King

ប្រតិបត្តិការស្រាវជ្រាវ
 Bulletin of Analysis



ធុនក្រូច Fish sauce

ឈ្មោះផលិតផល (Designation of Product) : **ធុនក្រូច**
 ពាណិជ្ជសញ្ញា (Trade Mark) : **មីក្រូ**
 ឈ្មោះម្ចាស់ ក្រុមហ៊ុន- សិប្បកម្ម (Name of entrepreneur of Company / Handicraft) : **លី ឆាយ**
 អាសយដ្ឋាន ក្រុមហ៊ុន- សិប្បកម្ម (Address of Company / Handicraft) : ផ្លូវលេខ៩៩៩ ភូមិទួលតោក សក.ទួលសង្កែ ខ.ប្រស្សីកែវ រាជធានីភ្នំពេញ
 ថ្ងៃទទួលវិភាគ (Received Date) : ២៧ មេសា ០៧ ថ្ងៃចេញលទ្ធផល (Issued Date): ០២ ឧសភា ០៧

| ល.រ No | លក្ខណៈរូប - គីមី Physical Chemical-Characteristics | កំរិតអនុញ្ញាត-ធុនក្រូច Permissible level -Fish Sauce | លទ្ធផល Results |
|-----------|---|---|---------------------------|
| 1 | pH | 4.0 - 8.0 | 5.8 |
| 2 | ដង់ស៊ីតេ (Density) | 1.150 - 1.250 | 1.096 g / cm ³ |
| 3 | អាស៊ីត(អាស៊ីតអាសេទិច) Acid (Acetic Acid) | 2 - 7.8 g / l | 2 g / l |
| 4 | អំបិល (Salt) | > 200 g / l | 295 g / l |
| 5 | អាសូតសរុប (Total N ₂) | > 10 g / l | 5 g / l |

សេចក្តីសន្និដ្ឋាន (Conclusion) : មិនអនុលោមតាមស្តង់ដារ
 (Non-conform by Standard)

បានឃើញ Approved ភ្នំពេញ, ថ្ងៃទី ០២ ខែ ២០០៧
 P.Penh 02 05 2007
 អនុប្រធាននាយកដ្ឋានឧស្សាហកម្ម រ៉ែ និង ថាមពល
 Assistance of GDI
 Deputy Director
In. Samdy
ស៊ុន សំបូរ

បានពិនិត្យត្រឹមត្រូវ Verified ភ្នំពេញ, ថ្ងៃទី ០២ ខែ ២០០៧
 P.Penh 02 07 2007
 ប្រធានមន្ទីរពិសោធន៍មីក្រូជីវសាស្ត្រ ចំណីអាហារ និងគីមីសាស្ត្រ
 Chief of Food Microbiology and Chemicals Laboratory
គឹម តែមហាវិ

ភ្នំពេញ, ថ្ងៃទី ០២ ខែ ២០០៧
 P.Penh 02 07 2007
 អ្នកវិភាគ
 Analyst
អ៊ុយ សុខា

សំគាល់: លទ្ធផលនៃការវិភាគនេះ មិនអាចប្រើប្រាស់សំរាប់ការផ្សព្វផ្សាយបានទេ មិនមែនតំរូវលេចចេញនៃលទ្ធផលបញ្ជូនមកប៉ុណ្ណោះ
 Note : The result of analysis is not to be used for advertising purposes and valid for the submitted sample only.
 N°45 Norodon Blvd, Khan Daun Penh, Phnom Penh, Cambodia Tel: 012 242 111; 012 220 475 E-mail: mime_cambodia@yahoo.com

ATTACHMENT – 2: SOY SAUCE SAMPLE BULLETIN OF ANALYSIS – MINISTRY OF INDUSTRY, MINES AND ENERGY



ព្រះរាជាណាចក្រកម្ពុជា
ជាតិ សាសនា ព្រះមហាក្សត្រ
Kingdom of Cambodia
Nation Religion King

