

THRIPOSHA PRODUCT AND PROGRAM



Prepared by
Irwin Hornstein
for
U.S. Agency for
International
Development
Washington, D.C.
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PREFACE

This is the third in a series of descriptions of innovative or unusual nutrition programs undertaken in Third World countries which include a food technology component. They have been prepared in the hope that others may find the information useful in their own work in development.

The Thripasha program combines a number of elements that give it particular interest. It represents a successful conversion of a feeding program from full reliance on imported commodities to a program where a substantial share of the food used is locally grown and processed. It illustrates the use of name and packaging to create a strong positive image for a supplementary food. It provides a demonstration of the capability of take-home feeding to achieve nutritional impact when combined with other nutrition and health services. And it includes introduction of the supplement through commercial channels as a complement to the donation element.

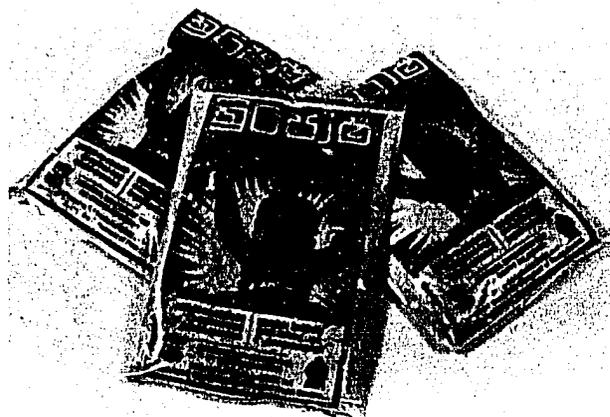
This piece was written by Irwin Hornstein, Visiting Professor, Colorado State University (at time of preparation), with assistance from Robert Weil, Food Technology Branch, Office of International Cooperation and Development, U.S. Department of Agriculture.

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INTRODUCTION

Walk down a street in Colombo and ask any man or woman if they have heard of CARE or the United States Agency for International Development (AID) and you will probably be met with a blank stare. Ask if they know what Thriposha is and the chances are excellent that a smile of recognition will follow. Thriposha is a household word to virtually all Sri Lankans. Its name is synonymous with good nutrition and its value as a food for children is well understood. In Sinhala, Thriposha stands for three types of nourishment and conveys the idea of a food with three-fold nutritional value. The supplement provides energy, protein and vitamins and minerals. It consists of 40 percent locally grown and processed corn and soya and 60 percent of a donated U.S. blend of corn, soya, non-fat dried milk, minerals and vitamins. The goal is that within the next six years Thriposha will become a wholly indigenous product.

The Thriposha Program combines feeding and health services. It is a joint effort by Sri Lanka's Ministry of Health and CARE, a U.S. private voluntary organization that promotes development in the Third World. Support for the program is also provided by AID. The cereal based food supplement, Thriposha, is given at no cost to nutritionally at risk infants, preschoolers and pregnant and lactating women. It is essentially a "take-home" program with the product distributed through a variety of health centers in urban and rural areas. The take-home program covers five out of every six Thriposha beneficiaries. On-site feeding, primarily on government-owned tea, rubber and coconut estates, serves the remainder. The program, which reached only 75,000 in 1973, served 632,000 in 1983. Each recipient receives 1500 grams (3.33



750-gram packets of Thriposha (Colorado State University)

lbs) of Thriposha per month — enough for a daily 50 gram serving that provides 10 grams of protein, about 200 calories and a full daily complement of minerals and vitamins.

An evaluation by the Community Systems Foundation of the Thriposha Program concluded, "The amount of nutritional improvement surpasses that seen in any other food supplementation program that has been subjected to the rigorous statistical tests applied to this data." The authors emphasize that the positive nutritional impact of the program "is due to the entire program — immunizations, primary health care including deworming and mineral and vitamin supplementation, health education and Thriposha." The evaluators, however, found it impossible to sort out the role of Thriposha, independently of other factors. In their words, "We emphasize the package of services because we cannot isolate the contribution of Thriposha

alone. However, we firmly believe that without Thripasha the benefit observed would not be found."¹

This message is clear — what makes the Sri Lanka Program distinctive and effective is the synergistic combination of a nutritionally balanced food supplement, nutrition education and a health program that controls and treats infection. The com-

bined package of food, health and nutrition services is all-important.

In the hope that the Thripasha program will encourage others to explore the feasibility of introducing similar programs in their own countries, the production of Thripasha and the setting in which it is distributed are described here.

BACKGROUND

Sri Lanka, a tear-shaped 25,000 square-mile island, 18 miles southeast of India, has a population of 15.9 million. Its transportation system and compact geography make all areas readily accessible to major population centers. Seventy-five percent of the population lives in rural areas. The per capita annual income is about US \$320, although the income in rural areas, urban slums and on the government-run estates is less than half that figure. The primary target groups for supplementary feeding programs are the malnourished among the country's 2.25 million preschool children and 250,000 pregnant and lactating women.

Malnutrition is a serious problem. In 1976 a nutritional status survey of preschool children based on measurements of height and weight found that 35 percent of preschoolers were too small for their age (stunted), and 6.6 percent were appreciably underweight for their height (wasted). The same data in terms of the Gomez nutrition classification system indicated that 42 percent of all preschoolers suffered from moderate (Grade II) or severe (Grade III) malnutrition.² More recent surveys confirm the existence of malnutrition as a continuing problem.

The nutritional status of many pregnant and lactating women is also precarious. Their increased

requirement for additional calories, protein and other nutrients during pregnancy and lactation is seldom met, and at least one-fourth of these women are classified as anemic.

This profile — undernutrition and low-income — is typical of most developing countries. The Sri Lankan health statistics are, however, very atypical:

- Infant mortality is, on the average, 31 infant deaths per 1000 live births.
- Average life expectancy at birth is 69 years.

These data are far superior to figures for infant mortality and life expectancy in countries with similar per capita incomes. A World Bank report found that Sri Lanka has half again the life expectancy and one fourth of the infant mortality than might be expected for a country with a similar per capita income.

In great measure, this anomaly reflects the government's concern with food, health and nutrition. Since the early 1940s, Sri Lanka has striven to make health services and food available to all its people. The substantial drop in infant mortality from 145 per 1000 in 1945 to the present 31 per 1000 was achieved, in a large part, through a health system that provided better coverage than in most developing countries and a food subsidy scheme that provided ample rations of rice to the poor. However, in the more remote rural villages, city slums and on the government tea, rubber and coconut estates where 1.2 million people live and work, infant mortality is higher, life expectancy lower and fewer children attend school than depicted by the national average.

