

**Feasibility Study Report
Soy-based Weaning Food
in Thailand**

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Table of Contents

I. Executive Summary	1
II. Introduction	4
III. Background	5
A. Weaning and weaning food	5
B. Extrusion cooking.	6
C. Soy-based products	8
D. Thailand	8
IV. Project Description.11
A. Public-sector activities11
B. Private-sector activities.11
V. Conclusion13

Appendix A Factors Affecting Eating Habits of the Thai People

Appendix B Malnutrition Is Still a Tenacious Enemy For the Children of Food-Rich Thailand

I. Executive Summary

Activities in Indonesia

From October 1984 to the end of 1985, PATH worked with P.T. Sanghiang Perkasa of Jakarta, Indonesia, to study the feasibility of producing a soy-based weaning food which would be marketed to the less affluent consumers in Indonesia. Technical assistance was provided through the United States-based International Foundation for Agricultural Development (IFAD). IFAD identified a private company, Garrison Products, Incorporated of Chicago, as the source of know-how for soy extrusion cooking. A plan was developed to utilize extrusion cooking to process soybeans and rice, resulting in an instant weaning food which would be packaged in 30-gram, individual packs and 250-gram, family-size packages. With the 250-gram package priced at Rp 2250 (\$2), the resulting product would be the first nutritious weaning food in Indonesia which was targeted to class C and D consumers. The required investment in the project was determined to be \$350,000. A feasibility study was completed in the fall of 1985.

Late in 1985, Kalbe Farma learned that the San Maru Company had entered the Indonesian market with a product similar to the proposed weaning food. San Maru's product was introduced at a lower price than the price at which Sanghiang Perkasa had intended to enter the market. This, together with Kalbe Farma's corporate policy of not following another company into the market, has convinced Sanghiang Perkasa to defer further action on this project.

Replication in Thailand

The entry of San Maru into the weaning-food market in Indonesia convinced PATH that the original concept of the project was sound. PATH had done preliminary work in researching the opportunity for

a soy-based weaning food in Thailand. Since the project was viable in Indonesia, it was thought there would be a good chance of implementing a project in Thailand.

However, the tastes and nutritional status of the Thai people are significantly different from those of Indonesians. Most important, the market for supplementary and weaning foods in Thailand is considerably more developed, leaving little opening for another nutritious product, even at low cost. Nutritious traditional foods using rice, coconut milk, fruit, nuts, and other natural foods are readily available at low cost in Thailand. Many mothers serve their children a rice porridge fortified with seafood or meat that provides adequate nutrition for the majority of young children. Malnutrition in Thailand is associated with poverty and inadequate eating habits of minority groups in rural areas (see Appendix A).

An important indicator of the potential, or lack of potential, for a product is the degree of interest expressed in the area by the private sector. In this case, it has not been possible to interest a commercial firm in the production of an extrusion processed weaning food in Thailand. PATH is, therefore, submitting this feasibility study with the conclusion that it is not presently economically feasible for a private corporation to expand the availability of nutritious, low-cost foods through the use of extrusion cooking in Thailand.

The following are the key conclusions of this feasibility study:

- Although there is a substantial amount of malnutrition among children in Thailand, the problem stems principally from inadequate purchasing power or lack of education.
- There are currently a wide variety of nutritious supplementary

and weaning foods on the market in Thailand at prices which are reasonable.

- No commercial company that was contacted in the course of doing this study believed there was a market sufficient to warrant investing in an extrusion-processed, soy-based weaning food.

II. Introduction

Most families in the developing world cannot afford the luxury of a diet high in animal protein foods, such as meat, fish, and eggs. There is a clear need for simple and inexpensive food processing plants which can convert locally grown products into nutritious foods that mothers and young children enjoy eating.

A number of foods grown in third-world countries can, in fact, be combined to produce highly nutritious food products that are rich in protein. Cereals (rice, wheat, corn, and sorghum) and soybeans can be used to produce protein-rich food products.

One problem is that foods having good acceptability are sometimes hard to prepare at home. Another is that gruels made from cereal alone, which mothers often feed their weaning-age children, are usually lacking in nutritional content. Under such conditions, the young children who eat these foods can become malnourished and increasingly susceptible to infection and disease. They can die from disease brought on by this poor diet.