ក្រសួងឧស្សាហកម្ម រ៉ែ និង ថាមពល

Ministry of Industry, Mines and Energy

អគ្គនាយកដ្ឋានឧស្សាហកម្ម

General Department of Industry (GDI)

មជ្ឈមណ្ឌលជាតិស្រាវជ្រាវឧស្សាហកម្មកម្ពុជា (ម.ម.ម.ក)

Industrial Laboratory Center of Cambodia (ILCC)

លេខ (N): 4.13. 2707

ប្រតិបត្តិការស្រាវជ្រាវឧស្សាហកម្ម
Bulletin of Analysis

ឈ្មោះផលិតផល (Designation of Product) : **ទឹកស៊ីស៊ូង / Soy Sauce**
 ពាណិជ្ជសញ្ញា (Trade Mark) : **ធានាធានា**
 ឈ្មោះម្ចាស់ ក្រុមហ៊ុន- ដំឡើង (Name of entrepreneur of Company / Handicraft) : **លោក-លោកស្រី ម៉េង ហុន**
 អាសយដ្ឋាន ក្រុមហ៊ុន- ដំឡើង (Address of Company / Handicraft) : **ផ្លូវលេខ ១២ ភូមិស្រែចម្ការ ខណ្ឌស្រែចម្ការ រាជធានីភ្នំពេញ**
 ថ្ងៃទទួលបាន (Received Date) : **២៨ ឧសភា ០៧** ថ្ងៃចេញលិខិត (Issued Date) : **០២ មិថុនា ០៧**

| ល.រ No | លក្ខណៈរូប - គីមី Physical Chemical Characteristics | កំរិតអនុញ្ញាតអតិបរិមា-ទឹកស៊ីស៊ូង Max. Permissible level - Soy Sauce | លទ្ធផល Results |
|-----------|---|--|---------------------------|
| 1 | pH | 4,6 - 5,5 | 4,6 |
| 2 | ដង់ស៊ីតេ (Density) | 1,110 - 1,250 g / cm ³ | 1,120 g / cm ³ |
| 3 | អាស៊ីត អាស៊ីតអាសេតិក (Acid Acetic Acid) | 2 - 8 g / l | 5 g / l |
| 4 | អំបិល (Salt) | > 150 g / l | 158 g / l |
| 5 | អាសូតសរុប (Total N ₂) | > 9,5 g / l | 15,5 g / l |

បានអនុញ្ញាត
 ភ្នំពេញ ថ្ងៃទី ០២ ខែ មិថុនា ២០០៧
 P.Penh ០២ ០៤ 2007
 អនុប្រធាននាយកដ្ឋានឧស្សាហកម្ម រ៉ែ និង ថាមពល
 Assistance of GDI
 Deputy Director

បានប្រឹក្សា
 ភ្នំពេញ ថ្ងៃទី ០២ ខែ មិថុនា ២០០៧
 P.Penh ០២ ០៤ 2007
 ប្រធានមជ្ឈមណ្ឌលជាតិស្រាវជ្រាវឧស្សាហកម្ម និង គីមី
 Chief of Food Microbiology and Chemicals Laboratory

ភ្នំពេញ ថ្ងៃទី ០២ ខែ មិថុនា ២០០៧
 P.Penh ០២ ០៤ 2007
 អ្នកសិក្សា
 Analyst

ម៉ី ស៊ីនាដេច

ស៊ុន សុខា

សំគាល់: លទ្ធផលនៃការស្រាវជ្រាវ មិនអាចប្រើប្រាស់សម្រាប់ការផ្សព្វផ្សាយបានទេ គឺវាមានតម្លៃតែសម្រាប់គំរូដែលបានបញ្ជូនមកប៉ុណ្ណោះ ។
 Note : The result of analysis is not to be used for advertising purposes and valid for the submitted sample only.
 N : 15 Neodun Blvd, Khan Daun Penh, Phnom Penh, Cambodia. Tel: 012 249 141; 012 820 475 E-mail: ilcc_cambodia@yahoo.com