¹Drake, W.D. et al. *Nutrition Programs in Sri Lanka Using U.S. Food Aid — An Evaluation of PL 480 Title II Programs*. (Community Systems Foundation, Ann Arbor, Mich., 1982) pp. IV, 25.

²Sri Lanka Ministry of Health, *National Nutrition Survey, 1975/76* (Colombo).

To overcome existing shortcomings, both the food subsidy schemes and the health system are being restructured. Increased emphasis is being given to health care delivery at the local level and to increased community participation in health programs.

The food subsidy schemes in existence from 1940 to 1977 provided free rice but proved a heavy burden on the government, consuming up to 14 percent of its revenues. In 1977, a new government came to power and replaced the free rice distribution program with a less costly food stamp plan. Recipients are limited to households with incomes of less than 400 rupees (\$20) per month. The stamps can be used to purchase basic food staples. About 7.5 million people, half the population, benefit from this program. However, the increase in the price of food has outpaced the periodic increases in the purchasing power of food stamps. As a result, families that had been receiving 80 to 90 kilograms of rice per year received only about 60 kilograms in 1983. Daily caloric intake has dropped substantially for the poor. For example, on the tea estates it is estimated that two-thirds of the population now consume less than 2000 calories a day. In the early 1970s only

three percent were in this category. The overall effect has been to further enhance the need for an effective supplementary food. Thriposha helps fill that need.



Program participants with Thriposha packet (CARE — Steve Maines)

THRIPOSHA

Thriposha was conceived as a food supplement to meet immediate needs and attain future goals. The concept was:

- **Timely.** It helped ease the nutritional problems created by the government's belt tightening programs of the early 1970s.

- **Innovative.** The use of low-cost extrusion technology reduced processing costs and produced a centrally-processed product with excellent acceptability.

- **Dynamic.** From its inception, the program sought to combat malnutrition by (a) providing a food which would be more effective than most take-home foods because it would have a more distinctive image as a nutritional supplement; (b) progressively increasing the locally-produced component of Thriposha until a wholly indigenous nutri-

tional food, not dependent on foreign food donations or imports, would become a reality; and (c) ultimately selling Thriposha through commercial outlets, as well, to reach those not qualifying for the feeding program or not reached by it.

The approaches used to attain these goals have created a product that enjoys widespread consumer acceptance. Every effort was made to dissociate Thriposha from the stigma of being a "poor man's" food. Thriposha was introduced as a well packaged, attractive product with an aura and image befitting a food designed to improve nutrition and health.

Low-cost extruders enabled the program to grow to its present dimensions. The application of low-cost extrusion (LEC) technology to the produc-

tion of blended foods in developing countries was pioneered by Paul Crowley. Scarcely a decade ago he recommended that AID explore the utility of this technology for the preparation of centrally-processed, nutritious, low-cost blended foods in developing countries. AID acted on this recommendation. Implementation was placed in the hands of the Nutrition and Agribusiness Group in the U.S. Department of Agriculture (USDA), headed by Mr. Crowley. The Koehring Co., manufacturers of the Brady Crop Cooker — one of several low-cost extruders developed in the U.S. for on-farm processing (cooking) of soya beans — loaned AID three extruders. Their utility for quick-cooking mixtures of cereals, soya, legumes and/or oilseeds was demonstrated under field conditions in developing countries.

Colorado State University served as the research and development backstop for the project. Judson Harper, now Colorado State's vice president for research, headed the project and support was provided cooperatively by the Department of Agricultural and Chemical Engineering and by the Department of Food Science and Nutrition.

To those who had been associated with the program since its inception and had seen it start as a Brady anchored to a small concrete slab at a demonstration site, the first view of the Thriposha plant at Ja-Ela must have been an exciting and inspiring experience. This modern, well-planned, immaculate facility, housed in a building covering an area as large as a football field, is not only a force in combatting malnutrition but also a tribute to the people and institutions that brought the concept to fruition.



Ja-Ela plant — main processing building with warehouse to left (Ron Tribelhorn)

Jacque Lauriac, director, and Justin Jackson, assistant director, of the CARE program in Sri Lanka were the key CARE figures who, in conjunction with the Sri Lankan Government, made Thriposha a reality. In March 1972, CARE submitted to the Sri Lankan Government a proposal to develop an indigenously produced, cereal-based weaning food to be used in the government's maternal/child health care programs. The initial plan called for the replacement of a small portion of the U.S. donated foods by locally produced foods. The proposal was timely: non-fat dried milk was in short supply, there was talk of the U.S. phasing out its donated food program and ongoing supplementary feeding programs supported by the Government of Sri Lanka were in jeopardy. A locally produced, cereal-based supplementary food appeared to be a potentially useful substitute. In April, CARE's proposal was approved by the government with the proviso that the project be developed in cooperation with the Ministry of Health.

An important contribution to the development of the program was made by Dr. Beatrice De Mel, a pediatrician at the Medical Research Institute, Ministry of Health. She was one of the advocates of the need for a weaning food in Sri Lanka and helped to build interest in the initial proposal. Subsequently, she was assigned by the Ministry of Health to serve as liaison between the Ministry and CARE. Working directly in the CARE office, she provided valuable support and continuity.

In the initial period of the program, wheat soy blend (WSB), a donated U.S. Government food commodity shipped to Sri Lanka in 50-pound bags, was repackaged into small plastic bags holding 750 grams. The plastic bags were manufactured and printed locally, as were the master bags into which the smaller plastic bags were packed for distribution. Beneficiaries were given an attractively packaged product with a local identity — a package with a distinctive name, directions for use and information concerning the product printed in the three languages of the country.

Mr. Jackson describes the significance of this packaging. "The packaging of Thriposha is central to its success to date. It provides value and dignity to the recipient and also relieves the already overworked medical and clerical staff at the clinics of the burden of having to measure and handle an

unpacked commodity."³ An assessment of acceptability indicated that in less than two and a half years Thriposha was known to about nine-tenths of Sri Lankan householders and had been used at one time or another by a majority of low-income households.⁴



Packets of Thriposha being filled at the Ja-Ela plant (Ron Tribelhorn)

Adding indigenous cereals to Thriposha was begun in 1974, when cooked sorghum was substituted for 20 percent of the WSB. Sorghum was cleaned, pearled and ground at one location, then transported to a biscuit manufacturing company. There the sorghum was mixed with shortening, formed into a biscuit and baked. The biscuit was then reground into a flour and blended with WSB. This cumbersome and inefficient procedure had to be used until a better process could be found.

