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P R O C E D U R E S F O R S C H O O L L U N C H
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We hereby recommend that the dissertation prepared under
our supervision by Bina Bhatia Poplai
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be accepted as fulfilling this part of the requirements for the Degree of
Doctor of Philosophy.

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CHAPTER I

I N T R O D U C T I O N

Food is one of the necessities of life. There have been extremely rapid and striking advances in the field of nutrition in the past century and the results have indicated that optimum nutrition is essential for a healthy life. The earlier belief that appetite is a good guide in the selection and consumption of food is no longer true in accordance with the present knowledge of nutrition. From a biological point of view, a number of chemical compounds are recognized as essential for optimum growth and development. For maximum benefit, the frequency of consumption is also an important factor.

Primitive man consumed all that was available and edible. The change from man, the hunter, to man, the food-gatherer brought about many new ideas and concepts concerning food. As civilization progressed, many changes in the diet took place and many of these changes became firmly established practices that are still in existence among various cultural groups. Man cultivated food on farms, prepared it by different methods, and usually ate well. Even the poorer classes had a simple but ample supply of food. There was

little scientific knowledge of the nutritive values of foods, of the use of storage facilities, or of the preservation of food. Not until the late nineteenth century was it known that foods differed in nutritive value.

Todhunter (100) has pointed out the changing patterns in the food supply and in diets with the passage of time. Throughout the ages there have been some people who, either by choice or necessity, have followed a vegetarian diet. Feeding experiments with animals, dietary studies with humans, and clinical and metabolic studies have failed to provide any evidence of harmful effects from meat consumption. On the contrary, the newer knowledge of nutrition, especially with regard to amino acids, indicates the desirability of animal products in the diet and emphasizes the difficulties encountered in trying to provide adequate and balanced amounts of the amino acids from plant sources only. McCollum and Simmonds (74) have emphasized the difficulty in maintaining health and vigor on a vegetarian diet, in securing the right combination of plant foods to meet protein needs, and in eating the quantities deemed necessary.

Investigations in 26 countries, as reported by Copping (26), revealed the fact that the major problem and cause of malnutrition is the failure to make proper use of available foods rather than a lack of food supplies. These reports further indicated that nutrition education has been

badly neglected, not only in the developing countries, but in some of the highly developed countries as well, especially when an older system of education prevailed. Hence there developed an awareness of the need for nutrition education, planned on the basis of community needs, ethnic groups, and cultural patterns.

During the first half of the twentieth century, enough scientific knowledge had accumulated for considerable improvement in the nutritional health of people all over the world if only this knowledge were effectively applied. Beuwkes (18) reviewed the growing recognition of the significant role that nutrition can play in the prevention of disease and maintenance of health. Major avenues for nutrition education were emphasized. The above author called attention to two special problem areas; namely, motivation of the people to seek and use valid information, and the recognition of food faddism as a serious economic and health hazard. The author further pointed out that although much progress has been made, a world that is not yet free from hunger demands that, within the limits of existing resources, the maximum potential be achieved through education. The situation requires an understanding of the cultural, social, and economic factors underlying existing food habits.

A review of the present status of nutrition education and an evaluation of existing programs were undertaken by McKenzie and Mumford (76). These authors were of the opinion that it would be wrong to regard nutrition education as either always being an effective tool for modifying food habits or always being ineffective. Research as to the effectiveness of nutrition education has been limited. Research data suggest that success or failure of an education program depends on the methods used, the personalities involved, and the circumstances prevailing in the area. The authors stressed the need for close cooperation between social scientists and nutritionists in establishing a satisfactory and simple methodology. The use of evaluation as an integral part of any program was emphasized by the authors.

King (61) pointed out the important role of some voluntary agencies in helping with the problem of malnutrition in developing countries, especially in work with children. This author noted that malnutrition is a major cause for low vitality, sickness, and early death. Unfortunately public records in such countries are not available to show the real causes of sickness or death, except for the final manifestations such as pneumonia, diarrhea, tuberculosis, or a fever.

Subrahmanyam and co-workers (96), in reporting recent studies of protein malnutrition in India, pointed

out that protein malnutrition is the most widely prevalent nutritional inadequacy among the deficiencies in many of the underdeveloped and overpopulated countries of the world. With infants, preschool children, and pregnant and nursing mothers, the inadequacies may range from the extremes of protein deprivation to milder degrees, both quantitatively and qualitatively. These countries have realized that protein-rich sources can be successfully used to augment protein supplies on the basis of availability, cost, acceptability, economic, and religious factors. The works of these authors pointed toward the utilization of protein sources not fully explored in the past. Also discussed were the basic foods, high protein foods, and processed foods made of extracted protein which can be used in a variety of ways.

The causes of malnutrition among the young in the developing countries may be attributed to non-availability of protein-rich and protective foods, poverty, ignorance and superstitions, infestation, and infections. Swaminathan (98) pointed out that although methods of feeding children in different countries are varied, the problems are similar. Scrimshaw (90) stressed the idea that any infection, no matter how mild, has a significant and relatively prolonged detrimental effect on persons already in a poor state of nutrition. The retarded growth and development and increased mortality and morbidity of preschool children in developing

countries are joint consequences of poor nutrition and infection.

A major problem in India is a dietary deficiency of proteins, vitamins, and calories, especially among children and infants. Early in life the child gains a feeling of warmth, love, and security through food. It is generally agreed that health influences performance throughout life, especially if health is defined as a state of complete physical, mental, and social well-being. Food has profound social, psychological, and emotional implications. To assure the security and well-being of children, and to build a healthy nation, it is important that children be fed nutritious and wholesome food. A large number of children can be protected and helped to attain their potentials by providing nutritious meals through the school lunch program.

The purposes of this study were:

1. To determine the existing policies, procedures and practices of a group of selected school lunch programs in Texas by use of a survey form.
2. Based on the findings from the above survey, to develop plans for organizing school lunch programs for India.
3. To plan kitchen lay-outs for school lunch programs in India.

4. To develop and standardize a two-week cycle menu plan for school lunch programs in India, to determine portion sizes, and to analyze the proposed menus for nutritive values.
5. To plan a training program for food service personnel to be used in the proposed school lunch programs.
6. To develop implications for planning educational programs for children in India.

CHAPTER II

R E V I E W O F L I T E R A T U R E

Interest in what and how much food man should eat was questioned by Sanctorius as early as the sixteenth century. However, the limited scientific knowledge and terminology of that period were inadequate to describe the information sought. Early studies by Lavoisier led the investigator to conclude that different amounts of food are required by people doing different amounts of work. The term "protein," meaning "without it no life is possible," was introduced by Mulder, a Dutch physician and chemist.

Edward Smith, in 1862, initiated dietary studies in England among different population groups to determine the type of diet that would maintain health at the lowest cost. However, it was not until Voit (1831-1908) developed the techniques for metabolic studies that nutrition was established as a science. The relationship between caloric requirement and energy expenditure was recognized by that time. Sherman (1911), an early authority on dietary standards, based his conclusions on a critical examination of balance studies undertaken to determine the need for different nutrients.

The twentieth century produced rapid advances in nutrition investigations. The League of Nations became interested in problems of nutrition and in 1932 the Health Committee considered the question of establishing dietary standards. By 1936, under the chairmanship of Edward Mellanby, a technical committee with representatives from seven countries was established to develop international dietary standards. In 1940, the Committee on Food and Nutrition, later called the Food and Nutrition Board, was established in the United States by the National Research Council of the National Academy of Sciences. The purposes of the committee were to give advice on nutrition problems in connection with national defense and to recommend the dietary essentials for people of different age groups in accordance with the newer knowledge of nutrition.

Several other countries have established committees to develop dietary standards and tables on recommended allowances. In 1950, a committee of the Food and Agricultural Organization (FAO) adopted average minimum standards for caloric requirements at the physiological level. Protein requirements were based on the nutritive value of any protein or any mixture of proteins, depending on the quantity of the essential amino acids contained and the proportion of these amino acids.

PROTEIN CALORIE MALNUTRITION IN
DEVELOPING COUNTRIES

Goldsmith (42) emphasized the importance of protein-calorie malnutrition throughout the world, especially for infants and children in the developing countries. This nutritional need led to the establishment of the Committee on Protein-Malnutrition by the FAO in 1956. Research programs were conducted in cooperation with the World Health Organization (WHO), the Food and Agricultural Organization (FAO), and the United Nations International Committee on Education and Food (UNICEF), and with the aid of the Rockefeller Foundation. The extent of malnutrition in the rapidly growing populations of developing countries, along with the failure to increase food production to keep pace with the requirements of increasing populations, is the most important problem that faces the nations today. However, national and international efforts are being promoted to eradicate malnutrition and to provide adequate diets not only for present but for future generations as well.

Berg (19) reviewed the efforts of the United States in meeting world nutrition needs. This author stated:

The year 1965 may well be looked back upon as the "year of nutrition." This was the year which saw the problems of malnutrition given attention at the highest policy levels of government and an important linking in this field of the scientific community with the operating community. It was the year in which malnutrition was suddenly recognized not only

in the moral and humanitarian context of the past, but now also as a basic obstacle to the entire economic and social development process. If one were to try to identify a single event which prompted this recent interest and resulting activity, one would have to point to the December 1964 International Conference on Prevention of Malnutrition in the Pre-School Child, held at the National Academy of Sciences in Washington.

Berg further asserted that in many countries, 50 per cent of the children die before attaining the age of six years, and of those who survive, 70 per cent suffer from some degree of malnutrition. There is evidence to show that malnutrition in early years of life impairs not only physical growth, but probably is responsible for mental and emotional damage as well. These facts have frightening implications.

A recent article by Berg (20), "Nutrition as a National Priority," outlines the efforts of the government of India in initiating a plan to combat malnutrition among preschool children by adopting a Children's Charter. If the recommendations are fully met, this charter will insure a minimum diet to 80 million preschool children. Some areas listed by Berg that need exploring before making a success of this program were: inadequacy of the agricultural revolution, fortification innovation, redirecting, new role of private enterprise, and novel concept in nutrition education.

EFFECT OF MALNUTRITION ON
GROWTH AND DEVELOPMENT

Barnes and co-workers (17) investigated a vitally important subject, the effect of malnutrition on mental development. Although these investigations were based primarily on observations with animals, results indicated that if protein-calorie malnutrition develops at a very early age, it may have long and perhaps irreversible effects on behavioral development and may lead to retardation in learning and intelligence.

Liang and co-workers (69), based on investigations with children, confirmed the findings of the above authors. Although these authors found that, on the basis of nutritional status during the preschool years, the intellectual as well as the physical development could be predicted with a high degree of accuracy, the authors did not claim that the impairment of intellectual development is or has been irreparable.

Garrow and Pike (41), in the long term prognosis of severe infantile malnutrition, have pointed out that there is no clear evidence that a period of severe malnutrition in infancy per se causes stunting of growth in children as it does in some animals. According to these authors, stunting of growth could be attributed to genetic factors

also. Graham (44), on studying the effects of infantile malnutrition on growth, pointed out that the older the infant or child when deprived of an adequate diet, the longer the period of undernutrition that can be tolerated without permanent stunting of growth.

Scrimshaw (89) noted that, for the great majority of children in the technically underdeveloped countries of the world, retardation in physical growth and its interaction with infection is a fact of existence. This author further pointed out that early malnutrition which stunts growth has also been shown to affect learning ability, memory, and behavior in experimental animals. Evidence is now available, according to this author, to suggest that malnutrition during the first few years of life does have an adverse effect on subsequent learning and behavior although the mechanisms involved are not yet established and the nature and severity of the malnutrition responsible needs clarification.

Coursin (27), in an overview of recent literature, demonstrated the relationship of nutrition to central nervous system development and function. The author's observations confirmed the fact that early in the course of kwashiorkor or marasmus, patients became listless, apathetic, withdrawn and there is dulling of sensorium and response. In cases of mild undernutrition, therapy is more effective, with better results in physical and mental development.

According to Jackson (54) and Jelliffe (55), one of the most important signs of malnutrition in infancy is a stationary or decrease in body weight. This failure to grow may be caused by an inadequate diet and/or the frequent occurrence of disease, infection, and parasitic infestation.

Graham (44) reviewed the effect of infantile malnutrition on growth. This investigator pointed out that research efforts are handicapped by the lack of information concerning the genetic potential of each child, and by considerable diversity in the adequacy of health care and diets. However, long term follow-up studies show that, although the prognosis for growth can be improved by optimum diet, severe deficits seemingly cannot be made up, particularly the small head size.

Kerrey and co-workers (59) recognized that nutrition of the young child is an important environmental factor affecting growth and development. Further, food practices and attitudes established during the early years are believed to affect food choices and consequently nutritional status throughout life.

Champakam, Srikantia and Gopalan (23) have shown the effect of kwashiorkor, a condition of protein-calorie malnutrition, on mental development of children under three years of age. The above authors found a significant difference in performance with regard to intelligence tests, which was

more marked in the younger age groups and tended to diminish in older age groups. Further, the children with kwashiorkor had poorer intersensory organization, and retardation was noticeable, mainly with regard to perceptual and abstract abilities.

The influence of protein deficiency on keratomalacia was investigated by Sinha (93). This serious eye disease is characterized by rapid liquefaction of the whole of the cornea, and has been attributed to vitamin A deficiency. The author reported that in addition to a deficiency of vitamin A, protein malnutrition is an important factor in the development of this disease in India.

Rosso, Hormazabal and Winick (87) studied the changes in brain weight, cholesterol, phospholipid, and deoxyribonucleic acid (DNA) content of nine children who died of severe malnutrition. These data were compared with those collected from eight well nourished children who died of accidents or acute infections. The results of the study indicated the reductions in wet and dry weight of the brain, and in cholesterol, phospholipid, and DNA content in marasmic children were proportionally reduced during the first year of life. Further, the DNA was less reduced than the other parameters studied during the second year of life. The author's interpretation of the findings indicates a reduction in the number of cells, each containing a normal amount of proteins

and lipids, during the first year of life. The size of the remaining cells was considerably reduced during the second year. There was also a proportional reduction of lipids and protein content in each of the cells. The authors concluded that the cell is proportional to, and accompanied by, a reduction in the size of the cell processes.

Stewart and Platt (95) demonstrated the adverse effect on the central nervous system of diets low in protein and calories in experimental animals. The authors were uncertain how much of this information from animal studies could be applicable to human beings. However, evidence shows that malnourished mothers produce smaller infants. These infants have a high neonatal mortality rate, and the survivors have comparatively poor health and somewhat low intelligence quotients (IQ). Since man reacts like other animals, the authors concluded that the dietary deficiency may be more intense for humans and therefore attention needs to be given to the maternal diet.

Levie and Nogrady (68) studied the effect of restoration of adequate nutrition on the rate of brain growth. These authors found that restoration of adequate nutrition in deprived young children may result in rapid brain growth with rapid increase in head circumference and radiologic evidence of separation of the cranial sutures. The authors explained that once the dietary intake of the undernourished

child improved, his growth spurt was increased remarkably. The growth velocities of these children increased two to three times that of normal, with their weight, length, and skeletal maturation returning to their genetically predetermined levels. The authors concluded that the recognition and proper interpretation of this entity may prevent unnecessary and extensive neuroradiologic investigations in these children.

Early studies of simple undernutrition with rats and pigs, conducted by Widdowson (104), were extended to include specific deficiencies, primarily of protein. This author found that the animals became nervous and ravenously hungry. The protein-deficient animals became docile and less easily disturbed. Further, the animals lost their appetite and it was difficult to induce them to eat. In these characteristics, the animals resembled children with kwashiorkor. The author's observations of the effects of protein-deficient diets of the mothers during pregnancy, and of their offspring who were also fed deficient diets after weaning, confirmed the above findings and showed that the effects were even more pronounced.

Frankova and Barnes (39) reported the influence of malnutrition in early life on exploratory behavior of rats. These authors found the protein restriction of lactating rats soon affected growth and behavior in their offspring.

Lower body weight and slower development of exploratory behavior were found in experimental animals. The authors recommended that analysis of different characteristics of behavior was necessary in order to obtain more detailed information about the influence of early malnutrition.

Zeman and Stanbrough (111) reported the effect of maternal protein deficiency on cellular development in the fetal rat. The effect of maternal protein deficiency on body and organ size was primarily a result of a decrease in cell numbers in the last four days of gestation.

Zanenhof, Marthens and Margolis (110) presented the effect of protein on deoxyribonucleic acid (DNA) in neonatal brain alterations as a result of maternal dietary protein restriction. These authors stated that brains of newborn rats from females on low protein diets contained significantly less DNA and this reduced DNA content indicates significantly lower total brain cell numbers. At birth the brain cells are reported to be predominantly neurons, which do not divide any more after birth. Any neuron deficiency at birth may persist throughout life. According to these authors this may contribute to impaired behavior of the offspring of protein-deficient mothers.

Howard and Granoff (52), in studying the effect of neonatal food restriction in mice, reported no functional

impairment on DNA, cholesterol, and adult delayed response learning. However, a longer period of food restriction might be expected to produce a greater degree of lasting reduction in brain size and on appreciable functional impairment. Further, the authors pointed out that different tests for analysis of possible functional alterations may be available. The findings of a large reduction in cerebellar DNA suggested the desirability of further study directed towards analysis of the cerebellar function following food restriction in early life.

WORLDWIDE EFFORTS TO

COMBAT MALNUTRITION

György (46) stated that, in the great majority of developing countries today, 70 per cent of the children under six years of age are malnourished and have no opportunity to develop to their full potentials. Early malnutrition and other environmental factors may have a lasting imprint on the physical and mental development of these children. For the immediate future, the author recommends new emergency programs. These should be initiated without further delay if the generation of tomorrow is to be made healthy, physically and mentally.

Berg (19) outlined three general goals relating to the Food for Peace Program. These were as follows: to

attain higher protein foods for distribution; the enrichment and fortification of foods which are already available; and the development of "formulated foods" (a single food which contains all the nutrients and can fit into the social, cultural and religious patterns of the people involved. The author also pointed out the concept of changed nutrition education in developing countries and the technical assistance that is being offered to needy countries such as India. The author strongly recommended that this program of fighting malnutrition throughout the world has to succeed, for there is no other alternative.

Herbert (49) reviewed the contributions of FAO, WHO, UNICEF, and the United Nations, organizations involved in a global effort to increase the use of oilseed products as protein resources for humans, especially for children. The author stated that the freedom from hunger campaign and the world food programs have awakened many individuals to the real food issues. The work of UNICEF in the fortification of foods, the encouragement of local industries, the development of new processing methods, and the extension of nutrition education were especially commended by the author.

Scrimshaw (89) stated that the future of the developing countries depends on improving the knowledge and technological competencies of their people. Investments in other aspects of development, such as building schools and

training teachers, will be reduced in value if the generations of the future are currently being damaged in mind and body.

Hegsted (48) outlined the problems of over-enthusiasm about the benefits which might be derived from the addition of crystalline amino acids to cereals to produce products with high quality protein comparable to meat and milk. However, these additions do not generally produce comparable products. The author pointed out the cost of supplementation in addition to problems of determining protein quality. Field studies in many areas of the world were suggested to determine whether amino acid supplements affect growth and development, and the morbidity and mortality rates of the pre-school child. Until data are available, amino acid supplementation must be considered an expensive gamble that developing nations can ill afford.

Howe, Jansen and Gilfillan (53) recommended the supplementation of cereal grains with amino acids to meet the world needs for better protein nutrition. These authors indicated that for the cereal eating populations of the world, the shortage of protein is more a problem of quality than of quantity. Data were presented to show that if the limiting amino acids, involving only lysine, tryptophan, and threonine, were added to the staple cereals, their quality could be compared to a standard milk protein, casein.

The authors indicated that amino acid supplementation of cereal-based diets could be an answer to protein deficiencies.

Leverton (67) indicated that the greatest current need in the field of protein nutrition was for studies of "typical proteins in typical diets." These programs are especially needed in developing countries; in pockets of poverty or ignorance in this country; or in our affluent society, prone to obesity and heart disease.

An estimation of human protein requirements, based on the consideration of amino acid content of various types of diets and of individual food proteins, was reported by the FAO Committee on Protein. Flodin (37) stated that the biological value of the individual protein may be lowered by the absence of one or more of the essential amino acids. Further, this deficiency of amino acids could be made up either by a combination of foods whose amino acid content is adequate or by adding the limiting amino acid in a synthetic form. Experiments conducted by Flodin indicated that if the addition of synthetic amino acids is too great, further imbalance may result, decreasing the nutritive value of the diet or food. The application of this knowledge, however, makes supplementation of diets for the consumption of human beings difficult because of the uncertainty as to the optimum amino acid pattern in human nutrition. Various viewpoints have been expressed in approaching this problem.

The FAO Committee has suggested the use of a theoretical "reference protein" based on all available data. There is no assurance that the reference pattern developed by FAO is biologically good as compared with the pattern of amino acids in eggs or milk.

Scrimshaw and co-workers (92) attempted to evaluate the FAO "reference pattern." Experiments were conducted in which the FAO "reference pattern" was used for supplementation of food proteins for children who were recovering from kwashiorkor, a severe form of protein malnutrition. The results indicated that the amount of lysine and tryptophan needed to supplement cereal to bring it to the level of the "reference pattern" markedly improved nitrogen retention. Thus supplementation of a vegetable protein with limiting essential amino acids may be considered satisfactory to weight gain and its maintenance.

Winitz and co-workers (107) studied the effect of chemically defined diets on metabolic nutrition. These diets were unique in that the essential and nonessential nitrogen sources were exclusively provided in the form of optically pure L-amino acids, and these were administered as a single, clear aqueous solution that was nutritionally complete. Experimental data from a six month period of study revealed that the diets were adequate as a sole dietary regimen for adult men. The authors concluded that

the data demonstrated that chemically defined diets could provide adequate nutritional support and maintain normal physiologic function and physical well-being.

Altschul (1) points to the recognition of the fact that protein malnutrition in young children not only affects their resistance to disease and hence their mortality, but also more importantly affects their mental development. The deprivation could be met by exploring new sources of protein from seeds. The above author further pointed out that it is possible to have adequate protein nutrition by supplementation with amino acids and by developing foods such as protein beverages and textured products. These latter products have been well accepted and would supplement a short supply of animal proteins.

Observations by Doyle and co-workers (32), on nitrogen and energy balance in young men consuming vegetarian diets, were based on the evidence that in many parts of the world dietary proteins were obtained mainly from vegetable sources. Vegetable proteins are satisfactory to maintain life, yet are inadequate to fulfill the recommended requirements. The authors were of the opinion that a supplementation with small amounts of high quality protein may offer practical possibilities to increase the efficiency of the vegetarian diets. Balance studies conducted with adults, using such supplementations, revealed that no apparent

improvement in nitrogen retention was observed when small amounts of milk or egg protein were substituted for a large amount of vegetable protein. The authors suggested that the replacement of 25 per cent of the vegetable protein by milk or egg protein was not of great benefit. However, when the egg and milk protein in the diet was increased by 50 per cent, a positive nitrogen balance was achieved and maintained by the subjects.

Scrimshaw and Bressani (91) pointed out that since individual plant proteins are of poor biological value due to their amino acid pattern, they could be improved either by supplementation with animal proteins or by mixing with other plant proteins having a complementary amino acid content. The other alternative suggested by the authors was supplementation with synthetic amino acids, a plan which may not be practical at the present time due to the high cost of producing synthetic amino acids. Among the possible vegetable foods for supplementation listed by the author were legume seeds, oil seeds, nuts, palm kernel, and leaf proteins. The concentrated protein sources which were mentioned as having received the most attention in this regard were common beans, cow beans, Bengal gram (chick peas), soybean flour, peanut flour, cottonseed flour, and copra proteins. An example of this type of supplementation is Incaprina, a vegetable mixture which yields 25.1 per cent

protein content and is similar to milk in protein quality. Incaprina can be made at a low cost, in the form of a thin gruel, and is highly acceptable in Central America. The authors emphasized the fact that since Incaprina has helped in the problem of preventing protein malnutrition in Central America, it could also help in other technically underdeveloped areas of the world.

Studies carried out in the nutrition research laboratories located at Hyderabad, India, were reviewed by Gopalan (43). These studies investigated the effectiveness of vegetable protein foods in different combinations in the treatment of protein malnutrition. The vegetable proteins investigated were Bengal gram, sesame, groundnut and cottonseed. Results of these studies indicated that the combination of Bengal gram and groundnut was effective in the treatment of even severe cases of protein malnutrition. However, the speed of response, as judged by serum albumin regeneration, was comparatively slower than when skim milk was used. The above author concluded that in spite of the relative inferiority of some vegetable protein sources, suitable combinations would be of practical use in the prevention and treatment of protein malnutrition. Gopalan also pointed out that groundnut, by itself, was not satisfactory, but a combination of three parts of groundnut with one part of milk proved as efficient as milk itself. This combination presents the possibility of using the locally

available groundnuts and extending their nutritive value by mixing them with small amounts of milk, which in itself is currently available in limited quantities. The article cited an example of such a combination based on Bengal gram and groundnut, known as the Indian Multi-purpose Food (MPF), which is being used in some pilot school feeding programs. Modifications were suggested in cooking procedures for these specially formulated foods. Modification may be necessary to protect some of the important nutrients added.

Bailey, Capen and LeClere (16) presented the merits of soybeans, a most important though relatively new crop in the United States. The potentialities of this crop as given by the authors were: can be grown under a variety of climates; is the only and chief source of vegetable protein and possibly also of vitamins and minerals for a large majority of people from developing countries; and can be converted into a variety of forms and products. In addition, soybean flour is a concentrated, wholesome, nourishing and an economic food. It is rich in protein, both in quantity and in quality; in fat; in minerals; and in most of the known vitamins. Soybean flour is an inexpensive source of protein, fat, minerals, and energy. Mixed with whole wheat flour, in proportions up to 20 per cent, this product yields an extremely acceptable and nourishing loaf of bread.

Daniel and co-workers (28) studied Indian diets containing ragi, kaffir corn and pearl millet supplemented with Bengal gram (chick-pea), red gram, and soybean, to determine the effectiveness of these supplements as compared with skim milk. The results of studies by the above authors indicated that the use of soybeans at 5-6 per cent levels was as effective as Bengal gram or red gram at 15-16 per cent levels of supplementation. The authors concluded that soybean is a more economical source of protein than common Indian pulses for use as a supplement in northern India where the climate is favorable for the cultivation of soybeans.

"High protein" food products have been explored and given considerable attention. Among this group are the soy products. Wilding, Alden and Rice (105) attempted to determine the protein quality of soy products and compared their protein quality with that of cereal proteins in different combinations. These studies were based on feeding experiments with rats. The statistical analysis of the results indicated the soy protein to be significantly superior to that of white bread or the other commercial high-protein breads tested. A significant maximum increase in protein quality was obtained when soy protein and white bread protein were combined in the ratio of three to one. A 100 per cent soy protein resulted in a decrease from the maximum

in protein quality. Thus the authors concluded that the soy protein concentrates aided substantially in improving the quality of the protein source.

Westerman, Oliver and May (103) compared the use of soy flour and wheat germ in bread. The results indicated that both soy flour and wheat germ were equally beneficial in promoting growth in experimental rats when added to non-enriched flour but the growth rate was not satisfactory when either one of these two products was added to enriched flour. Both wheat germ and soy flour promoted good growth. Besides improving the amino acid pattern, the addition of these substances produced a significant difference in the retention of B-vitamins in the livers of the experimental rats. This was true for thiamine and riboflavin, but not for pantothenic acid and niacin. Animals fed diets with enriched flour plus soy flour stored the largest amounts of these vitamins in the liver.

