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REVIEW OF FEASIBILITY OF ALTERNATIVES FOR THE SCHOOL MILK AND SCHOOL LUNCH FEEDING PROGRAMS IN KENYA

by

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Review of Feasibility of Alternatives for the School Milk and School Lunch Feeding Programs

INTRODUCTION

Two important concerns face the Ministry of Basic Education of the Government of Kenya in relation to their two major feeding programs involving primary school children, namely the school milk program and the school lunch feeding program. The concern in the school milk program regards finding a suitable alternative form of milk or milk containing food item to supplement the current morning distribution of liquid whole milk. The concern regarding the school lunch feeding program is a search for prepared food(s) which might be centrally processed and suitable for use as a midday meal in individual schools and requiring no cooking at the school level. These two concerns will be addressed separately in this report as they represent two rather different problems and two separate methods of evaluation for feasibility and definition of possible alternatives.

School Milk Program

In early 1979, President Moi announced the establishment of a program for providing liquid whole milk at mid-morning break to all primary school children in the country and assigned the task of planning and implementing the program to the Ministry of Basic Education. The school milk program was initiated in May 1979 with the first distribution of milk to school districts. The program called for the providing of a unit (200 ml) of liquid whole milk to each of the 3,270,423 primary school children on two different mornings of the week during the regular school term. The quantity of milk needed to meet this requirement is approximately 55 million liters. There are tremendous logistics problems associated with obtaining, processing, packaging and distributing this quantity of milk. The distribution problems are

compounded by the fact that approximately 80% of the program is represented by rural school districts spread throughout the country. In order to provide "fresh" (not spoiled or deteriorated) liquid milk to the children in these rural school districts it was necessary to use the concepts of ultra-high-temperature (UHT) processing and aseptic packaging. Kenya Cooperative Creameries (KCC) installed the necessary equipment and provides both pasteurized and UHT milk to the program. UHT processing adds an additional production expense which coupled with the distribution costs for such a large quantity of liquid milk represents a sizeable budget for the program.

Officials of the Ministry of Basic Education in their considerations for expansion of the school milk program believed that there might be more convenient and less expensive methods of providing milk in some other form or a milk containing food on one or more of the other days of the week when liquid milk is not distributed. They sought to find such alternatives. Information was obtained by members of the Ministry about a whole-milk biscuit (tablet) which is produced in New Zealand and which contains essentially the equivalent nutrients as 200 ml of liquid whole milk. Samples of the milk biscuit were obtained through USAID/Nairobi and evaluated by Ministry personnel. They believed the biscuits had the potential as a suitable supplement product being sought. Since Kenya is traditionally a good milk producing country and since it was believed that sufficient expertise and facilities for production of such a product might exist in the country, the Ministry decided to have a feasibility study made for the in-country production of "milk biscuits" or a suitable replacement rather than only consider the importation of this product from New Zealand with its accompanying drain of foreign exchange, etc. At the same time it was decided than an expanded feasibility program be carried out both to consider the "milk biscuits" as cited above, and to consider and evaluate other alternatives for providing

milk in some form which might meet the requirements of the program. Through the remainder of this report the word "milk biscuit" represents the product made by compressing together into tablet form a mixture of dry whole milk and sugar plus a flavoring material.

Any consideration of alternative forms of milk or milk containing food to be used to supplement the liquid milk program must include comparative costs of its production and delivery to the school district in relation to the costs of milk in the present system. The present school milk program includes use of liquid whole milk both in the common pasteurized form and in the UHT processed form, both supplied by KCC. The pasteurized milk is distributed by KCC in the greater Nairobi area and represents about 20% of the program. The program charge for one unit of pasteurized milk delivered to the schools is stated as KShs. 2.50 per liter or 50 cents per unit. The remaining 80% of the program is represented by rural school districts which receive UHT milk. The program cost for UHT milk is listed as KShs. 3.48 per liter or 70 cents per unit which includes the cost of transportation to the school district office. This cost is based on KCC not receiving a profit for the processing. If a profit factor is included, the unit cost goes to 73 cents. In the following specific section on the School Milk Program Supplement, a "milk biscuit" program is discussed and alternatives are outlined with estimated unit cost and suggested steps of implementation.

