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FEASIBILITY STUDY AND RECOMMENDATIONS FOR FOOD FORTIFICATION SYMPOSIUM IN LESOTHO

(Review, Evaluation, Preliminary Planning)

A Report Prepared for: Food and Nutrition Coordinating Office
Lesotho Food and Nutrition Council
The Kingdom of Lesotho

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and

USAID/Lesotho

SUMMARY

This report is the result of a consultation visit to Lesotho during the period of October 28 to November 12, 1980 for the purpose of providing technical assistance to the Food and Nutrition Coordinating Office of the GOL for carrying out a feasibility study and a review of the potential for holding a food fortification symposium in Lesotho. The goal of the consultation was to review the present nutritional deficiencies of the general population of Lesotho, evaluate how appropriate and effective a program for the fortification of staple foods might be toward eliminating those deficiencies, and to make recommendations regarding the reason and value of undertaking a food fortification symposium, and assist in the planning of such a symposium if appropriate. The conclusions reached and the recommendations being made are summarized below.

1. There is sufficient evidence of specific vitamin and mineral deficiencies such as niacin and iron in Lesotho which can be ameliorated or eliminated through a program of fortifying (enriching) staple foods through the utilization of vitamin/mineral fortification technology. Serious consideration should be given to the planning and implementation of a program for vitamin/mineral fortification.
2. The common staple foods, maize meal, sorghum meal and wheat flour, which provide the great majority of the calories and other nutrients for the people of Lesotho are the same ones for which the greatest fortification technology is available and are the types of foods which are the basis for many such programs around the world.
3. The food processing units which produce the various staple foods under consideration for fortification are sufficiently large and centralized to provide the necessary conditions for control, accuracy, and efficiency of addition of the nutrients.

4. The in-country production of these staple foods represents such a large part of the total consumed that fortification of this production would make available meaningful nutritional amounts of the nutrients to a large segment of the population including children and women of child bearing age.

5. The major maize milling unit in the country is planning to start a program soon of fortifying a portion of its production of maize meal with niacin and riboflavin. At the same time, at least one maize meal production unit in the Republic of South Africa is developing a fortified meal which may be introduced into the market in Lesotho. The GOL should be prepared to evaluate, encourage and regulate such products to the nutritional benefit of the people.

6. The protein-calorie-malnutrition problem can not be addressed at this time through protein fortification of staple foods due to lack of protein material in the country and the impractical prospects of importing a suitable protein material with which to carry out such a protein fortification program. Perhaps the long range possibility could be explored of increasing the local production of a suitable protein material such as sunflower or soybeans which could subsequently be used in a protein fortification program.

7. Based on points 1 through 5 above, it appears quite feasible to fortify maize meal, sorghum meal, and wheat flour with vitamins and minerals to help overcome the respective dietary deficiencies among a majority of the population. It behoves the GOL to give full consideration to the development and implementation of a program for the enrichment (fortification) of these staple foods with the needed vitamins and minerals.

The above facts and conclusions have led to the following recommendations:

A. That a food fortification symposium be planned and carried out as soon as is reasonable. The purpose of the symposium would be to inform decision makers, planners, and implementers both in and out of government of all aspects of food fortification and the goal would be to have the participants subsequently plan and implement an appropriate food fortification program.

B. That the agenda of a proposed symposium center on the addition of selected vitamins and minerals to the common staple cereal foods included in the feasibility study. However, a general discussion of protein fortification technology should be included so that the symposium presents a complete review of food fortification.

C. That the program include specific discussions on government responsibility, regulatory aspects, economics, and technological factors involved in the planning and implementing of a national program for food fortification.

Specific suggestions regarding various aspects of planning the symposium are included in the text which follows.