Recently there has been increased interest in the possible use of plant protein in the diet to supplement or replace some of the animal protein. Among these possibilities, soybeans, peanuts, and cottonseeds offer good nutritive values. Jones and Divine (57) studied the growth promoting values of soybeans, peanuts and cottonseeds and their supplementary values when added to protein flour, using experimental animals. All three plant proteins were

found to have high nutritive value and were good sources for supplying dietary protein of a quality comparable to proteins from animal sources. Results indicated that as little as 5 per cent addition of soybean, peanut and cottonseed flour to 95 per cent wheat flour increases the protein value of wheat flour by 16 to 19 per cent.

Dumm and co-workers (34) studied the effects of groundnut protein isolate supplementation in the diets of preschool children attending a day nursery in a village near Vellore, India. The children were fed three meals a day for a period of seven months, being given a supplement of a processed vegetable protein food of groundnut protein isolate and Bengal gram flour with additions of minerals and vitamins. The diets consisted mainly of small quantities of milled rice to which pulses and vegetables were added. Although no significant improvement in hemoglobin levels was noted, the results indicated a general improvement in the liveliness of the children, and a significant increase in height. Based on the acceptability and tolerance for the supplements, the authors recommended the use of groundnut protein with poor rice-pulse diets for children, provided sufficient iron and vitamin A were furnished by the rest of the diet.

Metabolic studies on the supplementary value of animal and vegetable proteins were conducted in Brazil by Dutra, Scatera and Duarte (35). The authors evaluated the

supplementary value of a combination of animal proteins (cow's milk, meat, and eggs) and of vegetable proteins (soymilk, soybean flour and ground beans) in a basic Brazilian diet consisting of rice, beans, vegetable pear, pumpkin, oil, sugar and bananas, which contributed 25 per cent of the total dietary protein. The remaining protein was furnished by the above mentioned animal and vegetable supplements. These diets were fed to children one to three years of age. These children had a previous history of malnutrition and resided in the southern part of Brazil. Metabolic balance studies conducted by the author indicated the diet supplemented with animal protein was, on the average, better absorbed than that supplemented with vegetable protein. Further evaluation indicated that vegetable protein supplements resulted in higher nitrogen retention. These findings pointed out that the proteins from soymilk, soy flour, and common beans had a value comparable to that of animal protein. Vegetable proteins have an added advantage in their use, for they are comparatively less expensive, readily available, and could be adapted to local food habits.

A report by the director general of WHO (11) indicated that protein malnutrition in infants during weaning and in the post-weaning periods was one of the most widespread nutritional disorders in the developing countries. The resulting syndromes, which include kwashiorkor and

marasmus, were designated as protein-calorie deficiency diseases. Further, the treatment of protein malnutrition thus far had been based on reconstituted skim milk. Various other vegetable protein mixtures and products are being tested in Asia, Africa, and Central America. The results of those trials have shown that vegetable protein mixtures, based on cereals and pulses, and enriched with vitamins and minerals, were effective in the preventive programs of protein-calorie malnutrition. Among the programs included were supplementary feeding, nutrition education of mothers, training of personnel, and community participation.

Pirie (84), at a symposium on "Food Production in the Year AD 2000," stressed a personal optimism that by intensification of conventional agriculture, enough vegetable proteins could be produced for the 1000 million people who are at present underfed, as well as for the greater number anticipated at the end of the century. Selection among the different possibilities would, however, depend on climate and the need for variety. Among the possibilities suggested were soybean; coconut and other oilseeds; and leaves, which could be used for making plant protein concentrates, a product that might be both cheap and nourishing.

Standal and Kian (94) developed a product simulating milk from soybeans. This product has been found very useful for artificial feeding of infants, especially when cow's

milk is either not available in sufficient quantities, or is expensive, or in areas in which unhygienic dilution of milk makes consumption harmful. The above authors pointed out that soybean milk has been in use in China as an infant food for centuries. Further, a spray dried mixture of peanut protein isolate and soyflour was found to have a protein efficiency ratio (PER) of 2.34 for rats. Coconut milk has also been used for feeding infants and children with gastric disorders, other nutritional disturbances, and milk allergies. The authors noted that a simulated milk mixture requires a substitute for the milk components, chiefly the minerals, carbohydrates, and proteins. Calcium and iron salts are always added to these vegetable preparations. The carbohydrate and protein substitutes preferably should have low fiber content, thereby increasing the ease of digestion. The authors found these conditions being met by the use of poi (fermented, pounded, steam-cooked taro-roots) for carbohydrates and tofu (soybean curd) for protein.

Soybean protein and bananas have been combined to form a new, protein-enriched powder for beverages. Working under a Public Law 480 Grant of the United States Department of Agriculture, scientists in Israel have found that soy protein can be added to sticky banana puree to increase the percentage of non-sticky solids, making spray drying of the puree possible (8). The final powder contained 4-20 per cent

soy protein and had no effect on flavor, color, or nutritive value of the final product. The powder has potential in making a beverage for infant feeding, particularly when insufficient or limited supplies of milk are available. In other food tests, protein levels of certain bread formulas were increased by about half by replacing 6 per cent of the flour with soy protein.

Lachance (64) coined a new term "nutrification" for fabricated food marketed and used as a meal replacement. The author recommended that such a food should provide a minimal proportion of the human needs for vitamins and minerals. According to the above author the term suggested would be appropriate to describe the addition of a proportion of all necessary nutrients to a fabricated food. To avoid the misuse of such foods, the author suggested that such a food should provide a proportion of all vitamins and minerals on the basis of proteins and calories. The initiative by industry in the matter of "nutrifying" fabricated foods was encouraged by the author.

The relative yields of minerals and vitamins in plants were compared with those in milk by Long and Wokes (70). In view of the uncertain contributions from dairy products, attention was focused on world supplies of riboflavin, vitamin B₁₂, vitamin D, and calcium. The authors pointed out that since vitamins could be manufactured

inexpensively and calcium added easily as a supplement, the greater consumption of plant-protein would require improved storage methods to avoid toxicity through bacterial or mold growth.

Sukhatme's (97) efforts to assess the relative contributions to the incidence of protein deficiency resulting from dietary patterns was based on data from dietary surveys conducted in rural areas of two states in south India. The surveys indicated that in only about one in 10 cases was protein deficiency due to inadequate protein intake. Most cases observed showed protein inadequacy resulted from inadequate energy intake. Furthermore, it was shown that diets based on cereals and pulses could meet protein needs for all ages, provided enough food was consumed for energy requirements. The author concluded that infants must be assured of a smooth transition from breast milk to solid food, and special attention needs to be given to the diets of pregnant and lactating women.

Lucas (71) emphasized the feasibility of solving the world problems of both energy and protein by reliance on plant sources. A new scale of units for energy values of foods to be used when calculating the energy requirements of large populations was proposed. The author further pointed out that in view of the varying needs of individuals, these units cannot be referred to as standard units, but are

useful as reference units. The principal sources of energy foods and their energy values were listed. Food supplies in developing regions, according to the above author, are deficient in energy in addition to protein. About 20 per cent of the populations are undernourished and about 60 per cent are malnourished. Short-term targets were suggested by FAO for 1975 for these developing regions. These programs would result in an overall increase of 50 per cent in the production of energy foods. The author concluded that increasing the production of plant sources of protein is absolutely necessary.

Bressani (22) reported on the improvement of nutritional status in the developing countries as a result of improved food production. The fact that increased production of cereal grains does not improve the nutritional status of the malnourished populations directly was emphasized. One method suggested by the author for improving protein quality of cereal grains was by genetic means, as was the case of the opaque-2 corn reported in this article. This new product compared favorably with animal proteins. A more rational and effective method suggested was by supplementation with protein-rich foods in the form of vegetable protein mixtures. Enriched cereals appear to offer the best possibilities for improving nutritional status of population groups without drastic changes in food habits.

Parpia (82) presented the problems faced by newly developing countries in food shortage, both quantitative and qualitative, leading to malnutrition and low levels of productivity. The percentages for these countries accounted for 71.3 per cent of the world's population and 42.7 per cent of its food production. These countries account for only 21.5 per cent of the world's income. The estimated food losses in the field, during storage, processing, and distribution attributed to rodents, insects and micro-organisms are 30 to 50 per cent. If these losses could be cut in half, most of the developing countries would become nearly self sufficient. According to this author, the application of technology to existing conditions could help solve not only the problem of food shortage but also that of economic growth as well.

Forman (38) reviewed the efforts of the Food for Peace Program in providing over 40 million school children from 93 countries with some form of supplementary food assistance by using surplus agricultural commodities from the United States. Among the foods donated are wheat flour, bulgar, corn, corn meal, non-fat dry milk, salad oil, and shortening. The transportation costs are also met by the government of the United States. The local governments provide the handling, warehousing and internal transportation facilities along with provision for preparation and serving.

Local governments and voluntary relief agencies operate the program. The author pointed out that although the school feeding plan was simple, difficulties were encountered on account of lack of administrative structure, inefficient distribution systems, resistance to the concept of child feeding, lack of a concept of sanitation, carelessness in storage, and rejection of new ideas. Solutions suggested by the author were regional and local workshops, mobile units, pilot programs for developing new foods, and local food technology.

Swaminathan (98) cited some of the conditions that exist today in some developing countries that affect the infant and preschool child. Unsanitary environmental conditions are responsible for infectious diseases. Infections are prevalent and the quality of the diet is poor. The relationship of growth to nutritional status of infants and children, the causes and effects; the nutritional requirements and present feeding practices; and methods of improving infant feeding and measures of preventing malnutrition were discussed. The measures suggested included increased production and distribution of low cost protein-rich and protective foods such as legumes, oilseeds, and oilseed meals, and fish flour. The suggested programs for the prevention of malnutrition included the institution of supplementary feeding programs for needy children through Maternity and Child Health

Centers for the treatment of malnourished children, and a nutrition education program for mothers.

SCHOOL LUNCH PROGRAM IN THE UNITED STATES

HISTORICAL DEVELOPMENT OF THE SCHOOL LUNCH PROGRAM

Although the idea of feeding young children in school is relatively recent, the idea was conceived centuries ago. Historical records indicate that Plato (427-377 B.C.) served dinner to his students following lessons at the Greek Academy. A similar practice of serving a small portion of food existed in England's private boarding schools such as Eton and Harrow. This dormant idea was revived and made into a practical reality by the great social force of the 19th century. This concept of school feeding was translated into national practice and applied to a large number of public schools and made available to children in the United States, irrespective of economic or social differences.

Through the efforts of Mrs. Ellen H. Richards, working in the field of Home Economics, a school feeding program was initiated in Boston in 1894. Hot lunches, served for a penny, were made available to school children. By 1909, New York City was also participating in feeding programs. In 1912 the Women's Educational and Industrial

Union made further advances in this field and offered a large variety of items for school lunches in Boston, ranging from one to five cents in price.

By the end of the first decade of the 20th century a concern for nutrition in the school lunch program was recognized and milk became a popular item. Some schools tried to meet one-fourth of the day's requirements of important nutrients in the noon meal served in the school lunch program.

No obvious changes were seen, however, in the next few years. By 1935 financial assistance was made available by the Federal Government under Public Law 320 which sanctioned government distribution of donated commodities. In 1946, the National School Lunch Act was signed as Public Law 396. In the same year, following this action, the American School Food Service Association (ASFSA) was formed. The shortcomings of the earlier act of 1946 were remedied in the Child Nutrition Act of 1966. A recent amendment to this act was adopted in 1968. This was a further effort to overcome malnutrition in children as a result of poverty.

A speech by Perkins (83) reviewed the efforts of both public and government agencies as to their contributions to the school lunch program. The author outlined government policies with regard to the school lunch program, and the efforts on the part of the government to rehabilitate those

countries overseas that needed help in feeding programs. A large sum of money was sanctioned for these purposes. Perkins pointed out the fact that food service for feeding children is one of the greatest and largest businesses in the world. No other service has been more effective than the school lunch program. Appreciating the efforts of those working in this field, the speaker indicated that not only was humanitarian work being done but also a great service was being rendered. The doubts in the minds of some educators, that feeding children should be the responsibility of some welfare agency, had prevented a large number of schools from having school lunch programs. The speaker clarified this point and indicated that feeding school children was the responsibility of the schools and the teachers since it was not possible to teach a hungry child. Perkins concluded by saying "Let's make sure that we'll feed all the malnourished children in America through the school lunch program."

A report by the United States Department of Agriculture (3) outlines the steps being taken by the Agricultural Marketing Service (AMS) as a part of the "war on poverty." This report also emphasizes the idea that "You can't teach a hungry child." This fact has been pointed out again and again by many educators, especially those working with children from poverty-stricken homes. Obtaining an education is the one chance by which many a needy child

may become self-supporting. Teachers have emphasized the fact that even one good meal a day, lunch at school, can make a considerable difference in the child's mental and physical capacities. This report listed the details of the school lunch program in the United States and the various aspects and facilities provided under this program for deserving and needy children.

McElhinney (75) stressed the importance of food as one of the greatest weapons of the modern world. According to this author food plays a dual role in any disaster situation, since food is the main rehabilitation ingredient in the recipe for survival. First, food builds the morale of those affected; and secondly, food provides strength and vitality. The author reported a study concerning emergency mass feeding during a disaster and outlined the problems that may be encountered. As a result of these findings, the three R's of emergency mass feeding were formulated:

1. Reality--or the realization that the possibility of disaster lives with us constantly.
2. Responsibility--that we would be expected to assume responsibility if and/or when disaster occurs.
3. Readiness--we should be ready to take this responsibility and prepare now so that in case of need we could work quickly and efficiently.

The importance and convenience of the prepackaged school lunch was reviewed in a 1966 issue of the School

Lunch Journal (9). In Indio, California, the elementary school district adopted prepackaged food service in 1963. For this type of service no special eating facilities are necessary and the children eat in their classrooms. Packaging materials are disposable; therefore, dishwashing facilities are not required. A financial loss was reported in the first year of operation due to initial packaging costs and retraining of the employees. The introduction of the system was initiated by serving typical prepackaged lunches at the Parent-Teacher Association and to the school board members. The lunch menu was served in two containers, one for hot and one for cold food. Baskets of hot packets of food could be stacked and placed in convection ovens for reheating. Also described was the preparation of foods, both hot and cold. Attention was given to portioning methods, kitchen equipment, and service methods.

Page (81), Director of the Division of Food Service, Board of Education, St. Louis, Missouri, is considered the architect of one of the most promising innovations in the history of school food service. This new type of lunch, called the Vit-A-Lunch by the author, is a cold lunch that meets Type A requirements. The lunch consists of a sandwich, two ounces of protein, a quarter cup of raw vegetables or salad, a piece of fresh fruit, and two cookies along with a half-pint of milk. Packing was originally done in brown

paper sacks, but to maximize appeal, a tray covered with polyethylene film and run through a shrink tunnel was used. This helps to give the lunch appeal and color, while keeping it airtight and almost leak-proof. Also included in the package were a napkin, a straw and a plastic spoon. Page pointed out that with limited funds and facilities this Vit-A-Lunch could be an answer to the increasing rate of growth of free lunches.

PLANNING AND DESIGNING

PHYSICAL FACILITIES

Jernigan (56) pointed out that before any new food establishment is planned and designed, much time and study are required in order to determine the best policies. Other authors have also indicated the importance of planning all aspects in designing new and efficient kitchens for the school lunch program. Since the planning of food service involves many areas of specialization, seldom is one person qualified to cope adequately with all different aspects. Kotchevar and Terrell (63) suggested that a team having qualified members to represent the different speciality areas is more likely to produce a better and more satisfactory plan. This planning team should include representatives of four major areas:

1. The ownership--to define needs, policies and procedures; to allot funds and approve plans.
2. The management--to supplement data for successful operation.
3. The architect--to provide design, cost, and construction information.
4. Food service consultant or an engineer--to give specialized information on planning new facilities or remodeling and renovating the existing facilities.

Guidelines for selecting a consultant on food service equipment and layout are suggested by the American Hospital Association (6). The services of the consultant should be obtained at the beginning of any planning period, and the objectives and overall goals of the department or organization should be given in writing. The work of the consultant should include the following: assistance in determining space needs; equipment specification and layout; ventilation and lighting; selecting construction material for walls and floors; determining cost estimates for equipment and layout; supervision of the installation of equipment; and orientation and training of personnel in the use of new equipment.

Prior to the making of any final decisions, adequate time should be spent in proper counseling and developing detailed plans. This will not only add to the efficiency of the department, but will make the facility a pleasant place in which to work and one that may not require changes for a long period of time (7). For greater efficiency,

one-third of the floor area in the kitchen should be covered by equipment and the remaining two-thirds left for traffic lanes.

Marshall (72) gave some guidelines for food service personnel, to be used while working with the designer on new kitchen plans. According to the above author, the analysis of problems is expedited by considering the following areas: work area for cooks, baking area, serving area, beverage station, dishwashing area and pot-washing area.

Jernigan (56) pointed out the five basic factors that should be considered in achieving proper patterns in food service were as follows:

1. The kitchen should be connected to both the entrance and exit, to the serving area, to the service elevator or entrance, and to the cleanup area.
2. There should be adequate duplication of tools and storage.
3. Equipment should be so located as to be easily accessible.
4. Unnecessary screening and partitioning should be avoided.
5. Provision of adequate space is needed for mobility in all areas.

The author further listed some of the equipment that should be planned in excess of present needs. Space should be allowed for these items in case expansion becomes necessary. The equipment listed included refrigeration units, dish storage units, and delivery carts.

The future status of the school food service director in the educational programs was cited by Zabriskie (109). In order to safeguard the quality of the school lunch program, a trained director should be selected and appointed. In order to attain the respect and dignity this position demands, the directors of the school lunch program should give serious consideration to standardizing qualifications for the position and to developing certification standards. Working in cooperation with others and abiding by laws and regulations would provide maximum benefits.

Fuller (40) discussed the problems faced by managers of school lunch programs as a result of the rapidly expanding and overcrowded food service facilities. Giving an example of one such school, the author discussed the solutions to the problems arising from rapidly increasing enrollment and shortage of space and equipment. Cooperation, understanding, and patience of the food service personnel can help overcome the problems and make possible the feeding of nutritious Type A lunches to all students.

Lane (66) reviewed recent studies and reported that a worker's productivity in an average dietary department runs between 50-60 per cent. Dietary consultants are of the opinion that much of the loss of employee efficiency could be eliminated with modern, well planned, and easily supervised kitchens. A further indication as to the reason for

high costs in the operation of the food service department was a poorly arranged kitchen which affects both employee efficiency and production cost. The above author stressed the need for a well-designed kitchen to minimize loss of time. The ideal kitchen has a definite directional work flow, and there are specific areas designed for specialized operations. Attempts to remedy the efficiency level of an existing kitchen must involve improvement of the directional flow of the work areas. Sometimes the results are obtained by simply rearranging movable equipment. Further discussed by the above author were the merits of a good plan which provided minute details. With the guidance of a good basic plan, kitchen improvements could be successfully accomplished over a period of time. It is most important from the standpoint of economy that small improvements be a part of the basic overall plan. A question frequently asked is "Can one afford the expense of kitchen improvement?" In response to this question, the author stated, "Can you afford the continuing, everyday high cost of an employee work productivity loss, which may be as high as 50 per cent?"

West, Wood and Harger (102) outlined the problems faced by most dietitians and food service managers in the planning and construction of new food service facilities or the remodeling of existing ones. A detailed planning of the specific requirements should include the combined effort of specialists in the various aspects. No part of the

architectural features or equipment specifications and arrangements should be left to chance or to misinterpretation. According to the above authors more thought and supervision are now given to planning and construction than ever before and definite standards have been formulated. Also discussed were the trends in food service planning and the different steps involved in planning.

A need for newer approaches to the school lunch program was suggested by Kelp (58). In view of rising costs, the author discussed the urgency of change for the school lunch program in order to maintain low plate cost and still give the children a nutritious lunch. The areas discussed were:

1. Centralization of the kitchen--"Kitchen-to-transporting-to-student" form of food service.
2. Disposables--The introduction of disposable plates, spoons, forks, and knives would insure sanitation, help save labor, and be a standby in emergency.
3. Labor--Cost and shortage can be solved by bulk cooking and self-help service.
4. Education--Food service should add a new dimension to the student learning program.
5. Buying--The practice of in-season buying with available money is better than the bid system and/or the purchase of out-of-season foods.
6. Convenience--More convenience and pre-cooked foods help in taking short cuts in the preparation of foods for the school lunch programs.

Until 1962 all the schools in Atlanta, Georgia, operated their own individual lunch programs. With the

introduction of centralization in accounting, banking, and purchasing, there was an overall improvement in the functioning of school food service (5). By providing a professional coordinator, the cost of bakery products decreased from \$86,000 a year to \$9,000. After centralization, it was possible to add food service coordinators who were to guide the individual managers and to provide intensive in-service training. In addition, help was given to individual managers in menu planning, determination of quantities needed, and in plotting information to satisfy the type A lunch requirements. After centralization it was possible to cater to 70 per cent of the total group of children as opposed to 35 per cent who were served earlier. The ultimate aim of this program of centralization was to feed 90 per cent of the children.

Kotschevar and Terrell (63) discussed the fact that equipment values are based on the degree to which the equipment is needed and the functions performed. Equipment directly affects the food facility's standards, volume of business, and financial success. Although needs differ with the specific operation, they are influenced to a large extent by the menu, by volume of business, by peak loads, by types of service, and by the utilities and services available. Factors that would influence the selection of equipment to yield the best values for food operations are based on need,

cost, performance, satisfaction, safety and sanitation, appearance and design, and general utility values.

Nance (80) reported that a well-planned school lunch kitchen which contains adequate equipment is essential in the school lunch program if standards and efficiency are to be maintained. A common error of being over-equipped or under-equipped for a specific operation or job often results when plans of another organization or institution are followed without due consideration to the present needs. Although experience of others provides valuable information, an intensive evaluation of the existing needs is very necessary. In order to obtain successful working performance from school lunch employees, the equipment and tools that are to be provided must be in accordance with specific job performance. The author discussed the merits and the important role of portable and mobile equipment in school lunch kitchens. Maximum utilization of space in the school lunch kitchen may be obtained by the use of mobile equipment. The author concluded that a wise selection of equipment and an understanding by employees of their use will be an asset to any kitchen.

Lane (65) stated that dietary consultants agree that kitchen designing and the selection of equipment, as determined in the blueprint stage, will directly influence food production costs for the lifetime of the kitchen. The

original selection of equipment, good or bad, will continue to influence menu efficiency and versatility as long as the equipment must be used. Nonetheless, kitchen planning is frequently undertaken casually, perhaps even carelessly, by well-meaning persons who simply do not understand the complexities and the proper use of institutional kitchen equipment. The author further pointed out that sometimes the blueprint of a kitchen is developed before the final stage of kitchen planning is properly considered. Many such errors in planning occur from the confusion of out-of-date information and ignorance of quantity cooking methods. Understanding the source of the food service problem has much to contribute in contemplating additional kitchen expenditure in either equipment or layout.

Productivity is important in the food service industry particularly when decisions are made concerning the purchase or non-purchase of labor saving equipment. The responsibility for such decisions become even greater when funds are limited. Labor-saving equipment is not always used when and where it will save money. Montag, McKinley and Kleinschmidt (78) compared the cost of operating each of eight machines with the cost of hand methods of food production to determine at what volumes and wage rates machines do and do not have cost advantages. The authors were of the opinion that this research should provide a

factual basis for economic decisions regarding the addition of labor or the acquisition of labor-saving machines. Other factors, particularly human relations, need to be considered. When analysis indicates an economic advantage in favor of a machine method, the additional responsibilities that may occur immediately for the food service manager may include: placing the equipment in the most convenient location, training employees to put the machine to optimal use, scheduling production for greatest possible productivity, and keeping the machine in good operating condition.

Blaker (21) outlined principles associated with improved productivity. These included a definite and fixed place for tools; tools, materials, and controls located close to and directly in front of the operator; materials delivered to the point of use; and materials and tools located to allow best sequence of motion and good visibility, both for working and inspecting. Further, the author related these principles to certain concepts as "point of use" and "the modular concept" (use of selected units of measures as a basis for standardization). Attention was given to special pieces of equipment such as revolving tray ovens, deck ovens with separate thermostats, convection ovens, steam equipment, refrigerator systems, and mobile storage and service equipment. The assembly line for tray service was considered and related to the menu needs and management.

Since there are conflicting opinions regarding essential sanitation requirements for food service equipment, a need for having uniformity in standards has been recognized. As a result the National Sanitation Foundation (NSF) was requested to develop standards for different phases of sanitation. Dankoff (29) gave the basic concepts and what the basic NSF standard seal of approval represents. The author stated that without hesitation there should be complete trust in the NSF program. By placing confidence in technically trained experts of the foundation for the evaluation of food equipment, under the specifications of the NSF standards, additional valuable personnel may be added to the staff of the food service department without extra cost.

Wheeled equipment has been found useful due to its flexibility and better sanitation (12). Since a large number of women work in food service units, mobility of equipment improves working conditions and increases production. Before planning any equipment on wheels it is important to carefully study the traffic flow and aisle space. Since it is now possible to obtain a large variety in all types of heavy equipment, the selection should be on the basis of need, utility, safety features and price.

Jernigan (56) discusses factors that should be kept in mind when selecting casters and wheeled equipment for

food service. According to the above author, the weight of the equipment, type of floor covering, travel requirements, kinds of tires or treads, safety and ease of cleaning, maintenance, and the type of brakes should be thoroughly investigated before making selections. Also the type of bumpers needed to protect the equipment should be specified.

SUPERVISION, MOTIVATION AND TRAINING OF FOOD SERVICE PERSONNEL

Applebaum (13) compared good and poor supervision. One way of defining better supervision is to compare it with poor supervisory practices. There are certain basic principles in supervision that are the same in whatever capacity one works. These basic principles are: to define the job and make sure it is understood, to give proper guidance, to give recognition to good work, to give on-the-spot compliments, and to criticize constructively and with restraint. To obtain the maximum in work performance, not only does the job need to be evaluated, but the supervisor's own qualities also need evaluation. Qualities mentioned by the author were: a sense of dedication, love for one's work, ability to create enthusiasm, ability to bring out the best in one's self and others, and a willingness to allow employees to breathe. The author concludes with a remark that good supervision is organized common sense. To be a successful manager, one must know the job and know one's self.

The challenge of modern methods of supervision to dietitians and food managers striving energetically for more efficient operations was outlined by Coffey (25). Motion and time study techniques are currently being applied to food service, a practice that has been followed in the past by other industries. New ways of automation are being investigated and utilized to simplify jobs and insure greater productivity. These efforts, however, make the manager's job difficult. It is not easy to stimulate efficiency and at the same time remain considerate in treating employees as human beings. These two conditions often conflict. Some characteristics of effective supervision as pointed out by the author are: general supervision in contrast to close supervision; supervision of the group rather than the individuals within the group; designating clear goals and standards; employee participation in decision-making; delegating duties; communicating effectively; and motivating the employees. Common oversights among supervisors as pointed out by Coffey were awareness, analysis, and achievement. The author concluded that an overbalance in favor of either productivity or employee satisfaction was likely to lead to less than optimal results for the organization and the employees.