School Lunch Feeding Program

The school lunch feeding program has two operating entities: (1) the National School Feeding Council which carries out nationwide programs outside of the Nairobi area and which soon will implement a midday meal program which eventually will feed approximately 300,000 children in the semi-arid and arid regions of the country; and (2) the School Feeding Council of the City of Nairobi which provides midday meals from a central kitchen facility

to children in the Nairobi primary schools. These two programs are funded and operated differently. It is the program operated by the National School Feeding Council which will be reviewed and suggestions made for centrally processed prepared foods that might be useful in the program for use in the far reaching rural areas.

SCHOOL MILK PROGRAM SUPPLEMENT

Background

Dr. Ojiambo of the Ministry of Basic Education contacted USAID/Nairobi regarding technical assistance for carrying out a feasibility study for the production of "milk biscuits" in Kenya with the study to include equipment required, technical assistance needed, estimated cost of production, and cost of delivery to the school districts. The study also was to include a comparison of the cost of the present system to the cost of "milk biscuits" or other alternatives studied. The following data and discussions are a condensation of the information obtained from various people and sources which relates to the major points to be included in the feasibility study and includes discussion about some facts and problems relating to the present milk situation in the country.

The initial evaluation made was the cost of producing one unit of "milk biscuit" based on ingredient and equipment requirements and on the assumption that there is an adequate supply of dry whole milk. This assumption, however, plays a key role in the potential for implementing a program and will be discussed later.

Production

The "milk biscuit" can be described as the result of compressing together into a large rectangular tablet a blend of 19.2 grams of dry whole milk and 2.6 grams of sugar (sucrose) with a minimum of added flavoring material.

Ingredients:

Dry whole milk	KShs. 16/kg	1.6 cents/gram	- 30.7 cents/biscuit
Sugar	KShs. 3/kg	= 0.3 cents gram	- 0.9 cents/biscuit
		Ingredient cost	31.6 cents

Equipment

1 Blender - fabricated in-country 500 pound capacity	KShs. 10,500
1 Tableting machine - Single punch Supplier - Stokes Div. Pennwalt Corp., USA	280,000
Freight charges	35,000
Tax and import duty waived	
Equipment Cost	KShs. 325,500

To reach a production cost figure per unit (milk biscuit) for the equipment, a decision must be made on the number of years for a depreciation schedule for the equipment and then spread the cost of the equipment over the anticipated production of tablets in that period. Based on a production schedule of 40 per minute for 16 hours per day, 6 days a week and 52 weeks a year, one machine would produce 11,980,800 "milk biscuits" per year. If that machine is depreciated in one year the cost per unit would be 2.8 cents whereby if it is written-off over 4 years the unit cost will drop to 0.7 cents. Any other selection of years for write-off can be used and the cost will vary accordingly. Since a 4-year depreciation is reasonable it was used in this feasibility calculation.

Equipment cost per unit 0.7 cents

Packaging:

a.	Polyethylene bag 6 x 10 - 18 cents 30 units	0.6 cent
b.	Outer carton 41/4 x 4½ x 61/4 - KShs. 1.0 90 units	1.0 cent
c.	Outer box 12 x 13½ x 6½ - KShs. 3.0 810 units	.4 cent

Packaging cost per unit 2.0 cents

Labor Costs

Labor costs will be incurred in the blending, machine operation and packaging activities. Based on the utilization of three people and the current wages reported for workers in these categories and with production at the expected rate, the cost per unit for labor is calculated to be 0.3 cents.

Labor cost per unit 0.3 cents

Distribution

Delivery of these "milk biscuits" to the School District Offices would need to be accomplished only once a term and would represent only about 1/10th the weight of the liquid milk of the same number of units. On the basis that present distribution costs are 44 cents per liter or 8.8 cents per unit of milk, a figure of 0.9 cent per unit is used for the distribution cost of the "milk biscuits".

Distribution cost per unit 0.9 cents

A summary of the costs for a "milk biscuit" program shows:

Ingredients	31.6 cents per unit
Equipment	0.7
Packaging	2.0
Labor	0.3
Distribution	0.9
	35.5 cents per unit

This cost of 35.5 cents per unit delivered to the school district office compares favorably with the current 70 cents and 50 cents for UHT and pasteurized milk, respectively.