I. BACKGROUND

During the last two decades, two national nutrition surveys have been conducted in Lesotho. The first was a rather lengthy one conducted by the World Health Organization (WHO) over the period of 1956 through 1960. The second was carried out by workers from the University of California at Los Angeles (UCLA) in 1976 under the sponsorship of AID (4). This latter report identified several areas of malnutrition in the population that were significant. The first of these was protein-calorie-malnutrition (PCM) which is due to an inadequate supply of calories (food) and a deficiency of total protein and protein of suitable quality. The second was an iron deficiency anemia in children and women of child bearing age as measured by hemoglobin conditions. The third was the deficiency of niacin which exhibits itself as the physiological conditions known as pellagra.

Upon receipt of this latter report with its identification of these nutritional diseases of concern, the Food and Nutrition Coordinating Office, the Secretariat of the Lesotho Food and Nutrition Council of the Government of Lesotho (GOL), initiated actions to address these problems and to consider plans and programs designed to overcome them. As one step to this end the Second Lesotho National Food and Nutrition Planning Conference (3) was held in phases in late 1978 and early 1979 to plan various strategies and projects which, if implemented, would reach certain nutritional improvement goals. Once such goal was that all people at-risk to under-- and malnutrition have access to an improved diet. One strategy proposed to reach this goal was the commercial fortification of common staple foods used by the people in the at-risk groups.

Prior to the planning and implementing of any such programs where specific nutrients such as protein, vitamins, or minerals would be added to

staple foods, the FNCO believed the wise pathway was to obtain information about food fortification technology and programs, the experience and results of such programs in other countries, whether it is a practical or a workable solution for Lesotho. This decision prompted a request from the Central Planning and Development Office of the GOL to USAID/Lesotho for a consultant who could provide technical assistance to FNCO for carrying out a feasibility study and a determination of the potential and value for holding a food fortification symposium in Lesotho. The consultant was to make recommendations regarding the planning and content of such a symposium if the feasibility was positive and to provide assistance in the actual planning of such a symposium if appropriate.

The following report covers the consultative visit by the writer during the period of October 28 - November 12, 1980 regarding the study of the feasibility of a food fortification symposium. It includes details of discussions and study carried out as part of the data collection on which to prepare an evaluation of feasibility, the specific foods, nutrients, and other topics that need to be included in the program of a potential symposium, and preliminary plans which include guidance regarding participants, expenses and symposium agenda.

II. Results of In-Country Contacts

A. Foods of Concern

All discussions, reports, and food consumption data available (1) clearly point out that cereals as a food classification are the staple foods of the country and represent by far the major source of calories in the typical Lesotho diet. In Lesotho these cereal staples are represented by maize meal, sorghum meal, and wheat flour, with the maize meal far exceeding the others in total consumption. Maize meal is reported

eaten by all people, of all ages, at all economic levels, and in all sections of the country. Sorghum meal is probably consumed more in the rural areas while wheat flour and bread is consumed more in the urban areas. It is reported that appreciable but unquantified amounts of sorghum meal are used to produce beer and so consumed in this manner. Let us take a look at these three major staple cereal foods individually.

1. Maize

The production of maize grain in the country falls seriously short of the needs of the people so that appreciable quantities of maize must be imported generally from the Republic of South Africa (RSA) to be ground into meal to meet the needs of the people. The shortfall in local maize production mainly is due to lack of sufficient land under production and/or due to the low yields from the land in production. Those people in the rural areas who produce their own maize have it ground in local hammer mills or in regional roller mills as long as the grain lasts. Unfortunately the locally produced maize grain is used up in a few months and the people have to revert to purchasing maize meal through commercial marketing channels.

The commercially marketed maize meal is produced in Lesotho in two major maize mills and several medium sized regional roller mills. These maize mills are so constructed and operated as to be able to accommodate the equipment necessary for the addition of vitamins and minerals to the meal. The manager of the Lesotho Milling Company at Maputsoe said his mill produced about 90% of the maize meal used in the country. Others expressed doubt that the quantity was that high, but it might depend on the meaning of the word used. If it means that percentage of the maize meal purchased in the country, then that

may be a representative figure. Also, if he includes the production of the Maseru Roller Mills which is a sister-mill owned and operated by the same combine (made up of Tiger Oats, private investors and LNDC) the the 90% figure may be valid. The amount of maize ground into meal by the several regional mid-sized roller mills such as the one located at Makhalanyane and by the local hammer mills is unquantified at this time. It is both ironic and fortunate that the consequence of the shortage of local maize production, namely that the general public must rely on commercially produced and marketed maize meal, provides a positive feasibility for the addition of vitamins and minerals to maize meal with an expected general improvement in the nutritional status of the population.

