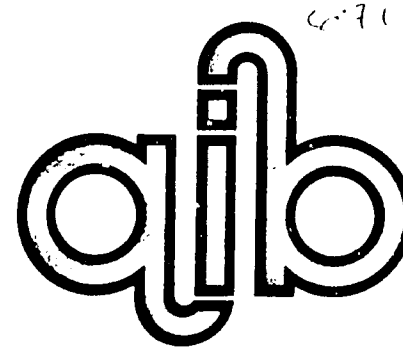

SOY-SUPPLEMENTED BAKERY PRODUCTS AND THEIR NUTRITIONAL VALUE

SPU/CIAE/ICAR PROJECT
BHOPAL, INDIA

CONSULTANCY REPORT

BY

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SUBMITTED TO

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TABLE OF CONTENTS

SUMMARY

My consultancy focused on developing soy-supplemented bakery products and evaluating their sensory and nutritional characteristics.

Five products were developed. Three of these -- bread, bread rusks and buns -- contained 12% soy flour based on wheat flour ("maida") equal to 100% (Baker's percentage). The other two products namely biscuits (cookies) and cake rusks contained 30% soy.

Among these products, bread rusk, buns, biscuits and cake rusks offer the most potential for wide acceptance by the target population to correct protein-calorie malnutrition. These products provide additional protein which also carries a more favourable amino acid profile than protein in products made without soy. In addition, soy-supplemented products also contribute significant amounts of several minerals and vitamins which are deficient or marginal in the diet of many in the low-income group.

OVERVIEW AND OBJECTIVES

The Soybean Processing and Utilization (SPU) Project at the Central Institute of Agricultural Engineering (CIAE), Bhopal, was initiated in the mid-1980s with the ultimate goal to improve the nutritional status of the target (low-income) population through increased consumption of soybean products either directly or through addition to foods such as baked and extruded products.

The main objective of this consultant's visit to Bhopal (CIAE) was to assist SPU's effects to develop selected bakery products which contain a significant amount (consistent with product acceptability) of soy flour.

Full-fat soy soy flour, properly treated to inactivate antinutritional factors, involves a minimal technology to prepare. For this reason, full-fat soy flour was used in all bakery products tested. Defatted or partially defatted soy flour can conveniently replace full-fat soy flour with little or no change required in the formulation.

MATERIALS AND METHODS

Soy Flour: Full-fat soy flour (protein about 40%; fat, about 20%) was used throughout.

Wheat Flour: All-purpose white flour ("maida").

Other Ingredients: Sugar (finely ground cane sugar), shortening (hydrogenated vegetable oil) salt (iodized), baking powder, baking soda, yeast (compressed), eggs (whole, fresh), nonfat dry milk, condensed milk ("khoa") and additives such as lecithin (liquid) and sodium stearoyl lactylate (SSL).

Analytical: Products were not analyzed directly; instead the compositional information developed by Gopalan and associates (see footnote) was used to calculate the nutritional profile of products baked.

Product Scoring: A simplified (see Table) "product scoring sheet" was developed which assigned the "external" and "internal" product characteristics a score of 30 and 70, respectively (total 100).

Formulation: All formulas as based on baker's percentage where wheat flour always equals 100%.

PRODUCTS DEVELOPED

The work performed during my three-week stay in Bhopal involved (a) testing and developing formulations for selected bakery products, (B) scoring product developed, and (c) developing a nutritional profile of the products. The first two aspects, as they are closely interlinked, are discussed jointly under the above mentioned main heading; nutritional aspects are discussed separately.

1. BREAD (Straight-Dough Method)

Background: Based on flour equal to 100%, a maximum of 10-12% soy flour can be added to bread to produce an acceptable product. Even this addition requires processing aids (dough strengtheners, emulsifying agents, anti-oxidants, etc.) such as potassium bromate (about to be banned in U.S.A. and probably in India), ascorbic acid, GMS, lecithin, azodicarbonamide (ADA) and SSL to achieve desirable product quality.