Implementation

To carry out the above program for the in-country manufacture of "milk biscuits" it would require an initial purchase of equipment and its installation at one or more appropriate locations since there is no known facility in operation in the country capable of this manufacture. Management and technical expertise will be needed for the installation and operation of one or more manufacturing facilities. Also, it seems probable that some product development or modification work will be needed before actual production can begin. To provide this guidance and expertise, it is suggested for your consideration that Mr. Peter Kuguru, Manager of Kuguru Foods be contacted regarding his availability and interest for assisting in further planning or implementation of the project. Mr. Kuguru's background and experience indicate that he would be capable of handling the problems that will be encountered. He is a professionally trained Food Technologist and is technically quite knowledgeable. In fact, he is essentially the originator of the initial "milk biscuit" having developed the first formulation and produced them for his thesis topic during his schooling in New Zealand. It seems that upon a decision to continue evaluation of, or to initiate a program for the in-country production of "milk biscuits", that the involvement of Mr. Kuguru in some capacity such as program coordinator or product/production manager should be seriously considered and pursued.

A second point regarding production and production sites is that the above example included only one tablet machine in production making 11,980,800 units per year. Even if production were calculated on a 24 hour day, 6 days a week all year, the total production would be about 17.9 million "milk

biscuits" or enough for one distribution a week for six weeks. Thus multiple production units (tablet machines) will be needed based on the desired frequency of distribution. One alternative would be to install tablet machines in each of the three locations in which KCC produces dry whole milk, namely Kiganjo, Kitale and Eldoret. This could increase production to between 36 million and 53 million "milk biscuits" or one distribution a week for 12 to 18 weeks. Implementation of this program described above for the installation of one production unit in each of the three locations would require an initial investment by the Government or private sector of about U.S. $140,000 or the equivalent in other currency for the purchase of equipment. Additional production units would have to be added if the program was to be expanded to distribute "milk biscuits" for more weeks. It would require at least double the above production capacity to produce enough milk biscuits for one distribution a week for the entire school year.

Discussion

As mentioned earlier, a very real problem and major hurdle in the implementation of a "milk biscuit" program is the availability of dry whole milk to be used in making them. It must be remembered that for the production of sufficient "milk biscuits" to be given to each child on one day, it requires the same amount of liquid whole milk that would be given on that day, converted to dry whole milk before use and made into the "milk biscuits". Thus in times of shortage of liquid milk there would be a corresponding shortage of dry whole milk unless stocks of dry milk and "milk biscuits" were accumulated during a period of adequate supply. An alternative to using locally produced dry whole milk would be to import it such as from Holland. At the present time that would appear to be economically advantageous to do so since the currently quoted price for imported milk is KShs. 10/kg which is

less than the price stated for in-country produced dry whole milk.

Comments and criticisms by various people during discussions were directed at the "milk biscuit" approach as presenting a confusion to the children between receiving liquid milk one day and "dry" milk (biscuit) the next day. Also, if the dry milk is colored or flavored orange or chocolate and the liquid milk as known by the children is not, there would be another element of confusion.

One might consider the distribution and use of dry whole milk per se in the schools but this quickly is rejected as a viable alternative since it requires (1) reconstitution before use which poses serious problems of adequate water supply and quality of the water available, (2) a drinking vessel for each child, and (3) the later need for the vessels to be washed before reuse.

The technological feasibility for the in-country production of milk biscuits is positive. The economic feasibility is questionable due to the relatively large requirement for production facilities to meet the program needs even though the unit cost of a "milk biscuit" as shown in this report compares favorably with the present costs of liquid whole milk.

ALTERNATIVES

Although the major element of the overall evaluation of the school milk program was to determine the feasibility of the in-country production and use of "milk biscuits", another evaluation that was asked to be made was to consider and discuss other forms of milk or milk containing food items which might be suitable supplements to be given to the children on the days when liquid milk is not served.

Alternative One

The alternative of importing "milk biscuits" from New Zealand should be addressed even though while feasible it may not be desirable because of the use of foreign exchange or other reasons. The cost of "milk biscuits" in New Zealand is equivalent to 20 cents Kenyan. The cost of shipping them to Kenya would be approximately 2.0 cents and the cost of distributing them to the school districts another 0.9 cents making them cost about 23 cents per unit. One positive aspect of this alternative is that it might allow early implementation of the program based on imported product while the in-country facilities were being completed. Perhaps more valuable, it could allow a trial program on a limited basis using imported "milk biscuits" to be carried out as a testing mechanism to see if the children would accept and consume the product before expenditures and plans were made for the in-country production.

One negative aspect of this alternative is that if it were used for an extended period of time, or in fact became the permanent basis of the "milk biscuit" supplement program, it would place the program in a position of dependence on New Zealand for adequacy of production and promptness of delivery. Also, the product would surely be at least one month or more old when it arrived for distribution to the school districts.