**Food and Agriculture
Organization of the
United Nations**

**World Health
Organization**



Agenda Items 5-9

Conference Room Document 19
English only

**FAO/WHO REGIONAL CONFERENCE ON FOOD SAFETY FOR ASIA AND
THE PACIFIC**

Seremban, Malaysia, 24-27 May, 2004

Cambodia Country Report on Food Safety

1. Country Overview

Cambodia is an agricultural country located in South East Asia with a total landmass of 181,035 square kilometers. It has a tropical climate with two distinct monsoon seasons (dry and rain seasons). The latest population census in 1998 recorded a total of 11.5 million people with an annual growth rate of 2.5 %. In Cambodia 84% of the population lives in rural areas. In 2002 the GDP was US\$360. However, thirty six percent (36%) of the total population live below the poverty line, but in rural areas the percentage of the population that live below the poverty line rises to 79%.

Agriculture, mainly rice production, accounts for 40% of the GDP employing more than 70% of the workforce. The growth rate in agricultural employment is, however, slowing down. National disasters (annual flooding and drought) result in year-to-year fluctuations in the agricultural sector

Agro-based food production is one of the main characteristics of the Cambodia food production. The middle and small industrial sector play a crucial role in the nation's economic framework. Besides raw agricultural products (rice, maize, soy bean, green bean, fresh meat, fish, sea products, fruits, fresh water), milk, flour, soy sauce, fruit juices, beverages, bottled drinking water and etc. are locally processed. Food safety remains a major public health concern. Food-borne disease outbreaks are common and caused by mishandling of perishable food and unhygienic preparation, especially ready to eat food (in restaurants, street food, and hawkers).

2. Morbidity and Mortality

Life expectancy at birth among females is 58.3 and male 54.5. Cambodia Demographic and Health Survey (CDHS) 2000 revealed high level of mortality among children and women: infant mortality rate 95 deaths per 1,000 live

| Diarrhea syndromes | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|----------------------------|-------------------|-------------------|---------------------|--------------------|--------------------|--------------------|
| Cholera | 146 | 212 | - | 244 | - | - |
| Diarrhea | 5,293 | 6,243 | 8,701 | 8,709 | 10,847 | 10,178 |
| Dysentery | 2,078 | 2,071 | 2,266 | 1,976 | 3,470 | 2,632 |
| Total (%) | 7,517(5.0) | 8,526(5.4) | 10,967(5.60) | 10,929(3.8) | 14,317(5.1) | 12,810(5.1) |
| Total in patients reported | 150,433 | 156,945 | 195,790 | 291,248 | 283,140 | 250,301 |

births, under five mortality rate 124 deaths per 1,000 live births, and maternal mortality rate 437 deaths per 100,000 live births. These mortality rates are highest in the region. Diarrheal diseases, acute respiratory infection and vaccine preventable diseases cause about half of all deaths in the under-five age group.

Health Statistics:

1) In Patients for Cholera, Diarrhea, and Dysentery (source: MoH report)

2) Cases and Fatality Rate of Diarrhea, and Dysentery among In Patients

| Fatality rate (%) | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|--------------------------|------------------|------------------|-------------------|------------------|-----------------|-----------------|
| Diarrhea | 35 (0.66) | 41 (0.66) | 103 (1.18) | 70 (0.80) | 54 (0.5) | 54 (0.5) |
| Dysentery | 14 (0.67) | 12 (0.58) | 7 (0.31) | 13 (0.66) | 63 (1.8) | 63 (2.4) |

In 2002, fatality rates by dysentery were increased 3 times higher comparing with cases fatality rates in 1997.