Gopalan, C., Rama Sastri, B.V., and Balasubramanian, S.C. Nutritive Value of Indian Foods. National Institute of Nutrition, ICMR, Hyderabad, 1974.

Formula and Procedure: Bread was made first mixing the top flour ingredients (Table I) at low speed (1 min.), adding yeast (mixing at low speed, 1 min.) and then water (low speed mixing following by high speed mixing, total 5-7 min.). Mixed dough was divided, moulded and placed in the bread pan directly to ferment and proof at 39°C for 1.5 hour. This is the procedure customarily followed by some of the local bakeries. Bread was then baked at 220°C for 20 mins.

Results: Bread baked containing lecithin or without SSL (no bromate was used) collapsed in the oven; those containing SSL produced acceptable product which was further improved in quality in subsequent test bakes.

Significance: Studies involving changes in processing parameters (dough mixing time and speed, stage of soy addition, etc.) is likely to improve the bread quality still, but the product would have a limited, 3-4 days shelf-life even if calcium propionate (mold inhibitor) is used. The product can be converted into another product, namely bread rusk, quite easily. Rusk is a popular product locally.

Commercial Baking: The formula in Table I was tested both at CIAE and at the local "Kayvees" bakeries. Under the commercial production condition, bread pan is lidded at the top, thus, producing a rectangular, dense, product. A 450-g dough piece yields a 400-g bread (20, 20-g slices).

2. BREAD RUSK

Background: As mentioned, 12% soy-supplemented bread can be conveniently processed into bread rusk, which is used locally as a snack item with tea or milk.

TABLE I
BREAD FORMULA

Ingredient	Amount (%)
Flour	100
Soy Flour	12
Sugar	1.5-3
Salt	2
Yeast[a]	3
Additives[b]	Variable
Water	75-77

[a]May reduce yeast and use longer fermentation.

[b]Lecithin, 1%; SSL, 0 or 0.5%.

Formula and Procedure: Bread, baked based on the formula shown in Table I, was sliced into appropriate size pieces (1.5-3.5" long; 2" wide) and dried in the oven (200°C) till nicely browned (15 min. or more). This product was evaluated by an untrained panel (SPU employees) using the score sheet shown in Table II.

Results: A majority of the taste panel preferred the product which contained no SSL or lecithin.

Significance: A 12% soy bread, produced without SSL or other processing aid, can be readily converted into rusk, a popular snack item.

3. BUNS (Straight-Dough Method)

Background: Like rusk, buns, sold in different package sizes, are also a popular item locally. They differ from bread in that additional sugar is included in the formulation for the slight sweetness the consumer desires.

Formula and Procedure: Buns were made both at CIAE and at "Kayvees" bakeries using the formula listed in Table III. Dough, mixed like the

bread dough, was fermented (39°C, 30 mins.) in a bowl covered with a wet cloth. Afterwards, the dough was punched, lightly oiled and divided into dough pieces of 120-g each. Properly moulded, each dough pieces was sub-divided equally into two balls (60-g each) and placed on a lubricated flat tray side by side (allows hinging). Properly covered, the dough balls were proofed (30°C, one hour) and then baked at 220°C for 15 min. or more. Each baked produce weighed approximately 50 g.

Results: Quite desirable products were produced with taste panel consistently preferring buns over bread (both contained 12% soy). Buns made at CIAE scored an average of 83 points out of a maximum 100.

Significance: A popular selling packet contains two buns (hinged together); larger packets are also sold. They are consumed at meal time ("Pao Bhaji") as well as with milk and tea. Buns made contained 0.5% SSL, but no problem is anticipated if SSL is left out.