2. Sorghum

The consumption of sorghum is less well defined either in quantity or method of use. Based on general information obtained, it appears to be consumed at a level approximating 40-50% of that of maize meal. At that level and based on relative production figures (1) the domestic production of sorghum essentially satisfies the domestic consumption requirement. The major method of consumption of sorghum meal is as a porridge which is eaten by all members of the family including children of all ages. Most of the sorghum is ground in the regional roller mills and village hammer mills. This makes it a little more difficult though not necessarily impossible to add selected nutrients at the time of preparation of the meal as part of a food fortification program. It appears that the addition of nutrients to sorghum meal to the maximum extent possible would make those nutrients available to a significant number of the population.

As mentioned earlier, a certain unspecified quantity of sorghum meal is used to produce a traditional beer of low alcohol content which is consumed (often heavily) by the men and for periods of time so that the beer represents a considerable portion of the caloric intake for that period. If nutrients are to be added to sorghum meal during its production, then surely some of that meal subsequently will be used for beer production. It is suggested that the composition, alchohol content, and other characteristics of sorghum beer be defined and compared to the chemical and physical characteristics of niacin, riboflavin, and iron to get an insight into the possible survival and distribution of these nutrients if fortified sorghum is used for the production of beer.

3. Wheat

Wheat is grown in relatively small quantity in the country and is consumed in only about 10-15% of the amount of the other two cereal groups. However, the consumption of wheat flour as such or in the form of bread and pasta products is increasing, especially in the city and near urban areas. Since the production of wheat flour is centralized and essentially all is produced in the Lesotho Flour Mills in Maseru, it becomes a serious candidate to be fortified despite its current comparatively lesser consumption per capita.

4. Other Foods

A review of the various other foods produced and consumed in the country does not reveal any other food(s) which are suitable for fortifying with the needed nutrients or which provide a feasible intervention for doing so. Even when only vitamins and minerals (not a protein material) are considered for addition, there appears

to be no reasonable possibility for adding such to milk, eggs, beans or peas.

B. Nutrients of Concern

As indicated in the Background section, the general nutritional deficiencies of concern identified in Lesotho are of niacin, iron, and protein-calories. Each of these specific nutrients will be discussed separately in relation to how they can be and are being used in fortification programs elsewhere and how they address the various nutritional deficiencies.

1. Niacin

Niacin is one of the B-vitamin complex whose absence in the diet in sufficient quantity causes a deficiency disease called pellagra which can be identified by clinical signs. The absence of sufficient niacin and/or tryptophan in maize is the major reason for the onset of this condition.

Niacin is commonly included in vitamin-mineral mixes used to fortify cereal foods worldwide such as wheat flour, bread, maize meals, pastas, and rice. There are some 30 or more countries which add various vitamins especially thiamin, riboflavin and niacin to cereal meals and related foods. The technology is proven, simple, and inexpensive. This technology could easily be implemented in the Lesotho Milling Company facilities, Lesotho Flour Mills, and the regional mid-sized roller mills similar to that at Makhalanyane.

Niacin displays excellent stability under most conditions of light, heat, acidity, etc. and is used successfully in various cereal meals. It surely would be stabile in the general uses of maize and sorghum meals in Lesotho but information should be obtained regarding the physical and chemical properties of sorghum beer and reviewed in

relation to the properties of niacin. Due to its water solubility and general properties, one would expect the niacin to distribute itself in the beer (liquid) per se rather than be carried down with the sediment which is used for purposes other than human food. This same thinking probably would apply to any addition of thiamin or riboflavin that might be made as part of a vitamin/mineral fortification program.