3) Out Patients for Diarrhea

| Cases | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|--------------------|---------------------------|---------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| Diarrhea | 382,604 (11.4%) | 354,743 (11.4%) | 266,410 (9.2%) | 301,224 (8.7%) | 304,834 (7.5%) | 333,612 (7.3%) |
| Total out patients | 3,347,367 | 3,108,329 | 2,909,986 | 3,477,485 | 4,078,688 | 4,595,939 |

4) Food Safety Outbreak in Cambodia 1996 – 2004

| Year | Outbreak/Problem | Effect |
|------|--|--------------------------|
| 1996 | Drinking rice wine that mixed with some pesticide (to make it strong) | 40 deaths |
| 1998 | Drinking rice wine that mixed with Methanol (to make it strong) in rice wine | 30 deaths |
| 2000 | Eating puffer fish that had poison | 7 deaths |
| 2001 | School children eating contaminated rice | 212 children/hospital |
| 2002 | Eating meat from a dead marine turtle | 3 deaths/100 affected |
| 2003 | Drinking contaminated well-water | 1 death/112 affected |
| 2004 | Bird flu in farms near Phnom Penh and other two provinces | 3 outbreaks in provinces |

3. Food Safety Policy and Legislation

In 1993 a new system of developing legislation was introduced in Cambodia. Subsequently, there has been only one framework law that has been enacted and is related to products such as food. The Law on The Management of Quality and Safety of Products and Services (NO 0600/001) was approved on June 21, 2000. The law addresses "Production and Commercialization"; consumers' rights and economic operators' obligations; labelling; commercial fraud repression; action against products or services, which are likely to induce grave or imminent dangers; Inspection procedures for quality and safety of products, goods and services; and offences.

Since the Law has been approved, several actions have been taken to disseminate information about the law by using media, meetings at schools, and consumer education. In addition, the law has been applied in legal actions against any violators of the law's provisions. In addition, a number of sub-decrees have been endorsed since 1997. These include the following:

a) Sub- Decree NO 54 (22/09/97) – Sub-Decree on the Organization and Functioning of the Ministry of Commerce. Under this sub- decree the Ministry of Commerce assigns duty to the Department of Cambodia Import and Export Inspection and Fraud Repression (CAMCONTROL) as follows:

- Inspecting and repressing goods with fraudulent quality while being in circulation at markets.

- Analyzing the quality of both foodstuff and consumer goods.
- Inspecting and certifying conformity with the national standards on the quality, safety, and labelling of food and consumer goods (except medical products, medical equipment and cosmetics).
- Inspecting both imported and exported products.

b) Sub-Decree NO 64 (29/ 07/ 2001) relating to the designation and management of border control at the border gates, airport and the seaports of the Kingdom of Cambodia.

c) Sub-Decree NO 69 (October 20, 2003, Ministry of Planning) concerning the Management of Exploitation of Iodized Salt in the Kingdom of Cambodia. The purpose of this sub-decree is to eradicate iodine deficiency disorder by supplying properly iodized salt. The responsible agency in charge of quality and safety control is the quality control agency of the Ministry of Commerce, in cooperation with relevant ministries.

d) Sub-Decree No 67 (October 22, 1997) Identified that the Ministry of Health (MoH) is responsible for controlling the safety and the management of food. As a result, the MoH added 'Food and Cosmetics' to its existing Department of Drugs and Medical Devices. At present, the Department of Drugs and Food is responsible for food safety for the MoH. This sub-decree No 67 clearly and unambiguously defines the duty of the Ministry of Health to control the safety (and wholesomeness) of the food supply.

e) Sub-Decree No. 12 (February 2002) established the Department of Industrial Standards of Cambodia which is in charge of national standards development in order to improve the quality of local products, including food.