By the summer of 1975, Thriposha recipients had risen from an initial 42,000 to 310,000, and the cooking and processing of sorghum had become a serious bottleneck. CARE, aware of the

³Jackson, J.R. "Food Production Applications in Sri Lanka", *Low-Cost Extrusion Cookers, International Workshop Proceedings*, eds. David E. Wilson, Peggy Stumpf (Agricultural and Chemical Engineering, Colorado State University, Fort Collins, Colo., 1973), p. 101.

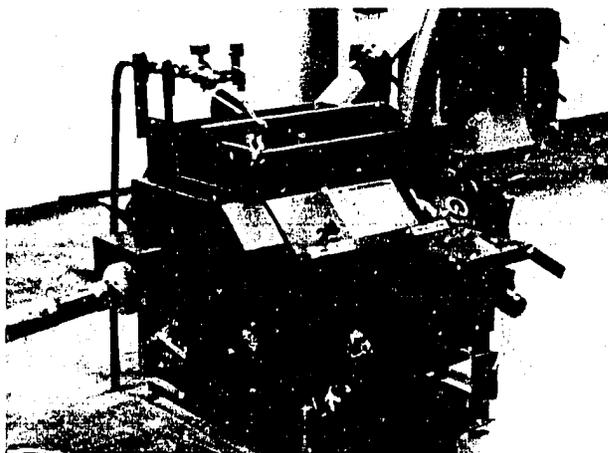
⁴Pre-market survey conducted by Sevum Seva Market Research Service, 1975-1976 quoted in Jackson, *op. cit.*

AID-funded low-cost extrusion program, requested AID/USDA's assistance. In May 1975, Mr. Crowley visited Colombo to explore the feasibility of installing an LEC system to quick cook sorghum — and blend it on site with WSB. The LEC approach appeared feasible. As a result of this visit, a joint venture agreement was reached. CARE purchased a Brady model 206 extruder. AID/Washington provided ancillary equipment (motor drives, feeders, conveyors, etc.) and funds for the design of the system. The Sri Lanka Ministry of Health furnished the site and provided funds for local equipment and labor to install and test the system and for the plant's operating personnel.

In July 1975, Dr. Harper and Ronald Tribelhorn, both of Colorado State University, visited Colombo to design the plant and identify the needed equipment. Criteria for equipment selection included cost, availability and capability.

The Brady and accessories arrived in late December. In February, Mr. Tribelhorn returned to assist in the installation and shakedown of the equipment and in the training of personnel in its use and care. By March 1976, only nine months after the CARE and USDA decision to use low-cost extrusion to make Thriposha, the equipment was installed in a rice mill in Kundasale, 80 miles from Colombo.

The first year of operation clearly demonstrated that an LEC system could produce an acceptable, low-cost, nutritious product. A number of formulations made from indigenous ingredients were



Brady 206 (Ron Tribelhorn)

evaluated including sorghum/maize, maize/soya and maize/navy bean/coconut oil. During the first year, WSB was replaced by Instant Corn Soy Milk, another U.S. donated "Food for Peace" commodity consisting of corn, soya and non-fat dry milk. Wheat is not grown in Sri Lanka, and this change was in keeping with the goal of ultimately producing a wholly indigenous product. In addition, sorghum was replaced by a more acceptable mixture of indigenous maize and soya.

An evaluation team reviewed the Kundasale operation in March 1977. The team specifically recommended that an adequate spare parts inventory be established and that the existing system be improved to permit continuous operation. These steps were taken and ultimately raised the level of production to 90 percent of capability.

In a more general vein, the team found that:

1. The LEC system presented no unique problems and competent technicians in grain processing would find the requirements of LEC operation usual and routine.

2. The Brady Crop Cooker, the heart of the operation, was unique and innovative because of its simplicity and low cost. "Its mechanical elements are common mechanisms; all other mechanisms in the system are standard designs and available over the counter."⁵

3. Environmental sanitation, quality control and management control requirements were neither unusual nor sophisticated or difficult.

In short, the team agreed that the LEC technology provided a good fit for Sri Lanka's needs.

In 1978, the operating efficiency of the Kundasale plant had been improved. However, the lack of capacity to process local cereals to meet future production requirements, combined with the expense of transporting extruded cereals to Colombo for blending, necessitated a major relocation and expansion program. The Ministry of Health and CARE agreed to build a Thripasha processing complex to meet future program requirements on a 7-acre site in Kapuwatte at Ja-Ela, 11 miles north of Colombo. The site had direct access to rail and main road transportation networks.

The agreement to build this new plant marked a new commitment by the Government of Sri Lanka to the Thripasha program. Until this time, continuation depended on the renewal of annual agreements. Each year, CARE and the Ministry of Health would establish a target for the number of recipients to be reached during that year, and funds for the purchase of local commodities and operation of the program would then be provided by the Government of Sri Lanka. In 1977, a 10-year plan including the building of the new plant at Ja-Ela was approved at the highest levels of the Sri Lankan Government. This long-range commitment called for increasing the number of recipients and even for the eventual expansion of the new plant.

In the fall of 1978, work on the Ja-Ela plant began. Earl Goodyear, the CARE Thripasha Project Manager at that time, spearheaded the drive to construct the new facility.

CURRENT OPERATIONS — TECHNOLOGY AND COSTS

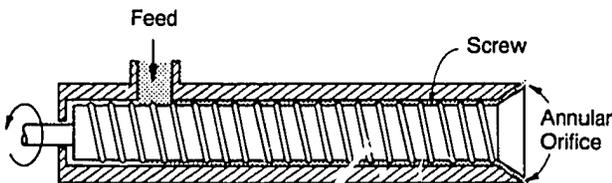
The Ja-Ela plant commenced production in December 1979. The following description may help to give a picture of current operations.

⁵Ackles A., Gaylor, R., Kuphal, E. *Evaluation of Low-Cost Extrusion Cooker in Sri Lanka* (Agricultural and Chemical Engineering, Colorado State University, Fort Collins, Colo., 1977), p. 117.