By using extrusion cookers, cereals and soybeans can be converted into precooked nutritious foods with excellent acceptability. When given in addition to mother's breast milk, these foods provide children with a complete weaning-age diet. The nutritional benefit and acceptance of foods made from blends of cereal and soy have been thoroughly studied. Examples are the Food for Peace products, such as corn-soy-blend (CSB) and wheat-soy-milk (WSM) which have been extrusion-processed in the United States and distributed overseas for several decades.¹

This feasibility study examines the potential for introducing a soy-rice weaning food to be produced by extrusion cooking in Thailand.

III. Background

A. Weaning and weaning food

Weaning is the time when a child's diet changes from breast milk to family foods. During weaning, the child is at high risk of infection, particularly diarrheal diseases, and of malnutrition. Because of the high mortality rate of these children, improving weaning practices is a critical objective of child health care.²

Between the ages of four- and six-months, breast milk alone becomes inadequate to meet the growth needs of an infant. At this time, an infant is growing so quickly that its protein and calorie needs, on a per-gram-of-body-weight basis, are much greater than those of an adult. While breast milk is an excellent and, in many cases, essential source of calories and high-quality protein through the first years of life, it needs to be supplemented. At this stage, infants also need vitamin C and iron from supplemental foods.

Because infants can initially handle only small volumes of food, it is necessary to make sure that what they consume is nutrient-dense. This is a problem with very starchy and fibrous, low-protein staples, like plantains or cassava, where high volumes would have to be eaten to provide for the child's protein requirement.

There are several ways to circumvent the nutrient density problem. One is to increase the frequency of feeding. Many feeding guides suggest feeding weaning food at least four times each day in addition to *ad lib* breastfeeding. Another is to modify the staple in ways that improve its nutrient-to-bulk ratio. The addition of sugar and oil is suggested to improve caloric density. Milk, fish powder, egg, and

complementary plant proteins (legumes for maize or rice staples) are suggested for improving protein density; fruits, vegetables, and their cooking water are suggested to provide additional vitamins. Efforts to ensure continued breast-feeding also improve nutrient density. The pattern of amino acids in breast milk protein enhances the less complete patterns found in plant proteins by filling in the missing amino acids. Another approach to improving the nutrient density is by reducing the bulk. This is mainly done through food processing, or preparation procedures, which somehow modify the fiber content or chemical structure of the staple. The extrusion process for treating soybeans is an example of the latter. In that process, the heat changes the chemical structure in a way that makes the final product more digestible and reduces its ability to hold water.

B. Extrusion cooking

Extrusion cooking has its origins in the concept that farmers could, under some conditions, extrusion-cook soybeans on the farm, feeding them directly to livestock more economically than selling them to soybean crushers and then rebuying the defatted soybean meal for feed. As a result, certain inexpensive, mass-produced extrusion cookers were developed which were capable of cooking soybeans and inactivating the growth-inhibiting enzymes that prevent their direct use for animal feed or for human food.³

William Shurtleff and Akiko Aoyagi of The Soyfoods Center (P.O. Box 234, Lafayette, California, 94549) describe the process which led to the acceptance of extrusion cooking in their upcoming book, The History of Soybeans and Soyfoods: Past, Present, and Future.

The key technological breakthrough that led to widespread extrusion cooking of soybeans for food use was the development of the short-time/high-temperature extrusion cooking technique and cooker by Wenger International, Inc. of Sabetha, Kansas, and of Kansas City, Missouri. In its simplest form, an extrusion cooker consists of a heavy cylinder or barrel in which a close-fitting screw rotates at moderately high speed. At the feed end of the barrel is an opening for running in the ingredients to be cooked (typically ground soybeans and/or grains). At the opposite or discharge end is a much smaller opening (a die), through which the product is forced out. Rotation of the screw by a motor generates frictional heat in the mixture and this, combined with the pressure of forcing the ingredients through the small die opening, cooks them. The high-temperature/short-time cooking process denatures enzymes that cause oils to rancidify, inactivates anti-nutritional factors (such as trypsin inhibitors), pasteurizes the finished product, cooks the starch and proteins to make them more digestible and better tasting and, if desired, can impart form and texture to the finished product.⁴