4. Food Safety Administration

The system of food control in Cambodia is complex. To enhance coordination of the inspection of quality safety of products and services, an inter-ministries committee was established under sub-decree No 5: Establishment of an Inter-Ministerial Committee Coordinating Inspection of Quality and Safety of Products and Services. Another step to enhance coordination was the formation of the Cambodia national Codex committee (CNCC) in 2001. It is the same committee as the Inter-ministerial Committee Coordinating Inspection of Quality and Safety of Products and Services. Eight Members have been appointed to the CNCC. The CNCC is to consider matters related to policy on safety and quality of products and services, consumer protection and fair trade and to ensure coordinated action by relevant ministries. The Codex Contact Point is located within Camcontrol (Cambodia Import Export Inspection and Fraud Repression Department) of the Ministry of Commerce.

Significant control is exercised by the Ministry of Commerce and the Ministry of Industry, Mines and Energy (MIME). Camcontrol's officers inspect imported foods at the point of entry as well as foods for export. The inspectors also perform market monitoring throughout the country. The major focus of Camcontrol's activities is on preventing the distribution of unsafe, poor quality, adulterated, misbranded or contaminated products, including food.

The MIME is responsible for quality control in manufacturing industries. Under the sub-decree No. 4 (February 1992) on the Management and Quality Control of Industrial Products of Factories and Handicrafts and its related law, every three months, inspectors sample processed foods and undertake microbiological

and/or chemical analyses in their laboratories on a diversity of products e.g. bottled water, rice wine, fish sauce and vinegar. Before issuing production licenses, the results of analytical testing should be satisfactory. Where there are no Cambodian food standards against which to interpret the results, Codex standards are applied. A limited number of national standards have been approved by the Industrial Standards Technical Committee.

The Ministry of Agriculture, Forestry and Fisheries has a key role in managing the safety and quality of agricultural products as they enter the food chain. Concerns exist that some meat entering the Phnom Penh market has not been inspected and may have been processed at illegal slaughtering operations. There are also concerns about movement of animals through Cambodian border checkpoints. The Ministry has nine checkpoints to control this issue. The Ministry of Health has responsibility for all matters of public health, including assuring the safety and wholesomeness of food offered for sale in Cambodia. The Department of Drugs and Food has been requested to provide the Ministry with guidance in the creation of a fully integrated food control structure, involving all stakeholders in the food supply and food control chain. Implementation of the objectives of this program will help achieve the Ministry of Health's goals of safe food for all Cambodians. Ministry of Health is the focal point of the Asian Expert on Food Safety.

5. Food borne Disease Surveillance and Contaminant Monitoring

There are several sections with a laboratory in each of the key ministries including the National Institute of Public Health and the Department of Drugs and Food in MOH; fisheries, agronomy and animal health in MAFF; and laboratories in MIME, MOC and the Ministry of the Environment. In addition there are private laboratories such as the Pasteur Institute. There is however no coordinated programme of food surveillance and little analytical data regarding microbiological or chemical contamination of food.

Ministry of Health, Department of Drugs and Food, conducts monitoring of microbial and chemical hazards in foods. In relation to chemical hazards, analyses are limited but the Department is capable of the basic assessment of food colours. Ministry of Commerce, Camcontrol, also conducts assessment of microbial and chemical hazards in foods. Ministry of Industry, Mine, and Energy also conducts assessment of microbial hazards in foods. Ministry of Agriculture, Forestry, and Fisheries also conducts assessment of microbial hazards in foods. The Department of Agronomy and Agricultural Land Improvement laboratories conducts assessment of pesticide formulation and is planning to develop pesticide residue capability. Animal health authorities have recently set up a veterinary public health laboratory and are receiving support from Japan and Norway for training in analytical procedures of relevance. Upcoming training will focus on veterinary drug residues in imported meats and milk and in meat slaughtered in slaughterhouses in Cambodia. The Pasteur Institute can also determine antibiotic residues and evaluate the antimicrobial resistances of isolated cultures. Cambodia does not have an active programme of food borne disease surveillance and outbreak response is often limited by the lack of available expertise.