2. Iron

Iron deficiency anemia has been identified as being present in significant amounts in the general population and especially in children and women. This can be caused by lack of adequate quantity of iron in the diet or lack of availability to the body of the iron that is present in the food due to inhibitors present or for other reasons. The two major ways to overcome iron deficiency anemia are to add more iron to the diet via its addition to a staple food or to add iron in a form which is readily available to the body and more accessible than other inherent diet irons. The common forms of iron which are used are ferrous sulfate and small-particle reduced iron. These are present in vitamin-mineral mixes mentioned above for the fortification of cereal foods. As for the addition of the B-vitamins, the technology for adding iron compounds to staple cereal foods is well proven, simple, and inexpensive.

The case for the fate of iron compounds added to sorghum meal which is subsequently used for beer production is not as clear-cut as it seems it might be for the B-vitamins described earlier. Ferrous sulfate is water soluble but relatively reactive while reduced iron is less reactive but is not water soluble. It would appear to be a good chance that the ferrous sulfate would tie-up

with some components of the meal and not be available and that the reduced iron would be retained in the sediment after the beer is removed. The amount of sorghum meal used in beer production and the iron nutrition status of the people who consume the beer should be defined. However, it does not seem likely that these results should deter the addition of iron to the majority of the sorghum meal as well as to the maize meal and wheat flour which are consumed by so many people and by the at-risk groups.

Two other vitamins were discussed considerably during the contacts with in-country people, one being riboflavin, the other vitamin A.

3. Vitamin A

Although not mentioned for concern in the Nutrition Survey (4), several discussions with nutritionists brought out the opinion that there was sufficient vitamin A deficiency in the country to be of concern and warrant attention, and that any discussions or plans for adding nutrients such as vitamins to staple cereal foods should include the consideration for adding vitamin A. Although not as commonly practiced, as the addition of B-vitamins and iron, although vitamin A is added to cereal-based blended foods such as CSM, etc., it can be adequately done as the technology is available. The inclusion of vitamin A into flours and meals is perhaps the most cost effective way of introducing increased vitamin A into the diet of people who rely on such staple foods as their main source of calories.

4. Riboflavin

Riboflavin deficiency was neither identified in the Nutrition Survey nor mentioned as a problem by in-country nutritionists as compared to the situations for the previously discussed nutrients. It is being discussed in this report due to its impending presence as an added

vitamin in certain quantities of maize meal which will be produced and/or marketed in Lesotho either by local or RSA sources. The manager of the Lesotho Milling Co. (Pty) Ltd. said that company will initiate a program in December for the production and marketing of a small portion of their production which will be fortified with niacin and riboflavin. Reports have appeared in the literature that Fedfoods of the RSA has developed a fortified maize meal with the same nutrients added. Certainly if there is actually a riboflavin deficiency in the at-risk population, a food fortification program is a good way to eliminate it and the introduction of foods containing added amounts of the nutrient is to be welcomed. However, the GOL should be well enough versed on the aspects of food fortification so it can evaluate, encourage and/or control the addition of nutrients to the best nutritional status of the people rather than to allow or accept an indiscriminate addition of any nutrient(s) to foods without a demonstrated need for the nutrient(s) and an organized program for their addition. However, one wonders why thiamin is not mentioned or considered by the producers of these proposed fortified meals since it along with riboflavin and niacin make up the common B-vitamin complex and are usually mutually occurring and thought to be mutually functional in the body. Essentially all vitamin-mineral mixes used in the fortification of staple cereal foods contain both thiamin and riboflavin in predesignated amounts and ratio along with niacin and some form of iron compound. The B-vitamins individually and collectively and the various forms of iron available for use in foods would be thoroughly discussed as part of a symposium on food fortification.