There is a main processing building complemented by an adjacent warehouse, garage and a canteen which contains medical, eating, lavatory and shower facilities for all plant workers. The 20,000 square-foot processing facility houses two Brady extruders, cleaning and dehulling equipment, packaging equipment, an office and a quality control laboratory. The plant is managed by Ceylon To-

bacco Ltd., the successful bidder on a contract to perform this function.

As a first step, raw corn and soy are cleaned and destoned, and soy is dehulled. These dry ingredients are then metered in the proper combination into the two extruders. Each extruder has an auger that rotates in a stationary cylindrical barrel. As shown in the drawing below, as the auger rotates, the uncooked cereal mixture is forced through the barrel. The auger works the material mechanically and also generates heat through friction, cooking the mixture at a temperature of 160°C. The cooked product is discharged through an orifice. The rapid drop between the high internal pressure and the outside atmosphere causes some of the superheated moisture in the mix to flash off and the product to expand to form a cooked flake.



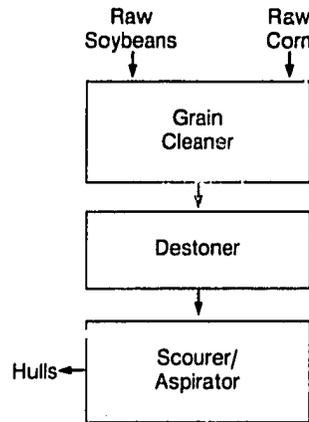
Action of extruder screw

In a single step a pre-cooked product is produced. Its starch and protein constituents are broken down into readily digestible components. Chemical factors present in soybeans and other oilseeds and pulses which interfere with the body's ability to use their protein are deactivated. Furthermore, the product's storage life is extended by destruction of microorganisms from the heat generated by the rotating auger.

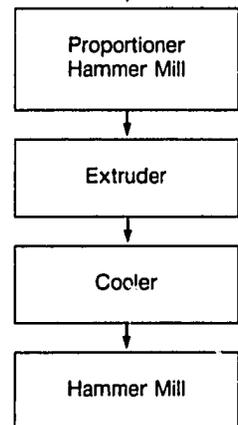
After the product is extruded, it is cooled and ground, and vitamins, minerals and milk solids are added. It is then packaged. A flow chart for the Thripasha production process is shown in Figure 1.

Figure 1. Flow Diagram for Making Thripasha

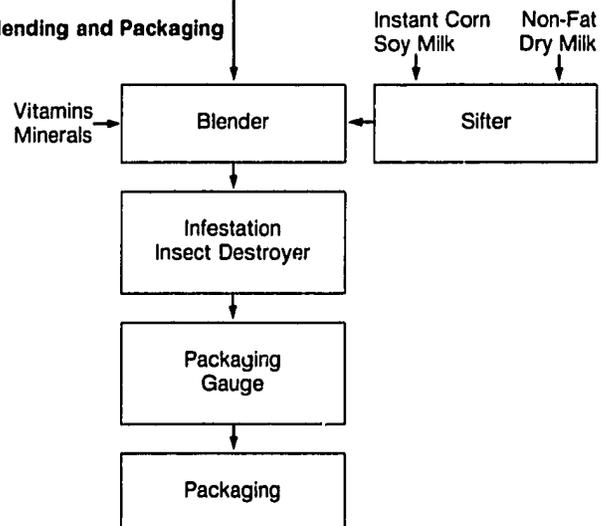
Cleaning and Dehulling



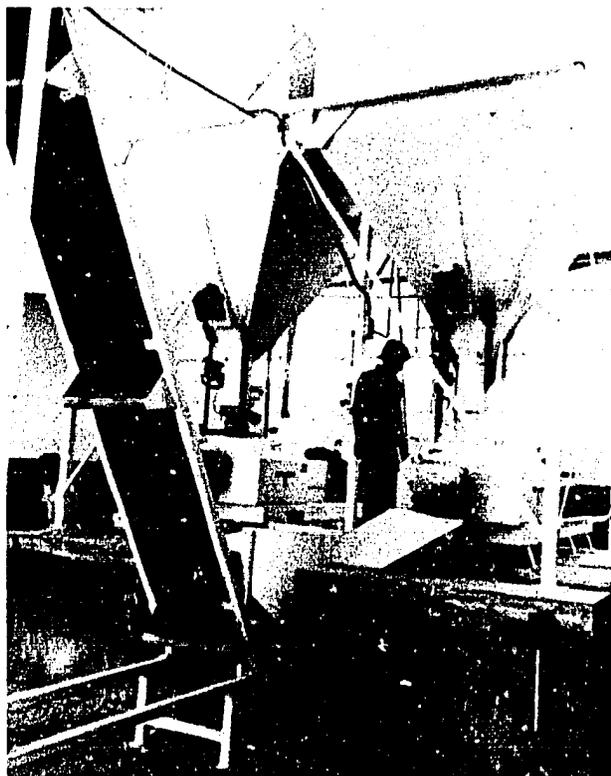
Processing and Milling



Blending and Packaging



The product is a 70/30 mixture of maize and full-fat soya. This mix is blended with 12 percent non-fat dry milk and a 2 percent premix of vitamins and minerals. It is then combined in the ratio of 40/60 with donated Instant Corn Soy Milk to make Thripasha. The final product contains maize, 59 percent; full-fat soya, 27 percent; non-fat dry milk, 12 percent; and vitamins and minerals.



Twin Bradys in operation at the Ja-Ela plant — overhead surge tanks provide corn and soy for extrusion (Ron Tribelhorn)

The investment cost to build this plant in 1977-79 was about U.S. \$850,000. Approximately one-third of this investment represented the cost of equipment, another third the cost of construction and the final third the cost of land, rail sidings, installation and miscellaneous items such as furniture and canteen equipment.

Much larger costs are the recurring ones for the raw commodities to be processed and, to a much lesser extent, the operation of the plant itself. For example, in 1981, recurring costs came to \$4.3

million. Of this amount 85 percent represented the costs of the food materials (including the cost of U.S. donated food). For these expenditures, more than 12.5 million packets of Thripasha were produced. The cost of a two-week ration — one 750-gram packet — was U.S. \$0.35. This included the cost of:

raw materials	U.S. \$0.30
packaging	U.S. \$0.02
processing	U.S. \$0.03

Thus, packaging added 7.1 percent to the commodity cost and processing added another 10.2 percent. As percentages of the total cost, packaging accounted for 6 percent and processing 8.6 percent.