The simplicity and economy of extrusion cooking make it an attractive choice for developing countries. A number of cost analyses have been published: Smith (1967, 1969); Stone (1974); Anonymous (1977); Buffa (1971); Mitra (1976); and de Muelenaere and Buzzard (1969). The results can be summarized by saying that extrusion processing was generally found to be flexible and low-cost as measured by processing costs. Drum-drying systems were found to have a higher processing cost and initial capital investment per unit of production.⁵

C. Soy-based products

In 1961 and 1962, a new concept in low-cost, high-protein foods, cereal-legume blends, was pioneered in the form of Incaparina in Guatemala and Pro-Nutro in India. In 1966, the U.S. Agency for International Development (USAID), as part of the PL 480 Food for Peace Program, introduced CSM (corn-soy-milk) which was used largely as a weaning food in third-world countries. By 1974, eight more fortified cereal-soy blends had been added to the Food for Peace Program, and soy flour and grits had become the undisputed first choice worldwide as the lowest-cost, highest-quality protein source for use in these nutritious foods.

There were various reasons that interest in soy-fortified foods began to grow in the early 1960s: advances in nutrition and food science, which used the principle of protein complementarity to develop plant protein mixtures which were nutritionally equivalent to animal proteins; and a growing belief that protein was the main nutrient in short supply in third-world countries, and that preschoolers and pregnant and nursing mothers were the main groups in need of it. Thus, the new blended foods were designed and targeted for these groups. These new foods had three major points in their favor. They were 1) nutritious, 2) very inexpensive, and 3) convenient, requiring only minutes to prepare.⁶

D. Thailand

Malnutrition is a major problem in Thailand, as it is in nearly all developing countries. With a strong agricultural base, many think there is no reason for malnutrition to exist in Thailand which is one of the world's largest rice exporters. The markets are well stocked, and the country also exports corn, chicken, and seafood.

However, the problem of malnutrition persists. Public officials don't deny it exists. The Fifth National Economic and Social Development Plan lists the following as major nutrition problems of the country:

- Protein-energy malnutrition,
- Iron-deficiency anemia,
- Vitamin A deficiency,
- Beri-beri due to a lack of vitamin B 1,
- Goiter resulting from iodine deficiency,
- Angular Stomatitis due to vitamin B 2 deficiency,
- Bladder stone disease due to phosphorus deficiency.

Protein-energy malnutrition (PEM) is considered the most widespread and serious of these problems.

In a survey between October 1983 and January 1984, the percentage of malnourished children under five was 35%. In the latest survey between October and December of 1984, the figure was 30%. Nonetheless, the Ministry of Public Health estimates that malnutrition is a factor in the approximately 55,000 deaths every year of Thai children aged five and under.

Malnutrition in Thailand is often rooted in poverty. In addition, a large number of poor families can afford food, but don't know which foods are nutritious, or how they should be prepared. The Ministry of Public Health estimates that 10% of malnutrition may be caused by poverty, while closer to 50% is a result of inadequate education.

In 1983, the Public Health Minister's permanent secretary, Dr. Amorn Nondasuta, said in a newspaper interview that Thailand's abundance of rice has aggravated dietary

deficiencies. "Rice fills the stomach, but doesn't provide enough calories," he said.

The Asian Wall Street Journal carried an article by Richard Borsuk on August 19, 1985 which reported on this situation (see Appendix B).

IV. Project Description

A. Public-sector activities

In examining the status of weaning foods in Thailand, PATH found that considerable research had been done by the Institute of Food Research and Product Development at Kasetsart University in Bangkok. This government-sponsored institute, with a staff of 200, has investigated various baby foods, soy milk, textured vegetable protein, soy cookies, nutritious snack foods, full-fat soy flour, and soy noodles. The Institute had developed several soy products which have not found wide market acceptance in Thailand.

The AID mission in Thailand is supporting a village-level program of production of nutritious baby foods. The program emphasizes community participation and the free distribution of food to seriously malnourished children. No opportunity for the sale of a centrally processed weaning food is possible through this program.

B. Private-sector activities

To determine the opportunity which existed in Thailand for a soy-based weaning food, an effort was made to identify the market size, and to find a private-sector firm which found the idea attractive.

Discussions were initiated with Loxley (Bangkok) Limited, a diversified trading company which produces vegetable oil from soybeans and is active in the wholesale marketing of many foods. The firm expressed initial interest and said it would be willing to make an investment in a soy weaning food, if a market could be identified.