Kotschevar (62) pointed out some factors for motivating workers to increase productivity. Giving workers better

working conditions has been shown to increase productivity. However, all workers are not motivated to do their best by the same thing. Usually workers want a job that covers their basic needs: food, clothing, housing, and medical expenses. Once these are satisfied, money becomes a secondary motivating factor in making workers want to do their best. The above author pointed out that appreciation, security, and job satisfaction play a very important role in motivating the workers to do their best. One reason given as to why the food service industry has such a poor rate of increased productivity as compared with the national average for other industries is probably because the food service industry has not known nor applied the principles that increase productivity in workers. In conclusion, Kotschevar stressed the idea that the important factor in obtaining higher productivity is to create better job satisfactions.

Ross (86) reported the steadily increasing need for skilled managers in large scale feeding operations. Special attention was focused on certain aspects of feeding operations in Europe, India, and the Near East. Government and private enterprises in the developing countries are recognizing the importance of providing an adequate diet for their workers and of achieving better distribution and more effective use of food supplies through industrial feeding programs. The development of these programs is seriously

hampered by the shortage of trained workers. While capital input for the training of personnel is primarily the responsibility of the national governments and individual industries, funds are becoming available through technical assistance of specialized agencies of the United Nations such as the FAO and WHO, who are assisting in these field activities.

According to Sandell (88), "Training means learning the rules. Experience means learning the exceptions." Both training and experience are necessary components of an effective job training program. Some guidelines were given by the author for the supervisors who are responsible for planning and executing the training activities of those under their jurisdiction. In order to determine the kind and amount of training needed the following formula was stated: "The total requirement of the job - what is already known about the job = What the individual needs to be taught."

A 16-phase training program, based on a national survey of university food service departments, was reported by Umbreit (101). Four of the major goals mentioned in the study were:

1. Improving the existing management programs.
2. Better administration of the existing training programs.

3. Identifying the trends prevalent in the training of college graduates employed in food service departments.
4. Formulating a recommended training program based on information collected by respondents.

Based on the results of this study, Umbreit formulated a 16-phase, 90-day management training program and recommended its use in food service departments of residence halls.

Mellory (77) reported the development of assistance programs for groups with special needs. These programs, designed to alleviate poverty and intended to meet needs of many people, were carried out under the amended Social Security Act and the Economic Opportunity Act of 1964. The Economic Opportunity Act relating to youth included three areas, provision for the job corps, and work training and work study programs. An amendment to the Manpower Development and Training Act included the categories of occupational training and vocational education. All these acts reflect a concern for the following needs of people: to be prepared for jobs they now hold; to retrain persons displaced by automation; and to focus on needs of employers on well trained personnel. Training programs for food service workers carried on under the terms of these legislative acts were reported by each state. Figures furnished by the Manpower Development and Training Branch revealed that the largest numbers of trainees were enrolled in classes in institutional management with training for various jobs

ranging from assistant kitchen managers to kitchen helpers. Mentioned by the author was an official publication entitled "Supervised Food Service Worker: A Suggested Training Program." This publication provides information regarding training programs and resource materials from which local training programs can be developed.

Based on a study by Young and Cutlar (108) an outline of the procedures used in training programs for non-supervisory food service employees was developed. Techniques were evaluated and an improvement of training programs was suggested. Participating respondents reported a limited number of methods and procedures used for non-supervisory employee training. However, some school food service systems had excellent programs. The personnel responsible for organization and administration should adapt and apply the most efficient and effective training methods, techniques, and aids. More attention should be given to orientation and off-the-job training.

Hoglund (51) stressed the idea that in addition to providing nutritionally adequate and attractive meals at a minimum cost, school lunchrooms have a unique opportunity to serve as an educational laboratory. A carefully planned and organized on-the-job training program could offer experiences which are educationally significant to the school food service program, to the student, and to the

community. The quality of a training program can be improved through an evaluation which determines both the weaknesses and strengths of the curriculum, and the effectiveness of the instructional techniques used. Informal techniques of self-evaluation and group-evaluation should disclose the additional changes which may be necessary to make the behavior of the trainees consistent with the goals.

Baden (15) reported that training hospital dietary employees is an on-going cooperative responsibility of the dietary staff. This is important for a smooth and efficient food service operation. At present the need is becoming increasingly imperative as a result of the keen competition for labor, changed procedures of food production and service, availability of more efficient equipment, and a shortage of professional staff for in-service training. Successful on-the-job training could decrease the personnel turnover rate. The author elaborated on the training of supervisors, group training of all personnel, and continuing education of the staff and employees.

"Training in Depth," the name given to a comprehensive training program established in Georgia for school lunch managers, has been presented by Martin (73). This program was the result of a cooperative venture of the Vocational Education Division, the Trade and Industrial Education Service, the School Lunch Section, and the local

school system. The author reported that since 1962, more than 260 courses had been offered with an enrollment of over 8,000. Four basic courses were described: Foundations of School Lunch Operations, Menu Planning for the School Lunch, Nutrition for the School Lunch, and Quantity Food Preparation. Details of the program were also described in terms of policies, financing of training, qualifications of instructors, requirements for enrollment, the graduate program, and training for other food service personnel.

An important part of any training program for food service personnel is a study of bacteriology as it relates to sanitation. Di Liello (31) reported that a series of lectures on "Bacteriology and Sanitation" was presented as part of a training program to personnel involved in school lunch programs in the Long Island area. This program was based on the fundamental principle, "If there were no harmful microbes or poisonous chemicals in our environment there would be no need to take sanitary precautions." The author reported that emphasis in the program was placed on understanding the nature of microbes, their characteristics and habits, and their potential danger, and not on the mastery of technical terminology and nomenclature. The use of demonstration material (visual aids) was found extremely helpful in making the students aware of the fact that they could be the "carriers" of many microbes, harmful as well as harmless

ones (possible food spoilage types). Also described by the author was a guide, in outline form, that was distributed to the participants. This guide consisted of four major subject areas: principles of bacteriology and sanitation; preservation of foods; principles of sanitation; detergents, sanitizers, and disinfection procedures.

NUTRITION EDUCATION

Todhunter (99) traced the history of nutrition education from the eighteenth century until the 1920's, at which time nutrition education programs were given impetus in the United States. As concern for the health of children developed, universities placed emphasis on this area. The work of Mary Swartz Rose at Columbia initiated studies on methods of teaching nutrition to school children. Another effective program, developed by a research group at Harvard University, studied the problems of teaching nutrition in elementary schools. Government support for nutrition education began in 1912 with publications on child care consisting of information leaflets and bulletins produced by the United States Department of Agriculture (USDA). The Nutrition Foundation, founded in 1941, developed comprehensive research and teaching activities. International programs by WHO and FAO were initiated when a universal need for nutrition education became apparent. Todhunter pointed out the fact

that as the number, kinds, and availability of prepared foods has continued to increase, proper selection as to the best buys in both nutritional and monetary values becomes difficult. Research is needed to discover how to make the public aware of the importance of nutrition and means of applying this knowledge to actual eating habits.

Davies and Hargreaves (30) reviewed the history of nutrition education since World War II. There has been very little impact since the post-rationing period, and the returns are not commensurate with the efforts. Major social changes, more working mothers, more meals eaten away from home, changes in eating habits, availability of more food, and more money to spend on food were some of the reasons listed for the inefficiency of nutrition programs. Nutrition education was extremely successful during the rationing period of World War II. A nutrition policy was formulated and cooperative effort of the experts helped to implement the program. Moreover, people were in a receptive mood at that time. Currently, however, many people are more interested in personal whims and fancies about food than in good nutrition. Their real nutritional needs no longer act as the guiding force in buying foods and planning meals. These factors make education more difficult. Since the government departments of Health, Education and Welfare; Agriculture; Fisheries; and the Food and Drug Administration are interested in nutrition and have a contribution to make, the authors

recommended that an interdepartmental committee on nutrition education be formed.

Hill (50) pointed out that the earliest efforts in teaching nutrition in schools were geared towards the eradication of deficiency diseases through adequate dietary intakes. Later it was realized that nutrition education could be beneficial to all children. This idea led to teaching and encouraging children to make better selections of those foods which would provide specific nutrients to prevent deficiency diseases. Although enrichment programs have helped in the eradication of deficiency diseases, the continuation of nutrition education keeps the public informed of the need for using these foods to ensure protection against deficiency diseases. As stated by Hill, educational responsibility involves a much broader scope than this. The best educational approaches, emphasizing the food essentials for an adequate diet, must be employed in order to obtain an overall health protection for all individuals. The author concluded by stating that the health of future generations depended on the ability to accomplish these goals.

A survey of 206 school lunch programs in state and Catholic primary and high schools located in Australia was reported in a 1970 issue of Food and Nutrition Notes and Reviews (2). The report indicated that these lunch programs were organized principally to provide schools with additional

funds. The programs operated on a daily or weekly basis. The daily programs usually had facilities that were provided by the schools, and these facilities were better equipped than the weekly ones. The daily canteens often sold food items like cakes, sweets, and soft drinks (considered unsuitable foods for the school lunch program). Unit lunches were not popular and were sold infrequently. The different organizations in charge of operating this program were mentioned. In many instances the mothers operated the programs. Recommendations of the survey included: health education goals of lunch programs, management, supplies, hygiene, design and maintenance for facilities, and establishing policies concerning foods sold.

Dukes (33) pointed out that in order to make the school lunchroom an integral part of the educational program, each school building of 25 or more classrooms should have a lunchroom manager with a degree in foods and nutrition. This person, according to the author, should be on the same salary scale as a teacher. In addition to administering the lunchroom, the manager should visit one classroom each day to talk to students about nutrition. Ways of integrating nutrition with other subjects were also suggested by the author. Tasting parties and the etiquette of eating were suggested as a part of the nutrition program.

Chapman (24) reviewed the efforts of the Director of Food Services for the School District of Santa Fe Springs, California, in developing nutrition lessons to be presented in the classrooms. The lessons for each grade varied in complexity. The program began in the kindergarten with a unit entitled "A Good Lunch Helps Us to Grow." In the first grade the idea of "How We Grow Strong" was presented. The second grades were presented the concept of how "A Type A Lunch Pattern was Developed." A monthly display of a bulletin board for the lunchroom entrance was assigned to the third graders. The processes of digestion were taught to the fourth graders and more complicated topics for the higher grades were similarly designed. As part of the district's in-service training program, a nutrition institute was included for the teachers. No evaluation of the program was reported.

Similar efforts were reported by Flatt (36). The manager of a school cafeteria in Spokane, Washington, designed a set of demonstrations for food units for different grade levels. The units described were: "Fruits and Vegetables" for grade one; "Adequate Breakfast" for grade two; "A Type A Lunch Pattern and the Basic Four Food Groups" for grade three; "High Energy Foods and Protein Rich Foods" for grade four; "Nutritional Needs, Food Fads, and Food Sources of Vitamins" for grade five; "Food Values and Balanced Diets" for grade six.

The importance of using visual aids in imparting nutrition education in the lunchroom was emphasized by Musick (79). Also pointed out were the benefits of conducted tours of the lunchroom facilities and the presentation of adequate and attractive meals as a means of indirect education. These experiences could then be related to classroom teaching situations to make learning more meaningful.

Griffith (45) studied the influence of nutrition education on food acceptance of 146 fourth grade children enrolled in three elementary schools in Henderson, Texas. Data were collected by means of a nutrition information survey form. The survey form was administered as a pre-test and again as a retest following the completion of the teaching unit. The detailed teaching unit was planned by the author. The data revealed that a well-planned nutrition education program influenced children to improve food habits. The author recommended that nutrition teaching programs be included in the elementary schools. Such a program may not necessarily be presented as a separate unit, but may be a part of health, science, and related areas. Further, activities pertaining to food and nutrition hold interest for the children and carry benefits that can be realized throughout life.

Beeuwkes (18) reviewed the major avenues for nutrition education. The problem areas emphasized were how to

motivate people to seek and use valid information, and how to help them recognize food faddism as a serious economic and health hazard. The author indicated that in the area of nutrition education for children, much progress has been made. In order that nutrition education may become an increasingly greater influence within our total education program, the necessity of providing continuing in-service education for all teachers and making serious efforts to adequately assist teachers in training was emphasized.

As part of the Applied Nutrition Program (ANP) in India, Rajlakshmi and Ramkrishnan (85) undertook a program of community education. The use of vegetable foods in the nutritional care of infants and preschool children was emphasized. Based on feeding trials with children, the above authors formulated special school lunches providing approximately half the day's energy requirements. Suggestions for one dish meals and inexpensive nutritious snacks were based on a combination of vegetables, cereals, legumes, greens, local fruits, and buttermilk. The cost, the nutritive value, and the effects of the formulated diets were presented. Listed among other objectives of the ANP was "creating among the people an awareness of nutritional need and how it could be met through extension and similar workers in the field." The visual aids and teaching materials for the ANP were especially prepared under the guidance of

these authors. In conclusion, Rajlakshimi and Ramkrishnan pointed out that a major endeavor in the field of nutrition is to educate people in the use of available or potentially available foodstuffs. Motivating the residents of the villages to grow and use more protective foods along with the conventional crop was the most difficult and trying task experienced by the authors.

Based on the report of a meeting of experts, organized jointly by FAO and WHO (4), the aim of applied nutrition programs is to teach populations to produce and to use more nourishing and better balanced diets. The relationships and mechanics involved in developing and coordinating these programs were established in this report. In order to coordinate activities of the Departments of Public Health, Education, and Agriculture, an administrative framework of committees was established at three main levels, inter-ministerial, the regional and the local. Further, the experts emphasized that evaluation is a vital feature of applied nutrition programs and should be practiced as a constructive review in which every worker engages as a part of his normal duties.

CHAPTER III

P L A N O F P R O C E D U R E

This study was undertaken to determine policies and procedures for setting up school lunch programs in India. Findings from this study should reveal the strengths and weaknesses of current school lunch programs in some selected schools in the United States. On the basis of these findings, recommendations will be made for the proposed school lunch programs in India.

Schools selected to participate in the preliminary survey of school lunch programs were from a group of those included in the Denton, Fort Worth, and Dallas area of North Central Texas. The survey included 23 schools, selected at random from the above mentioned area. The criteria for selecting these schools were as follows:

1. The school served a Type A Lunch.
2. The school was a part of the National School Lunch Program.
3. The school lunch program included either elementary or high school students.
4. The school was one of a group recommended by the food service directors of the state of Texas.

The author recognizes that the sample is small but this survey was planned to include only schools that were recommended by the state authorities. It was hoped that these schools would represent those following desirable policies and procedures in the school lunchroom program. A small number of selected schools was considered a better sample on which to base recommendations for a program for India than would be a large number of schools selected completely at random from the state as a whole.

A questionnaire, "Survey of School Lunchroom Practices," was developed by the author (Appendix A) to collect data from the schools participating in this study. The purpose of this instrument was to obtain information from either the managers or the supervisors of the school lunchrooms concerning different aspects relating to the school lunchroom practices. The questionnaire consisted of 66 questions relating to health, social, economic, educational, and efficiency goals and functions of the school lunch centers. Data were collected in the summer and early fall of 1970 by personal interviews with the food service supervisors or managers.

The kitchen planning layout and design were also studied by the author while visiting the different schools participating in the study. A rough outline of the kitchen layout was made for 10 schools selected at random from the group of 23 schools participating in the survey. In five of

these 10 schools the author observed the work flow of the kitchen when food preparation was in progress. In the other five schools, the flow of traffic was studied in the cafeteria lines. The information obtained from these observations was translated into work flow charts that should be useful in setting up various kitchen layouts in establishing school lunch kitchens in India. The proposed layouts were planned to utilize the existing physical facilities and to meet the anticipated basic needs of the individual institutions which may participate in the proposed school lunch programs in India.

Recipes using foodstuffs locally available in India, supplemented with other suitable foods high in nutritive value, were developed and standardized. A cycle menu, planned for a two-week period, was developed for the proposed school lunch programs. Foods included were those that are in keeping with the cultural patterns of the groups concerned. The experimental laboratory of the College of Household Arts and Sciences, Texas Woman's University, was used to develop and standardize the recipes.

Each of the menus was planned to meet approximately one-third of the day's recommended allowances. These allowances were based on the recommendations of the Indian Council of Medical Research, 1966 (14), for boys and girls, in the age group of seven to nine years.

All diets are planned as vegetarian diets because of the shortage of animal foods in India, and the religious beliefs and low socio-economic levels of the communities concerned. However, milk and milk products were incorporated wherever and whenever practical. Also fish flour was included in one recipe to test the acceptability of this product. Since most of the proteins included in the menus were from vegetable sources, an effort was made to provide higher than recommended allowances of proteins. Since the two-week cycle menus were suggested as sample menus to be used in the school lunch program, the nutritive values of these menus were calculated from the tables of nutritive values for India (14).

The acceptability of the recipes as well as that of the total menus developed could not be tried on the population groups for whom they were intended. It was neither possible to get the desired Indian subjects in Denton, Texas, where the study was conducted, nor was it possible for the author to get back to India during the course of the study to try the recipes. The taste panel used for the study consisted of seven members, graduate students and faculty at Texas Woman's University. This panel evaluated acceptability for texture, flavor, and appearance of the food items to be included in the proposed menus. Along with this evaluation, personal judgment was used by the author for determining the

acceptability of these foods, on the basis of the author's previous experience in working with the local communities and teaching foods at the Lady Irwin College, Delhi University, India. The following criteria were developed for selecting food items to be included in the proposed menus:

1. All foods and ingredients used would encompass those locally available to schools in India at a reasonable cost.
2. All foods would be finger foods, in accordance with the local eating patterns.
3. Fifty per cent of the recipes would be developed around foods familiar to the children in India, and the other 50 per cent would be developed to introduce new foods into the menus to help facilitate change in food habits.
4. The portion sizes would be nutritionally adequate and enough to satisfy hunger, and yet avoid waste.
5. None of the recipes would require any special methods of cooking or involve the use of special equipment that might not be locally available or that cannot be improvised in India.

A meal planning guide was developed by the author to assist in planning balanced meals. The guide is proposed for use by the individuals responsible for planning the school lunches in their respective communities. The menus have been

referred to as Type-I lunch menus by the author. The Type-I menus are based on the use of the five basic food groups as a daily guide in planning meals that meet approximately one-third of the day's recommended allowances.

To ensure the practicability of the proposed plans for organizing school lunch programs for India, the author developed a training manual. This manual is intended to be used for the training of food service supervisors. In planning this manual the intention of the author was to provide some basic guiding principles on which programs can be developed to meet the needs of individual institutions. The training manual was planned to include the following sections:

1. Guidelines for planning training programs in India.
2. A training manual.
3. A sanitation manual.

On the basis of the review of literature concerning nutrition education in the United States, implications will be made for nutrition education for children in India. The recommendations for nutrition education will be general rather than specific in nature.

CHAPTER IV

DEVELOPMENT AND PRESENTATION OF PLANS FOR SCHOOL LUNCH PROGRAMS FOR INDIA

This study was designed for the purpose of making recommendations concerning policies and procedures for the organization of school lunch programs in India suitable for the village and urban communities. These recommendations were based on the opinions of food service supervisors in response to a survey of practices followed in 23 selected school lunch programs in Texas. The data for the survey were collected by means of an instrument entitled "Survey of School Lunchroom Practices." Findings were analyzed and the data presented in a manner that would enable the author to interpret the information and make recommendations that would be applicable to conditions in India.

A plan of presentation was developed for interpreting the findings and presenting recommendations for India. This plan is presented under the following subheadings:

1. Overview of school and community situation in India;
2. Survey of selected school lunch systems;

3. Proposed menu plans for school lunch programs for India;
4. Proposed work organization charts;
5. Development of training manuals; and
6. Implications for nutrition education.

This chapter presents pertinent information regarding these topics.

OVERVIEW OF SCHOOL AND COMMUNITY

SITUATION IN INDIA

A large majority of India's population still live in villages, although a small fraction has started moving out of the village to urban communities. These urban communities have come into existence in the past decade as a result of industrialization. Although some measures have been taken by the government of India, in the Five Year Plans, to extend the facilities for free and compulsory elementary education to many rural and urban areas, there is still no major effort to provide a free meal or a meal at nominal cost to the vast majority of these school age children. Since it has been shown time and again that it is not possible to teach a hungry child, and that nutritional deficiencies at an early age can leave lasting scars on the child's physical and mental development, an organized program for school lunches becomes important. This program of feeding should meet at least one-third of the day's recommended dietary allowances.

An effort has been made to present recommendations for setting up such programs in India to meet the needs of children, especially those from families of low socio-economic levels and with limited educational backgrounds. These recommendations will be made in four major areas: physical facilities, menu planning, training programs for food service personnel, and educational program for children.

A village in India may range from a population of a few hundred to a few thousand or more. In India's first Five Year Plan, community development was described as "the method, and rural extension as the agency, through which the process of transformation of social and economic life of the village was to be initiated" (47). A large number of villages were included in the community development program. In addition to other services, Applied Nutrition Programs (ANP) have been extended to the villages. Under these programs midday meals are now being provided to many school children. These programs are aided by the local and central governments and by international organizations.

The feeding programs in the communities were initiated by the members of Mahila Samiti (women's organization) and by Yovak Mandal (youth clubs). Staple foods like wheat and rice are contributed by farmers and parents at the time of harvest. These foods are stored by the workers of the Mahila Samiti and used for noon meals for the rest of the school year (10).

Some money is sanctioned by the government on the basis of enrollment in these schools. This money helps pay for such foods as sugar and condiments or spices, items which may not be locally produced and may have to be purchased. Vegetables for school meals are either grown by the school children in the school garden or contributed by members of the women's organizations and youth clubs, either from their own homes or from the community gardens. The parents and other interested people in the village provide fuel and help in preparing the noon meals and assist in serving these meals to the children.

A typical school may be housed in a single room at the community center or in a separate building. Depending on the size of the village and the number of children enrolled, a separate portion of the building is allocated for the preparation of meals and the storage of foods and equipment. No dining facilities are available. In most cases, when the weather permits, the lunches are served outdoors; otherwise, the classrooms are converted into dining areas.

At present there is no uniformity in planning, preparing, or serving these noon meals. Casual and on-the-spot planning often results in unsatisfactory meals. Currently there are no set standards the lunches are required to meet and there is little or no training of the individuals who are responsible for feeding the children.

In order to minimize some of these problems, two-week cycle menus using locally available foods have been planned. Portion controls and nutritive values have been planned to meet one-third or more of the day's recommended allowances for certain important nutrients.

Since proteins, calories, and vitamins are the most limiting nutrients in the diets of the majority of the Indian people, especially pre-school and school children, an effort has been made to present desirable kinds and combinations of foods in these sample menus. All foods selected are finger foods and present ease in serving as a package lunch. This plan was developed to eliminate initial expenditures for serving equipment and for dish washing and storage facilities. In addition, this plan will minimize labor costs. The proposed type of meal service will have an added advantage for areas having several schools. The meals can be prepared and packaged at a central location under the supervision of trained workers and later transported to the individual schools for distribution by the teachers or other similar personnel involved in the program.

SURVEY OF SELECTED SCHOOL LUNCH SYSTEMS

A survey of 23 selected schools in the Dallas, Denton, and Fort Worth areas was conducted. The opinions of the school lunchroom supervisors were recorded on a survey form.

This survey form included questions pertaining to the various policies and practices followed in these selected schools.

Of the 23 schools that participated in this study approximately 50 per cent were supported by local agencies, 25 per cent by the state, and 25 per cent by both state and local agencies. The majority of the schools included in the survey reported participation in the school lunch program for a period of 10-29 years. Only two schools indicated participation for less than 10 years, and five schools had been in the program for over 30 years.

Seventeen of the 23 schools were serving Type A lunches and six were serving à la carte meals. Type A lunch requirements provide the framework for nutritionally adequate school lunches. As specified in the National School Lunch Regulations, a Type A lunch contains as a minimum:

Fluid whole milk

One-half pint of fluid whole milk as a beverage.

Protein-rich foods

Two ounces (edible portion as served) of lean meat, poultry, or fish; or two ounces of cheese; or one egg; or one-half cup of cooked dry beans or dry peas; or four tablespoons of peanut butter; or an equivalent of any combination of the above listed foods.

Vegetables and fruits

Three-fourths cup serving consisting of two or more

vegetables or fruits or both. A serving (one-fourth cup or more) of full-strength vegetable or fruit juice.

Bread

One slice of whole grain or enriched bread; or a serving of bread such as cornbread, biscuits, rolls, or muffins made of whole grain or enriched meal or flour.

Butter or fortified margarine

Two teaspoons of butter or fortified margarine.

À la carte service provides choices among a number of separate dishes. Each individual selects the food items to be eaten. The choices may or may not constitute a complete meal.

The level of education for food service supervisors participating in the survey varied from less than a high school education reported by six individuals to five and one-half years of college education reported by one supervisor. Nine supervisors were high school graduates, and eight reported having some college education. One of the latter group reported a half-year of college and one had five and one-half years of college. Supervisors with the least education had the maximum number of years of work experience in the school lunch program.

In response to the question concerning work experience in food service, 13 of the food service supervisors indicated having less than 10 years work experience; whereas,

one supervisor had more than 30 years experience. Fifty-two per cent of the food service supervisors had more than five years work experience in their present positions.

The number of employees under the supervision of the food service supervisors ranged from two to 25, with an average of 8.2 employees per supervisor. An average of 6.4 full time employees were supervised by the respondents. Other employees supervised by food service personnel were either part-time workers or were employed occasionally.

Replying to the question concerning cooperation of employees, all except one supervisor indicated full cooperation from the employees in time of emergency. However, no reason was given by the one supervisor who reported partial cooperation by the employees.

Fourteen of the 23 supervisors reported that they were expected to evaluate employees; nine stated they were not expected to evaluate workers. No written forms were provided for those expected to evaluate the work of the employees. Evaluation of the work of the employees was through observation. Evaluations were made once every three months by one supervisor and once a year by four supervisors. The other participating supervisors did not report how frequently evaluations were made. Four of the supervisors reported that these evaluations of the food service personnel were used both for upgrading of the employees and for the official

records. Other supervisors did not indicate how the employee evaluations were used.

Responses were given in the affirmative by 52 per cent of the supervisors to the question, "Are you provided with an organization chart?" Of the remaining individuals, 26 per cent reported making their own organization charts, and the other 22 per cent did not report favorably.

Written policies to be followed in the school lunch programs were provided for 16 of the 23 food service supervisors. These policies were intended for the use of both the supervisors and employees. These policies were reported by 14 supervisors to be flexible; whereas, nine supervisors reported that the policies were rigid and could not be altered by the supervisors under any circumstances. Reasons listed by supervisors reporting flexibility as to when these policies could be changed were: seven supervisors indicated changes could be made when the need arose; one reported changes were made when indicated by the authorities; and two reported that policies could only be changed with the consent of the school board.

Records were maintained by the supervisors relating to various categories as shown below:

<u>Records Maintained</u>	<u>Number of Responses</u>	
	<u>Yes</u>	<u>No</u>
Employees reporting to work	15	8
Health of the employees	16	7
Number of meals served	22	1
Left-over food items	14	8
Food items received	22	-
Sanitation and safety inspection	20	3
Accidents in the kitchen	16	6
Equipment	20	3

Nine of the 23 supervisors reported checking of the above mentioned records by those in authority as a daily practice. Two supervisors reported the checking was done weekly, eight reported records were checked monthly, and only three reported the records were checked once a year. One supervisor indicated that these records were checked occasionally but at indefinite intervals.