Packaging and processing taken together represented a cost of U.S. \$1.22 per beneficiary per year or one-third of one cent per day. This one-third of a penny per day assured a readily digestible food, insect free and microbiologically safe. Furthermore, this small cost enabled savings to be made in the amount of fuel normally required for the prolonged cooking of corn and soya and savings in time for the homemaker.

The 50-gram (2-ounce) daily ration of dry Thripasha makes up into the equivalent of one third- to one half-pound of prepared food. The supplement provides a high level of protein, about 40 percent of the recommended dietary allowance for a one- to three-year-old child. And it provides approximately 15 percent of the calorie requirement, corresponding to roughly half of the estimated deficit of a low-income rural preschool child. Essential vitamins and minerals are also included.⁶

Commenting on the convenience aspect of the product, Dr. De Mel states, "Thripasha has led the way in our country for the women who find it so

⁶Medical Research Institute, Sri Lanka Ministry of Health in *Low-cost Extrusion Cookers, Second International Workshop Proceedings* eds. David E. Wilson and R.E. Tribelhorn (Agricultural and Chemical Engineering, Colorado State University, Fort Collins, Colo., 1979), p 211; Medical Research Institute, "Table of Average Intake", in *Low-Cost Extrusion Cookers, International Workshop* (1976), *op. cit.* p. 110.

difficult to put one, two and three [ingredients] together to make a weaning food. It's all there and all processed, and I think that is one of the biggest things in its favor. It is considered both a convenience and a nutritious food.⁷



750-gram packets in master bags (30 packets per bag) for delivery to health centers (CARE — Sri Lanka)

The Ja-Ela plant now extrudes about 4.6 million kilograms of indigenously grown corn and soy. This represents 40 percent of the total 11.5 million kilograms of Thriposha which is consumed by some 650,000 recipients. As a result, the plant's two Bradys are now operating at full capacity, 900 kilograms per hour, 22 hours per day. The Bradys have proved eminently well suited to producing at this level of output. Their simple friction process

results in a machine that is relatively simple to operate and maintain. In addition, where production requirements remain below one ton per hour, the Bradys can turn out products at the same unit cost as much larger and more expensive extruders that use a more complex moistening and drying process. But an expansion of plant capacity is needed to increase the number of recipients and support commercial marketing, while continuing the shift in the ratio of indigenous to imported materials.

Accordingly, as a next step, a proposal was developed that would increase the extrusion processing output from the present 900 kilograms per hour to 2500 kilograms per hour. An engineering team funded by AID and provided through USDA designed an expanded processing line to meet the increased requirement. Costs of equipment, installation, engineering services and electrical connections were estimated at slightly under U.S. \$500,000. The proposal recommended use of an eight-inch Anderson International extruder which has the capacity of approximately five Bradys. Increase of production beyond the present point would make a large machine operating at full capacity more economical than the use of several smaller Bradys. The general question of plant expansion was one of the topics discussed at a 1985 workshop in Colombo attended by representatives of the Sri Lankan Government, AID and CARE and at subsequent meetings of these parties. A final decision regarding expansion has not, however, as yet been made by the government.

DISTRIBUTION AND IMPACT

The furnishing of a nutritious, attractively packaged, processed product has been a major achievement of the Thriposha program. But the full impact of the Thriposha approach resulted from then joining this product to other nutrition and health services. These services are made available

through clinics and rural health centers. They are the first line of an extensive network which includes hospitals as well as health posts. The system is staffed by medical officers, medical practitioners, nurses, family health workers and midwives. Health care is readily accessible. It has been estimated that the average distance a family has to travel to reach a government health facility is only three miles and that in 1980, 83 percent of pregnant women and 60 percent of children born that year visited a health post at least once.

⁷De Mel, B. "Question and Answer Session" *Low-Cost Extrusion Cookers, Second International Workshop Proceedings, op. cit.*, p. 201.

The public system is also complemented by an extensive network of private care which includes 10,000 Ayurvedic indigenous health practitioners.

The public system is the major provider of Thripasha and health services. Mothers are advised to bring their preschoolers to the government health posts at least once a month. A well attended rural center may accommodate 250 children and 50 to 75 mothers per month. The object is to provide the mother with health, nutrition and family planning information and to furnish health care for the child. If immunization is called for, the child receives the appropriate vaccine. The immunization program, a vital element of the country's health program, protects against diphtheria, tetanus, whooping cough and tuberculosis.

As an accompaniment to these services Thripasha is also provided. Mothers are given a one-month supply of Thripasha for each child consisting of two 750-gram packets. The result is that the recipient receives a combined health and nutrition package which is considered the key to the program's success. The Thripasha is intended for preschool children identified as malnourished through periodic weighings and for pregnant and lactating women showing clinical signs of anemia or having difficulty in breast feeding. This screening of recipients seeks to target Thripasha to those most in need. It is a very important element of the program. Screening is in place in many of the program's centers. At the same time, there also remain a good number of centers where this

element has not yet been implemented. Implementation in these centers has accordingly been recognized as an important further program objective.

In the evaluation of the program's impact on nutritional status, made by the Community Systems Foundation, children were considered malnourished if their weight was less than 70 percent of the U.S. National Academy of Sciences standard. The nutritional status of children who were in the program for varying amounts of time was compared. Comparisons were made between children of similar age because variation in nutritional status may occur as a function of age. This is due to the fact that needy children typically experience maximum nutritional risk in the period after weaning with the risk later decreasing. By comparing children of similar age, the evaluators sought to avoid confusing possible improvement in nutritional status occurring with age with improvement as a result of participation in the program.

The evaluation was based on records of 1799 children at 42 sites in various parts of the country and included both rural and urban populations. The evaluators found that the rate of malnutrition was lowest among those children with greatest exposure to the program. For example, 44 percent of new entries aged 1 to 2 years were malnourished. In contrast, only 29 percent of children of similar age who had been participating in the program were malnourished, a difference of 33 percent.



Mothers and children attending health clinic (CARE — Steve Maines)



Health workers give out 750-gram packets of Thripasha to pregnant and lactating women (CARE — Sri Lanka)

Similarly, in the case of children aged 2 to 3 and 3 to 5 years the prevalence of malnutrition among longer-term participants was less than new entries by 28 percent and 31 percent respectively. The evaluators also compared the rate of malnutrition among similarly aged children who were all already participating in the program but for different lengths of time. Here also, substantial differences were found in the prevalence of malnutrition, which progressively decreased as participation in the program increased.