Interviews with other food company executives and public-sector officials indicated the market was already quite competitive, and that several firms which were introducing nutritious foods had recently declared bankruptcy. Surveys of neighborhood stores in Bangkok showed up to 14 brands of various powdered weaning foods were available. Outside of Bangkok, the choices were reduced, but the products were available. Gerber had apparently tried for several years to enter the Thai market, with only modest success at the upper-income level.

It also was reported that soybeans suffer from a bad image in Thailand, as in many other countries. Mothers object to foods with soy in them, principally due to the smell.

Further conversations with Loxley indicated that the firm did not have sufficient confidence in the market to launch a full-scale market study. No other commercial firm has expressed an interest in proceeding to evaluate this product.

V. Conclusion

Although there is a substantial and serious malnutrition problem in Thailand, the focus of the problem is a combination of inadequate purchasing power and insufficient education. The Ministry of Public Health has identified education as a priority in dealing with malnutrition and has designed programs to deal with this issue.

There are a wide variety of nutritious supplementary and weaning foods available on the market in Thailand at reasonable prices. This makes the market unattractive for further investment.

Confirmation of the above perspective was provided by the lack of interest commercial firms had in introducing an extrusion-processed soy weaning food. The opinion of these companies was that the market was well supplied and did not offer the potential for a good return on their investment.

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Factors affecting eating habits of the Thai people

by Supapohn Kanwerayotin

WE may have an idea that malnutrition results from poverty. But as a matter of fact, the improper eating habits generated from tradition and superstitious beliefs account significantly for malnutrition.

People in the North and Northeast believe that pregnant women should not eat eggs, fish and fat, because these three kinds of food will result in oversized babies, and hence the difficulty in giving birth.

Mothers of new-born babies are also advised to avoid the same kinds of food. They believe that the first milk is poisonous and harmful to the new born. In fact, the first milk provides immunity against many diseases, and is highly nutritious.

Many mothers think that feeding their babies with rice would boost their growth. So instead of breastfeeding, they feed rice to their babies, some as young as one week. On the contrary, when the babies reach a proper age to be fed with supplementary food, mothers who stick to the old tradition would do the opposite. It is usually not until a baby can utter the word "ja" (fish) that the mother will feed them fish and eggs.

Those are some points presented during a three-day workshop on cause and factors that affect the eating habits of Thai people, organised by the Nutrition Research Institute of Mahidol University.

The research programme is supported by the ASEAN Food Habits Project. Under the same topic, the research is conducted by close observation and inhabiting with villagers in selected areas in seven regions all over Thailand.

The target groups are pregnant women, mothers and children of pre-school age.

While presenting the findings culled from the upper North, leader of the research team, Yingyong Taoprasert, noted that the decline in popularity of breastfeeding, giving supplementary food to babies before a proper age, and premature weaning are "side effects of development."

"We cannot consider such beliefs and tradition in eating habits as insignificant. It's essential to know how to approach them, promoting the old beliefs that are practical and useful," he said, recommending that due to the strong seniority system in Thailand, we should first educate the old.

Northeast is the most interesting area when it comes to nutrition. The region has long been the target of development projects and many assistance programmes.

The child-raising tradition of the Northeast rules that rice is the main nutrition of human beings and thus they started feeding ground rice to one-week-old babies. Protein food such as fish, meat and egg must not be fed to babies under one year of age.

The main point nutritionists are

attempting to tackle is "how to make them realise that such protein food is essential for the children's growth."

Like those in other parts of the country, pregnant women in the Northeast believe that eating too much protein food, especially meat and egg, and sweets will make the baby over-protected by fat causing birth difficulty.

Mothers are advised to abstain from eating some kinds of vegetables and fruit, for instance, banana and orange, fearing that some poisonous substance from the fruits will be passed to the babies through their milk.

In the lower part of the Northeast, the research outlines a desirable condition for pregnant women that is based on tradition and old beliefs. Here, pregnant women are exceptionally cautious towards medicine. They will try to avoid consuming drugs except when necessary and under doctors' recommendation. Breastfeeding still exists as their way of feeding babies.

Adding to the hygienic nutrition is the belief that mothers must drink boiled water until the babies are a few months old, and that they must abstain from eating raw food, including uncooked fermented fish.