4. BISCUITS/COOKIES (Sugar Cookies)

Background: Initial testing, following the standard AACC procedure, by the CIAE Scientists found cookies made with soy and containing the recommended level of sugar to be sweeter than desired. Studies were, thus, directed initially to lower the level of sugar in the formula and yet simultaneously increase the level of soy. A number of cookie product were made containing different levels of soy (0, 25, 30 or 35%), 40% shortening, and two levels (35 or 45%) of sugar. Based on product scores, another bake test was run where the formula now contained 40% sugar, 35% shortening and three levels (24, 30 or 35%) of soy. This test yielded the product which contained 35% soy as slightly more acceptable than the other two

TABLE II
PRODUCT SCORING
(Soy-supplemented Bakery Products)

Your Name:_____ Product:_____

Date :_____

Time :_____

Please rate these samples for overall quality according to the following descriptions:

	Maximum Point	Product 1 Point You Gave	Product 2 Point You Gave	Product 3 Point You Gave
External (Appearance, Colour, etc.)	30			
Internal				
Texture/Grain	10			
Colour	10			
Flavour	20			
Taste	30			
TOTAL	100			

Note: Table can be expanded to include more than three products.

Comments, if any.

TABLE III
BUN FORMULA

Ingredient	Amount (%)
Flour	100
Soy Flour	12
Sugar	8
Salt	2
Yeast	3
SSL	0.5
Water	80

products. Two additional bake tests were carried out, varying sugar and soy levels. The final formula contained 50% sugar, 30% shortening and 30% soy (Table IV).

Formula and Processing: Sugar and shortening (preferably use plasticized shortening) were first creamed together (up to 5 min. at low and high speeds) followed by the addition of water (1 min. mixing) and then rest of the ingredients (1 min. mixing). Dough was then rolled to a thickness of 4 mm, cookies were cut out (different mould sizes used) and then baked (190^{o}C, 15 min. or more).

Results: Taste panel judged the products as quite acceptable (average score, 75; maximum score, 100).

Significance: Yeast-leavened products such as bread and buns do not allow substantial addition of soy without an adverse effect on product quality. Such is not the case with chemically-leavened products such as cookies and cakes (gluten functionality is not desired). Although the formula listed in Table IV contained 30% soy, additional testing may allow still higher levels.

Biscuits have a long shelf-life. They are conveniently packaged, easy to carry and widely used at snack or meal time in school or at work.

5. CAKE/CAKE RUSK

Background: Cake products are enjoyed by many, but they use expensive ingredients in large amount. They also have a limited shelf-life and not always convenient to carry to school or work. These hurdles can be greatly circumvented by formulating a product which uses the expensive in-

TABLE IV
COOKIE FORMULA AND CHARACTERISTICS

	Amount (%)	Measurements
Ingredients		
Flour	100	
Sugar	50	
Shortening	30	
Soy Flour	30	
Salt	1	
Sodium Bicarbonate	0.8	
Baking Powder	1	
Water	45	
Measurements (5 Cookies)		
Weight (unbaked), g		29.6
Weight (Baked), g		24.5
Height, mm		30.6
Diameter, mm		208.8
Spread, ratio		6.82

NOTE: Cookie dough, rolled to a higher thickness than 4 mm may ensure a softer, more desirable, interior when baked.

gredients at the minimal level consistent with product quality, and is processed further to allow both an improvement in shelf-life and the convenience of packaging and use. Cake rusk, a popular product locally, was, thus made (at the local "Jai Hind Proteins Bakery"), using the formulation listed in Table V, to meet the aforementioned objective.

Formula and Process: Cakes were made both with and without eggs. In the egg-free cakes, sugar, shortening (plasticized) and "Khoa" were first thoroughly mixed (2-3 min.), water was then added (2-3 min. mixing) followed by the addition of the remaining ingredients (through mixing

again, 1-2 min.). The batter, poured into a greased circular pan, was baked (140°C) for over one hour. In the egg-containing cake, shortening and sugar were first creamed together followed by the addition of milk powder (1 min. mixing), gradual addition (and mixing) of eggs and finally the rest of the ingredients (thorough mixing again). This batter, poured into a pan, was also baked at 140°C but for less than one hour. After adequate cooling, cakes were sliced (2" x 3" slices) and oven dried (190°C) for up to 30 min. (egg-free slices required longer drying).