The other nutrient of concern regarding its deficiency in the diet of the people of Lesotho as indicated by the Nutrition Survey data is protein.

5. Protein

Two facts appear in the Nutrition Survey data. (1) The people in general are not receiving enough food (calories) per day, and (2) the people subsequently are not receiving sufficient protein quantity. The obvious, yet essentially unobtainable answer is to get more food to the people in some manner which probably would satisfy both problems. Since this seems infeasible, the second thought is to add protein material in some form to that quantity of food (staple) the people do eat and thus improve their protein intake and their protein nutrition condition. This often is not as simple or possible to do as it might seem despite the fact that considerable quantities of blended food containing added protein materials are produced and distributed around the world for use including those used here in Lesotho.

The first prerequisite for such a program of the protein fortification of foods is the selection of suitable protein material. The more common of these are dry milk, soy flour, peanut (groundnut) flour, and wheat gluten or wheat protein concentrate. In some instances, pea, bean and other legume flours are considered when they can be made available. The selection of a protein material to be used usually is based on its protein quantity and quality, compatability with the staple food to which it is to be added, cost, and acceptance by the people of the resulting protein fortified food. The second prerequisite is whether those protein materials are

domestically produced or if they need to be imported. This second prerequisite usually determines the feasibility of a protein fortification program because necessary importation presents too many drawbacks and negatives in regards to cost, adequacy of supply, and required reliance on outside sources for continuation of the program even if economically viable.

Unfortunately, at the present time Lesotho has neither a domestic source of any adequate protein material, nor a suitable protein material in sufficient quantity to support a program for fortification of a staple cereal food, and there doesn't appear to be so in the foreseeable future. The small quantity of peas produced and the not much greater supply of beans, many of which are exported as is or after processing, do not represent a near term supply of protein material with which to fortify maize and/or sorghum meals.

As indicated above, a very important consideration in any protein fortification program is the effect the addition of any type or quantity of protein material will have on the physical or organoleptic properties of the staple foods and whether or not that fortified food will be accepted, purchased and consumed by the people. Contrary to the addition of vitamins and minerals to foods where there are seldom product alterations or any problems associated with acceptance by the people, the addition of protein material often takes on the aspect of introducing a new food or at least a sufficiently modified staple which would require considerable nutrition education and introductory support to give it fair chance of success.

The technology of adding protein materials to staple cereal foods is well advanced and relatively simple requiring only a modest amount of expense and equipment to accomplish due to the relatively larger quantities added compared to the vitamin-mineral mix. Despite the various drawbacks present and the apparent negative feasibility of implementing a protein fortification program, a discussion of protein fortification technology should be included on a symposium program both for information and for guidance.

III. PRELIMINARY DETAILS

A. Proposed Participants

The following categories and specific organizations are proposed or suggested as possible invitees and potential attendees.

1. Members/representatives of the various departments and agencies of the Government of Lesotho who will have some concern with any future food fortification program whether in the area of planning, implementation, education or regulatory aspects should be invited. This might include but not be restricted to the following--in no special order.

   a. Food and Nutrition Coordinating Office

   b. Ministry of Agriculture

      (1) Nutrition

      (2) Extension

   c. Ministry of Health

   d. Ministry of Commerce & Industry

      (1) Consumer Welfare Division

      (2) Division of Licenses and Manufacturing

      (3) Lesotho National Development Corporation

e. Office of the Permanent Secretary

f. Ministry of Finance

g. Food Management Unit

h. Central Planning and Development Office

2. Representatives of the private volunteer agencies or other groups whose programs involving food distribution and nutritional concerns parallel the goals of a food fortification program should be invited, such as:

   a. USAID

   b. CRS

   c. CARE

   d. WHO

   e. WFP

3. Representatives of the food production units that would be affected by the implementation of a food fortification program should be included in the attendees.

   a. Lesotho Milling Co. (Pty) Ltd. - Maputsoe

   b. Lesotho Flour Mills

   c. Maseru Roller Mills

   d. Manager of the cereal roller mill at Makhalanyane and other mills of similar size.

   e. Representatives of identified company(ies) of the RSA who are or might be engaged in supplying maize meal to Lesotho.