Alternative Two

A second alternative which appears to merit consideration as a supplement to the liquid milk program is the use of a true biscuit, or cookie as it is known in the United States. This cookie could be made from wheat flour and/or maize flour to provide a maize-like flavor which is common to the children. It could contain relatively high levels of dry whole milk and shortening, weigh 10 grams and provide about 55 calories.

The formulation for a nutritionally improved cookie might contain the following although the levels of sugar, shortening and milk can be altered as desired.

Flour	100 parts
Sugar	40 parts
Shortening	30 parts
Dry whole milk	40 parts
Water (variable)	as needed

A contact was made with the company Cookiematic Kenya Limited regarding their ability and/or interest to produce nutritionally improved cookies to be used as supplements to the school milk program. The results were positive. There may be other companies which were not contacted which also are capable and interested. The manager of Cookiematic Kenya Ltd., Mr. Rajabally Manji, provided information about the operation. They have two production sites with equipment producing cookies on a regular basis for their own trade. They have facilities and production capacity to produce and package 840,000 cookies per week based on production time of 20 hours a day, 7 days a week. A cost estimate based on their current formulation was 14 cents per cookie not counting cost of packaging material. A cost estimate made for a cookie for the program based on the increased expense of the higher milk and shortening levels indicated above produced a cost of approximately 18 cents. A cost analysis for a nutritionally improved cookie is:

Cookie (includes ingredients, labor and equipment)	18.0 cents
Packaging and boxing	2.0 cents
Distribution	0.9 cents
Cost (per cookie)	20.9 cents

Since the above cookie would weigh 10 grams, some consideration might be given to providing two cookies per serving in order to deliver 20 grams of food and about 110 calories for approximately 41 cents which compares favorably with the cost of about the same amount of food and nutrients as the other items under consideration. Although no nutritional goals have been set for the supplement item to the school milk program, based on information obtained regarding the daily nutrition and food intake of a typical school child, what is needed is calories, and that any item that provides more calories and some level of protein would be nutritionally important. This will be discussed further in the section on Nutritional Considerations.

The feasibility of this alternative is positive as it offers (1) the immediate implementation on a limited basis after a short production trial of the formulation, (2) no initial equipment expenditure by the Government or private sector, and (3) it would avoid the criticisms that have been directed at the "milk biscuit" as indicated earlier.

Final Cost Comparisons

The following table compares the cost of delivering about the same quantity of food and/or calories through the items now used in the School Milk Program to the alternative foods discussed in this report.

Item	Cost Per Serving
Pasteurized milk	50 cents
UHT milk	73 cents
Milk biscuit - Kenya	35 cents
Milk biscuit - New Zealand Alternative One	23 cents
Cookie (two per serving) Alternative Two	42 cents

The cost of the Kenya milk biscuit might very well be higher since no expense is included to provide building space for the production or to

provide a "profit" for the company which actually does the production. A profit factor is included in the costs of Alternatives One and Two and UHT milk and probably for the pasteurized milk.

NUTRITIONAL CONSIDERATIONS

The School Milk Program is designed to provide milk per se without any special nutritional goal or consideration other than the worthy contribution of nutrients and calories that the milk provides that day. It is my understanding based on the overview of the nutrition problems in Kenya as found and reported by Dr. Linda Meyers in her report of August 1979 that protein--energy malnutrition--primarily lack of calories is the most widespread form of malnutrition in Kenya. Under such conditions of shortage of calories from all sources, the probability is that the proteins in the milk will be used by the body as calories as much as for a source of amino acids for body building and repair. Under this consideration, much of the nutritional impact of the protein component of liquid milk will be lost. It seems likely that the supplementation of the liquid milk program with a "milk biscuit" or a high calorie cookie on the day before or after the day liquid milk is consumed would considerably improve the nutritional impact of the nutrients provided by both sources. In addition, since the delivered cost of either of these supplements is less expensive than liquid milk it makes them both appear feasible and desireable to be implemented on a nutritional basis.