The evaluators noted that the data, although taken from a fairly large number of clinic sites, were not based on a random sample since these were clinics which had adequate weight records. They believe these clinics may, therefore, be better run, although they state they have no evidence of this. As a result, they caution against generalizing to all elements of the program. But what they do conclude is that substantial impact is being achieved in an operational setting even if statements regarding this level of impact cannot necessarily be made for the total program. It might be added that due to measurement factors, including absence from the sample of fully recovered graduated children, the evaluators believe their findings actually understate the true degree of impact at the clinics studied.

In reporting their results, the evaluators went on to state that it was the package of services that was critical since the study was not designed to isolate the independent contribution of each element. Contributing factors would have included the food, which was probably shared with other family members to some degree, and the other services, the utilization of which was believed itself to be partly induced by Thriposha's incentive effect on clinic attendance. In addition, improved mother's care may also have been called forth by exposure to the combined package. Of central importance, however, whatever the mechanism actually operative, the evaluators concluded that the observed beneficial impact would not have occurred without Thriposha.

Although take-home feeding is considered by many the most effective means of reaching pre-school children, there are few documented in-

stances of its nutritional impact. This is due in part to the fact that it is considered very difficult to measure nutritional impact in a field setting without a carefully controlled experiment designed in advance. In addition, the problem is further complicated in the case of take-home feeding where the actual feeding does not take place in a supervised situation. But in the Thriposha case, clinics providing take-home food were found capable of achieving substantial impact under field conditions. A demonstration was provided that the take-home approach can be made to work, given the right combination of inputs.

On-Site Program

In addition to the take-home program, about 15 percent of the recipients are provided Thriposha through day-care centers serving Sri Lanka's government tea, rubber and coconut estates.

Mothers bring their children to a day-care center, or Creche, before going to work. Creche attendants are responsible for caring for the children, preparing their food and acting as pre-school teachers. They receive six weeks of formal training provided through an ongoing UNICEF program. Backing up the attendants are a family health worker (midwife) and a Family Welfare Supervisor. The Family Welfare Supervisor serves as the liaison between the estate's 250 to 500 families and the health system. He arranges medical appointments, meetings, etc. A Regional Estate Medical Officer, appointed by the Family Health Bureau in the Ministry of Health, coordinates the activities of the health teams on 20 to 30 estates. In addition, he conducts a monthly clinic at each estate. At the clinics, children are examined, weighed, immunized and dewormed. Mothers receive family planning, health and nutrition education. All estates in which clinics are conducted receive free Thriposha. The Thriposha reaches the children through the Creches and is fed to the children on site.

The estate superintendent holds the key to a successful program. His interest in the welfare of the estate workers and their children determines the resources that will be allocated to the program. Thus, the health care facilities and the number and quality of the Creches on the estate reflect this interest.



Children at a Creche on a tea estate being given their mid-morning meal (CARE — Sri Lanka)

Dr. R.S. Perera, Medical Officer for the Sri Lanka State Plantation Corporation Board II, Comba-woode Office, Talawakelle, assessed the impact of on-site feeding of Thriposha in an integrated health/nutrition Thriposha Program on 40 estates in the Kalutara region. Infants and preschoolers enrolled in the program in January 1982 received a

daily 50-gram ration of Thriposha fed on-site for a year. He compared their nutritional status prior to entering the program and after a year in the program. The percentage drop in second and third degree malnutrition was about 55 percent for both infants and preschoolers with a concomitant increase in the percentage of normal children and those mildly malnourished, i.e., first degree malnutrition.

Another, much smaller but interesting, on-site system in which volunteerism is emphasized serves as a vehicle for distribution of Thriposha in the Mahaweli region. A resident project manager is responsible for community development in about 20,000 homes. At the next lower level a block manager is responsible for 4,000 homes. At the base of the system is a volunteer who provides rudimentary health care and supplementary food to 20 homes. One of the functions of this volunteer is to provide Thriposha to children under five. The volunteer prepares Thriposha in the form of porridge. In the early morning hours prior to setting off for work, women bring their children to the volunteer's home where the children receive and eat the food.

COMMERCIAL DISTRIBUTION

Thriposha has been used primarily in feeding programs. In addition, however, a start has been made in distributing it through commercial channels. Approximately 100,000 one-pound packets are now sold in nine districts each month.

Use of commercial outlets was envisioned as early as 1972 when CARE submitted its original proposal for a new product for Sri Lanka's feeding program. Thriposha, sold for a low price, could help children not sufficiently malnourished to qualify for free distribution but whose economic level put them in jeopardy of becoming malnourished. The use of commercial outlets could play a major preventive role. It could also provide a means of serving children who were malnourished but were not reached by the feeding program.

Normally, a major obstacle to the introduction of a commercial processed food is the lack of public awareness. Without extensive advertising a product may never achieve the image required for mass acceptance. Even then, new products often fail because they do not meet perceived needs. But in the case of Thriposha the situation was different. The feeding program had already established Thriposha's image. As a result, when, in 1977, Thriposha was tried out in consumer trials, there was ready acceptance. A study by CARE, Lever Brothers and Texas A&M University found that 92 percent of those surveyed had already heard of Thriposha and that 67 percent had used Thriposha at some time. The survey concluded that the concept of Thriposha as a "nutritious

product" that is "good for children" was "understood, believed and accepted."⁸

The strategy of creating a special package and name for a take-home food had paid off. Observers believe that it was the awareness created by the feeding program which induced Lever Brothers, a large private corporation, to decide to take on Thriposha as a potentially viable product.

In 1980, following the positive results of the consumer acceptance trials, Lever Brothers initiated a test market operation in four sales areas — Kandy, Mutale, Galle and Matara. Thriposha, through Lever's extensive retail network, now took its place — alongside soap, toothpaste and other household items — in 2,000 outlets including many small shops in remote rural areas.

Initially the product was supported at the point of sale with posters and leaflets but no conventional advertising. An analysis carried out in May 1981 showed that the average monthly purchase was about 1,000 cases or 48,000 pounds per month. Lever Brothers continued to distribute the product, and sales remained at a similar level during 1982-83.

In August 1983, distribution was widened to include two additional coastal areas, Ambalangada and Tangalle. At the same time changes were made in the method of distribution.