4. Representatives could be invited from appropriate Ministries or Departments of the Governments of other Southern African countries of close vicinity which have similar food consumption, food supply and nutrition considerations. This might include:

   a. Botswana

b. Malawi

c. Mozambique

d. Swaziland

e. Zambia

f. Zimbabwe

g. Government of Republic of South Africa

(1) Ministry of Commerce and Industry

(2) Ministry of Agriculture

The above suggested invitees could represent approximately 30-35 people if all responded positively. This number would be supplemented by the three or four speakers on the program from the U.S. or wherever, so the total attendance would probably be about 40 people.

B. Potential Expenses

The expense of carrying out such a symposium as is being proposed should be diversely split among the various entities represented by attendees so that only certain core expenses would need to be borne by the sponsor, FNCO, which should be minimal. A review of potential sources of expense follows.

1. A first expense could be involved with the facilities for holding the symposium. It is proposed that the meeting be held in Maseru at the Government-owned/operated Airport Conference Center. This could possibly be attained at no-charge for the use of the facilities or at a reduced rate with payment being accomplished by an inter-agency transfer of funds from FNCO. Thus the only real expense (cash outlay) for the category of "facilities" would be in the subsidiary activities that might include the cost of coffee breaks,

and food expenses associated with a potential luncheon or banquet that might be included as part of the symposium agenda and hosted by FNCO.

2. A second expense could involve travel and per diem expenses connected with certain attendees. Examined by category it looks like this:

   a. Government employees - Since all of the government attendees are based in Maseru there should be no travel or per diem expenses connected with their attendance. Any noon meal expense or salary compensation considerations for the time spent at the symposium should be covered by their parent agencies at no cost to the sponsor.

   b. PVOs and similar groups - Again the potential attendees are Maseru based and the same logic applies as for the government employees.

   c. Food Production Units - The parastatal nature of Lesotho Milling Company and Lesotho Flour Mills should place their attendees on the same basis as for government employees. Even though Lesotho Milling Co. is not Maseru based, any travel and per diem expenses should be covered by their organizational budget. Representatives from any private sector companies such as from the RSA would be expected to pay their own way as part of good business practice and keeping abreast of happenings which might affect production and marketing of their products.

      The only expense I can see in this category would be for the manager/operator of one or more mid-sized roller mills which service considerable numbers of people in their regions. I'm not sure that these mills are sufficient profit centers to warrant or allow them to carry their own expenses associated with a

three day meeting when they are not Maseru based. There is not sufficient information or data available at this time to put a Rand value on what this expense might be.

d. Other Southern African Countries - It is proposed that the contact made with the other Southern African countries be in the form of an information notice that such a symposium is to be held and that the program will cover food fortification (include tentative program) and, if they feel that the topics to be covered are of sufficient interest or importance to them, then please feel free to send a representative to attend. The announcement should not be a formal request for attendance that would imply that support was available. Thus they would know that their representative/ attendee would need to have their own funding.

e. Speakers - The technical assistance in planning the symposium and the speakers from out of the country making the formal technical presentations will be funded by the U.S. Department of Agriculture in cooperation with USAID/Maseru so there will be no expense for the major portions of the agenda. I assume that opening and closing remarks or major nontechnical speakers, probably from the GOL would be expense-free also.

3. There probably will be expenses associated with the typing required to prepare the copy for the meeting notices and program and for the symposium proceedings if it is decided that the presentations should be published and disseminated. This rather sizeable typing load may be too great for the administrative support available to FNCO. A definite expense will be incurred in the reproduction and distribution of the symposium proceedings if that is included in the overall meeting plans.