Regarding the overall responsibility of the supervisors, 21 of the 23 supervisors reported being held entirely responsible for the school lunch program by the food service administrator. Two supervisors indicated not assuming the overall responsibility for the school lunch program. A total of 68.1 per cent of the supervisors reported the relationships between the food service department and the total school program were good; 27.2 per cent reported these relationships as fair; and 4.7 per cent indicated an indifferent

relationship existed between the school lunch program and the total school program.

Attitudes of school principals, teachers, students, and parents towards the school lunch program were reported as either good or indifferent. The majority reported the attitudes as being favorable as indicated by the report of responses shown below:

<u>Individuals</u>	<u>Attitudes</u>		
	<u>Good</u>	<u>Poor</u>	<u>Indifferent</u>
Principals	22	-	1
Teachers	20	1	2
Students	21	-	2
Parents	16	-	6

Responses as to the contribution of the food service supervisors to the total school lunch program were vague. More than half of the supervisors could not give a concrete indication of any specific contribution. Responses were as follows:

<u>Contribution of Food Service Supervisors</u>	<u>Number of Responses</u>	
	<u>Yes</u>	<u>No</u>
Maintaining standards	13	10
Making menus	5	18
Ordering supplies	4	19
Work organization chart	4	19
Training employees	8	15
Assistance to employees	0	23

Supervision is an important and integral factor contributing to the efficiency of any work organization, especially food service. The supervisors were requested to check methods in which the program of supervision was maintained in four listed areas. More than 50 per cent of the supervisors did not respond favorably as to a program of supervision in the different areas listed as indicated below:

<u>Areas Observed</u>	<u>Number of Responses</u>
Kitchen	8
Store room	8
Serving lines	8
Dining rooms	7

Responses to the survey items concerning safety indicated that it was not considered the responsibility of the food service supervisor to make provision for the safety of either the employees or the school children. Nine supervisors reported that the employees were made aware of unsafe practices. One supervisor pointed out that floors were kept clean to prevent accidents such as slipping. This same reason for keeping floors clean was given by five supervisors as a safety provision maintained for children.

Only four of the 23 food service supervisors made any daily provision for in-service training of the employees. An equal number reported training was given when the need arose. Seven reported training given monthly at the staff

meetings and occasionally through workshops. Seven supervisors stated occasional in-service training was given to the employees. A short training course was reported by 58.2 per cent of the schools as provided for the employees.

As reported by the majority of supervisors, no special effort was made to encourage student participation in the school lunch program. However, eight of the 23 supervisors stated the food service department encouraged student participation by catering to the needs of the students. Three supervisors named good meals, and two supervisors indicated the use of visual aids as means of encouraging student participation.

Twelve of the reporting supervisors indicated the establishment of standards and specifications for quality were determined by the food service directors. Of the others reporting, three supervisors were responsible for specifications for standards in their school systems, four reported managers as the individuals responsible, three reported specifications were based on USDA standards, and one reported the cook as the one who determines these standards. Written specifications were indicated by nine of the 23 supervisors; six reported no written specifications; and six reported both written and unwritten specifications were provided.

All but one supervisor reported checking both quality and quantity of food supplies when delivered. One supervisor

reported checking for quantity only. Responses as to who sets standards and maintains portion sizes of the foods served were as follows:

<u>Type of Responsibility Determined by</u>	<u>Number of Responses</u>
Food service director	11
Food service supervisor	2
USDA standards	5
Managers	5

Previous records of sales were used by 15 supervisors to anticipate the daily participation of children in the school lunch program. However, two respondents indicated using the help of teachers, and six reported the use of both sales records and teacher assistance.

One item in the survey form requested information as to whether any special arrangements were made for meal service to teachers and staff. Only 10 supervisors extended special services to staff by giving special seating arrangements and/or special service at extra cost.

The types and number of meals served were investigated. The number of schools serving a complete meal ranged from two schools serving less than 100 to one school serving more than 1000 lunches. The number of lunches sold averaged 420 per school. Serving a complete meal was more popular than the à la carte style of service. Only three schools

reported serving à la carte meals. One of these three schools served 100 to 200 lunches and two schools served 200 to 300 lunches. Five schools sold snacks in addition to a complete meal type of lunch. The number of snack items reported sold was as follows: 200 to 300 items in one school, 300 to 400 reported by one school, and 500 to 1000 food items reported by three schools.

In addition to the regular school lunches served, 21 of the 23 supervisors indicated assistance was extended to school organizations in serving food for social activities. Four supervisors reported catering only to social events, three catered for athletic meets, and one for parent-teacher meetings. Six other supervisors indicated catering to all the above mentioned activities and seven catered for all school events requiring food service. The extent of assistance given to planning and preparing food for these special occasions was requested. Four supervisors reported extra help was provided when requested. Eight supervisors indicated extra help from students, faculty, and part-time employees was utilized for these special occasions.

The accessibility of the dining room to students was reported as satisfactory by all the supervisors. All respondents checked the receiving areas being easily accessible to delivery men. The driveways were reported as relatively free of student traffic. The physical facilities in schools were

not adequate for the rapid increase in school enrollment that was taking place. In case of need, the school dining room facilities were accessible for after school functions in 15 of the 23 schools.

The kitchen planning was such that the store room, dining room, and the delivery entrance were conveniently located in respect to each other in all except one school. Twenty-two supervisors indicated the cooking, serving, and storage areas were protected from dust, flies, and rats. The physical facilities were regularly inspected by health authorities in 21 of the 23 schools included in this study. Of those inspected, 65 per cent were inspected yearly, 30 per cent semi-yearly, and 5 per cent reported a once a month inspection. Inspection by local health departments was reported by 79 per cent of the supervisors and the other supervisors reported lunchroom facilities were inspected by central health departments (district).

In 20 of the 23 schools construction of the school building was such that the floors for kitchen and dining areas were higher than the street level. In three schools the kitchen and the dining areas were in the basement, but the receiving area was level with the street for easy delivery. Elevator facilities were provided for transportation of foods to other areas in these three schools.

The total area of the kitchens ranged from 200 to 1200 square feet, with an average of 748.6 square feet. The areas for store rooms averaged 125.2 square feet with a range of 54 to 250 square feet. The dining areas averaged 2265.7 square feet with a range of 225 to 3600 square feet.

The shapes of the kitchens, store rooms, and dining areas were rectangular in the majority of the schools. Square areas were more frequently reported for dining areas than for store rooms or for kitchens as shown below:

<u>Area</u>	<u>Number of Schools</u>		
	<u>Square in Shape</u>	<u>Rectangular in Shape</u>	<u>Irregular in Shape</u>
Kitchen	1	20	1
Store room	2	19	1
Dining room	4	15	3

The layout designs planned for cooking areas were reported as straight line arrangements, 13 supervisors; back to back arrangement, three supervisors; and an island type of arrangement, two respondents. Two supervisors indicated no specific planning for cooking areas. In response to the question concerning a separate preparation unit for each major item, 13 of the respondents indicated having a separate unit for each of the major items of cooking. Ten respondents indicated that no separate areas were provided. All except

one supervisor reported that the area allotted for the kitchen was sufficient. The reason given for this insufficient kitchen area was the rapid expansion of the school food service.

The aisle spaces were reported sufficient by all except two supervisors. All except one supervisor reported that the serving lines were adequate. The individuals required for serving on the serving lines ranged from two to seven with an average of 2.9 individuals per serving line. The serving lines were reported as straight line arrangements by 15 supervisors, U-shaped by three supervisors, and broken and parallel lines were reported by two respondents each.

In response to the question concerning the number of children that could be seated in the dining room at one time, 19 supervisors indicated less than 500 children, three supervisors indicated a seating capacity of 500 to 750, and one supervisor reported a seating capacity for 750 to 1000 children at one time. The length of each lunch period ranged from 15 minutes in one school to 120 minutes in two schools, with an average of 58 minutes per school. The results of the survey indicated a close relationship existed between the seating capacity in the dining areas and total serving time and the number of lunch periods in operation. The schools with the greatest seating capacity in the dining area had longer intervals for eating since fewer lunch shifts were required to accommodate the students.

All except one supervisor reported the food storage area as sufficient. The storage areas ranged from 54 to 250 square feet, with an average of 125.2 square feet. Adequate shelf space in the storage area was reported by 21 supervisors. Only two supervisors reported insufficient shelf space for storage. The rapid expansion of the school lunch program was the reason given for a lack of adequate shelf space.

The temperature at which different foods were held was investigated. Twelve supervisors reported holding fresh fruits and vegetables at temperatures between 30° to 40° F. Seven supervisors reported holding fruits and vegetables above 40° F, and only one indicated a temperature below 30° F was used. Milk and milk products were reported as being held at between 30° to 40° F by 19 of the supervisors, one indicated holding milk and milk products above 40° F, and three others did not report the storage temperature. Meat and meat products were reported held below 30° F by 12 of the respondents and between 30° to 40° F by eight respondents. Canned foods were reported as stored at room temperature by 17 of the supervisors and three reported a 40° F temperature was used for canned foods. One of the categories checked for food storage was the left-over food items. Only nine of the 23 supervisors reported having any foods left after serving the daily lunches. These left-over food items were held at temperatures between 30° to 40° F.

In response to the question as to the frequency with which foods were purchased by the school service department, most of the milk and milk products and the baked goods were reported purchased daily. Vegetables, fruits, staples, and the canned foods were reported as purchased weekly by the majority of the schools as is shown below:

<u>Food Items Purchased</u>	<u>Responses as to Frequency of Purchase</u>			
	<u>Daily</u>	<u>Weekly</u>	<u>Monthly</u>	<u>Occa- sionally</u>
Vegetables and fruits	2	21	-	-
Milk and milk products	23	-	-	-
Meat and meat products	6	16	1	-
Staples	1	15	4	3
Canned foods	1	15	6	1
Paper goods	-	12	6	5
Soaps and detergents	-	3	11	9
Serving equipment	-	-	21	2
Baked goods	13	3	-	2
Other items	-	-	-	23

Store room records were maintained in the form of stock registers by 11 supervisors and as inventories by nine supervisors. The other three supervisors did not give the method of maintaining store room records.

The anticipated ultimate enrollment was estimated to range from 500 to 7650, with an average estimate of 1935 children per school. The average for the anticipated ultimate

participation in the school lunch program was reported as 1341 children. The possibility of expanding the existing food services was reported in the negative by 16 of the 23 supervisors. The other seven, however, reported the possibility of some expansion.

The question as to the kind of menus planned was misunderstood by the supervisors. However, when explained by the author, 12 of the supervisors reported the menus were based on the requirements of Type A lunches; three supervisors reported menus were based on the surplus commodities available; and eight supervisors did not indicate any particular basis for planning menus.

The results of the findings from the survey were summarized to determine strengths and weaknesses of the programs surveyed. These findings were used as a basis for making recommendations and developing training manuals for India.

As indicated by the results of the survey, there was no uniformity in the educational levels of the food service supervisors. The range in educational level varied from less than high school to five and one-half years of college. The supervisors with less educational background had more years of work experience in the present position. Short training courses and workshops were extended to a

majority of the food service supervisors in order to keep them well informed and up-to-date in the profession.

The survey indicated that supervision and evaluation of the work of the employees was an integral part of the supervisor's job. Good supervision helps to build confidence and trust of the employees in the supervisors. Practically all the supervisors reported receiving full cooperation from the employees in time of emergency. This reflects the ability of the supervisor to command respect from the employees working under her supervision.

Policies regarding the functioning of the school lunch programs were set by the food service director and provided in a written form for the supervisors. This insured some degree of uniformity in the functioning of the school lunch system in a particular area. Many of the policies issued by the food service directors were flexible and the food service supervisors could make alterations as the need arose.

Maintenance of records relating to various categories was reported by a majority of the food service supervisors. These records were checked by the authorities. The food service supervisors assumed the overall responsibility of the school lunch program and were responsible for maintaining satisfactory relationships with the total school program and with the principals, teachers, parents, and students.

The food service supervisors reported assuming little responsibility for safety measures. On-the-job training was another area in which there was an apparent need for greater emphasis. A majority of the food service supervisors were extending varying degrees of assistance to school organizations in serving food for social activities.

The investigation of physical facilities indicated that rectangular and square types of kitchens were more popular than other shapes. However, the efficiency and ease of working in the various kitchens depended on the relative proximity of the major work areas such as storage, cooking, serving, washing, and disposal of garbage. Among the other physical facilities receiving consideration of the supervisors were: screening of doors and windows, protection of food from rodents and insects, the placement of equipment, and provision for adequate aisle spaces.

PROPOSED MENU PLANS FOR SCHOOL

LUNCH PROGRAMS FOR INDIA

The food habits of a nation, to a large extent, determine the nutritional status and the health of its people. The kinds as well as the amount of food eaten is an important factor in determining how well the body is nourished. Limitations in both quality and quantity of foods will obviously result in malnutrition and hunger. Availability of food in itself is no guarantee that people are well nourished. Eating

patterns and food habits are established over a period of time and are dependent on the availability of foods, the economic level, the cultural and family patterns, climatic conditions, and the educational background of the individuals residing in the communities. These eating patterns eventually result in national eating practices. Therefore, it is important to recognize basic eating patterns before undertaking any plans for improvement in the diets of population groups.

All the above influences, directly or indirectly, determine the child's eating habits, nutritional status, and the ultimate influence on physical and mental well-being. The planning of adequate meals that will meet all the needed nutrients for children merits careful consideration of some basic factors. Among these factors are: knowledge of the limiting nutrients, both quantitatively and qualitatively; awareness of the cultural food patterns and habits; recognition of economic levels and the feasibility of putting the proposed plans into practice; and knowledge of the multiple resources available.

DEVELOPING PROPOSED MENUS

According to Kinder (60), the planning of meals is based on four basic goals. The first and the most important goal is to achieve nutritional adequacy; second, matching meals to the food budget; third, catering to the likes and

dislikes of the groups concerned; and fourth, management of time. These four goals of meal planning have been considered by the author in developing the proposed two-week cycle menus for school lunch programs for India. The recommendations suggested by the Indian Council for Medical Research (14) for improving the diets of children in India were also considered by the author in planning the proposed menus.

The proposed two-week cycle menus were developed and standardized by the author. The term, Type I lunches, was applied to the 10 proposed menus. The kinds and the amounts of foods listed were planned with a nutritional goal to furnish at least one-third of the Recommended Dietary Allowances of India for children in the age group seven to nine years. The selection of foods included in the cycle menus was made on the basis of five food groups instead of the basic four food groups currently used in planning school lunches in the United States. This modification in the number of basic food groups was developed by the author after a careful examination of the types of foods available locally in India and their nutritional contribution to the diet. The five food groups as proposed by the author are:

1. Protein-rich foods such as pulses, legumes, beans, soybeans, and nuts - to provide the essential amino acids.
2. Whole wheat grains, cereals, and sugars - to provide calories, some of the B-vitamins, and minerals.

3. Fruits and vegetables - to provide most of the vitamin A, vitamin C, and other vitamins and minerals.
4. Fats and fortified oils - to provide calories and vitamin A (vanaspati is fortified with vitamin A).
5. Milk and milk products - to provide calcium, riboflavin, vitamin A, and other nutrients.

Some locally available and inexpensive protein sources such as soybeans and peanuts were included in the proposed menus. Fish flour was introduced in one of the menus to determine the acceptability of this product as a new protein source. Fish flour may gain importance in India, especially in some coastal areas, if this product can be successfully incorporated into certain foods and is found acceptable in the local diets.

The recipes for the proposed menus were planned to yield seven servings. However, some food items were included as individual servings in order to meet the Recommended Dietary Allowances of India for certain nutrients. The nutritive values of the individual menus were calculated using the tables in the Nutritive Value of Indian Foods and the Planning of Satisfactory Diets (14). The menus are found in Appendix B, the detailed recipes in Appendix C, and the calculations for nutritive values in Tables II through XXI in Appendix D.

NUTRITIVE VALUE OF PROPOSED MENUS

The term nutrients includes proteins, fats, carbohydrates, minerals, and vitamins. These nutrients provide energy, structural materials from which different tissues are made, and some nutrients contribute to the biochemical functions, either directly or indirectly. The sum total of all these functions is life.

The body has a limited capacity to store nutrients. Thus the consumption of most nutrients is necessary every day and throughout the life cycle. All persons require the same nutrients because of the similarity of the biological composition, yet the amounts required are different not only for different age levels, but also for different individuals of the same age groups.

The author has developed, standardized, and calculated the nutritive value of food items to be included in the school lunch programs for India. The foods selected were in keeping with the cultural patterns and eating habits of the population groups concerned. Some new foods have been included in the two-week cycle menus. It is hoped that if children are exposed to new foods they will make wise selections in the future. This would provide a basis for nutrition education programs for which implications are suggested as part of this study.

The nutritive values of the foods included in the proposed menus were based on the recommendations of the Indian Council for Medical Research and were calculated from the tables given in Nutritive Value of Indian Foods and the Planning of Satisfactory Diets (14). The proposed menus have been planned to meet one-third or more of the day's recommended allowances. The age group selected for the study was seven to nine years. The proposed menus can be adjusted to the needs of children of different age groups by making a few necessary changes. A meal planning guide was prepared by the author to assist in planning meals for school lunch programs (Appendix E).

The energy value of the foods included in the menus and the nutritive value of the eight most limiting nutrients in the diets of people in India were calculated. These nutrients included proteins, iron, calcium, vitamin A, ascorbic acid, thiamine, riboflavin, and niacin.

The contribution of individual food items used for the proposed daily menus was calculated for energy value and eight nutrients. These menus are found in Appendix B. The daily menus were planned to yield seven servings, and the nutritive values of these menus were calculated for each serving. Certain food items were included as individual servings in order to bring the nutritional contributions to the required level. The percentages from the proposed

two-week cycle menus and the overall weekly averages were calculated and are presented in Table I. The contribution of individual food items was calculated along with the total contribution for each meal. The total energy value was calculated for each food item and for each menu. The contribution from proteins, fats, and carbohydrates is presented in Tables II through XI, Appendix D. The contributions from selected minerals and vitamins are presented in Tables XII through XXI, Appendix D.

Calories

The energy value of food is expressed in terms of calories. This energy is made available to the body by the oxidation of the ingested food. Three nutrients are oxidizable: proteins, fats, and carbohydrates. Proteins and carbohydrates have the same caloric value, while fats have more than twice as many calories per gram. Foods differ in caloric values because of differences in their nutritive content.

When planning a well-balanced diet the ratio of the energy contribution from proteins, fats, and carbohydrates is usually calculated. These ratios are not well defined for much depends on the type of foods available, the economic level of the population groups, and the eating habits of the communities. After careful consideration of the conditions

TABLE I

AVERAGE PERCENTAGE CONTRIBUTION OF THE PROPOSED TWO-WEEK CYCLE MENUS FOR SCHOOL LUNCHES
TO THE DAILY RECOMMENDED ALLOWANCES FOR FOOD ENERGY AND EIGHT NUTRIENTS

Menus	Food Energy Cal.	Protein g.	Iron mg.	Calcium mg.	Vitamin A I.U.	Ascorbic Acid mg.	Thiamine mg.	Riboflavin mg.	Niacin mg.
<u>First Week</u>									
Menu I	33.4	72.1	75.0	52.9	38.5	90.0	75.6	59.0	37.5
Menu II	33.7	78.5	84.4	42.4	31.0	32.5	44.4	21.0	35.0
Menu III	32.1	49.7	72.2	41.3	34.3	40.0	48.9	37.0	39.3
Menu IV	32.9	58.2	43.9	43.3	50.7	50.2	36.7	38.0	25.4
Menu V	31.9	49.1	98.4	77.8	154.8	192.5	46.6	41.0	51.3
Average	32.8	61.7	74.8	51.5	61.9	81.0	50.4	39.2	37.7
<u>Second Week</u>									
Menu VI	34.3	54.8	71.7	51.6	97.7	65.0	37.8	40.0	27.0
Menu VII	31.8	55.2	64.4	30.9	45.5	155.0	40.0	36.0	21.8
Menu VIII	32.8	59.7	56.1	35.6	52.7	50.0	43.3	31.0	29.1
Menu IX	34.9	90.3	41.7	104.2	46.2	40.0	55.6	79.0	28.6
Menu X	33.7	67.9	55.0	68.4	22.7	37.5	65.6	48.0	34.5
Average	33.5	65.6	57.8	58.1	52.9	69.5	48.5	46.8	28.2

currently existing in India, a tentative ratio of the energy contribution from protein, fats, and carbohydrates was proposed by the author. The range is as follows:

Proteins	10 - 20 per cent
Fats	18 - 40 per cent
Carbohydrates	48 - 70 per cent

The percentage contribution of calories from proteins, fats, and carbohydrates was calculated for the proposed menus and is presented in Tables II through XI (Appendix D). In the first week's menus the percentage of calories from proteins ranged from 11.7 to 17.1 per cent. Fats contributed 18.5 to 40.4 per cent and carbohydrates contributed 48.1 to 70.4 per cent to the total for the day's caloric requirements. For the second week the percentage of calories from proteins ranged from 11.8 to 18.5 per cent. Fats contributed 18.9 to 38.1 per cent and carbohydrates from 48.4 to 69.3 per cent. These values have been presented graphically in Figures 1 and 2. Since the calculations of the menus were based on the table of food values and were theoretical, some arithmetical adjustments had to be made for presenting these graphically.

Children need sufficient calories to promote normal growth. The recommendations of the Indian Council of Medical Research (14) for boys and girls in the age group seven to nine years is 1800 calories per day. An effort was made in planning the proposed menus to meet at least one-third, 33.3

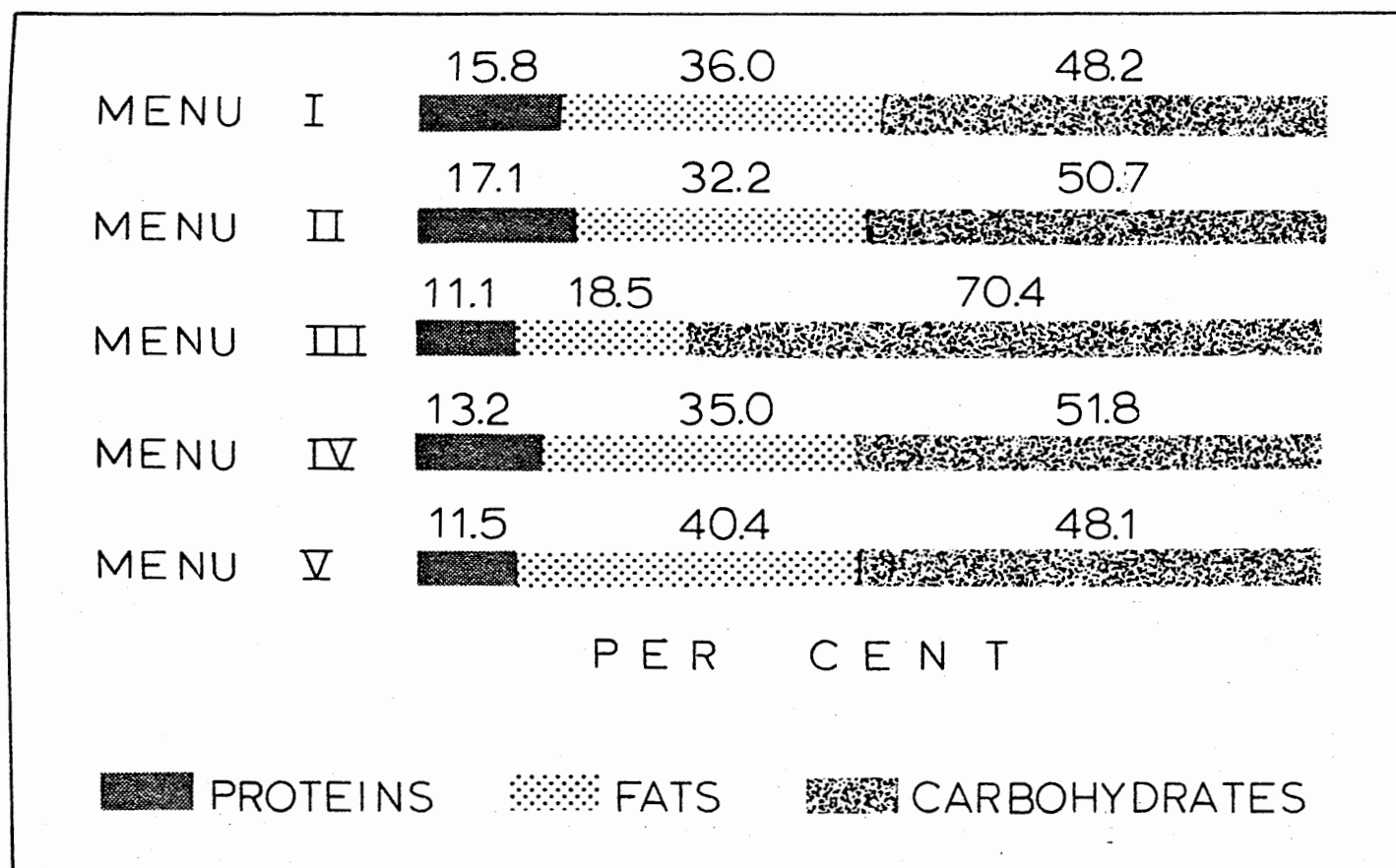


FIGURE 1
PERCENTAGE CONTRIBUTION OF THE PROTEINS, FATS AND CARBOHYDRATES
IN THE FIRST WEEK OF THE PROPOSED MENUS

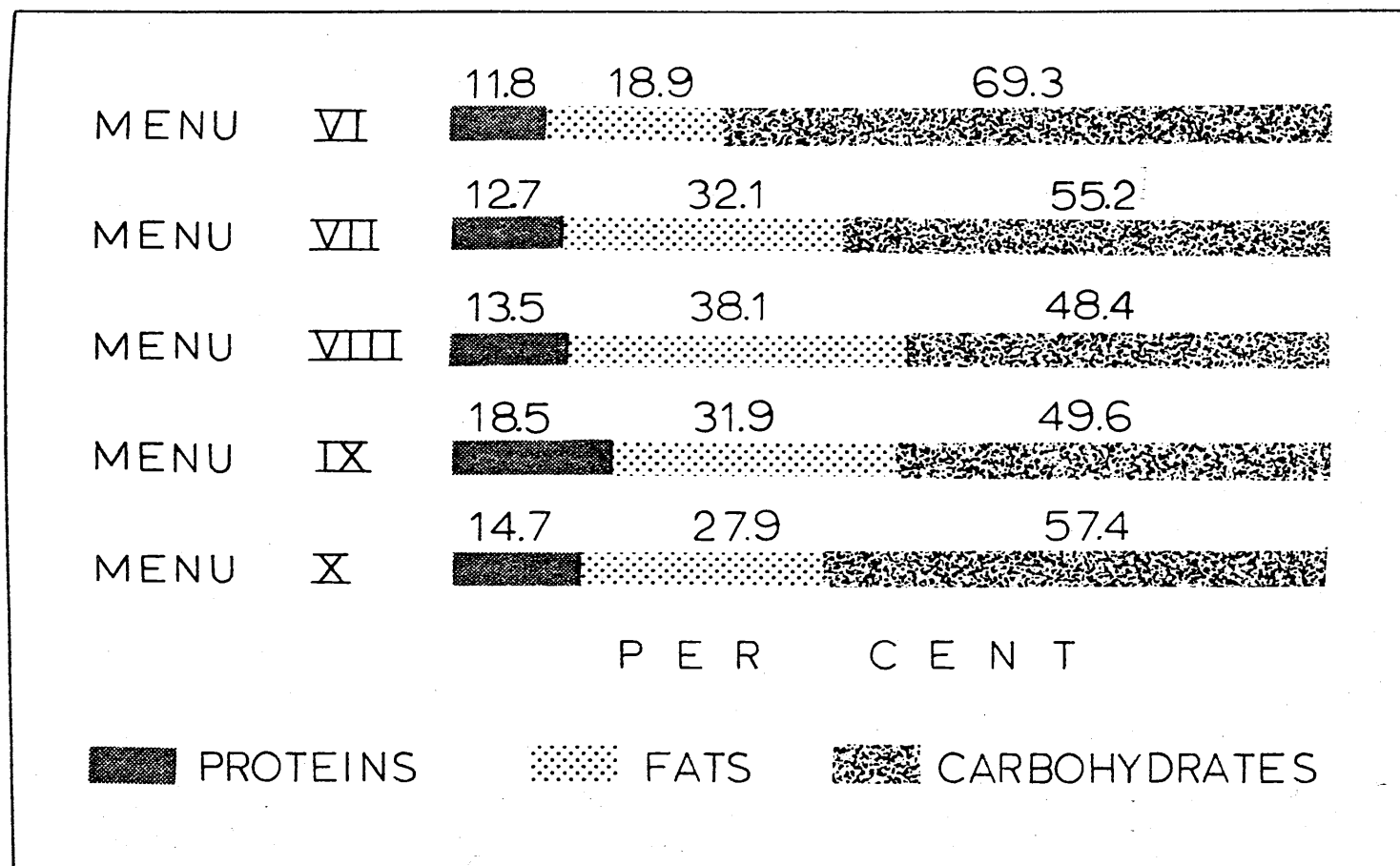


FIGURE 2

PERCENTAGE CONTRIBUTION OF THE PROTEINS, FATS AND CARBOHYDRATES
IN THE SECOND WEEK OF THE PROPOSED MENUS

per cent, of the recommended caloric requirements. The caloric contribution ranged from 31.9 to 33.7 per cent, with an average of 32.8 per cent for the first week; and from 31.8 to 34.9 per cent, with an average of 33.5 per cent, for the second week.