The South of Thailand is renowned for its fertile food resources. But the region comes third in malnutrition problems behind the Northeast and the North respectively.

Songkhla was chosen as a study area, because it is the centre of various cultures, while Pattani was also selected to represent the Thai-Muslim culture.

The Buddhist Thais in the South eat vegetable more than the Muslim Thais do. However, the latter group consume more fruit and fat.

The difference in geographical location also governs their food habits. People who live on highlands in this region have more vegetable supply, and thus eat this kind of food more than those living in coastal areas.

For the Central Plains, the research team expresses worry over the trend of using seasoning powder (monosodium glutamate). They find out that children under four years old do not eat fruit as much as they should. The children prefer candies and other colourful sweets while parents do not pay much attention in teaching the children to eat fruit.

Villagers in the study areas in this region have problem with drinking water. Very few of them have year-round supply of rainwater, and the majority still rely on canals or river which they usually drink straight without boiling.

The research recommends a way to deal with malnutrition. They agree that the mass media can educate the people so that a new attitude towards better food habits will be formed.

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Malnutrition Is Still a Tenacious Enemy For the Children of Food-Rich Thailand



Malnutrition Remains A Tenacious Enemy in Food-Rich Thailand

By RICHARD BORSUK

SOB ERM, Thailand—Visitors to this remote village 370 miles north of Bangkok quickly attract attention. People crowd round to learn why outsiders have ventured up the muddy, rutted road to their poor hillside homes.

Among the onlookers is 20-month-old Chom Bangwen, brought by his mother. But he isn't curious about the visitors. He doesn't show much interest in anything as he stares blankly ahead. Unlike other children, he doesn't smile or respond to attention from adults.

But Chom is like hundreds of thousands of Thai children in one way—he is suffering from malnutrition. Chom's physical growth is impaired. His mental development may be, too.

'Land of Plenty'

Malnutrition is a major problem in Thailand, as it is in nearly all developing countries. But many feel there's no reason for malnutrition to exist here. With its strong agricultural base, Thailand is one of a privileged small group of food-exporting nations. The country is by far the world's largest rice exporter, and ships large amounts of corn, fruit, chicken and seafood. Local markets are well-stocked, and for many Thai citizens, good food is a passion.

"Ironically, in this land of plenty, there is serious malnutrition," says Dr. Chokchuang Chutinaton, chairman of the Consumers Group of Siam. Officials don't deny the problem exists, but they say it's diminishing as the economy grows, rural health services improve and knowledge about nutrition spreads.

A survey by the Ministry of Public Health between January 1979 and March 1982 showed that 51% of all Thai children up to age five were malnourished to some degree, and of that number, slightly more than 2% were considered to have third-degree malnutrition. According to an international classification system, first-degree malnutrition is marginal while third-degree is severe and could be life-threatening if not treated.

Improving Statistics

In a survey between October 1983 and January 1984, the percentage of malnourished children under five declined to 35%. And in the latest survey, between last October and December, the figure was 30%, of whom only 0.27% were in the third-degree category. Nonetheless, the ministry estimates that malnutrition is a factor in the approximately 55,000 deaths every year of Thai children aged five and under.

Malnutrition often is rooted in poverty. Thailand's rural areas and urban slums contain thousands of families unable to afford sufficient nutritious food. But many people, including Dr. Chokchuang, say large numbers of poor families can afford nutritious food, but don't know what it is or how to produce it.

The Ministry of Public Health cites poverty as the cause in only 10% to 12% of cases of child malnutrition. Dr. Chavalit Buntikitrunguang of the ministry's nutrition department says another 50% to 80% of cases are the fault of ignorance—or what the ministry calls "wrong dietary practice."

Child Care

Most of the remaining cases result from what the ministry calls "inexperienced child care." This is connected with social changes in Thailand.

Traditionally, several generations of a family lived together, allowing a grandparent or other relative to supervise children while their parents worked. Today, however, many rural families have relocated without the older generation. If both parents are working in the field, infants are left in the care of brothers and sisters. Often these siblings, Dr. Chavalit says, "can't even take care of themselves, so how can they take care of a child?"

In many cases in northern Thailand, families of malnourished children have land and can provide them with a more nutritious diet—if they learn how to do it.

The Health Ministry in recent years has organized extensive campaigns to make people aware of the necessity of vaccinating their children and the need for a proper diet.