SCHOOL LUNCH FEEDING PROGRAM

BACKGROUND

As mentioned in the introduction of this report, a second concern to be addressed was the evaluation of possibilities for the central processing of foods that could be used in the midday meal in the individual schools and would require no cooking at the school level. The need for this evaluation of the possibilities of central processing of foods was stimulated by a World Food Program project for Kenya which presently is in the last phase of development and which is expected to be implemented later this year. The WFP project is designed for three years and calls for feeding of approximately 100,000 students in 12 school districts by the end of the first year, increasing to about 300,000 students by the end of the third year. The plans include making available to the National School Feeding Council maize, beans and oil which would be distributed to the individual schools for use as a midday meal for the students.

Implementation of this plan could present some problems associated with the preparation of the foods in each individual school each day. One problem could be water since many schools either have a lack of sufficient quantity of water or have difficulty in obtaining water of suitable quality for food preparation purposes. A second problem could be fuel due to lack of availability or because of its high cost when it is available. Technical assistance was requested for suggestions and help in developing plans for the central processing and use of foods (specifically maize and beans) which would result in a considerable reduction or the elimination of the need to use fuel and/or water for the preparation of the food at the schools. The following discussion

contains suggestions and brief descriptions of possible alternatives for addressing the concern and overcoming the problems.

LOW COST EXTRUSION COOKING

Introduction

Perhaps the primary problem associated with the preparation of foods for the midday meal is the expense and the difficulty of procurring the fuel needed for the extensive cooking requirements of some foods, especially beans. A primary suggestion for the central processing of foods which would help eliminate this problem is the development of a program using low-cost extrusion cookers (LEC) and the associated technology for the central processing of maize and beans. An approach such as this has been demonstrated to be suited for use in developing countries and it requires relatively small initial capital outlay and minimal auxiliary equipment and technical skill for operation.

The U.S. Department of Agriculture through the support of the Agency for International Development (AID) developed the LEC technology and has worked with USAID Missions, CARE and other institutions in several developing countries to implement programs which utilize that technology. The programs have included the central processing of maize, other grains, soybeans and legumes either alone or as mixtures such as blended foods. The principal of the LEC system is that the cooking of the food is accomplished by the heat generated by friction during the operation of the extruder eliminating the need for an external source of heat such as steam or hot water. In addition, since generally no water is added during the processing there is no energy (heat) requirement for drying the products after extrusion. The food materials are passed through the cooker/extruder where they are cooked and extruded in large flakes or pieces which have an open texture and puffed

appearance. The extruded material then is cooled. The finished material can be eaten "as is" in the dry form or flavored to produce a "snack" food. The extruded material can be reduced in particle size by crushing or grinding to any size desired such as a meal or a flour which can be reconstituted in hot or cold water to produce porridge or soup. A more comprehensive view of the stage of development and utility of LEC technolgoy can be obtained from the attached report on "Low-Cost Extrusion Cookers, Second International Workshop Proceeding, January 1979."

Application

In the specific application for Kenya it appears feasible that a mixture of maize and beans in the ratio of 5:1 as proposed to be available through the WFP project could be centrally processed in an LEC facility and distributed to the school districts for use. A variety of types and flavors of cooked-extruded foods could be produced to provide variation to the midday meal.

It appears that the production and use of such cooked-extruded material would greatly reduce or in some instances, eliminate the need for real "cooking" of food at the individual schools with the subsequent savings in fuel and water. Some possibilities for centrally processed foods are described below:

1. Maize/beans/oil

   These food materials could be co-cooked and extruded, and crushed to a coarse particle size representative of the pieces of maize kernels and beans that are present in ugi. For use, the material could be reconstituted at the school with a minimum of warm/hot water of acceptable drinking quality at the time of consumption. Depending on the type of beans used, a short cooking time of about 5 minutes might be desirable.

2. Maize/beans/oil

These food materials could be co-cooked and extruded as large flakes which would be broken down into smaller pieces or extruded in small prescribed shapes that can be used as "snacks." The materials could be flavored before or after extrusion with selected flavors acceptable to and preferred by the students.

3. Beans/oil

Cook and extrude the beans only with oil and crush the extruded material to a particle size similar to regularly cooked beans. The material could be reconstituted and warmed at time of use in the water used to cook the corn or along with the cooking of the corn at the school and then all components combined together for the midday meal.

The major portion of the fuel consumption requirement for food preparation at the schools could be eliminated through the use of centralized extrusion cooking as indicated above. A midday meal program could be developed based on alternating the use of items No. 1 and No. 2 which would provide variety and would require a minimum of water and fuel to make the food ready for consumption. A program based on the use of item No. 3, precooked beans only, could lead to appreciable fuel and water saving although there would still be a need for sufficient water and fuel at the school for cooking the corn.