TABLE V
CAKE FORMULA

Ingredient	Amount (%) Eggs Added	Eggs Not Added
Flour	100	100
Soy Flour	30	30
Sugar	80	60
Shortening	80	20
Condensed Milk (Khoa)	-	20
Baking Powder	1	1
Eggs (Whole, Fresh)	2.4	-
Sale	1	1
Nonfat Dry Milk	2	2
Water	-	60
Vanilla	Added	Added

Results: Judged by the taste panel, the egg-containing cake was preferred over the egg-free cake (both contained 30% soy). When comparing cake with rusk (egg-free products), rusk was consistently preferred over the cake.

Note: Drying egg-free cake to make rusk made the rusk crumbly. Adding some eggs, thus, appears essential. With eggs included, it may be possible to add more soy flour also.

Significance: Because of its high fat and sugar content and the content of eggs, cake rusks are likely to be more popular than bread rusks. They also allow more soy addition than bread or buns.

NUTRITIONAL CONTRIBUTION OF SOY-SUPPLEMENTED BAKE PRODUCTS

PERSPECTIVE ON SOY FLOUR

Because of its fat content (about 20%), full-fat soy flour is higher in energy value than defatted or low-fat soy flour or soy concentrate and isolate. All these soy products are, however, a good source of protein. They also contain about three times more lysine, the amino acid most deficient in cereal proteins, and thus, complement cereal proteins when soy flour is added to cereal flour. Depending upon its use level, soy flour can increase the protein quality, traditionally measured as "Protein Efficiency Ratio" (PER) of a finished product up to two-fold, from a PER value of less than 1.0 to a value approaching 2.0.

Full-fat soy flour is also a good source of polyunsaturated (and monounsaturated) fatty acids, and thus, provides essential fatty acids in the diet. These acids help absorb fat-soluble vitamins and could also be effective in lowering elevated blood cholesterol level, a risk factors in heart disease.

Full-fat soy flour contains about 15% fibre measured as "total dietary fibre" (not crude fibre). The Indian diet, however, is not reported to be low in fibre, unlike most western diets, and a strong case for additional fibre may be difficult to make.

With regard to micronutrients (vitamins and minerals), soy flour is appreciably higher in several of these as compared to white flour. For

example, soy flour contains about ten-fold more calcium, six-fold more phosphorus, and four-fold more iron, thiamin and riboflavin. Soy flour is also significantly higher in several other mineral elements such as copper, zinc and magnesium.

The high level of phytate and fibre in soy (as compared to "maida") may somewhat compromise the "biological availability" of certain minerals in soy, but because of the appreciably higher initial levels of these minerals in soy (as compared to "maida"), the net absorption of minerals in soy can still be substantial.

In most baked products tested, soy flour was the only other ingredient (besides "maida") which contributed micronutrients to the finished product. Where the products include ingredients such as eggs and milk they would, no doubt, have a more impressive nutritional profile.

NUTRIENTS IN BAKED PRODUCTS

Analyzing finished (as-consumed) products directly is the most accurate method to meaningfully assess their nutritional value. Because of the short-term duration of this consultancy and other various factors, products baked were not analyzed directly. Instead, tabular values on composition as published by Gopalan and associates (1974) were used (a few other sources were also used) to establish nutrient profile. Stepwise, the approach involved first calculating nutrients in the formula ingredients, and then calculating the number of servings (slices, buns, pieces, etc.) of a product the formula yielded. The information arrived at this way is presented in Table VI. Energy value was calculated using "total dietary fibre" value as subtracted from the total carbohydrate values. Since "total" rather than "crude" fibre values were used, calorie

TABLE VI
NUTRIENTS IN ONE SERVING OF A PRODUCT[a]