Dr. Chavalit says cases of malnutrition occur even in families that already have a good supply of protein. These cases, he says, usually result from ignorance or taboos. For example, he says, some fishermen believe their children shouldn't eat fish until they are old enough to have learned to spell the word fish. Sometimes, people aren't aware how to store food properly, and consequently the food is wasted.

Family Planning

But changing eating habits isn't easy. Dr. Junruon Mikhanom, Lampang province health officer, contrasts nutrition with family planning, which generally has been accepted in Thailand. Family planning involves little change in people's daily lives. Modifying eating habits, on the other hand, can mean several changes, especially when this entails having to grow new things, he says.

Dr. Chokchuang says nutrition in Thailand would improve markedly if people would simply switch to brown rice instead of polished white rice. "If we eat white rice, we are eating a much poorer quality food," he says.

However, it's extremely unlikely that many Thais will make the change, as white rice is the norm. Brown rice is considered "food only for prisoners," a health official says.

In 1983, the Public Health Ministry's permanent secretary, Dr. Amorn Nondasuta, said in a newspaper interview that Thailand's abundance of rice has aggravated dietary deficiencies. "Rice fills the stomach, but doesn't provide enough calories," he said.

Fed Only Rice

Chom is an example of a child who eats too much rice and too little of anything else. From the time he was six months old until recently, when an assistance program came to his village, he was fed only rice. At his age, he should weigh at least 22 pounds; he weighs 16 pounds. According to the international classification standards, he has second-degree malnutrition.

In Chom's case, malnutrition has been caused by poverty. His parents are landless, and his father's only income comes from working on other people's land. Chom's mother, Sub, says her husband usually gets only 20 baht (75 cents) a day—and some of that goes to buy rice for ducks they are raising.

"While the ducks eat into their income," they also help the family. Chom now eats duck eggs, a good source of protein. He and a less malnourished older sister also are part of a supplemental feeding program of a "village nutrition group."

The program, part of a campaign to combat the problem in sections of Lampang province, is sponsored by Thai government agencies and a private California-based group, Meals for Millions.

Effective Campaigns

The twice-a-month feedings "aren't enough, but they're helping," says Naiyana Khomson, project manager for the group, which is sponsored by donations and the U.S. Agency for International Development. Since the campaign began three years ago, malnutrition has been reduced considerably.

In Lampang province's Ngao district, the percentage of pre-school children suffering from malnutrition has declined to 32% from 51% three years ago, and almost all cases of third-degree malnutrition have been cured.

The heart of the Lampang project is nutrition education, but it doesn't stop there. The principle is that people should be helped to grow more of the food they need. In two provincial districts encompassing 15,000 families, the campaign is helping villagers grow and use soybeans, raise ducks, build fish ponds and plant vegetable gardens—all new activities to these areas. The campaign is also promoting construction of latrines, as well as wooden cabinets for storing food.

To try to make the project self-sufficient and self-sustaining—as well as to make clear to villagers this isn't a hand-out—a system of revolving funds has been set up. For example, a family is given five ducklings and assistance on how to raise and breed them. The following year, if the family wants to stay in the program and get help in other areas, it must return to a village committee managing the fund either five ducklings or the money to buy them. "This isn't a giveaway program," says Chatri Prachapiphat, who handles community development work for the project.

Meals for Millions is starting a second Thai project in rural provinces in the northeast, where there is more malnutrition and fewer resources to draw on than in Lampang.

All surveys show the poor but populous northeast to be the main problem area for malnutrition. In the 1979-82 survey, nearly two-thirds of young children were shown to be suffering from malnutrition in some provinces.

Hunger in the northeast was a source of controversy this year. In April a private group, the Children Development Foundation, began running television advertisements that graphically illustrated hunger and malnutrition there. They show emaciated, listless children. In one scene, some are catching lizards to eat; in another, they are eating salt licks.

Some Health Ministry officials criticized the ad as sensationalism that hurt Thailand's image. A few even charged that the children had been forced to eat salt lick for the camera. But many Thais responded to the ads with the same enthusiasm that others have shown toward helping the hungry in Ethiopia.

Sriawang Puawongpet, deputy chairman of the foundation, said the organization received 500,000 baht in donations in May, and two million baht in June—compared with a monthly average of around 80,000 baht before the ads appeared.