Protein

Proteins provide the essential amino acids which are required for building and repairing body tissues. Proteins contain an assortment of amino acids and differ in quality according to the specific amino acids present. Eight amino acids must be consumed preformed and these are called the dietary essential amino acids. The other equally important amino acids are synthesized by the body provided the essential amino acids are present in adequate amounts.

Although proteins are required by all individuals, the needs of children are higher per unit of body weight than those of any other age group. As recommended by the Indian Council for Medical Research (14), the protein need for children in the age group seven to nine years is 33 grams per day.

The proposed menus for the school lunch program, as developed by the author, provided between 49.1 to 78.5 per cent of the daily recommended allowances for protein for the first week, with an average of 61.7 per cent for the week. The second week's menus ranged from 54.8 to 90.3 per cent,

with an average of 65.6 per cent. These amounts are considerably above one-third of the day's requirements. Taking into consideration the fact that most of the proteins are planned from vegetable sources, the net protein utilization may be 75 per cent or less. Thus the menus have been especially planned to provide higher amounts than recommended. It is assumed that the other meals consumed by the children will contain comparatively more carbohydrates and less protein and fats. Thus the overall diet for the day should ultimately balance for proteins as well as for calories.

Minerals

A number of mineral elements are present in the human body. Bones and teeth contain large amounts of calcium and phosphorus, and iron is an important constituent of the blood. The body is continuously eliminating some portion of the ingested minerals. Thus a regular intake of adequate amounts of minerals is essential for growing children. Provision for children must provide the extra amounts necessary for building body reserves. Calcium and iron are the elements most likely to be deficient in the diets and therefore attention should be given to these two elements in planning diets for children. In general, it is assumed that a diet reasonably well balanced in proteins, carbohydrates, fats, and vitamins will provide enough of the required minerals also.

Iron is an important constituent of the hemoglobin of blood. Iron aids in the transport of oxygen in the body. In case of chronic malaria or hookworm infection, iron requirements are increased (14). In the treatment of certain forms of anemia, a condition with poor hemoglobin content, iron medication is more effective than the consumption of dietary iron; however, for the prevention of anemia, a diet rich in iron is extremely valuable. For children in the age group of seven to nine years, the recommended dietary allowances for India range from 15-20 milligrams per day. The proposed menus were calculated on the basis of a recommendation of 18 milligrams per day. The first week's menus provided an average of 74.8 per cent, which is more than one-third of the day's recommended allowance. The intake ranged from 48.9 to 98.4 per cent for the first week. The average for the second week was 57.8 per cent with a range of 30.9 to 104.2 per cent. Thus the menus provide a wide margin of safety and over a period of time should help build desired hemoglobin levels in the children (Tables XII through XXI, Appendix D).

Calcium is essential as a building material for bones and teeth. This mineral is also necessary for certain regulatory processes in tissues and blood. The normal functioning of heart muscle and the clotting of blood depend on the presence of calcium. Children need a relatively high calcium intake to meet the needs of growing bones. Milk and milk products are rich but expensive and scarce sources of calcium

in India. Cereals and leafy vegetables are therefore relied upon as the major sources for meeting calcium requirements in India. Certain foods, though rich in calcium, are also rich in oxalates. These oxalates combine with calcium and form insoluble calcium oxalate which makes the calcium unavailable for body use. Therefore, calcium sources should be carefully selected, especially for children. In India the recommended allowance for children in the age group seven to nine years ranges from 400-500 milligrams. The proposed menus were calculated on the basis of a recommendation of 450 milligrams per day. The calcium intake for the first week's menus ranges from 41.3 to 77.8 per cent with an average of 51.5 per cent. In the second week's menus the calcium intake ranges from 30.9 to 104.2 per cent with an average of 58.1 per cent. These values are much higher than the recommended allowances.

Vitamins

Vitamins are vitally important organic compounds which are required by the body in small amounts for many biochemical reactions. Vitamins are divided into two groups on the basis of their solubility. The fat soluble vitamins can be stored by the body. The water soluble vitamins, however, cannot be stored by the body in appreciable amounts and therefore need to be supplied daily. Vitamins are widely distributed in nature, both in animal and in plant life. In

order to obtain an adequate supply of these vitamins, a mixed diet from both animal and vegetable sources is desirable, but carefully planned vegetarian diets can also give a good combination of the required vitamins.

Vitamin A deficiency is very common in India, forming about a quarter of the nutritional deficiencies prevalent in the country. One of the important causes of prevalent blindness in India is a chronic shortage of vitamin A in the diet, especially for growing children (14). This shortage may be attributed to the limited amounts of animal foods which are good sources of vitamin A in the Indian diet. Since most of the vitamin A requirement in the Indian diet is met from vegetable sources, it is important that the proposed menus take into consideration the incomplete physiological conversion of carotene from vegetable sources to vitamin A.

The allowance for vitamin A for children in the age group seven to nine years was calculated on the basis of 3500 I.U. as the daily requirement. The proposed menus provide a range from 31.0 to 154.8 per cent with an average of 61.9 per cent of vitamin A for the first week. The range for the second week was from 22.7 to 97.7 per cent with an average of 52.9 per cent (Tables XII through XXI, Appendix D).

Vitamin A can be stored in the liver; therefore, it is possible to achieve an adequate supply of vitamin A in the diet over a period of time even though the intake for a particular day may be less than one-third of the recommended allowances.

Ascorbic acid is a water soluble vitamin, and has a limited storage in the body. Since this vitamin is sensitive to high temperatures and cooking, a well balanced diet for school children should consist of some vegetables or fruit served raw. The percentage contribution of ascorbic acid in the proposed menus ranged from 32.5 to 192.5 per cent with an average^{****} of 81.0 per cent for the first week. The range for the second week, however, was from 37.5 to 155.0 per cent with an average of 69.5 per cent. Since ascorbic acid in water solution is unstable when exposed to heat, light, and air, the higher percentage contributed in the proposed menus should compensate for destruction during cooking and handling.

Thiamine is an important member of the B-complex. This vitamin plays an important role in the utilization of carbohydrates in the body. During thiamine deficiency, full utilization of sugars and starches for energy needs is adversely affected. It is not difficult to obtain a sufficient intake of thiamine in a vegetarian diet, as unmilled cereals, pulses, and nuts are rich sources of thiamine. In India the recommended allowances for thiamine for the age group seven to nine years is 0.9 milligrams per day. The proposed menus provide thiamine in the range of 36.7 to 75.6 per cent of the daily recommended allowance for the first week with an average of 50.4 per cent. The intake for the second week, however, ranged from 37.8 to 65.6 per cent with an average of 48.5 per cent for the week. This allowance is

assured by using whole wheat and unmilled parboiled rice in the proposed menus.

Riboflavin is needed for several oxidation processes in the cell. The riboflavin requirements are somewhat influenced by the level of protein intake and are not very definitely determined (14). Foods from animal sources are rich in riboflavin and these foods are limited in the diets of the majority of the Indian population. Riboflavin deficiency, resulting in sore mouth and redness of the skin, is not uncommon in India. The recommended allowance for riboflavin for the age group seven to nine years as defined by the Indian Council for Medical Research is 1.0 milligram per day. The proposed menus provide riboflavin in the range of 21.0 to 59.0 per cent for the first week with an average of 39.2 per cent. For the second week the intake ranged from 31.0 to 48.0 per cent with an average of 46.8 per cent.

Niacin is an important nutrient required by the enzyme system used for hydrogen transport in the living cell. Lack of this vitamin in the diet over a period of time leads to a disease called pellagra, which has characteristic symptoms of a red, sore tongue; pigmented, scaly skin; and diarrhea. The amino acid tryptophan is converted to nicotinic acid and helps in meeting the requirements for this vitamin. Most of the requirement for niacin is met in the Indian diet by consuming whole cereals, pulses, and nuts. The recommended

amounts for the age group seven to nine years is 12 milligrams per day for India. The proposed menus provide niacin in the range of 25.4 to 51.3 per cent of the recommended allowances for the first week with an average of 37.7 per cent. The second week's menus provide niacin in the range of 21.8 to 34.5 per cent, with an average of 28.2 per cent.

These proposed menus are presented graphically in Figures 3 and 4, showing the weekly average percentages of food energy and eight nutrients as compared with the recommended allowances. Calculations for food energy and selected minerals and vitamins for the proposed two-week cycle menus are presented in Tables XII through XXI (Appendix D). The detailed menus are found in Appendix B. These are only suggested menus, and variations can be made by individuals who are interested in using these menus. A simple guide to help in planning menus for the individual school lunch programs was also prepared by the author and may be found in Appendix E.

PROPOSED WORK ORGANIZATION CHARTS

One of the basic and fundamental needs in initiating school lunch programs in India is to develop some guiding principles in the planning and constructing of new kitchens, or in the remodeling or renovating of existing facilities. The responsibility of undertaking this task must be fully understood before any changes are proposed for remodeling or ideas for new kitchens are presented.

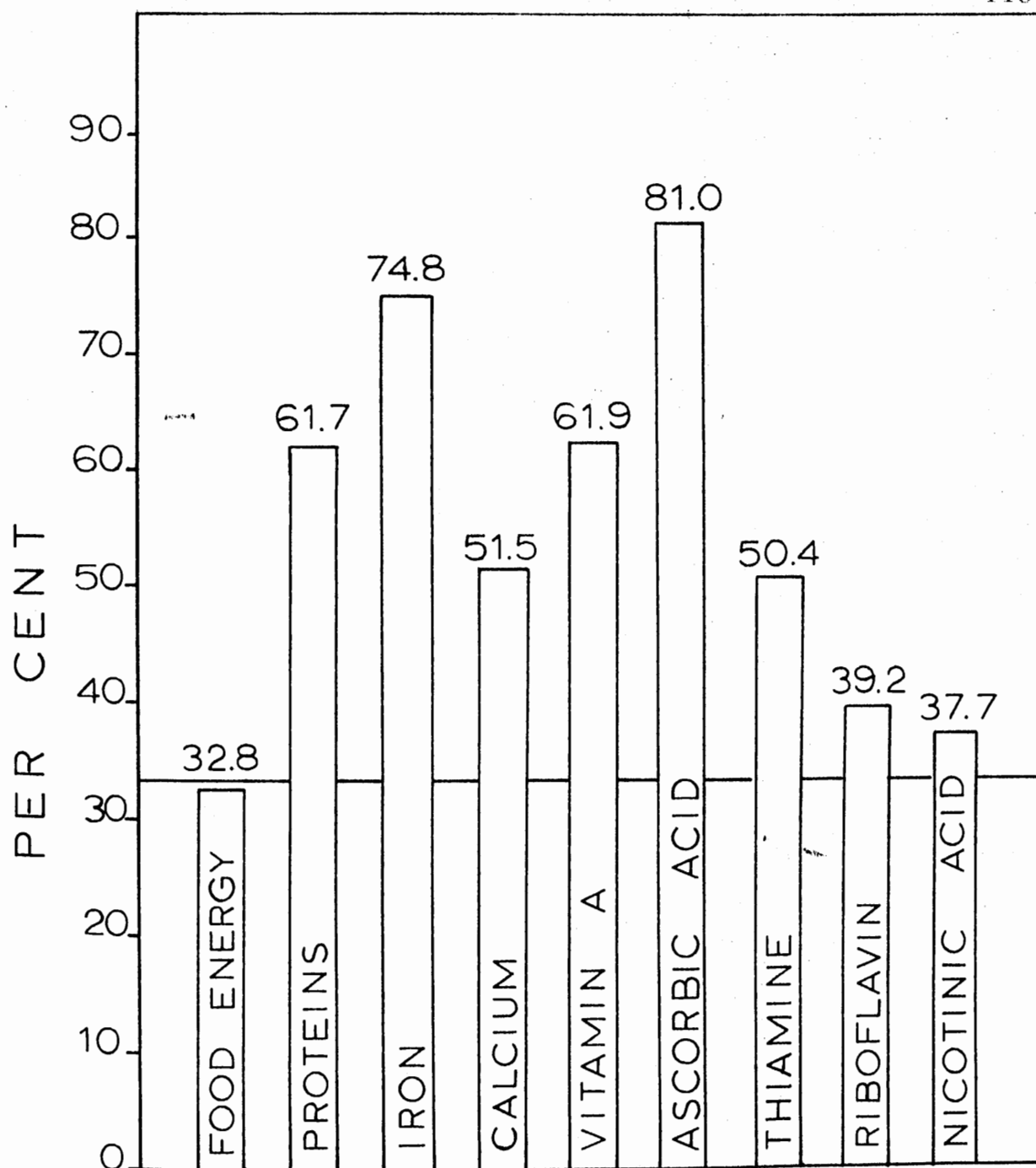


FIGURE 3

FIRST WEEK'S AVERAGE PERCENTAGE CONTRIBUTION OF FOOD
ENERGY AND SELECTED MINERALS AND VITAMINS IN THE
PROPOSED TWO-WEEK CYCLE MENUS

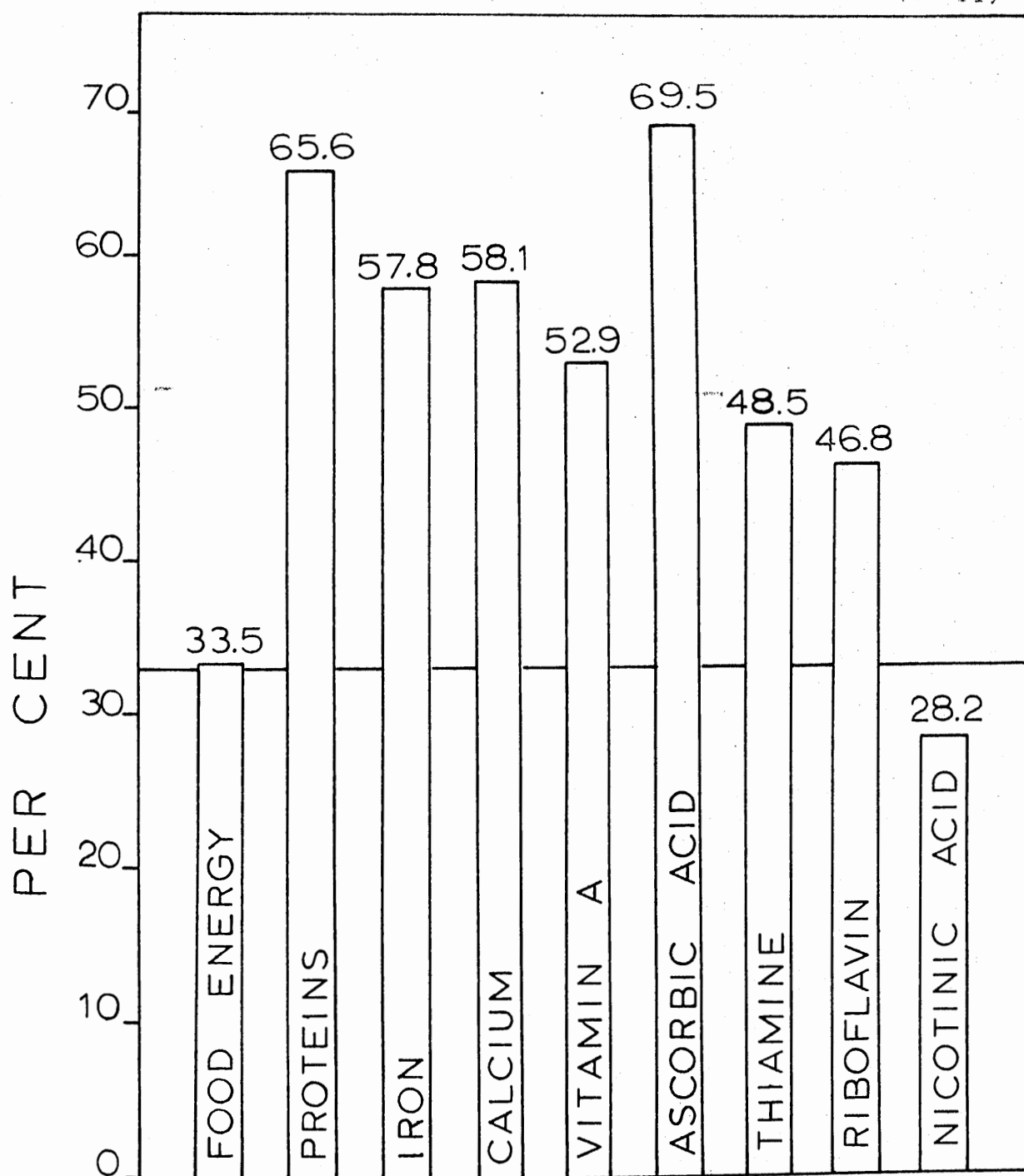


FIGURE 4

SECOND WEEK'S AVERAGE PERCENTAGE CONTRIBUTION OF FOOD
ENERGY AND SELECTED MINERALS AND VITAMINS IN THE
PROPOSED TWO-WEEK CYCLE MENUS

West and Wood (102) pointed out that more thought and supervision are currently being given both to the initial planning and to the actual construction of food service facilities than has ever been given to these areas previously. Furthermore, these authors pointed out that some definite standards have been formulated which can be used and adapted to different situations.

Kotschevar and Terrell (63) emphasized that adequate and appealing meals along with certain educational benefits should be the major goals for effective and adequate planning of school food facilities. Therefore, these goals have been incorporated into the overall plan in making recommendations for the school lunch programs for India.

The factors that influence the proper utilization of time, energy, and materials under different working conditions have been explored by workers in this field. Scientific studies have indicated that a close relationship exists between a good work flow and the arrangement of equipment and placement of tools. Most of the work in the kitchen centers around the worker, and the quality and amount of work performed by an individual worker depends on the amount of effort expended. In order to minimize the amount of wasted effort, a flow plan of work, in proper sequence, should be utilized.

"Flow of work" has been defined by Kotschevar and Terrell (63) as "the sequence of operations in the processing of materials or the performing of essential functions." If this definition is applied to the food service department, it would include the receiving of foods, storage, preparation, cooking, serving, cleaning and washing, and the disposal of waste. For efficiency and ease, various functions should proceed in a smooth sequence.

Five flow charts developed by the author are presented. These flow charts were based on the author's observations of the school lunch facilities in the schools participating in the survey, as well as on a review of current literature. Also taken into consideration were the following factors: lunch menus, cost of lunches, and/or facilities, utilization of the existing physical facilities, and the training of the individuals who may be responsible for the operation of the program.

The five flow charts have been designed to fit into the four most common types of kitchen arrangements. The four types of kitchen shapes that have been considered are the U-shaped, the L-shaped, the square, and the rectangular. The results of the survey indicated that the majority of the school lunch kitchens included in the study were rectangular in shape and were performing efficiently. Therefore, two different flow arrangements have been presented for the rectangular kitchen.

FLOW CHART I

The U-shaped kitchens are not uncommon but present the most difficulty in planning facilities for the major work areas. In this arrangement the serving area has been placed at the U-end of the kitchen (Figure 5). The advantage of placing the serving area in this position is that on one end it can be connected to the washing area and to the garbage disposal area, both of which will be used by the children. The receiving, storage, and cooking areas can be conveniently placed on the other side of the room. The straight lines and arrows indicate the direction of flow for the employees. The dotted lines and arrows indicate the direction of flow of student traffic.

This arrangement presents some difficulty due to the narrow passage between certain areas and to the presence of some cross traffic. However, the proposed arrangement presents ease of movement and eliminates unnecessary traffic.

FLOW CHART II

This type of flow plan is suitable for the L-shaped kitchen. In this arrangement the ease of flow is achieved by placing the receiving, storage, and cooking areas in a straight line along the main length of the kitchen (Figure 6).

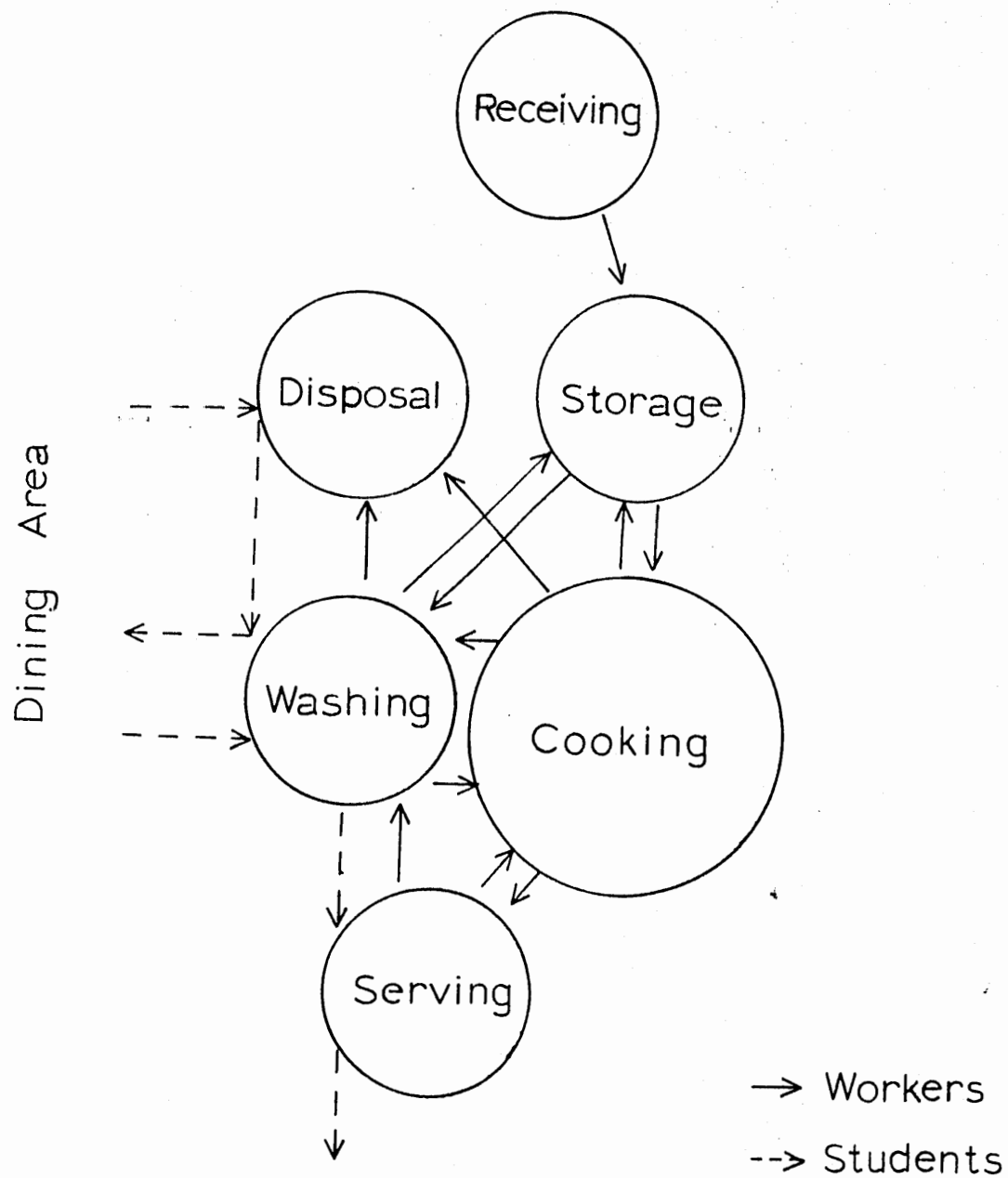


FIGURE 5

PROPOSED WORK ORGANIZATION CHART FOR
U-SHAPED KITCHEN PLAN

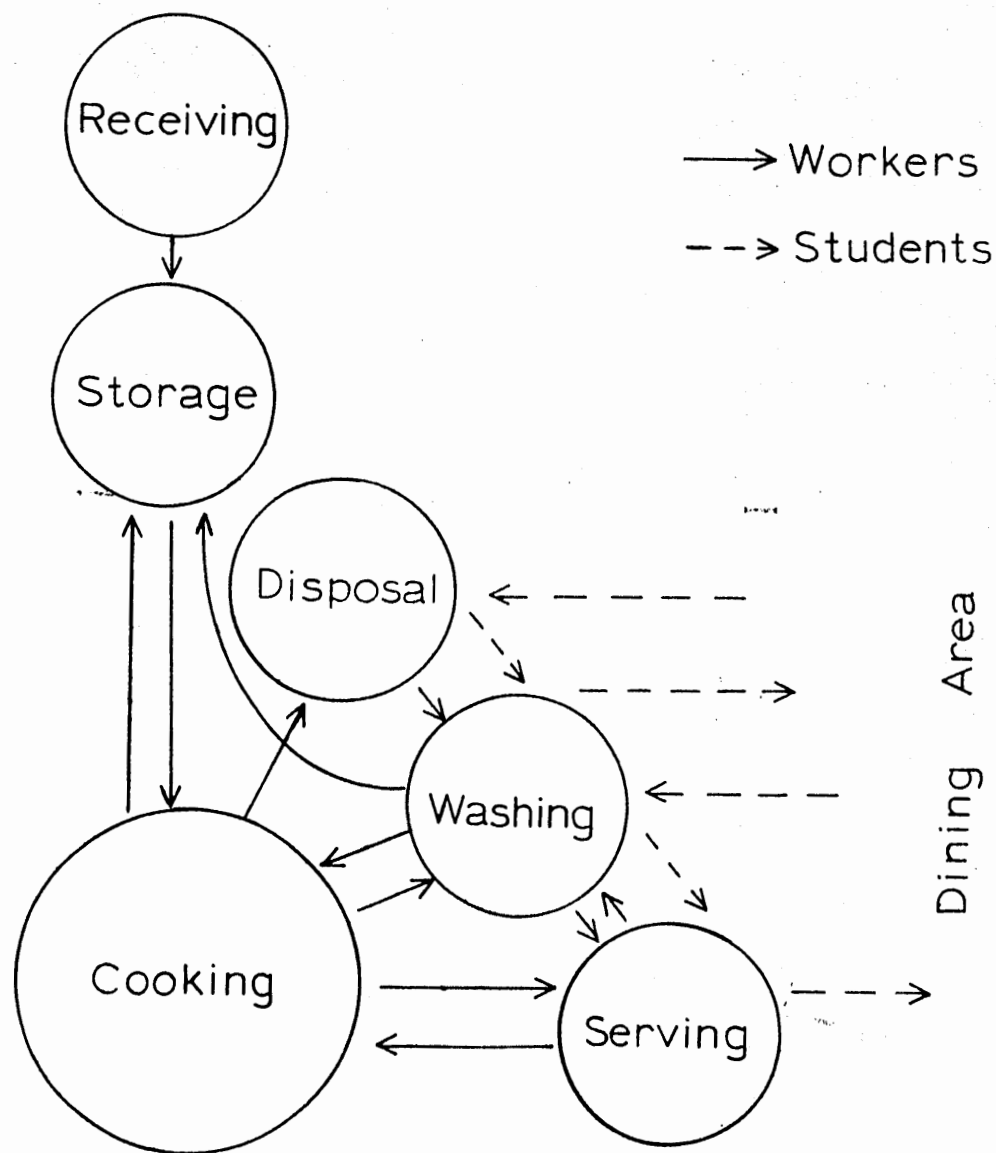


FIGURE 6

PROPOSED WORK ORGANIZATION CHART FOR
L-SHAPED KITCHEN PLAN

The serving, washing, and garbage disposal areas are also along the straight line but diagonally placed. There is no cross traffic and the entire flow is organized and systematic. The straight lines and arrows indicate the direction of flow for the food service workers. The dotted lines and arrows indicate the direction of flow of student traffic.