Nutrient	Bread	Bread Rusk	Bun	Cookies	Cakes Rusk
Energy, Kcal	184	150	245	210	380
Protein, g	7.6	6.2	9.5	5.5	18.5
Fat, g	1.5	1.2	1.9	8.2	23.0
Total Dietary Fibre, g	2.0	1.6	2.5	1.6	1.6
Calcium, mg	25	20	31	22	42
Phosphorus mg	96	78	120	75	137
Iron, mg	1.8	1.5	2.3	1.4	1.9
Zinc, mg	0.45	0.36	0.56	0.30	0.31
Copper, mg	0.16	0.13	0.19	0.13	0.13
Magnesium, mg	35	28	43	27	28
Thiamin, mg	0.09	0.08	0.12	0.08	0.10
Riboflavin, mg	0.06	0.05	0.07	0.04	0.16
Niacin, mg	1.3	1.07	1.64	0.76	0.77

[a]Serving Size: Bread, 4 slices or 80 g
Bread and cake rusks, 5 pieces or 45 g
Buns, 2 buns or 100 g
Cookies, 10 cookies or 50 g

values of the ingredient used in the formulation are lower than published in the Indian literature.

NUTRITIONAL CONTRIBUTION

We need about 40 or so different nutrients for good health. These include protein, essential amino acids, essential fatty acids and micronutrients. Precise daily needs (amount-wise) is established for only some of these.

Nutrients in one or more servings of a product must relate to the amounts of various nutrients we need in a day. For the Indian population, Gopalan and associates (1974) have published information on amounts we need. These are called Recommended Daily Intakes (RDIs). Values are

listed for 12 nutrients and calories (1981 revised edition) as well as for different age/sex groups. For the purpose of this report, nutrient composition as listed in Table VI, was related to only one category of individuals namely young boys. Calculation can easily be made and extended to other categories. Table VII lists the RDIs for 10-12 year old boys. Table VIII shows to what extent one serving of the developed products meets the daily need (RDIs) for various nutrients of a young boy.

It is obvious from Table VIII that cake rusk and buns provide the most energy. They also provide nearly one-fourth (buns) or one-half (cake rusk) of the daily need for protein. All products are a significant source of phosphorus and copper, and they provide appreciable amounts of various other nutrients also.

Protein-calorie malnutrition remains the major health concern in India. Soy-supplemented baked goods, as the data in Table VI and VIII show, can make a significant contribution in combating this problem. They not only provide more protein, a high quality protein, but also several vitamins and minerals, some in significant amounts.

TABLE VII
RECOMMENDED DAILY INTAKE OF SELECTED NUTRIENTS (FOR 10-12 YEAR OLD BOY)

Nutrient	RDI	Comments
Energy, Kcal	2420	
Protein, g	42.5	
Calcium, mg	400	(Lower limit, Indian value)
Phosphorus, mg	400	(Value selected to match calcium)
Iron, mg	25	(Lower limit, Indian value)
Magnesium, mg	350	(U.S. value)
Zinc, mg	15	(U.S. value)
Copper, mg	1.5	("Probable" need)
Thiamin, mg	1.2	
Riboflavin, mg	1.5	
Niacin, mg	16	

Note: RDIs are not listed for some nutrients either because compositional information (on food) is not available for calculation purposes or bakery products are an insignificant source (Vitamin C, for example).

TABLE VIII
DIETARY CONTRIBUTION OF BAKERY PRODUCTS[a]

	Product				
Nutrients	Bread	Bread Rusk	Bun	Cookies	Cake Rusk
Energy	8	6	10	9	16
Protein	18	15	22	13	44
Calcium	6	5	8	6	11
Phosphorus	24	20	30	19	34
Iron	7	6	9	6	8
Magnesium	10	8	12	8	8
Zinc	3	2	4	2	2
Copper	11	9	13	9	9
Thiamin	8	7	10	7	8
Riboflavin	4	3	5	3	11
Niacin	8	7	10	5	5

[a]In one serving (see Table VI for serving size).

RECOMMENDATIONS

-Add equipment -- mixer, moulder, proof box, fermentation cabinet and a small oven -- to increase the efficienty of test baking and to enable a proper control over processing parameters (current facilities are ably and effectively used by Kulkarni and Sinha).

-Limit the addition of soy flour to a few select products which are traditionally consumed and are inexpensive. Focus on improving their quality.