6. Food Safety Education and Training

Information, education, training and advice to producers, industry, consumers and regulators are quite variable across the different sectors of the food chain. Cambodian legislation does not stipulate training requirements for food inspectors. Inspectors do not have degree level qualifications and have minimal training in risk-based approaches to food safety. However, key Camcontrol inspectors have received some training on quality control of food with the assistance of FAO. The purpose of this training was to ensure Camcontrol could effectively implement its responsibilities in relation to inspection of imported food.

The Ministry of Health plays a leading role in relation to food safety education for consumers. Within the Ministry of Health is the National Centre for Health Promotion. It is actively involved in health education and food safety for the public and for school children. Even though active the National Centre for Health Promotion has developed and uses only limited information, education and communication materials.

Agriculture authorities have conducted an extensive integrated pest management (IPM) programme in 15 provinces between 1998 and 2004. This programme (supported by DANIDA and WB) has trained 80,000 (less than 1-2% of the total farming population) farmers in IPM rice farmer communities. Village animal health workers conduct training as part of their regular duties. The Ministry of Commerce has conducted several seminars and workshops at a national level on topics related to food safety including on how Codex works. In addition, the Ministry has a staff exchange program with other Asian countries. However, because of the limitation of such efforts most farmers, fishermen, food processors, food handlers and consumers are still in need of education and training in relation to food safety. In order for food safety education and training to have a significant impact on the safety of food there is a great need for any programme to both be better focused and better resourced.

7. The Future for Food Control in Cambodia

Still food control activities are weak and many examples of failure to control unsafe, fraudulent and improperly labeled food can be observed. Consequently Cambodia's food control authorities really need to ask how safe is the food in Cambodia, what the burden of food borne disease is both in terms of health and the economy of Cambodia, whether they want to better protect the population and facilitate economic development through enhanced trade in safe food and what they can do to improve on what is currently being done. This report looks at current concerns in Cambodia's food control system and identifies corrective actions to be taken.

Globalisation opens a window of opportunity that should allow Cambodia to learn from the mistakes of the developed countries that have spent significant time and resources trying to get their own food control strategies right. The country is at a point in the path to safer food where authorities can choose to either better coordinate food control activities using a risk-based farm-to-table

approach or to make the mistakes already identified in developed countries. These mistakes have included:

- Establishing multiple and overlapping laws, regulations and standards;
- Disagreements regarding food control management responsibilities;
- A lack of training, transparency and ethics in enforcement;
- Poorly focused enforcement activities;
- Expensive sampling and analysis of food for little risk management effect; and
- Ineffective communication, training and education.

Accession to the World Trade Organization and the signing of key agreements could very well provide the same momentum for a view of what is being done and what to do better as it has in other countries of the region, such as China and Viet Nam. Grasping this opportunity could provide an important catalyst for not only improving health but also improving the economy of the community. In looking at how to implement an effective food control strategy focusing on risk reduction a number of guiding principles need to be applied. The principles include:

- Priority to the health of the consumer,
- Developing science-based food control strategies,
- Establishing initiatives, along the full farm-to table continuum, that target both risk and economic development;
- Recognizing that food control is a shared responsibility between all stakeholders
- Food control is best achieved by addressing all key building blocks of a national food control system.

Cambodia needs to grasp these guiding principles and employ the building blocks as laid out by FAO and WHO from farm-to-table in a sector-wide approach to strengthen its food safety efforts, to better protect the health of consumers and to enable it to find an appropriate niche in the international trading market in food and food products.

A five-year action plan has been proposed by a Joint FAO/WHO mission to develop the food control system in Cambodia. The action plan emphasizes the importance of a coordinated and risk-based farm-to table approach. It provides for strengthening all key building blocks of a food control system including:

1. Food law and regulations;
2. Food control management;
3. Inspection services;
4. Laboratory services, monitoring and surveillance; and
5. Information, education, communication and training.