In summary, it appears that there would be a minimum of core expense to be borne by the sponsoring agency, FNCO. These would be (1) possible minimal charge for use of the conference facilities, (2) the cost of coffee breaks and a potential sponsored banquet or end of symposium luncheon depending on the wishes of FNCO, (3) the travel expenses and per diem for one or two managers of outlying roller mills, and (4) costs associated with the typing and reproduction of the meeting program and symposium proceedings.

IV. CONCLUSIONS AND RECOMMENDATIONS

The discussions, information gathering, and data review carried out during the period of this report provided a picture of the present nutrition problems in Lesotho, the eating patterns of the people, and the role played by the staple cereal foods consumed by the population. This information was used both in the determination of the feasibility and value for holding a food fortification symposium and in evaluating the potential for a subsequent food fortification program in Lesotho to combat nutritional deficiences.

The general conclusions derived are: (1) There have been identified three major nutritional deficiences in the general population of Lesotho. These consist of iron deficiency anemia, niacin and probably vitamin A deficiency, and protein-calorie malnutrition (PMC), (2) the staple foods of the country are cereal meals and flour prepared from maize, sorghum, and wheat which are used as-is or prepared into various forms for use, (3) the cereal foods provide the majority of the caloric intake of the people, and (4) the processing of the majority of the cereals for consumption is done in relatively few centralized processing units.

Analysis of the information shows that the vitamin/mineral deficiencies

identified are those commonly encountered in people living on diets based on cereal foods and are the same ones which have been shown to be able to be reduced or eliminated by the general fortification (enrichment) of those foods with the appropriate nutrients. Technologies have been developed for such food fortification and they are commonly employed in food fortification programs in many countries of the world. These technologies are simple and relatively inexpensive to implement.

The fact of the central processing of the majority of the cereal foods consumed provides an excellent intervention point for the addition of the nutrients. Centralized processing units offer the conditions for accuracy, efficiency, and quality control needed in a properly operated food fortification program.

The widespread consumption of cereal foods and by all segments of the population including children and women of child bearing age indicates an excellent probability that the nutrients added as part of a food fortification program would reach the people in the target groups which are experiencing the deficiencies.

The PCM problem while widespread and of great concern does not appear to be able to be combatted at this time through a food fortification program because (1) there is no domestic source of suitable protein material, (2) the expense of importing a protein material for a program is not feasible, and (3) the problems associated with the change in characteristics and the consumer acceptance of staple cereal foods such as these due to the addition of nutritionally meaningful levels of protein materials.

There already are plans by one company in Lesotho to produce and market a maize meal fortified with niacin and riboflavin with apparently no prior coordination with appropriate entities of the GOL regarding how such a food would address the nutritional needs of the country or what role it might play

in the nutritional status of the general population. The GOL should be prepared to evaluate, regulate, and encourage efforts toward food fortification so that any addition of nutrients to foods will be the most cost effective and most nutritionally beneficial for the people of Lesotho.

Based on the above reviews and evaluations the following recommendations were developed. It is recommended that a food fortification symposium be planned and carried out as soon as is reasonable to do so. The purpose of the symposium would be to inform the decision makers, planners, and implementers both in and out of government on all aspects of food fortification. The value of the symposium would be the review of the direct applicability of presently developed and utilized technologies for fortifying staple cereal foods with nutrients to the existing conditions in Lesotho. The goal of the symposium would be to have the participants subsequently plan and implement an appropriate food fortification program for the reduction or elimination of vitamin/mineral deficiencies.

It is recommended that the agenda for a proposed symposium center on the addition of vitamins and minerals, especially niacin, vitamin A and iron, to staple cereal foods. All aspects of a possible food fortification program which included the addition of these nutrients should be thoroughly covered to show its value and potential for implementation. Even though it does not appear feasible or likely that a protein fortification program for fortifying cereal foods for the general population can be implemented in Lesotho, the program should include a general discussion of protein fortification technology so that the symposium presents a complete review of food fortification.