-Because of the ease of processing and its relatively higher energy content, full-fat soy flour should remain the flour of choice to be used in bakery products.

-Set up a small dough rheology laboratory, using the extensigraph (already received) and farinograph (on the way) equipment, to test flour quality and the effect of ingredients on it. The industry would benefit from this also.

-To the extent feasible, analyze baked products directly for their nutrient composition or have the analysis done.

-Establish close contact with bakery operation locally and nationally (Britannia, Modern, etc.) and with academic institutions such as CFTRI (Mysore), PAU (Ludhiana), and even "U.S. Wheat Associates" (Delhi office).

-Conduct frequent open houses to acquaint the interested groups with products developed at SPU Facilities. Prepare technical sheets on products.

-Add one or two Cereal Scientists to provide the necessary balance in scientific expertise.

"U.S. Wheat Associates" (Delhi Office; Mr. Pat Khandhari) may be helpful in sponsoring a scientist to attend the AIB's 19-week course on "Baking Science and Technology." This course trains a person to be a full-fledged baker, who in turn can contribute immensely in developing new and varied soy-supplemented products, some of which are likely to take a firm hold in the marketplace in India.

ACKNOWLEDGEMENTS

I wish to acknowledge the support of Dr. N.S.L. Srivastava, Director, CIAE, Bhopal, for providing the facilities to undertake this consultancy assignment and of Dr. Nawab Ali, Project Director, SPU Project, for identifying specific objectives and goals for my assignment. Dr. Anwar Alam, Assistant Director General (Engg.), ICAR, was most helpful in providing the vision and insight into the SPU Project.

I worked most closely with Mr. S. D. Kulkarni, Senior Scientist, and Mr. L. K. Sinha, Scientist. They were most gracious hosts and made my stay in Bhopal a truly memorable experience. I could not have accomplished what I did without their whole-hearted and unfailing support. I would like to thank various other individuals associated with SPU Project, but particularly Mr. B. S. Bisht, Dr. A. P. Gandhi, Mr. R. T. Patil, Mr. P. C. Bargale, Mr. R. N. Tripathi and Ms. N. Awasthi, who were extremely helpful in several ways.

Finally, I must express my deep appreciation to many individuals associated with Winrock International -- Mrs. S. Bhatt (Washington, D.C.), Dr. A. Colin McClung (India Coordinator) and Mr. P. S. Srinivasan (Delhi Office) who so ably handled the many logistic details including the recovery of my missing baggage which failed to make it to Delhi with me. Thanks are also due to Mr. Haridas G. Menon (CIAE) and Ms. Lillian Cooke (Winrock) and Ms. Bev Martin (American Institute of Baking) who promptly and efficiently typed this report.

PERSONS AND ORGANIZATION VISITED

DELHI

Dr. A. Colin McClung, India Coordinator, Winrock International
Mr. P. S. Srinivasan, Admin. Specialist, Winrock International
Mr. John A. Becker, Director (AGRE), USAID, India Office
Dr. Anwar Alam, ADG (Engg.), ICAR
Dr. Surjan Singh, Prog. Spec. (Ag. Res.) (AGRE), USAID

BHOPAL

Dr. N. S. L. Srivastava, Director, CIAE
Dr. Nawab Ali, Project Director, SPU Project
Dr. T. P. Ojha, DDG (Engg.), ICAR
Mr. S. D. Kulkarni, Sr. Scientist
Mr. L. K. Sinha, Scientist
Dr. A. P. Gandhi, Sr. Scientist
Mr. B. S. Bisht, Sr. Scientist
Dr. K. C. Joshi, Scientist
Mr. P. C. Bargale, Scientist
Mr. R. T. Patil, Scientist
Mr. R. N. Tripathi
Ms. N. Awasthi
Mr. D.K. Jain
Mr. B. Mistry