Production Facilities

As mentioned earlier, installation of an LEC processing facility requires a relatively small capital investment compared to more sophisticated extruder systems and other methods of food processing because it requires only a low-cost extruder and a minimum of auxiliary equipment. This low initial capital requirement to establish an installation and the relatively

low manufacturing cost of processed foods make LEC technology applicable to the needs of developing countries.

The cost of establishing an LEC system in Kenya for the central processing of maize and/or beans as described above can not be determined at this time because of lack of information. However, a general summation of the equipment cost to set up a basic production unit including extruder and motor, conveyors, cooler, grinder, bagging equipment, etc. capable of producing and packaging about 1,000 pounds per hour is in the range of U.S. $80,000 - $100,000 FOB the United States. Other factors also enter into the cost of installation and operation of an LEC facility such as a building with areas for production and ingredient and finished product storage, spare parts, and labor. Data necessary for the calculation of the costs of those factors were not able to be collected during the period of this report. On-site evaluation by a person experienced in LEC technology is needed to collect the proper data and accurately determine these costs.

The WFP project plan calls for a daily ration per child of 150 grams of food comprised of maize and beans. Based on feeding 100,000 children per day by the end of the first year, it would require approximately 34,000 pounds per day of processed foods. Since the production rate of a typical LEC unit is about 1,000 pounds per hour, it would require two units to produce sufficient centrally processed food. The production units could be located in two different and suitable locations to best serve the 12 school districts and minimize problems and expense of transportation both of raw materials and of finished foods. Basically the total equipment costs for two such installations would be in the range of U.S. $160,000 - $200,000. However, some savings in equipment and facilities costs could be realized if both extruders were installed in a common location and the plant lay-out

designed for maximum efficiency in size of auxiliary equipment, storage facilities, etc.

Technical Assistance

In order to determine the economic and technological feasibility of the use of LEC technology for central processing of foods for use in the midday meal program, technical assistance is needed from someone experienced in LEC technology and application to carry out an in-depth evaluation to identify specific equipment needs, complete a cost analysis, and outline steps for planning and implementing such a program.

Additional basic information about the use and potential for LEC equipment may be more immediately available from the East African Industrial Research Organization in Nairobi. EAIRO had LEC equipment of the Brady Cooker type in 1976 and used it for testing and demonstration purposes. Mr. John Okorio was responsible for the program at AEIRO and probably he or his successor can provide information on the operation of the equipment and how it might be utilized to advantage of the midday meal program.

QUICK-COOKING BEANS

Introduction

The cooking of beans each day in each individual school as proposed for the midday meal program represents a tremendous consumption of fuel due to the long (1-2 hour) cooking time generally required for beans and a great expense due to the high cost of fuel. Any process or program which would reduce the cooking time of beans or in some way reduce the fuel requirement needed in the separate schools for their preparation could be very valuable to the midday meal program.

Two suggestions are advanced here for plans which would utilize a process which has been developed by the U.S. Department of Agriculture for the

production of "quick-cooking" beans. Quick-cooking beans have a greatly reduced cooking time requirement generally needing only 10-20 minutes to cook instead of the traditional one or more hours. Utilization in the mid-day meal program of beans processed this way could appreciably reduce the fuel requirement at the school level. The process is comparatively simple and relatively inexpensive. It includes the blanching of beans in boiling water for two minutes followed by a 16-20 hour soaking in water to which has been added 2% sodium chloride, 1% sodium tripolyphosphate, 0.75% sodium bicarbonate, and 0.25% sodium carbonate. After soaking, the beans are drained and rinsed and are ready for use or for further processing such as drying, freezing, or canning. At the time of use (consumption) the beans are cooked in the usual way except that the cooking time is reduced by approximately 80 percent.

This general description of the process for preparing quick-cooking beans is for the broad category "beans" and certain process conditions change in accordance with the specific type of beans being processed. Some types of beans do not require the blanching step in boiling water and some beans need only 3-4 hours soaking period instead of 16-20 hours yet the reduction in cooking time still is realized. Some preliminary testing may need to be done on each type of bean to be used. More specific information regarding the processing and properties of quick-cooking beans can be found in the reprints and information sheet attached to this report.

A preliminary review of the processing technology for quick-cooking beans suggest two ways which are described below in which this technology might be applied in Kenya and utilized in the School Lunch Feeding Program.