Finally, it is recommended that the symposium program include specific discussions on government responsibility, regulatory aspects, economics, and technological factors involved in planning and implementation of a national

program for food fortification. However, those discussions should not be too technical in nature in any given area at this time because of the more generalized nature of the backgrounds of the expected attendees. The proposed symposium covers most of 3 days ending at noon of the third day. It is suggested that the days of the meeting be Wednesday, Thursday, Friday. This will allow time for the out-of-country speakers to arrive and prepare for the meeting and give the in-country people Friday afternoon to return home or complete end of the week work in the office. The presentations in the proposed program marked with an asterisk will be given by speakers provided through USDA. The selection and providing of speakers for the other portions of the program will be at the discretion of FNCO.

V. APPENDICES

A. Appendix A Persons Contacted

1. Government of Lesotho

   a. Permanent Secretary - Miss Moshoeshoe

   b. Ministry of Health - Dr. P. Ngakane

   c. Ministry of Commerce and Industry - Mr. Moleli

   d. Ministry of Agriculture - Miss Jonathan

   e. Food and Nutrition Coordinating Office

      1) Mrs. Phafane

      2) Mrs. Sebatane

      3) Mr. Chobokoane

      4) Mr. Petlane

      5) Mr. Makote

      6) Mr. Jim Anderson

2. Private Sector

   a. Lesotho Flour Mills - Mr. Paul Brown

   b. Lesotho Milling Co. - Mr. Graham B. Gatcke

   c. Lesotho Cannery - Mr. MacLean

   d. Maize Roller Mill in Makhalanyane

   e. Maseru Roller Mills - Mr. A. Everett

3. Others

   USAID - Steve Norton

   CRS - Rick Carbone

I wish to express my appreciation and thanks to the above mentioned people who assisted in the collection of data and information and especially to those of FNCO who were especially cooperative and helpful.

B. Appendix B References

1. An Exploratory Study of the Food System of Lesotho: Report to the Lesotho Food and Nutrition Council. 1977. Slater et al.

2. Lesotho: Country Development Strategy Statement FY 82. 1980. USAID/Maseru.

3. Bridging the Gaps: The Second Lesotho National Food and Nutrition Planning Conference. 1979. Food and Nutrition Coordinating Office.

4. Kingdom of Lesotho National Nutrition Survey, 1976. Revised Final Report, 1977. Conducted by UCLA for USAID.

C. Appendix C - Suggested Symposium Agenda

Time	Day 1
8-10:00 a.m.	Registration
10-12:00 p.m.	Opening Session
	Greetings from Sponsor FNCO/LNDC
	Greetings from selected officials of GOL
	Review of purpose of Symposium and Nutritional Status in Lesotho
	LUNCH (open)
2-2:45 p.m.*	Meaning and Concept of Food Fortification
	Present Status of Food Fortification Technology - General
2:45-3:30 p.m.*	Government and Industry's role in Food Fortification Programs
3:30-4:00	Coffee Break
4:00-4:45*	Economics
	Adjourn
	Evening free
	Day 2
9:00-9:45 a.m.	Discussion of specific foods of Lesotho to be fortified-GOL
9:45-19:30 a.m. *	Presentation on Current Technology used with such foods
	Coffee Break
11:00 11:45 a.m.	Presentation by Lesotho Milling Co. on present program
	LUNCH (open)

TIME	DAY 2
2:00-2:45 p.m.*	Discussion of Regulations and Specifications
2:45-3:30 p.m.*	Consumer Acceptance and Marketing Testing
	Coffee break
4:00-4:45 p.m.	Representative of Fedfoods - RSA regarding fortified maize meal
	Adjourn
	(Evening free)
	DAY 3
9:00-9:45 a.m.*	Protein Fortification or Representative from PVM
9:45-10:30 a.m.#	Iron - need and addition to foods - GOL
10:30-12:00	Closing Remarks by GOL officials
12:00	Formal Luncheon (by Sponsor)
	Speaker - GOL
	Final Adjournment

#Substitute discussion by attendees from other Southern Africa countries.

* Speakers to be provided through USDA/AID.