ORGANIZATIONS

Kayvee Bakeries (Mr. Abhay Khandeya)
Em Pee Food Products (Modern Bakeries) (Mr. Rajkumar Adlakha)
Jai Hind Bakeries (Mr. Talreja)
Jai Hind "Proteins" Bakeries (Mr. Om Prakash)
Popular Bakeries (Mr. Dilip Kumar)
Sona Bakeries (Mr. Mallick)
Raju Bakeries (Mr. Sanjay)
Ahuja Bakeries (Mr. Laxman Ahuja)
Beeline Bakeries (Mr. Goorha)
Noble Soya House Ltd., (Dr. Gopal Sharma)
Britannia Industries Soy Complex (Dr. N. K. Sharma)
Shiba Bakeries (Mr. Aquil Ahmed)
Jhulelal Bakeries (Mr. Baluram)
Ashirwad Bakeries (Mr. L. Ahuja)

DAILY ACTIVITIES
(MAY-JUNE, 1990)

Thursday, 10 May	:	Fly from Manhattan, KS to St. Louis to New York and depart for Delhi.
Saturday, 12 May	:	Arrive Delhi (1:00 a.m.). Check into Hyatt Regency (night, 11 May).
Sunday, 13 May	:	Read CIAE and SPI materials provided by Dr. McClung.
Monday, 14 May	:	Discuss assignment with Dr. McClung and Mr. P. S. Srinivasan (Winrock), Mr. John Becker (USAID) and Dr. Anwar Alam, ADG (Engg.), ICAR.
Tuesday, 15 May	:	Fly to Bhopal (Kulkarni/Sinha). Discuss project with Dr. Ali.
Wednesday, 16 May	:	Met with CIAE Scientists. Planned experiments.
Thursday, 17 May through Saturday, 19 May	:	Test baking and product evaluation.
Sunday, 20 May	:	Rest day.
Monday, 21 May	:	Test baking and product evaluation.
Tuesday, 22 May	:	Visit four local bakeries.
Wednesday, 23 May	:	Made soy-supplemented bread and buns at "Kayvee Bakeries".
Thursday, 24 May through Saturday, 26 May	:	Test baking and product evaluation.
Sunday, 27 May	:	Rest day.
Monday, 28 May through Wednesday, 30 May	:	Test baking and product evaluation.
Thursday, 31 May	:	Process data collected. Gave a seminar at the CIAE's Summer Institute.
Friday, 1 June	:	Visited local bakeries and soy plants. Did additional calculations.
Saturday, 2 June	:	Test baking. Presented seminar to SPU staff (on work done).
Sunday, 3 June	:	Rest day.

Monday, 4 June	:	Visited Britannia Soy Complex and Surya Soy Complex (near Bhopal).
Tuesday, 5 June	:	Prepared first draft of the report.
Wednesday, 6 June	:	Report typed, corrected and revised. Revisited with SPU staff.
Thursday, 7 June	:	Fly to Delhi. Meet with Winrock International Staff. Turn in report.
Friday, 8 June	:	Corrected report. Visited with USAID/ICAR Scientists.
Saturday, 9 June	:	In Delhi.
Sunday, 10 June	:	Depart for airport to take midnight (11 June) flight to New York.
Monday, 11 June	:	Arrive Manhattan, KS (8:35 p.m.)

APPENDIX

The following publications by the "Bureau of Indian Standards" would provide quite useful both in developing bakery products and in conforming to equality standards.

-Specification for self-raising flour

IS: 3838-1966; February, 1967

-Recommended methods for determination of aroma and taste thresholds.

IS: 10641 - 1983; November, 1983

-General guidelines for consumer sensory evaluation of food and beverages.

IS: 10642 - 1983; November, 1983

-Specification for wheat flour for use in cake industry.

IS: 9194 - 1979; November, 1979

-Glossary of terms relating to bakery industry.

IS: 9373 - 1797; November, 1980

-Guide for sensory evaluation of foods.

IS: 6273 (part III/Sec. I) - 1983; July, 1983

-Specification for baker's yeast.

IS: 1320 - 1981; May, 1981

-Specification for white bread.

IS: 1483 - 1988; March, 1989

-Specification for bun.

IS: 8556 - 1988; September, 1988