Prior to August 1983, Lever Brothers did not add a charge for its role in distributing the product. But in August it was decided to place the operation on a more commercial basis. A small charge was added for the cost of warehousing, transport, sales and administration. This charge, about 4 percent, was added to the mark-up of the wholesaler and retailer of about 20 percent.

In November 1983, a review of the Thriposha commercial program by John Nichols, Texas A&M marketing specialist, concluded that Thriposha was a marketing success, and that sales were increasing despite the lack of a promotion effort.

⁸Corea, R., "Commercial THRIPOSHA Consumer Acceptance Test — Analysis of Principal Findings" in *Low-Cost Extrusion Cookers, Second International Workshop Proceedings*, op. cit. p. 193, 200.

Introduced in 1980 at 5.5 rupees per pound, increased costs required increases to a price of 9 rupees per pound, or about 45¢, in 1984. Nevertheless, Thriposha remains much less costly than other weaning foods that sell from two to ten times its price for a comparable amount of product. A recent CARE analysis indicated that the 9 rupee price would be in the range to cover cost plus return on investment in a commercial setting.⁹

A survey conducted in 1984 indicated that commercial Thriposha was consumed in significant quantity and that those receiving Thriposha included lower income groups.¹⁰ The survey was conducted prior to the price increase of 9 rupees so that further experience will be required to confirm these results, although an earlier one-rupee increase did not affect sales levels. The survey found that 62 percent of the persons interviewed purchased Thriposha once a month and on the average brought three one-pound packets. Eighty-two percent of the children, aged 0 to 2 years, were reported to consume Thriposha on an average of at least once a day. Average consumption per feeding was 20 to 23 grams depending on the preparation used. Seventy-two percent of children, aged 3 to 5, consumed Thriposha on an average of at least once per day. Average consumption per feeding was 27 to 29 grams. All age groups consumed Thriposha, with greater consumption reported for children and teenagers as compared to adults.

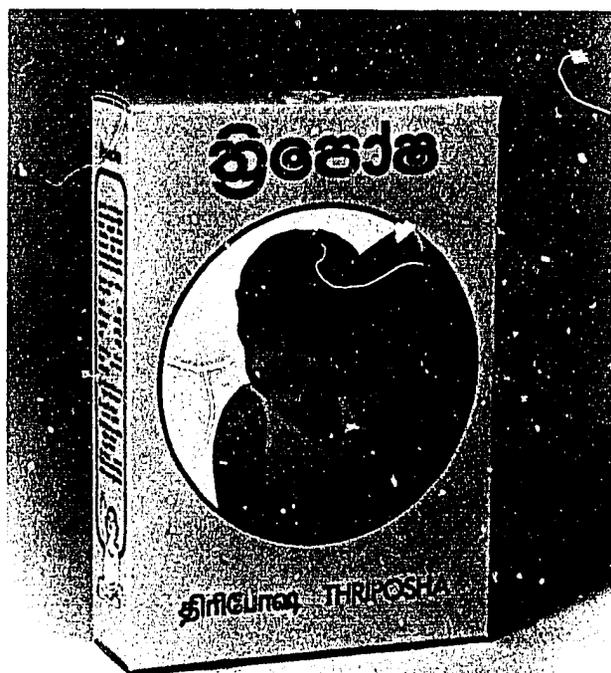
While all income groups in the sample purchased Thriposha, a substantial percentage had quite low incomes. In the rural areas, 40 percent of the households purchasing Thriposha had an estimated monthly cash income of 750 rupees (about \$37.50) or below, with 19 percent having an income of 500 rupees or below. In the urban areas 20 percent had an income of 750 rupees or below, and 8 percent had an income of 500 rupees or

⁹*The Thriposha Program, Background Information to Facilitate Decision Making*, prepared for the Thriposha Program Implementation Planning Workshop, January 29-February 13, 1985, Annex (1-H).

¹⁰Lanka Market Research Bureau, Ltd., *Thriposha, Study on the Impact of Advertising* (1985).

below. The eligibility requirement for food stamps is a family income of 400 rupees per month.

It is also of interest that some of those who purchased Thriposha also participated in the feeding program. This was the case for 38 percent of the rural sample and 15 percent of the urban.



One-pound box of commercial Thriposha (Colorado State University)

Some observers believe that commercial distribution of Thriposha could represent an additional means of alleviating Sri Lanka's nutrition problem. It might serve both as a preventive measure for children not malnourished enough to qualify for the feeding program and also help increase general awareness of the importance of providing an appropriate food for weaning. This might be accomplished at little or no budgetary cost to the government. In John Nichols' view, further market experience at the higher price is needed before it will be known whether this is possible. Nevertheless, he believes there is a fairly good chance that Thriposha could be sold at a price not substantially different from the present one that would both cover

its cost and be within the reach of most low-income people.

An important step has recently been taken toward the goal of establishing commercial Thriposha on a fully self-sustaining basis. In October 1985, the source of raw material for production of commercial Thriposha was shifted completely to local foods.

While experience is not yet sufficient to make a final determination, it would appear that commercial Thriposha has accomplished something that has very seldom been accomplished before. For despite a great many attempts, there has been very little success in providing a food that is low-cost, reaches young children and is commercially viable. Thriposha, although also consumed by other family members, appears to meet these criteria.¹¹

Observers cite several reasons for this achievement. One, previously noted, was the favorable image of Thriposha created by the feeding program. A second is the low price, facilitated by low-cost processing technology and inexpensive packaging. A third is the efficient distribution system of Lever Brothers. A fourth may be that Thriposha provides a convenient pre-cooked base for making a traditional snack, Aggala. The 1984 survey found Thriposha was often prepared as Aggala and consumed in this form by pre-school children as well as other family members.

¹¹Another interesting approach to use of commercial outlets has been tried in Colombia using food coupons to partially support the price of weaning and other special foods. A description of this approach appears in an earlier publication in this series. Sanders, T.G. *PAN — A Description of the Colombian National Nutrition Program*. (Office of Nutrition, USAID, Washington, D.C. 1980)

SOY PRODUCTION

In addition to its contribution to Sri Lanka's nutrition program, the development of Thriposha had another, not fully anticipated benefit. The Sri Lankan Government was interested in providing soy as a means of improving the caloric and protein intake of its people. In 1973, it applied to the United Nations Development Fund for assistance for this purpose. But a major obstacle to increasing soy production was lack of a market for a food new to potential consumers. The Thriposha program helped to provide this market, furnishing the stimulus for farmers to adopt the cultural practices needed to incorporate soybean production into their farming systems. It also bought time for people to become accustomed to the use of soya as a food ingredient.