Some difficulty is encountered in connecting the washing areas with the storage areas in this plan. The traffic has to proceed in a slight curve instead of the usual straight flow.

The cooking area is located at approximately equal distances from the storage, serving, washing, and the garbage disposal areas. This minimizes walking and cross traffic.

FLOW CHART III

This type of flow plan is suitable for a square kitchen. The storage, cooking, and serving areas are arranged in close proximity to the four corners and sides of the room in such a way that there is a minimum amount of flow across the room (Figure 7). The receiving and the garbage disposal areas lie side by side. In some situations the same entrance could be used for both purposes, a plan which is very common in some existing kitchen plans in India. The distance between the major work areas could be arranged according to the dimensions of the kitchen. The straight

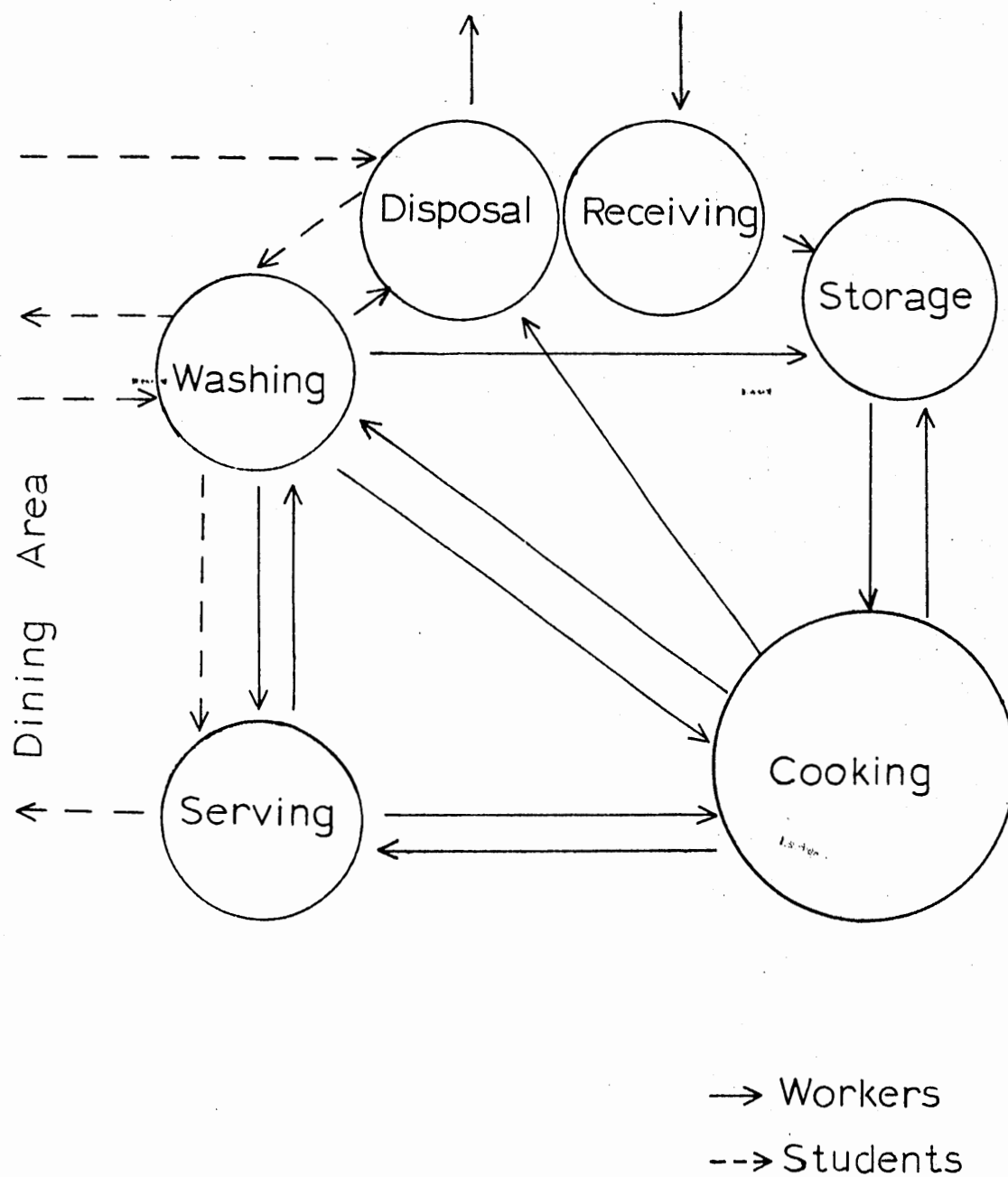


FIGURE 7

PROPOSED WORK ORGANIZATION CHART FOR
SQUARE SHAPED KITCHEN PLAN

arrows indicate the direction of flow for the employees or the workers. The dotted lines and arrows indicate the direction of flow of student traffic.

In all five of the proposed arrangements the washing and the serving areas are placed close to each other. This is because the cultural pattern of eating food with the fingers requires the washing of hands by the children both before and after eating the meal.

The serving center is close to the cooking area. Since there may be a limited number of workers, and frequently the same worker may be required to perform both the functions of cooking and serving, this plan has merit.

FLOW CHARTS IV AND V

The rectangular kitchens are by far the most common and popular type of kitchens in India. This type of kitchen shape gives more flexibility for the arrangement of the major work areas. Therefore, two flow plans are presented, both of which can be conveniently adapted to the rectangular kitchen (Figures 8 and 9).

In Flow Plan IV the direction of flow is in a straight line sequence at all major areas. The receiving area, storage area, and the cooking area are placed along one side of the main length of the kitchen. The serving, washing, and

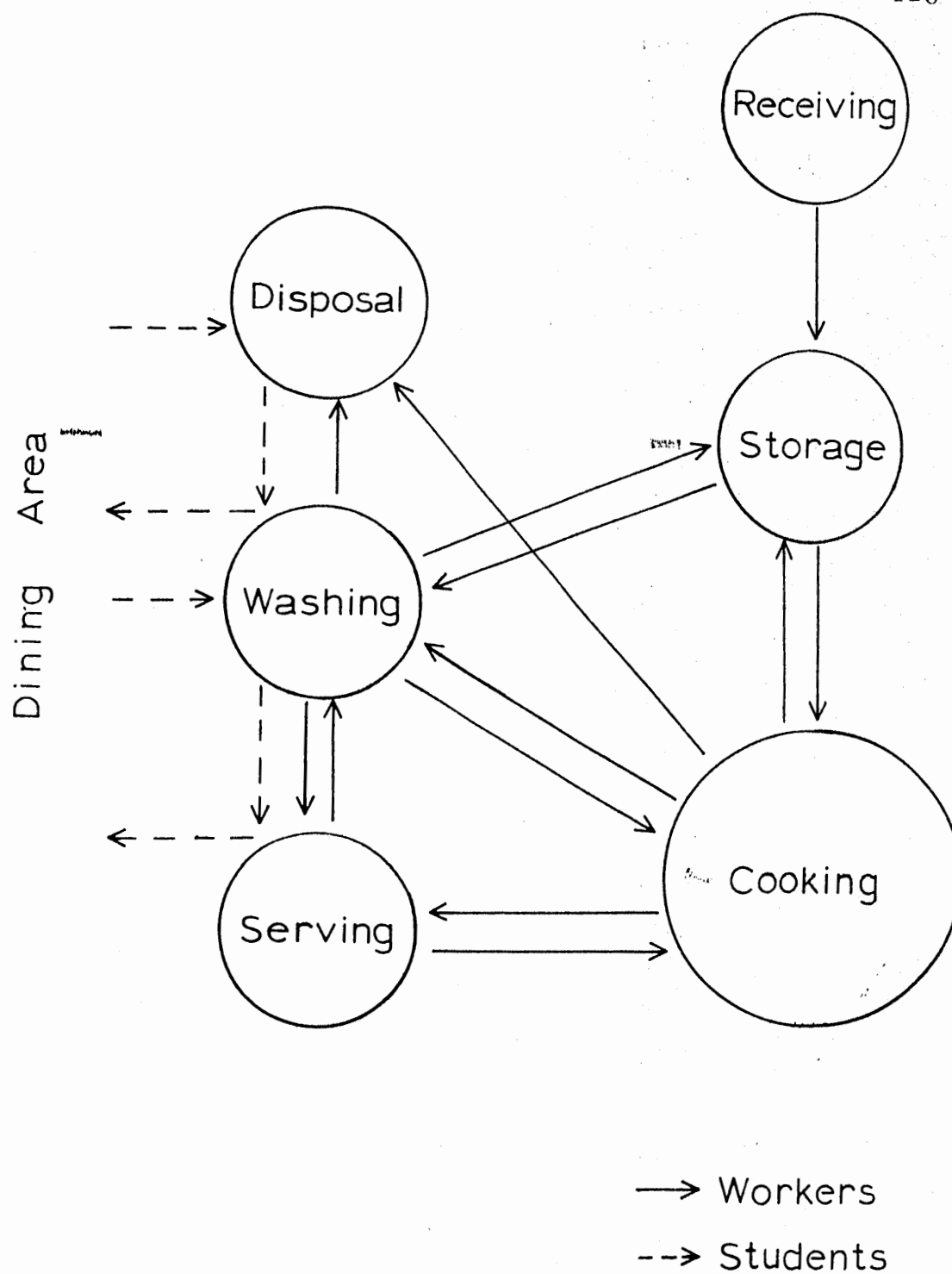


FIGURE 8

PROPOSED WORK ORGANIZATION CHART FOR
RECTANGULAR SHAPED KITCHEN PLAN

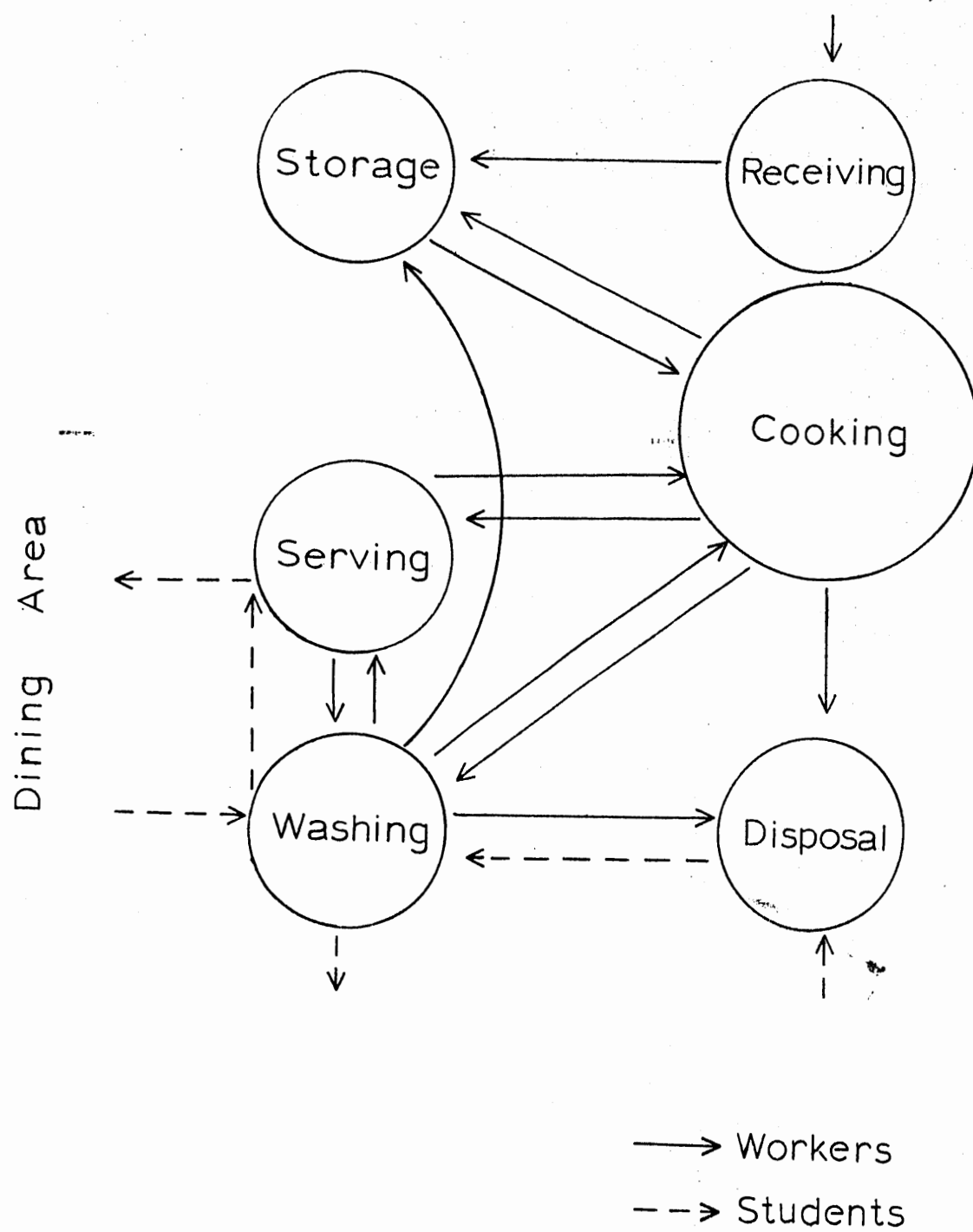


FIGURE 9

PROPOSED WORK ORGANIZATION CHART FOR
RECTANGULAR SHAPED KITCHEN PLAN

garbage disposal areas are located on the opposite side of the room. The cooking area is conveniently connected to the storage, serving, and washing areas. This type of kitchen shape allows adequate space for all traffic flow.

In Flow Plan V the receiving, cooking, and garbage disposal areas are placed along one side of the kitchen. The washing, serving, and storage areas are located along the other side of the kitchen. The traffic movement is smooth and convenient. However, the traffic along washing and storage areas proceeds in a slight curve rather than in the usual straight line. The straight lines and arrows indicate the direction of flow for the food service workers. The dotted lines and arrows indicate the direction of flow of student traffic.

DEVELOPMENT OF TRAINING MANUALS

The author has developed a set of training manuals for the training of food service supervisors for school lunch programs in India. Training of food service supervisors is extremely important in order to have some degree of uniformity in initiating the school lunch programs and in formulating some basic standards. These manuals have been specially designed for Indian conditions. A review of the literature pertaining to the training of food service supervisors was used as a basis for developing the training manuals.

In addition, the food service directors for school lunch programs of Texas and the personnel in charge of the training programs for food service supervisors in Texas were consulted before finalizing the plans for the training program.

In order to initiate any new program much work is required in the initial stages for the organization and establishment of policies and procedures. Guidelines for setting up various committees to formulate objectives, establish rules and regulations, develop curriculum, and to assist in the selection and appointment of both instructors and the trainees were also developed. These guidelines provide the framework within which training programs for India may be developed (Appendix F).

The training manual, developed by the author, is presented in three parts and was intended for the use of instructors charged with the responsibility of training food service supervisors (Appendix F). The need for training and the effect of training on learning are discussed in Part I of the manual. This section also deals with training policies; types of training; training principles; and the different methods of training. Objectives for training are listed for instructors, trainees, and for the institutions offering the training programs. The training plan is shown diagrammatically to present the requirements for both the initial training

periods and the requirements during the actual training period. Part II provides plans for eight training sessions. These sessions are planned to cover the following topics: orientation to the food service department; job descriptions for the food service supervisors; guiding principles for human relations; guiding principles for good communication; guiding principles for employee motivation; personal management; supervision techniques; and personal qualifications and evaluation. These eight lessons are by no means exhaustive and complete, but have been compiled with a hope that they be used as a reference and adapted to the needs of different institutions responsible for the training programs. Part III of the training manual consists of seven short lessons on sanitation. These lessons are planned to insure the safety of the food during handling, storage, and preparation before being served to the children. These manuals are found in Appendix F.

The meal planning guide developed by the author was intended for the use of food service supervisors in making necessary adjustments in the proposed menus. These adjustments are sometimes necessary in the initial planning of school lunches because of differences in existing conditions. The manuals developed and presented by the author are brief and mainly in an outline form. The manual on meal planning may be found in Appendix E.

IMPLICATIONS FOR NUTRITION EDUCATION

The conduct of nutrition surveys of the particular group concerned is an important basis on which improvement in nutritional status of a group of people or of a nation may be undertaken. An assessment of nutritional status is imperative in order to determine the existing nutritional deficiencies, the underlying factors involved, and possible means of combating these problems. Work in the field of nutrition has revealed that nutritional deficiencies in the early years of life may be responsible for long and lasting damage to both the physical and mental well-being of children. These frightening consequences of undernutrition and malnutrition have been responsible for worldwide recognition of the problem.

The most important cause of malnutrition, hunger, and illness, and of premature death in India is the fact that people do not grow enough of the right kinds of food. Even when food is available, poverty, lack of education, religious taboos, and a lack of understanding of nutritional needs prevent wise selection and utilization. This results in an uneven distribution of the available food among the population groups.

In order for the people to understand the basic underlying problems and to become aware of the relationship

of good nutrition to healthy living, nutrition education is imperative. Nutrition education has been found to be an effective means for improving the health of a population group.

Experience in the area of nutrition has shown that for any program to be effective, it should be based on the current needs of the people concerned. In order to stimulate and sustain interest, an active participation and involvement of the individuals concerned is extremely necessary in any educational program. Only when the immediate need for such a program is understood by the groups and the resulting benefits derived from such a program are apparent will the cooperation of the groups concerned and the success of the program be assured.

As part of the community development and extension services provided by the government of India, applied nutrition programs have been developed and extended to a large number of rural communities. The applied nutrition programs have been found to be one of the most effective and useful means of reaching large numbers of the population groups. Many of these programs currently in existence in India are geared towards teaching nutrition to adult population groups. A variety of teaching methods and materials have been used to reach the masses. These methods are especially useful

for reaching groups with little or no educational background. Evaluations of these programs have been extremely encouraging, but for long term results a continuation of these programs is necessary.

The government of India is assisted in conducting nutrition education programs by a number of voluntary local and foreign agencies. Some of the local agencies include the services of the Indian Council of Medical Research and its constituent Nutritional Laboratories; The Council of Scientific and Industrial Research and National Laboratories; the agricultural universities; and the Indian Council of Child Welfare. The programs assisted by the above mentioned local agencies have been extended to include the education of the people to follow recommended dietary patterns; the development of low-cost and inexpensive menus; and the popularization of some locally available and inexpensive protein sources. Nutritional surveys are also conducted by the local agencies to help pinpoint the nutritional deficiencies of the people in a respective area. The services of International agencies such as FAO, WHO, UNICEF, and CARE have been extended to include education and feeding programs.

In order to minimize nutritional deficiencies in any population group, children as well as adults need to be taught good nutrition. The impact of such a program would be accentuated by extending nutrition teaching to the children.

As a result, the children would be better fed not only by learning to make better choices but also by learning to accept new foods. A sound nutrition education program can be built into the regular teaching curriculum for school children in India. The author strongly recommends that this program of nutrition education be based on the school lunch program. The acceptance of new ideas and the exposure to new foods presented in the school lunch programs should increase the nutritional status of the school children over a period of time. The author's personal experience in working with community groups in India has revealed that if the food is accepted by children the possibility of the food being accepted by the family is greater. Therefore, children may have a strong influence in changing family food patterns.

Some recommendations suggested by the author for nutrition education programs for school children in India are:

1. All nutrition education programs should be planned with a nutritional goal of preventing deficiency diseases and minimizing malnutrition.
2. Nutrition programs should be planned and administered by a person who not only has a basic knowledge of nutrition but is also familiar with the nutritional status of the particular group for whom the education programs are being planned. The implementation of the programs can, however, be undertaken by other

teachers under the direct supervision of the individual or individuals trained in nutrition.

3. Nutrition education and school lunch programs should be planned and coordinated in such a manner that there is a reinforcement of the nutrition goals.
4. Nutrition education should be extended to all educational levels, and the complexity of the teaching should vary with age groups.
5. Nutrition concepts should be presented one at a time, advancing from simple to more complex concepts. New foods should be presented to the children in a familiar manner for initial acceptance.
6. Involvement of the children is very important if the nutrition education is to be meaningful. Projects and learning experiences should be related to the daily life of the children. Projects such as kitchen or school gardens for growing fresh fruits and vegetables will not only provide protective foods in the diets of the children but the children will learn to understand the ways and means of caring for these foods. Such programs should be carefully planned and incorporated into the general teaching curriculum.

CHAPTER V

S U M M A R Y, C O N C L U S I O N S, A N D R E C O M M E N D A T I O N S

The overall purpose of this study was to develop plans and recommendations concerning policies and procedures for the organization of school lunch programs suitable for village and urban communities in India. Other purposes included the following: to develop guidelines for menu planning; to develop and standardize two-week cycle menus for use in the proposed school lunch programs; to develop guidelines for initiating training programs for food service supervisors; to make recommendations for physical facilities for school kitchens; and to develop implications for nutrition education programs.

A majority of India's population live in villages, although a small percentage of the population has moved into the urban areas in the past decade as a result of industrialization. India's Five Year Plans provide facilities for free and compulsory education to many rural and urban areas; however, there has been no major effort to provide a free meal or meals at nominal cost to a majority of school children. In addition to other services extended to village communities under the Five Year Plans, the Applied Nutrition Programs

(ANP) have been expanded to include midday meals for many school children. These feeding programs were initiated by voluntary agencies, but later received financial assistance from the government of India. These feeding programs are limited with little uniformity in planning, preparing, or serving noon meals. Currently there are no set standards the noon lunches are required to meet and there is little or no training of the individuals who are responsible for feeding the children.

A typical school in an Indian village may be housed in a single room at the community center or in a separate building depending on the size of the village and the number of children enrolled. A small portion of the schoolroom or of the building is allotted for preparation of noon meals. Dining facilities do not exist in the majority of the schools. An effort has been made to present recommendations for setting up lunch programs in India to meet the needs of children residing in rural and urban communities.

As a basis for making recommendations, the author conducted a survey of 23 lunch programs in selected schools located in Texas. The purpose of this survey was to determine policies, procedures, physical facilities, and work organization procedures currently followed in the school programs surveyed. The investigator visited each participating school and obtained the necessary information from either the food service supervisors or from the managers.

The survey form included 66 questions relating to various aspects of the school lunch program and included information concerning the types and number of lunches served; work experience, education, qualifications, and responsibilities of the food service supervisors; attitudes of school personnel and parents toward the school lunch programs; information concerning the establishment and maintenance of standards for food quality, sanitation, and physical facilities; purchasing practices for food and other necessary items; and the adequacy of the present physical facilities in relation to the number of lunches served.

A majority of the participating schools had been part of the National School Lunch Program from 10-29 years. Seventy-four per cent of the participating schools served Type A meals; 26 per cent served a combination of Type A meals and à la carte meals.

The level of education for the food service supervisors varied considerably. Twenty per cent of the reporting supervisors had less than a high school education, 39 per cent were high school graduates, and 35 per cent of the supervisors had some college education. A majority of the food service supervisors had less than 10 years of work experience; however, one supervisor reported 30 years of work experience. Fifty-two per cent of the reporting supervisors had at least five years work experience in the present position.

The number of employees supervised by the food service supervisors ranged from two to 25. Ninety-five per cent of the supervisors reported receiving full cooperation from the employees in the time of emergency. Sixty-one per cent reported being expected to evaluate the employees although no written evaluation forms were provided. Approximately half of the supervisors were provided with an organization chart. Sixteen of the 23 participating supervisors indicated being provided with written policies which were flexible. These policies were intended for the use of both supervisors and employees. Those individuals reporting rigid policies indicated that these policies could not be changed by the supervisors under any circumstances.

Satisfactory planning of the physical facilities was reported by 95 per cent of the supervisors. The inspection of the physical facilities by health authorities was reported by the same number of individuals. The total area provided for the kitchen and for the serving lines was reported adequate by all the participants. The aisle space and serving lines were indicated as sufficient by 22 of the 23 supervisors. A majority of the kitchens were planned with the unit of service as a straight line. A straight line arrangement was reported by 13 supervisors as the layout design planned for the cooking area. The storage area was reported as adequate for all except one kitchen. The shelf areas in the store room were indicated as insufficient by

only two supervisors. These two individuals were working in schools in which the school lunch program had rapidly expanded while the physical facilities had remained unchanged.

The frequency of purchase of food and other items was investigated. In the majority of the school lunch systems, milk and milk products were purchased daily; whereas, vegetables and fruits, meat and meat products, canned foods, and paper goods were purchased weekly. The store room records were maintained in the form of stock registers by 11 supervisors and as inventories by nine supervisors.

Two areas in which there was an apparent need for more effective planning were supervision and safety. Only four of the 23 food service supervisors made any provision for in-service training of the employees. An equal number reported training was given when the need arose. Seven reported training given monthly at staff meetings and occasionally through workshops. Seven supervisors stated that occasional in-service training was given to the employees. A short training course was provided for employees in 58.2 per cent of the schools.

Twelve of the reporting supervisors indicated the establishment of standards and specifications for quality was determined by the food service directors. Other individuals reported responsible for establishing standards included food service supervisors, managers, and cooks.