Application

Presented below are outlines for two plans which would utilize the quick-cooking bean technology for making available beans with reduced cooking

time requirement which can be used in the midday meal program. One plan involves central processing while the other applies the technology at the school level.

PLAN 1 CENTRAL PROCESSING

A central processing facility could be established in Nairobi or elsewhere as appropriate in which beans would be treated with the quick-cooking process, rinsed, and dried. The dried processed beans would be distributed to the schools for use in the midday meal.

Equipment and plant capacity sufficient to process about 5,000 pounds of beans per day would be needed initially to feed 100,000 children based on the proposed daily ration of 25 grams of beans per child. As the program expands with the feeding of more children, the facility could be enlarged or similar processing unit(s) could be set-up around the 12 school district areas to minimize transportation problems and expense.

The specific process conditions to be used would be based on the needs of the type of beans being processed. As mentioned earlier, it may be necessary to do some preliminary testing and process studies to establish whether blanching is required, how long a soaking period in the salts solution is needed, and other factors. After the soaking period the beans would be drained and rinsed and then need to be additionally processed in order to preserve them while being transported to the schools for use. Methods that have been used to preserve the beans are freezing, canning, hydrastabilization which requires refrigeration, and drying. The first three methods do not appear feasible for consideration in this program for Kenya because of requirements for refrigeration/freezers, expense of canning, etc. Drying, however, does appear feasible. Various types of mechanical dryers could be used or it

may be possible to air dry the beans during certain periods of the year if there is sufficient sunshine that would dry the beans within 24-48 hours.

Even though drying may be the best and/or the only feasible way of preserving the quick-cooking beans for transport and storage before use, there is a negative aspect associated with it. There are changes which take place during drying of the beans which reduce the effectiveness of the quick-cooking processing and lengthens the cooking time over that of freshly processed beans. The magnitude of this change is in the range that instead of an 80% reduction in cooking time down to 10-15 minutes, there may be only 40% reduction in cook time with the beans requiring 25-35 minutes to cook. Again, this depends on the bean type. However, even a 40% reduction in cooking time could have a significant impact in reducing the fuel requirement at the individual schools.

At the time of use in the school, the quick-cooking beans could be cooked in the same water before or after the corn, or even possibly right along with the corn for appreciable savings in fuel and water, especially if the two foods are to be added together later anyway for consumption.

PLAN 2 SCHOOL PREPARATION

In lieu of establishing a central processing facility for producing quick-cooking beans, the technology may still be able to be used to advantage at the individual schools in the following manner. A supply of the special blend of the required salts could be provided to each school kitchen along with the distribution of the unprocessed beans. The beans would be blanched or not, depending on their characteristic and soaked in the salts solution for 3, 5, 9, hours or overnight as dictated by the requirement of the beans. At the time of use, the beans would be drained, rinsed and cooked in the most efficient manner. The cooking time of these beans will be short and reflect

the full 80% reduction since they are being cooked as freshly processed beans without a subsequent processing step. The cooking method may involve cooking the beans before or after the corn or even co-cooked with the corn because of the shortened requirement for the beans. This method of bean preparation at the school could use more water than usual due to the fact that the salts solution can not be used for any other cooking purpose and must be discarded. However, the fuel requirement should be appreciably reduced. Co-cooking of the beans and corn probably could be done because of the short cook time of the beans. Preparing those foods in this manner could provide a measurable decrease in both fuel and water use.

The technical and economic feasibility and potential for implementation of these plans should be determined through evaluation by competent experts experienced in the processing and use of quick-cooking beans which could provide the necessary data from which to draw conclusions regarding their feasibility.

SUMMARY

The preceeding discussion in the section on School Lunch Feeding Program was designed to provide ideas and to explore possibilities or alternatives for the production and use of prepared (central processed) foods in the midday meal program to replace the preparation of hot lunches at each school. The information supplied for each idea provides only a basis for determining whether that idea has sufficient potential or merit to warrant further consideration. These are not feasibility evaluations since there was not sufficient time during the TDY to develop and select the most promising ideas and gather sufficient data on which to determine economic and technical feasibility. Each idea presented should be reviewed for potential value to the midday meal program and selection made of the one or two most promising. Technical assistance should be obtained from appropriate experts for in-depth

evaluation of the chosen ideas and collection of sufficient data from which to prepare feasibility studies. Such technical assistance probably can be obtained in part upon request to the USAID office.

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