Other efforts were also made to stimulate development of markets for soy. For example, CARE and UNICEF helped provide support for the development of the government's Soybean Food Research Center at Gannoruwa. The purpose was to

increase outlets for soy by developing new soy-based products. With technical assistance provided by the University of Illinois, the center was completed in 1978. Its work has included the development of a soy substitute for coconut milk which was subsequently produced by the government.

The first extensive use of the soya began in 1976 when CARE purchased 26,000 kilograms of locally grown beans for use in the production of Thriposha. As late as 1980, Thriposha still consumed 65 percent of Sri Lanka's annual production of soybeans, which was 1,000 metric tons as compared to a mere 25 tons in 1972. In recent years, however, Sri Lanka's soy production has greatly expanded with Thriposha's use of soy in 1983 representing less than 15 percent of a 10,000 metric ton crop. Despite a setback in 1984, due to adverse weather conditions, soy production is now fully launched. Thanks in part to Thriposha, soy cultivation has become a viable agricultural activity in Sri Lanka.

SUCCESS FACTORS AND NEXT STEPS

The Sri Lanka experience has been significant in several ways. It has shown that:

1. A feeding program can be converted from one relying exclusively on U.S. donated commodities to a program where a substantial contribution is made by locally grown and processed foods.
2. A strong positive image can be created for a supplement despite the fact that it is used in a program directed to the poor.
3. A take-home feeding approach can be instrumental in achieving nutritional impact.
4. A supplementary food can also be marketed as a low-cost commercial product, permitting expanded access to the supplement.

Observers cite the following factors as key to these achievements:

1. There was a high level of commitment by those responsible for the program:
 - The Government of Sri Lanka shouldered a large part of the program's substantial recurring costs.

- Government personnel demonstrated an adaptability and willingness to experiment needed to move a useful concept to a fully functioning program.
- CARE sought to make the best possible use of Food for Peace commodities and had the wisdom to foresee the need for their replacement by locally grown and processed foods.
- AID also provided important support, including both technical assistance and financing. Together with CARE and the Sri Lankan Government, AID helped fund the construction of the Ja-Ela plant.

2. A technology was identified that in cost, ease of operation and output was compatible with Sri Lanka's capabilities and needs. The Sri Lanka experience demonstrates that an "appropriate technology" need not be a home or village level technology to be successfully transferred to a developing country. Productivity was enhanced by turning the plant operation over to the private sector. Ob-

servers attribute the efficiency of the Ja-Ela plant to its management by Ceylon Tobacco.

3. An attractive name and package helped make the supplement widely perceived as "nutritious" and "good for children." This image was further strengthened by the nutrition education provided.

4. The synergistic combination of Thripasha, a take-home food with a distinctive image, nutrition education, and health services led to the beneficial nutritional impact achieved.

5. Thripasha's introduction through commercial channels was facilitated by the supplement's positive image established by the feeding program, its low price, the distribution system used and possibly the product's convenience as a pre-cooked base for a popular traditional food.

Like any program, the Thripasha program has not been free of problems. Its impressive accomplishments to date should be viewed from the perspective of what an initial phase of a program can achieve rather than in terms of the ideal to which the program may be able to evolve. Observers believe that the program is now ready to move to a second phase of development in which elements that need further attention can be strengthened. Several principal areas have been identified.

One is to further improve the targeting of Thripasha. While many clinics are now providing Thripasha only to preschool children or pregnant and lactating women identified as malnourished, it is felt, as previously noted, that a considerable number of other clinics do not yet adequately screen recipients. A government analysis of the functioning of the Thripasha program recommended increased attention to this targeting problem. Other improvements in clinic functioning and overall program operations were also emphasized.¹² The Colombo workshop of government, CARE and USAID personnel, held in January 1985, also recommended increased attention to targeting as well as improved surveillance of program impact. In addition, the workshop recommended making the program

more preventive by also providing Thripasha to children at the first signs of faltering growth, as well as to those identified as definitely malnourished.

Some other elements identified as in need of strengthening were nutrition education and overall clinic operation. The workshop recommended both improving general effectiveness of nutrition education and providing a clearer message as to the purpose of Thripasha as a supplement to the normal diet rather than as a replacement. Recommendations for improvement in clinic management included limiting the number of functions assigned to single individuals and a more effective system of referral to hospitals.

The workshop also recommended, as a major evolution of the program, a further takeover by the Government of Sri Lanka. On the management side, this involves a shift in program management responsibility that has now been approved. Oversight for food production will be assumed by the Government of Sri Lanka instead of CARE, with the State Pharmaceutical Corporation having general responsibility and day-to-day operations handled by Ceylon Tobacco. This transfer is scheduled for July 1986. Further takeover by the government also involves continued progression in the share of local food provided, and it will also require a decision regarding the level of future government input as the program moves toward becoming fully locally supplied.

Finally, the workshop recommended that the commercial program now be phased over to a completely self-sustaining basis. As noted, implementation of this recommendation has also begun with the shift to exclusive use of local foods. The next step in the process will be to transfer all operations to a private company, such as Lever, with a concomitant decision required by the company to make commercial Thripasha a permanent part of its product line.

With CARE's help, the program has now achieved a momentum and a track record. Indigenous foods are locally processed. A distinctive product has been created. An integrated take-home feeding approach has been shown effective. The next step is both further refinement of the program and further integration into Sri Lanka's institutions.

¹²Food and Nutrition Policy Planning Division, Ministry of Plan Implementation. *An evaluation of the Thripasha Programme* (Colombo, 1983).

CONCLUSION

The development of the Thriposha program was not, of course, one of unbroken progress. Nor is it a program that could not be further improved. Nevertheless, the program demonstrates the feasibility of using local commodities and processing in a supplementary feeding program. Further, these inputs not only made the program more self-sufficient, but, in addition, the packaging that went with them improved the supplement's image and opened the way for potential commercial distribution. Finally, the Thriposha program demonstrates that a take-home food can make a significant con-

tribution to reducing malnutrition if provided as part of a combination of services.

Those interested in acquiring further information regarding the Thriposha program may write to: CARE-Sri Lanka, P.O. Box 1024, Colombo 5, Sri Lanka. For general technical information on low-cost extrusion technology, inquiries can be addressed to Department of Agricultural and Chemical Engineering, Colorado State University, Fort Collins, Colorado 80523.