Twenty-one of the 23 supervisors reported being held entirely responsible for the school lunch program by the food service administrator. Two supervisors indicated not assuming the overall responsibility for the school lunch program. Sixty-eight per cent of the supervisors reported a good relationship between the food service department and the total school program. The others reported an indifferent relationship existed between the food service department and the overall school system.

A majority of the supervisors reported good cooperation from principals, teachers, students, and the parents. None of the principals or teachers were reported to have an indifferent attitude towards the school lunch program. One supervisor reported the students were indifferent and three supervisors reported parents were indifferent towards the school lunch program.

Survey findings indicated the most efficient kitchen plan was one in which there is a smooth and continuous flow of work. Such a plan increases efficiency by conserving the employees' time and energy. On the basis of study findings and a review of pertinent literature, a set of five work flow charts was developed by the author for the organization of the major work areas; namely, receiving, cooking, storage, serving, washing and garbage disposal. With minor changes these flow charts can be adapted to different kitchen shapes.

Two-week cycle menus were developed and planned for use in the proposed school lunch programs for India. These menus were developed and standardized in the experimental laboratory of the Texas Woman's University, Denton, Texas. Menus were developed using food items that would be locally available in India. Inexpensive vegetable sources of protein-rich foods were used in developing the recipes for the proposed menus. The menus were designed to meet at least one-third or more of the daily recommended allowances for energy value and eight nutrients found most limited in the diets of children in India. The recommendations of the Indian Council of Medical Research for boys and girls in the age group seven to nine years were used as a basis for planning the menus.

The percentage contribution of calories from proteins, fats, and carbohydrates was calculated to insure well-balanced menus. The caloric contribution of the proposed menus was calculated for each day. The percentage contribution of these menus to the total calories recommended daily for this age group was determined. The average for the first week was 32.8 per cent and for the second week, 33.5 per cent.

The percentage contribution to the daily recommended allowance for protein provided by the proposed menus was calculated for each day. The average contribution for the first week was 61.7 per cent and for the second week, 65.6

per cent. This amount of protein is considerably higher than 33.3 per cent of the recommended daily allowances, the minimum contribution expected for the noon meal. Since most of the protein foods used in planning the menus were from vegetable sources, the net protein utilization may be 75 per cent or less.

The two-week cycle menus were proposed as sample menus and may be altered to meet the needs of individual institutions. A meal planning guide was developed by the author to assist the individuals responsible for planning the school lunch menus.

A training program for the food service supervisors is desirable to assure some uniformity in initiating the school lunch programs and in formulating some basic standards. A manual for the training of the food service supervisors for school lunch programs in India was developed by the author. Guidelines were developed to organize the various committees needed to initiate and organize the training programs. Suggested functions of these committees were: to formulate objectives, to establish rules and regulations, to develop the curriculum, and to assist in the selection of both instructors and trainees. These guidelines provide the framework within which training programs for India may be developed.

The training manual, developed by the author, was presented in three parts. The need for training and the effect of training on learning were discussed in Part I of the manual. Part II provided plans for eight training sessions, and Part III consisted of seven short lessons on sanitation.

Nutrition education has been found to be an effective means for improving the health of a population group. In order to minimize nutritional deficiencies in any population group, children as well as adults need to be taught good nutrition. The impact of any education program, and a nutrition education program in particular, would be accentuated by extending nutrition teaching to the children. Implications were developed and recommendations presented for nutrition education programs for school children in India.

Research in the field of institutional management has indicated that in either building a new kitchen or remodeling an older kitchen, thorough planning will result in efficiency and reduced labor costs. The assistance of the experienced food service supervisors who are familiar with the requirements and working operation will facilitate planning.

One of the reasons for conducting the survey of selected school lunch kitchens was to study the layout, design, and other physical facilities that may add to or reduce the

effectiveness of work output. Based on the findings of the survey, the author's observations of the various school kitchens, and the review of literature, certain recommendations have been suggested.

Based on the trends in school enrollment and the future plans of the government of India for free and compulsory education in elementary schools, the school lunch program facilities should be planned to allow for future expansion of the initial facilities. All kitchens should be planned to increase the initial capacity by a minimum of 50 per cent.

The layout of the kitchen should, in general, allow for a straight line flow without cross traffic. The major areas of work should be established according to functional convenience. The placing of equipment and the provision of adequate aisle space for free flow of traffic should be given priority. Not more than one-third of the floor area should be covered by equipment.

To produce the desired efficiency, the workers should be trained. In case of voluntary helpers for kitchen work, there should be a carefully planned program of supervision, and some provision for on-the-job training for all kitchen employees.

The number of workers and the total number of work hours should be based on the number of lunches to be served,

the size of the operation, and the type of menu served. Overstaffing or understaffing will reduce the efficiency of the operation. The types of menus served determine the size and number of pieces of equipment purchased. The number of lunches to be served presently as well as the anticipated expansion should be considered when selecting equipment. Other factors influencing equipment purchase are the number of employees, the type of training of the employees, the size of the kitchen, and the kitchen layout design.

Adequate and sanitary facilities for the washing area are strongly recommended. This would help to insure the safety and wholesomeness of the food served. A sanitary dish washing procedure would help reduce the possibility of spread of infection through unsanitary equipment.

Organization of work to increase the efficiency of the workers is essential to reduce labor costs. Another area that may contribute toward the success of the program is the operation cost and daily expenditures. Operational costs are successfully controlled through the use of appropriate records and an analysis of current data.

Factors such as adequate financial assistance, the local availability of foods, and the food habits and eating patterns of population groups make it impossible to completely follow any set of recommendations in planning and operating local school lunch programs. However, the proposed

recommendations were based on observations of the author, the findings from the survey of selected schools in the United States, and a review of pertinent literature. These recommendations along with suggestions for an appropriate nutrition education program should provide a framework on which to build reasonably good school lunch programs to meet the needs of the school children in India.

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A P P E N D I C E S

A P P E N D I X A

S U R V E Y O F S C H O O L L U N C H R O O M
P R A C T I C E S

1. Name of the school _____
2. Sponsoring agencies:
State _____ Local _____ Both _____
3. How long has your school participated in the school lunch program? _____
4. Types of lunches served:
Type A _____ Snack lunch _____ A la carte _____
5. Name of the food service supervisor or manager _____
6. Educational background:
Less than a high school graduate _____
High school graduate _____
Number of years in college _____
Any other special education or training _____

7. Work experience in food service. Years _____ Months _____
In present capacity _____
In other areas of food service _____
8. Total number of employees under your supervision _____

	Full time	Part time	Occasional
Cooks	_____	_____	_____
Kitchen helpers	_____	_____	_____
9. In time of emergency do the employees give:
Full cooperation? _____ Partial cooperation? _____

No cooperation?_____ (give reasons for no cooperation)_____

10. Are you expected to evaluate the employees under your supervision? Yes_____ No_____

If "No":

Do you prepare a written evaluation form of your own? Yes_____ No_____

Do you evaluate by observation? Yes_____ No_____

11. Are you provided with a means for evaluating the employees under your supervision? Yes_____ No_____

If "Yes":

What sort of an evaluation tool is provided?_____

How often is an evaluation made?_____

What use is made of your evaluation:

Upgrading the employees? Yes_____ No_____

Official records?_____

Any other reason?_____

12. Are you provided with an organization chart?

Yes_____ No_____

If "No," who makes the organization chart?_____

13. Are you provided with written policies

For the supervisors? Yes_____ No_____

For the use of employees? Yes_____ No_____

14. Are these policies rigid?_____ Flexible?_____

15. Under what circumstances could these policies be changed?

List_____

16. Are you expected to keep accurate records concerning:

	Yes	No
Employees reporting to work?	_____	_____
Health of employees?	_____	_____
Number of meals served?	_____	_____
Left over food items?	_____	_____
Food items received?	_____	_____
Sanitation and safety inspection?	_____	_____
Accidents?	_____	_____
Equipment?	_____	_____

17. How often are these records checked by the food service director (person in authority)?

Weekly_____ Monthly_____ Never_____

18. Does the food service director hold the food service supervisor responsible for the total set up of food service in a particular school? Yes_____ No_____

19. What are the relations of the food service department to the total school program?_____

20. What are the attitudes of the following persons toward the overall food service program?

	Good	Poor	Indifferent
Principal	_____	_____	_____
Teachers	_____	_____	_____
Students	_____	_____	_____
Parents	_____	_____	_____

21. What is the degree of cooperation of the following persons with the overall food service program?

	Full Cooperation	Partial Cooperation	No Cooperation
Principal	_____	_____	_____
Teachers	_____	_____	_____
Students	_____	_____	_____
Parents	_____	_____	_____

22. What is the contribution of the food service supervisor to the total school lunch program? _____

23. How does the food service supervisor maintain the program of supervision

In the kitchen? _____

In the store room? _____

In the area of serving lines? _____

In the dining room? _____

24. What provisions are made for the safety of

The employees? _____

The children? _____

25. What provisions are made for the in-service training program of the food service employees:

Daily _____

Monthly _____

Occasionally _____

Summer sessions _____ How often? _____

Never _____

26. How does the food service department encourage student participation in the lunch program? _____

27. Who establishes standards or specifications for the quality of foods that are purchased? _____

28. Are the specifications written? _____
Are the specifications rigid? _____ Flexible? _____
29. When the food supplies are delivered are they checked for
Accuracy of quantity? _____
Quality of products? _____
Both? _____
30. Who sets standards and maintains the portion size of foods served? _____

31. How does the food service personnel anticipate daily participation by the children?
Through previous records _____
Through help of teachers _____
Any other means _____

32. Is there any special arrangement made to serve lunches to teachers and staff? Yes _____ No _____

If "Yes," list _____

33. How many lunches are served?

	Daily	Approximate Number
Complete meal	_____	_____
A la carte	_____	_____
Snacks	_____	_____
Combination of _____		
and _____	_____	_____

34. Does the school lunch center assist in planning and preparing for social activities of the school when requested? Yes _____ No _____

If "Yes," on what special occasions?

Socials _____	Parent-teacher meetings _____
Athletic events _____	Any other _____

How much assistance is given? _____

35. Is the dining room easily accessible to the students?

Yes _____ No _____

36. Is the dining room easily accessible to delivery men?

Yes _____ No _____

37. Is the delivery driveway free of student traffic?

Yes _____ No _____

38. Is the dining room accessible for after school functions when the main building is not open?

Yes _____ No _____

39. Are the kitchen, dining room, and store rooms conveniently connected with each other? Yes _____ No _____

If "No," what is the difficulty? _____

40. Are the cooking, serving, and store areas protected from dust, flies, ants, and rats? Yes _____ No _____

If "No," what additional protection is needed? _____

41. Are the cooking and serving areas inspected by health authorities? Yes _____ No _____

If "Yes," how often? _____ By whom? _____

42. Is the floor level higher than the street level?

Yes _____ No _____

43. What is the total area (square feet) for

Kitchen? _____ Store rooms? _____ Dining room? _____

44. Check the shape of the area.

	Square	Rectangular	Irregular
Kitchen			
Store room			
Dining room			

45. How many children can be seated in the dining room at one time? _____

46. How many lunch shifts are there? _____

47. What is the length of each lunch period? _____

48. For the dining room, what is the number of and position of
Entrances? _____
Exits? _____
49. How many square feet per anticipated meal served have been provided for the food preparation area? _____

50. Is there a separate preparation unit for each major item? Yes _____ No _____
If "Yes," how much space is provided for each area?
Meat and vegetable _____ Sandwiches and snacks _____
Salad _____ Baked foods _____
Desserts _____ Pre-preparation area _____
51. Is the allotted area sufficient? Yes _____ No _____
If "No," list the areas not sufficient. _____

52. Are a sufficient number of serving lines provided?
Yes _____ No _____ Give number _____
53. Is sufficient aisle space provided? Yes _____ No _____
54. Are sufficient serving centers provided? Yes _____ No _____
55. How many individuals are required for serving on the lines? _____
56. Is the area of the main store room sufficient for the supplies received? Yes _____ No _____
57. Is enough shelf area provided in the store room?
Yes _____ No _____

58. At what temperature are the following foods held for storage?

Fresh fruits and vegetables _____

Milk and other dairy products _____

Meat and meat products _____

Tinned foods _____

Leftovers _____

59. How often are foods purchased?

	Daily	Weekly	Monthly	Occasionally
Vegetables and fruits _____				
Milk and milk products _____				
Meat and meat products _____				
Staples _____				
Canned foods _____				
Paper goods _____				
Soaps and detergents _____				
Serving equipment _____				
Baked goods _____				
Any other _____				

60. How are store room records maintained? _____

61. What is the anticipated ultimate enrollment? _____

62. What is the anticipated participation for the food center? _____

63. Is it possible to expand the planned facilities?
Yes _____ No _____
If "Yes," by how much? _____
64. What type of unit of service is planned?
Straight _____ Parallel _____
U-shaped _____ Circular _____
Broken line _____
65. What type of layout design is planned for the cooking area?
Straight line arrangement _____
Back-to-back arrangement _____
Island _____
None planned _____
66. What kinds of menus are planned? _____

A P P E N D I X B

P R O P O S E D M E N U S F O R S C H O O L L U N C H
P R O G R A M S F O R I N D I A

F I R S T W E E K ' S C Y C L E M E N U S

Hindi Version

English Version

Menu I

Stuffed Paranthas
with Soybeans

Stuffed Unleavened Bread
with Soybeans

Pudina Raita

Mint Raita

Radish Sticks

Radish Sticks

Bhuna Channa

Roasted Bengal Gram

Menu II

Pizza with Fish Flour

Pizza with Fish Flour

Nimbu Pani

Lemon Drink

Menu III

Alu Besan Roti

Bengal Gram Potato Bread

Lassi

Buttermilk

Cucumber and Carrot
Sticks

Cucumber and Carrot
Sticks

Patti

Puffed Rice and Jaggery
Sweet

Hindi VersionEnglish VersionMenu IV

Rice with Soybeans

Rice with Soybeans

Pudina Raita

Mint Raita

Alu Bhujia

Hash Brown Potatoes

Carrot and Radish Sticks

Carrot and Radish Sticks

Bhuna Channa

Roasted Bengal Gram

Menu V

Paustic Roti

Nutritious Bread

Radish and Cucumber
SticksRadish and Cucumber
Sticks

Peanut Brittle

Peanut Brittle

SECOND WEEK'S CYCLE MENUSHindi VersionEnglish VersionMenu VI

Rice with Carrot Greens
and Corn

Rice with Carrot Greens
and Corn

Plain Curd Raita

Plain Yoghurt

Gulglas

Brown Sugar Sweet

Bhuna Channa

Roasted Bengal Gram

Menu VII

Banana Coconut Bread

Banana Coconut Bread

Carrot and Cucumber
Sticks

Carrot and Cucumber
Sticks

Roasted Peanuts

Roasted Peanuts

Guava

Guava

Menu VIII

Griddle Cake Sandwich
with Peanut Filling

Griddle Cake Sandwich
with Peanut Filling

Alu Tikki

Potato Patty

Bhuna Channa with
Puffed Rice

Roasted Bengal Gram with
Puffed Rice

Hindi VersionEnglish VersionMenu IX

Pizza with Beans

Pizza with Beans

Banana

Banana

Menu X

Soyburger

Soyburger

Carrot and Cucumber
SticksCarrot and Cucumber
Sticks

Bhuna Channa

Roasted Bengal Gram

A P P E N D I X C

R E C I P E S F O R T W O - W E E K C Y C L E M E N U S

M E N U I

Stuffed Paranthas with Soybeans

Pudina Raita

Radish Sticks

Bhuna Channa

Stuffed Paranthas with Soybeans

(Seven servings with two paranthas per serving)

Whole wheat flour	480 gms.	Soybeans	113 gms.
Vanaspati	57 gms.	Onions	20 gms.
Green pepper	1 tbsp.	Salt	1 tbsp.

Cover soybeans with cold water and soak overnight.

Steam the soaked soybeans until tender. Pound the steamed soybeans until coarse in texture. Add chopped onions, green pepper, and salt. Make a stiff dough of wheat flour and water. Cover with a damp cloth and allow dough to stand for at least one hour. Roll dough and shape into small circles approximately six inches in diameter. Make two rounds for each parantha. Brush with fat and place soybean mixture (approximately two tablespoons) between the two circles of dough. Seal edges of dough and roll the parantha lightly. Cook on a hot tava (skillet) turning two or more times. Brush both sides

of parantha with oil and cook until light golden brown in color.

Pudina Raita

(Seven servings of approximately 60 grams each)

Curd	340 gms.	Water	180 gms.
Mint leaves	28 gms.	Salt	1 tbsp.

Separate mint leaves from stocks. Wash and dry the leaves. Grind to a smooth paste. Beat curd with a wooden beater until smooth. Add mint leaf paste, salt, and water. Beat for a few more minutes until smooth in texture.

MENU II

Pizza with Fish Flour

Nimbu Pani

Pizza with Fish Flour

(Seven servings)

Whole wheat flour	400 gms.	Curd	57 gms.
Fish flour	113 gms.	Yeast	7 gms.
Vanaspati	125 gms.	Cheese	57 gms.
Carrots	113 gms.	Peas, green	113 gms.
Field beans	113 gms.	Onions	1 tbsp.
Tomato paste	110 gms.	Salt	1 tbsp.
Coriander leaves	1 tbsp.	Sugar	1 tbsp.

Grate carrots and cut beans into fine strips. Place beans and peas in a pan with four tablespoons of water, and cook until tender. Add the grated carrots, salt, and one tablespoon of oil. Mix well and use for Pizza topping.

Sift whole wheat flour, fish flour, and salt together. Soak yeast and one tablespoon of sugar in four tablespoons of

lukewarm water for five minutes. Add yeast mixture and curd to flour. Add water to make a soft dough. Turn out onto a floured board and knead until smooth. Shape into a 12-inch circle, place on ungreased baking sheet, and brush with oil. Spread half the tomato paste, half the cheese, and all of the prepared vegetables on the dough. Top with remaining tomato paste and cheese. Sprinkle with coriander leaves. Bake in hot oven (425° F.) for 15-20 minutes. Cut in seven even wedges.

MENU III

Alu Besan Roti

Lassi Patti

Cucumber and Carrot Sticks

Alu Besan Roti

(Seven servings with two rotis per serving)

Whole wheat flour	240 gms.	Besan	226 gms.
Chopped onions	1 tsp.	Potatoes	454 gms.
Cooking oil	32 gms.	Salt	1 tbsp.
Chopped green pepper	1 tbsp.	Caraway seeds	1 tsp.

Boil and mash potatoes. Save potato water for kneading the bread dough. Add to the wheat flour the besan, mashed potatoes, chopped onions, chopped green pepper, salt, and caraway seeds. Use the potato water to make a stiff dough. Cover dough with a damp cloth and allow to stand for at least a half hour. Knead dough a second time until smooth. Divide the dough into 14 equal portions, and roll into circles eight inches in diameter. Brush both sides with oil and cook on hot tava. Cook until evenly browned on both sides.

Patti

(Seven servings)

Brown sugar	117 gms.	Cooking oil	25 gms.
Puffed rice	227 gms.	Water	4 tbsp.

Heat fat in a heavy pan. Add brown sugar and water. Cook on slow fire until the sugar thickens to the desired consistency (two-thread stage--a drop of hot syrup held on the end of a finger and pulled with the tip of the thumb leaves two distinct threads). Remove syrup from the fire and add the puffed rice. Mix well and pour on a greased plate immediately. Flatten to shape with the back of a wet spoon. Allow to stand for 10 minutes. Divide into seven equal size pieces. Serve when completely cold and crisp.

MENU IV

Rice with Soybeans

Pudina Raita Alu Bhujia

Carrot and Radish Sticks

Bhuna Channa

Rice with Soybeans

(Seven servings)

Rice	340 gms.	Soybeans	113 gms.
Fat	24 gms.	Salt	1½ tsp.
Caraway seeds	½ tsp		700 gms.

Cover soybeans with cold water and soak overnight. Heat fat in a pan. Add caraway seeds and brown. Add rice and soybeans. Cook for one or two minutes. Add salt and

water and cook over a slow fire until the rice and soybeans are tender and all the water is absorbed (about 10-12 minutes). Stir well before serving.

Alu Bhujia

(Seven servings)

Potatoes	454 gms.	Fat	90 gms.
Salt	1 tsp.		

Boil potatoes in jackets. Peel and cut into quarters, lengthwise. Heat fat in frying pan and fry to a golden brown color, adding a few pieces of potatoes at a time. Drain well and sprinkle with salt.

MENU V

Paustic Roti

Radish and Cucumber Sticks

Peanut Brittle

Paustic Roti

(Seven servings with three rotis per serving)

Whole wheat flour	240 gms.	Bengal gram flour	113 gms.
Potatoes	340 gms.	Turnip tops	227 gms.
Carrots	57 gms.	Cooking oil	120 gms.
Salt	1½ tsp.	Red pepper	1 tsp.
Curd	57 gms.	Coriander leaves	1 tbsp.

Boil and mash potatoes. Save potato water for making bread dough. Wash, dry, and chop turnip tops. Wash and grate carrots. Mix whole wheat flour, Bengam gram flour, mashed potatoes, chopped turnip tops, grated carrots, salt, pepper,

and the coriander leaves. Add curd and make a stiff dough with potato water. Cover with damp cloth and allow the dough to stand for at least half an hour. Knead dough a second time until smooth. Divide into 21 equal size portions and roll to one-fourth inch thickness. Cook on greased tava, brush oil on both sides while cooking. Cook evenly to golden brown color.

Peanut Brittle

(Seven servings)

Roasted peanuts	110 gms.	Cooking oil	50 gms.
Brown sugar	110 gms.	Water	4 tbsp.

Heat fat in a heavy pan. Add brown sugar and water and cook on slow fire until the sugar thickens to the two-thread stage. Remove from fire, add the roasted peanuts, and stir well. Immediately pour onto a greased plate. Flatten with the back of a wet spoon. Allow to cool for 10 minutes. Cut into seven equal size pieces. Let cool completely before separating the individual pieces.

MENU VI

Rice with Carrot Greens and Corn

Plain Curd Raita

Gulglas

Bhuna Channa

Rice with Carrot Greens and Corn

(Seven servings)

Rice	340 gms.	Dried corn	113 gms.
Carrot leaves	227 gms.	Vanaspati	10 gms.
Cumin seeds	1 tsp.	Salt	1½ tsp.
Water	600 gms.		

Cover corn with cold water and soak overnight. Wash and chop carrot leaves. Heat vanaspati in a pan, add cumin seeds, rice, corn, and carrot leaves. Cook for two to three minutes. Add salt and water. Cover and cook on slow fire until the rice and corn grains are tender and the water has evaporated.

Gulglas

(Seven servings with four pieces of gulglas per serving)

Whole wheat flour	227 gms.	Brown sugar	117 gms.
Anise seeds	½ tsp.	Vanaspati	50 gms.

Mix flour, brown sugar and anise seeds in a bowl. Add enough water to make a batter of drop consistency. Allow the batter to stand 10 minutes. Heat fat in a frying pan. When hot drop batter, a teaspoon at a time, into the frying pan. Fry until puffy and golden brown in color, six to eight balls at a time.

MENU VII

Banana Coconut Bread

Carrot and Cucumber Sticks

Roasted Peanuts

Guava

Banana Coconut Bread

(Seven servings with two slices per serving)

Whole wheat flour	170 gms.	Soy flour	113 gms.
All purpose flour	113 gms.	Brown sugar	100 gms.
Curd	57 gms.	Bananas	227 gms.
Vanaspati	100 gms.	Lemon juice	57 gms.
Fresh coconut	113 gms.	Baking powder	1 tsp.
Soda	$\frac{1}{2}$ tsp.	Salt	$\frac{1}{2}$ tsp.
Water	1 cup		

Sift together whole wheat flour, all purpose flour, soy flour, salt, soda, and baking powder. Cream vanaspati and brown sugar well. Beat curd with a wooden beater until smooth, then add one cup of water. Add dry ingredients and liquid alternately to creamed sugar and fat. Carefully blend in mashed bananas and fresh grated coconut. Pour into a greased loaf pan and bake at 350° F. for 45 minutes. Cool well before removing from pan. Cut into 14 slices for serving.

MENU VIII

Griddle Cake Sandwich with
Peanut Filling

Alu Tikki

Bhuna Channa with Puffed Rice

Griddle Cake Sandwiches with Peanut Filling

(Seven servings with two sandwiches per serving)

For griddle cakes

Whole wheat flour	170 gms.
Soy flour	113 gms.
Whole milk powder	100 gms.
Water	$\frac{3}{4}$ cup
Salt	$\frac{1}{2}$ tsp.
Vanaspati	1 tbsp.

For filling

Sweet potatoes	85 gms.
Roasted peanuts	113 gms.
Lemon juice	1 tsp.
Brown sugar	117 gms.
Butter	1 tbsp.

Sift together whole wheat flour, soy flour, and salt. Make into a pour batter consistency using the reconstituted milk. Heat flat tava and brush lightly once with fat. Pour one-fourth cup batter onto hot tava. The batter spreads into a small circle. Cook on slow flame, turn once, and cook the other side until evenly browned. Make 14 such cakes and spread the filling between two cakes. Cut into halves and serve two halves per serving.

Filling: Boil and mash sweet potatoes. Add brown sugar, lemon juice, butter, and coarsely pounded, roasted peanuts. Blend well and use as a filling between griddle cakes.

Alu Tikki

(Seven servings with two tikkis per serving)

Potatoes	454 gms.	Beet greens	57 gms.
Carrots	113 gms.	Salt	1½ tsp.
Pepper	1 tsp.	Chopped green	
Fat	100 gms.	pepper	1 tsp.
Coriander leaves	1 tsp. (optional)		

Boil and mash potatoes. Wash and finely cut beet greens. Grate carrots. Mix all the ingredients except fat in a mixing bowl and blend well. Divide the mixture into 14 portions and shape each into a patty. Shallow fry each until a light golden brown in color.

MENU XI

Pizza with Beans

Banana

Pizza with Beans

(Seven servings)

All purpose flour	200 gms.	Whole wheat flour	240 gms.
Soy flour	113 gms.	Yeast	28 gms.
Sugar	1 tbsp.	Field beans	100 gms.
Vanaspati	57 gms.	Onions	57 gms.
Tomato puree	100 gms.	Whole milk powder	100 gms.
Cottage cheese	100 gms.	Water	1 cup
Salt	1 tsp.	Pepper	½ tsp.
Coriander leaves, dry	½ tsp.		

Soak beans overnight in enough water to cover. Heat one tablespoon fat in a pan, add finely chopped onions and fry until golden brown in color. Add salt, pepper, and a half cup of water. Cook on slow flame until all the water is absorbed and the beans are tender. Use for pizza topping.

Sift together all purpose flour, whole wheat flour, and soy flour. Soak yeast in lukewarm water with one tablespoon of sugar for five minutes. Reconstitute powdered milk with one cup water. Add yeast, reconstituted milk, and curd to the sifted flour and make a soft dough. Turn onto a lightly floured board and knead for one to two minutes. Shape dough into a ball and roll into a circle about 12 inches in diameter. Place on ungreased baking sheet. Brush dough with oil. Spread half the tomato paste evenly over dough. Spread cottage cheese over tomato paste, add the cooked beans, and top with the remaining tomato paste. Sprinkle with the dried coriander and bake in oven at 425° F. for 15-20 minutes. Cut in seven even wedges.

MENU X

Soyburger

Carrot and Cucumber Sticks

Bhuna Channa

Soyburger

(Seven servings)

Soybeans, sprouted	113 gms.	Potatoes	454 gms.
Chopped onions	57 gms.	Salt	1½ tsp.
Vanaspati	114 gms.	Pepper	1 tsp.
Green pepper, chopped	1 tsp.	Amchoor	½ tsp.
Coriander	1 tsp.	Buns	7

Boil and mash potatoes. Coarsely pound the sprouted soybeans and add to the mashed potatoes. Add chopped onions, green pepper, salt, pepper, and amchoor powder. Mix all the ingredients well. Divide the mixture into seven portions. Shape each portion into a patty. Shallow fry in a pan or on a tava until evenly browned on both sides. Cut buns in half and place the prepared patty between the two halves. Secure the two halves of the bun with a toothpick.

A P P E N D I X D

C A L C U L A T I O N S O F N U T R I T I V E
V A L U E S O F T H E P R O P O S E D
T W O - W E E K C Y C L E M E N U S

TABLE II

CALCULATED CONTRIBUTION OF MENU I TO THE INTAKE OF FOOD
ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu I	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Whole wheat flour	480	1639	58.1	8.2	333.0
Soybeans	113	488	48.8	22.0	23.6
Fat (vanaspati)	114	1026	-	114.0	-
Curd	340	204	10.5	13.6	10.2
Radishes	340	58	2.4	0.3	11.6
Mint leaves	28	13	1.3	0.2	1.6
Total (seven servings)		3428	121.1	158.3	380.0
One serving		490	17.3	22.6	54.3
Tomato	100	20	0.9	0.2	3.6
Bengal gram, roasted	25	92	5.6	1.3	14.5
Total for one serving		602	23.8	24.1	72.4

TABLE III

CALCULATED CONTRIBUTION OF MENU II TO THE INTAKE OF FOOD
ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu II	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Whole wheat flour	400	1364	48.4	6.8	277.6
Curd	57	34	1.8	2.3	1.7
Fat (vanaspati)	125	1125	-	125.0	-
Yeast	7	24	2.5	-	3.2
Brown sugar	28	107	0.1	-	26.6
Fish flour	113	417	101.0	1.4	-
Cheese	57	198	13.7	14.2	6.9
Carrots	113	54	1.0	0.2	12.0
Field beans	113	54	4.3	0.8	7.6
Peas	113	105	8.1	0.1	18.0
Total (seven servings)		3482	180.9	150.8	353.6
One serving		497	25.8	21.5	50.5
Jaggery	25	96	0.1	-	23.7
Lemon juice	25	14	-	0.2	2.7
Total for one serving		607	25.9	21.7	76.9

TABLE IV

CALCULATED CONTRIBUTION OF MENU III TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu III	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Whole wheat flour	240	818	29.0	4.1	166.6
Besan (chickpea flour)	226	814	38.6	12.0	137.6
Potatoes	454	440	7.3	0.5	102.6
Curd	227	136	7.0	9.1	6.8
Cooking oil	57	513	-	57.0	-
Brown sugar	117	448	4.7	0.1	111.1
Puffed rice	227	738	17.0	0.2	167.1
Cucumbers	227	30	9.1	0.3	5.7
Carrots	227	109	2.0	0.5	24.1
Total (seven servings)		4046	114.7	83.8	721.6
Total for one serving		578	16.4	12.0	103.1

TABLE V

CALCULATED CONTRIBUTION OF MENU IV TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu IV	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Rice (parboiled, milled)	340	1173	23.1	1.7	265.9
Soybeans	113	488	48.8	22.0	23.6
Potatoes	454	440	7.3	0.5	102.6
Curd	340	204	10.5	13.6	10.2
Mint leaves	28	13	1.3	0.2	1.6
Radishes	340	58	2.4	0.3	11.6
Carrots	227	109	2.0	0.5	24.1
Fat (vanaspati)	114	1026	-	114.0	-
Total (seven servings)		3511	95.4	152.8	439.6
One serving		501	13.6	21.8	62.8
Bengal gram, roasted	25	92	5.6	1.3	14.5
Total for one serving		593	19.2	23.1	77.3

TABLE VI

CALCULATED CONTRIBUTION OF MENU V TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu V	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Whole wheat flour	240	818	29.0	4.1	166.6
Bengal gram flour	113	407	19.3	6.0	68.8
Turnip tops	227	252	9.1	3.4	21.3
Carrots	57	27	0.5	0.1	6.0
Cooking oil	120	1080	-	120.0	-
Curd	57	34	1.8	2.3	1.7
Potatoes	340	330	5.4	0.3	76.8
Cucumbers	227	30	9.1	0.3	5.7
Radishes	340	58	2.4	0.3	11.6
Total (seven servings)		3036	76.6	136.8	358.5
One serving		434	10.9	19.5	51.2
Jaggery	15	57	0.6	-	14.2
Peanuts	15	84	4.7	6.0	2.9
Total for one serving		575	16.2	25.5	68.3

TABLE VII

CALCULATED CONTRIBUTION OF MENU VI TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu VI	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Rice (parboiled, milled)	340	1173	23.1	1.7	265.9
Carrot leaves	227	174	11.6	1.1	29.7
Corn, dry	113	386	12.5	4.1	74.8
Whole wheat flour	227	774	27.5	3.9	157.5
Brown sugar	117	448	4.7	0.1	111.1
Fat (vanaspati)	57	513	-	57.0	-
Curd	340	204	10.5	13.6	10.2
Total (seven servings)		3672	89.9	81.5	649.2
One serving		525	12.8	11.6	92.7
Bengal gram, roasted	25	92	5.6	1.3	14.5
Total for one serving		617	18.4	12.9	107.2

TABLE VIII

CALCULATED CONTRIBUTION OF MENU VII TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu VII	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Whole wheat flour	170	580	20.6	2.9	118.0
Soy flour	113	488	44.8	22.0	23.6
All purpose flour	113	393	12.4	1.0	83.5
Brown sugar	100	383	0.4	-	95.0
Curd	57	34	1.8	2.3	1.7
Fat (vanaspati)	100	900	-	100.0	-
Bananas	227	275	2.0	1.1	64.2
Fresh coconut	113	46	1.0	1.6	7.1
Lemon juice	57	32	0.6	0.5	6.3
Carrots	227	109	2.0	0.5	24.1
Cucumbers	227	30	0.9	0.3	5.7
Total (seven servings)		3270	86.5	132.2	429.2
One serving		467	12.4	18.9	61.3
Bengal gram, roasted	25	92	5.6	1.3	14.5
Guava	25	13	0.2	0.1	2.8
Total for one serving		572	18.2	20.3	78.6

TABLE IX

CALCULATED CONTRIBUTION OF MENU VIII TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu VIII	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Whole wheat flour	170	580	20.6	2.9	118.0
Soy flour	113	488	48.8	22.0	23.6
Brown sugar	117	448	4.7	0.1	111.1
Fat (vanaspati)	100	900	-	100.0	-
Sweet potatoes	85	102	1.0	0.3	24.0
Milk	100	117	4.3	8.8	5.1
Peanuts, roasted	113	634	35.6	45.0	21.8
Potatoes	454	440	7.3	0.5	102.6
Beet greens	57	26	1.9	0.5	3.7
Carrots	113	54	1.0	0.2	12.0
Total (seven servings)		3789	125.2	180.3	421.9
One serving		541	17.9	25.8	60.3
Puffed rice	25	32	0.7	-	7.4
Bengal gram, roasted	5	18	1.1	0.3	2.9
Total for one serving		591	19.7	26.1	70.6

TABLE X

CALCULATED CONTRIBUTION OF MENU IX TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu IX	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Soybeans, sprouted	113	448	48.8	22.0	23.6
Potatoes	454	440	7.3	0.5	102.6
Onions	57	28	0.7	-	6.3
Fat (vanaspati)	114	1026	-	114.0	-
Carrots	227	109	2.0	0.5	24.1
Cucumbers	227	30	9.1	0.3	5.7
Total (seven servings)		2081	67.9	137.3	162.3
One serving		297	9.7	19.6	23.2
Hamburger bun		150	5.0	2.0	30.0
Bengal gram, roasted	25	92	5.6	1.3	14.5
Skim milk (powder)	25	89	9.5	-	12.7
Total for one serving		628	29.8	22.9	80.4

TABLE XI

CALCULATED CONTRIBUTION OF MENU X TO THE INTAKE OF
FOOD ENERGY, PROTEIN, FAT, AND CARBOHYDRATE

Menu X	Weight (g.)	Food Energy (cal.)	Protein (g.)	Fats (g.)	Carbohy- drates (g.)
Whole wheat flour	240	818	29.0	4.1	166.6
Soy flour	113	488	48.8	22.0	23.6
Curd	57	34	1.8	2.3	1.7
Yeast	28	96	10.0	0.5	13.0
Fat (vanaspati)	57	513	-	57.0	-
Field beans	100	48	3.8	0.7	6.7
Tomatoes	100	20	0.9	0.2	3.6
Onions	57	28	0.7	-	6.3
Cottage cheese	57	166	7.6	13.1	4.5
Whole milk (powder)	100	496	25.8	26.7	38.0
All purpose flour	200	696	22.0	1.8	147.8
Total (seven servings)		3403	150.4	128.4	411.8
One serving		486	21.5	18.3	58.8
Banana	one medium	121	0.9	0.5	28.3
Total for one serving		607	22.4	18.8	87.1

TABLE XII

CALCULATED CONTRIBUTION OF MENU I TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu I	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Whole wheat flour	480	55.2	230	235	-	2.35	1.40	20.60
Soybeans	113	13.0	271	802	-	0.82	0.86	2.71
Fat (vanaspati)	114	-	-	2850	-	-	-	-
Curd	340	1.0	507	347	3	0.17	0.54	0.34
Radishes	340	1.4	170	17	51	0.20	0.07	1.70
Mint leaves	28	4.4	56	756	8	0.01	0.02	1.10
Total (seven servings)		75.0	1234	5007	62	3.55	2.89	26.45
One serving		10.7	176	715	9	0.51	0.41	3.78
Tomato	100	0.4	48	585	27	0.12	0.06	0.40
Bengal gram, roasted	25	2.4	14	47	-	0.05	0.12	0.32
Total for one serving		13.5	238	1347	36	0.68	0.59	4.50

TABLE XIII

CALCULATED CONTRIBUTION OF MENU II TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu II	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Whole wheat flour	400	46.0	192	196	-	1.96	1.16	17.20
Curd	57	0.2	84	59	1	0.03	0.09	0.06
Fat (vanaspati)	125	-	-	3125	-	-	-	-
Yeast	7	1.5	11	-	-	0.22	-	1.89
Brown sugar	28	3.2	22	-	-	0.01	-	0.28
Fish flour	113	24.6	125	-	-	0.11	0.10	5.88
Cheese	57	1.2	405	156	-	-	-	-
Carrots	113	2.5	90	3560	3	0.05	0.02	0.68
Field beans	113	1.7	237	353	10	0.11	0.07	0.79
Peas	113	1.7	23	157	10	0.28	0.01	0.90
Total (seven servings)		82.6	1189	7605	24	2.77	1.45	27.68
One serving		11.8	170	1086	3	0.40	0.21	3.95
Jaggery	25	2.8	20	-	-	-	-	0.25
Lemon juice	25	0.6	-	-	10	-	-	-
Total for one serving		15.2	190	1086	13	0.40	0.21	4.20

TABLE XIV

CALCULATED CONTRIBUTION OF MENU III TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu III	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Riboflavin (mg.)	Niacin (mg.)
Whole wheat flour	240	27.6	115	118	-	1.18	0.70	10.30
Besan (chickpea flour)	226	23.1	456	714	7	0.69	1.17	4.80
Potatoes	454	3.2	45	182	77	0.45	0.05	5.45
Curd	227	0.7	338	232	2	0.11	0.36	0.22
Cooking oil	57	-	-	-	-	-	-	-
Brown sugar	117	13.3	94	-	-	0.02	-	1.17
Puffed rice	227	15.0	52	-	-	0.47	0.27	9.30
Cucumbers	227	3.4	23	-	16	0.07	0.02	0.45
Carrots	227	5.0	182	7150	7	0.09	0.05	1.36
Total (seven servings)		91.3	1305	8396	109	3.08	2.62	33.05
Total for one serving		13.0	186	1199	16	0.44	0.37	4.72

TABLE XV

CALCULATED CONTRIBUTION OF MENU IV TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu IV	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Rice (parboiled, milled)	340	10.5	34	-	-	0.20	0.20	6.46
Soybeans	113	13.0	271	802	-	0.82	0.86	2.71
Potatoes	454	3.2	45	182	77	0.45	0.05	5.45
Curd	340	1.0	507	347	3	0.17	0.54	0.34
Mint leaves	28	4.4	56	756	8	0.01	0.02	1.10
Radishes	340	1.4	170	17	51	0.20	0.07	1.70
Carrots	227	5.0	182	7150	7	0.09	0.05	1.36
Fat (vanaspati)	114	-	-	2850	-	-	-	-
Total (seven servings)		38.5	1265	12104	146	1.94	1.79	19.12
One serving		5.5	181	1729	21	0.28	0.26	2.73
Bengal gram, roasted	25	2.4	14	47	-	0.05	0.12	0.32
Total for one serving		7.9	195	1776	21	0.33	0.38	3.05

TABLE XVI

CALCULATED CONTRIBUTION OF MENU V TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu V	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Whole wheat flour	240	27.6	115	118	-	1.18	0.70	10.30
Bengal gram flour	113	11.5	228	357	3	0.34	0.58	2.40
Turnip tops	227	64.5	1612	35448	409	0.70	1.29	12.26
Carrots	57	1.3	46	1796	2	0.02	0.01	0.34
Cooking oil	120	-	-	-	-	-	-	-
Curd	57	0.2	85	58	1	0.03	0.09	0.06
Potatoes	340	2.4	34	136	58	0.34	0.03	4.08
Cucumbers	227	3.4	23	-	16	0.07	0.02	0.45
Radishes	340	1.4	170	17	51	0.20	0.07	1.70
Total (seven servings)		112.3	2313	37929	540	2.88	2.79	31.59
One serving		16.0	330	5418	77	0.41	0.40	4.51
Jaggery	15	1.7	12	-	-	-	-	-
Peanuts	15	-	8	-	-	0.01	0.01	1.65
Total for one serving		17.7	350	5418	77	0.42	0.41	6.16

TABLE XVII

CALCULATED CONTRIBUTION OF MENU VI TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu VI	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Rice (parboiled, milled)	340	10.5	34	-	-	0.20	0.20	6.46
Carrot leaves	227	20.2	772	21565	179	0.09	0.45	1.14
Corn, dry	113	2.3	11	170	-	0.47	0.13	1.58
Whole wheat flour	227	26.1	109	111	-	1.11	0.66	9.76
Brown sugar	117	13.3	94	-	-	0.02	-	1.17
Fat (vanaspati)	57	-	-	1425	-	-	-	-
Curd	340	1.0	507	347	3	0.17	0.54	0.34
Total (seven servings)		73.4	1527	23618	182	2.06	1.98	20.45
One serving		10.5	218	3374	26	0.29	0.28	2.92
Bengal gram, roasted	25	2.4	14	47	-	0.05	0.12	0.32
Total for one serving		12.9	232	3421	26	0.34	0.40	3.24

TABLE XVIII

CALCULATED CONTRIBUTION OF MENU VII TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu VII	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Whole wheat flour	170	19.6	82	83	-	0.83	0.49	7.31
Soy flour	113	13.0	271	802	-	0.82	0.86	2.71
All purpose flour	113	2.8	26	49	-	0.14	0.08	1.02
Brown sugar	100	11.4	80	-	-	0.02	-	1.00
Curd	57	-	85	58	1	0.03	0.09	0.06
Fat (vanaspati)	100	-	-	2500	-	-	-	-
Bananas	227	4.8	52	182	18	0.11	0.02	1.36
Fresh coconut	113	1.0	11	-	2	-	-	-
Lemon juice	57	1.3	40	-	22	0.01	0.01	0.06
Carrots	227	5.0	182	7150	7	0.09	0.05	1.36
Cucumbers	227	3.4	23	-	16	0.07	0.02	0.45
Total (seven servings)		62.3	852	10824	66	2.12	1.62	15.33
One serving		8.9	122	1546	9	0.30	0.23	2.19
Bengal gram, roasted	25	2.4	14	47	-	0.05	0.12	0.32
Guava	25	0.3	3	-	53	0.01	0.01	0.10
Total for one serving		11.6	139	1593	62	0.36	0.36	2.61

TABLE XIX

CALCULATED CONTRIBUTION OF MENU VIII TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu VIII	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Whole wheat flour	170	19.6	82	83	-	0.83	0.49	7.31
Soy flour	113	13.0	271	802	-	0.82	0.86	2.71
Brown sugar	117	13.3	94	-	-	0.02	-	1.17
Fat (vanaspati)	100	-	-	2500	-	-	-	-
Sweet potatoes	85	0.7	17	8	20	0.07	0.03	0.60
Milk	100	0.2	210	160	1	0.04	0.10	0.10
Peanuts, roasted	113	0.3	56	-	-	0.07	0.09	1.24
Potatoes	454	3.2	45	182	77	0.45	0.05	5.45
Beet greens	57	9.2	217	5569	40	0.15	0.32	1.88
Carrots	113	2.5	90	3559	3	0.05	0.02	0.68
Total (seven servings)		62.0	1082	12863	141	2.50	1.96	21.14
One serving		8.9	155	1838	20	0.36	0.28	3.02
Puffed rice	25	0.7	2	-	-	0.02	0.01	0.41
Bengal gram, roasted	5	0.5	3	9	-	0.01	0.02	0.06
Total for one serving		10.1	160	1847	20	0.39	0.31	3.49

TABLE XX

CALCULATED CONTRIBUTION OF MENU IX TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu IX	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid. (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Soybeans, sprouted	113	13.0	271	802	-	0.82	0.86	2.71
Potatoes	454	3.2	45	182	77	0.45	0.05	5.45
Onions	57	0.4	103	-	6	0.05	0.01	0.23
Fat (vanaspati)	114	-	-	2850	-	-	-	0
Carrots	227	5.0	182	7150	7	0.09	0.05	1.36
Cucumbers	227	3.4	23	-	16	0.07	0.02	0.45
Total (seven servings)		25.0	624	10984	106	1.48	0.99	10.20
One serving		3.6	89	1569	15	0.21	0.14	1.46
Hamburger bun		1.2	24	-	-	0.13	0.12	1.40
Bengal gram, roasted	25	2.4	14	47	-	0.05	0.12	0.32
Skim milk (powder)	25	0.3	342	-	1	0.11	0.41	0.25
Total for one serving		7.5	469	1616	16	0.50	0.79	3.43

TABLE XXI

CALCULATED CONTRIBUTION OF MENU X TO THE INTAKE OF
SELECTED MINERALS AND VITAMINS

Menu X	Weight (g.)	Iron (mg.)	Calcium (mg.)	Vitamin A (I.U.)	Ascorbic Acid (mg.)	Thiamine (mg.)	Ribo- flavin (mg.)	Niacin (mg.)
Whole wheat flour	240	27.6	115	118	-	1.18	0.70	10.30
Soy flour	113	13.0	271	802	-	0.82	0.86	2.71
Curd	57	0.2	85	58	1	0.03	0.09	0.06
Yeast	28	6.0	45	-	-	0.89	-	7.56
Fat (vanaspati)	57	-	-	1425	-	-	-	-
Field beans	100	1.7	210	312	9	0.11	0.07	0.79
Tomatoes	100	0.4	48	585	27	0.12	0.06	0.40
Onions	57	0.4	103	-	6	0.05	0.01	0.23
Cottage cheese	57	-	119	209	2	0.04	0.01	-
Whole milk (powder)	100	0.6	950	1400	4	0.31	1.36	0.80
All purpose flour	200	5.0	46	86	-	0.24	0.14	1.80
Total (seven servings)		54.9	1992	4995	49	3.79	3.30	24.65
One serving		7.8	285	713	7	0.54	0.47	3.52
Banana	one med.	2.1	23	80	8	0.05	0.01	0.60
Total for one serving		9.9	308	793	15	0.59	0.48	4.12

A P P E N D I X E

M E N U P L A N N I N G G U I D E F O R S C H O O L L U N C H P R O G R A M S I N I N D I A

The goal of every school lunch program should be to serve nutritionally adequate, wholesome, and inexpensive lunches. The menus planned should indicate not only the amounts and the kinds of foods to be prepared but also the size of the portions to be served to the children. However, the quality of the lunches actually served depends to some degree upon the knowledge, ability, and judgment of the individual in charge of a given school in using these menus to plan food combinations that are acceptable to the children. Menu planning for the school lunches has two major goals to fulfill:

1. To provide well-prepared, nutritious lunches at a minimum cost.
2. To help children, with the aid of parents and teachers, to eat nutritionally adequate meals and to accept the different types of foods presented.

Menu planning is an important tool in the hands of the school lunchroom supervisors. The type of menus planned is one of the deciding factors in determining the degree of

success of the operation. A good school lunch program provides:

1. A guide for evaluating the nutritional adequacy of the food served.
2. A means of educating the children by exposing them to new and attractive foods, and thus helping to change food habits.
3. A method of controlling food cost and minimizing food waste.
4. A guide for selecting employees, equipment, and other physical facilities that may be required in operating the program.

THE TYPE I LUNCH

The nutritional goal of the school lunch is to provide at least one-third of the daily Recommended Dietary Allowances of the Indian Council of Medical Research, India, for children of different age groups. The kinds and the amounts of foods included in the Type I pattern are selected on the basis of the recommended allowances for boys and girls of the age group seven to nine years.

The Type I pattern has been developed to help in making wise choices from the five food groups proposed by the author. These food groups are suggested for use as a daily

guide in planning to meet one-third of the day's nutritional requirements. The proposed five food groups are:

1. Pulses, legumes, beans, soybeans, and nuts;
2. Whole wheat bread, rice, cereals, and sugars;
3. Fruits and vegetables including green and yellow;
4. Fats and fortified oils; and
5. Milk and milk products.

PLANNING MENUS

Well-balanced and nutritionally adequate menus for children should include one or two servings of food from each of the five food groups proposed by the author. The following six steps will provide a basis for selecting suitable combinations and for adding variety to the proposed menus.

Step I - Select a food that is a good source of protein or a combination of foods that complement and/or enhance the protein value. Foods rich in proteins should be included as the main dish. These foods may be used either alone or in combination with other foods. The same food should not be counted as providing more than one category of nutrients, e.g., beans should not be counted both as a protein source and as a vegetable in the same menu.

Step II - Choose vegetables or fruits to supplement the nutritive value of the main dish. In addition, the selected combinations should be colorful and provide contrast in flavor and texture. Vegetables should be served raw when possible. If cooked, the method of cooking should be such that the maximum amount of nutrients, color, and texture are preserved. Vegetables should be prepared with a minimum amount of water and cooked only until barely tender. Any excess cooking water should be saved and used in preparing gravies and bread doughs. Overcooked vegetables lose part of their nutritive value as well as their eye appeal. Vegetables may be used in salads or as part of the main dish.

Step III - Include one or more servings of unleavened, whole wheat bread or a serving of rice, bread, or a bun each meal.

Step IV - Include at least two teaspoons of fortified cooking oil per person in preparing each menu.

Step V - Include milk, buttermilk, cheese, or curd in the menus at least two to three times a

week. Milk or buttermilk may be used either as a beverage or incorporated in cooked products.

Step VI - Add a sweet or some roasted nuts to compensate for any nutritional deficiency in a particular menu. Gur, roasted peanuts, Bengal gram, and puffed rice may be used for this purpose.

Planning menus for one or more weeks at a time will help to insure variety in the menus, ease in balancing the nutritive value, economy in purchasing, and effective use of physical facilities and employee work time. To plan weekly menus, the Type I pattern should be used as a guide. The following order of food selection is recommended in planning meals:

1. Plan protein-rich main dishes for the entire period of the menu cycle.

Select a different main dish for each day.

Include different combinations of protein-rich foods in each menu.

Vary the method of cooking or serving a particular food item during the menu cycle.

2. Select the vegetables or fruits to be served.

Select vegetables that are in season and combine well with each other and with the main dish.

Serve more raw than cooked vegetables. Care in cooking and handling insures maximum retention of nutrients and preserves quality. Include locally available and inexpensive fruits when possible.

3. Select a variety of breads.

Use whole wheat flour for making unleavened Indian breads.

Plan to include other cereal flours such as soybean, peanut, Bengal gram, ragi, and millet to add variety and to supplement the nutritive value of the staple flour.

Use non-cereal foods in combination with basic whole wheat flour for added nutritive value. Chopped greens and root vegetable tops, onions, and nuts may be added to the bread dough.

4. Include milk and milk products.

Include milk or milk products as frequently as the budget permits.

5. Add a sweet or roasted nuts.

When an additional food item is required to supplement the nutritive value, use gur or nuts, or a sweet food item prepared with a combination of these foods.

A P P E N D I X F

T R A I N I N G M A N U A L S F O R F O O D

S E R V I C E S U P E R V I S O R S

G U I D E L I N E S F O R P L A N N I N G T H E T R A I N I N G P R O G R A M

F O R F O O D S E R V I C E S U P E R V I S O R S

The success of any program, and the school lunch program in particular, depends upon the initiation of an adequate training program for those individuals responsible for the conduct of the program. To insure maximum benefits from any training program the overall objectives should be clearly defined. The main objectives of such a training program should include the following:

1. To develop the overall plans for a training program for food service supervisors.
2. To provide training adequate for the selected candidates to assume the responsibility of a dietary supervisor in the various school lunch programs.
3. To provide experiences that will enable the candidates to assist with the various

administrative and supervisory duties involved in school lunch programs.

4. To develop an awareness of the importance of standards for quality, sanitation, and efficiency.

Guidelines for the organization and establishment of a training course for food service supervisors include the selection and appointment of various committees. The functions and objectives of these committees are outlined below:

1. Membership committee. This committee should be composed of representatives of the various community groups who recognize the need of a training program for food service supervisors. The committee members may include representatives of government hospitals, public health and welfare departments, private nursing homes, and college or university food service departments.

This committee assumes the responsibility for initiating, organizing, and providing the training program. The committee should also be responsible for obtaining the necessary approval and recognition from public and government authorities employing the food service supervisors following the training period.

2. Policy committee. The membership of this committee should include individuals from public and

government institutions, including the home economic department of the universities. These should be individuals who are qualified to determine guidelines for such a program.

One of the duties of the policy committee is to establish rules and regulations for organizing and developing the training program. In addition, this committee should formulate criteria for the selection of a co-ordinator who would be responsible for implementing the policies established by the committee. The individual selected as a co-ordinator should be responsible for the coordination of the membership, advisory, administrative, and curriculum committees. The policy committee, with the assistance of the co-ordinator, should select and appoint the advisory committee.

The responsibilities of the co-ordinator would involve assistance in the coordination of the work of the various committees. The responsibilities of this individual should include the following: creating public consciousness regarding the importance of training food service supervisors; keeping in close contact with persons in institutions who are likely to employ trained food service supervisors; and working towards gaining status and approval for the training

program. The co-ordinator should also be responsible for selecting an auxiliary committee to assist with the work of the policy committee.

3. Advisory committee. This committee may consist of representatives from among the following organizations: hospital associations, health and welfare departments, nutrition societies, home economics associations, extension and community development departments of the government, education departments (all levels), and child welfare departments. The Indian Standards Institution (ISI), responsible for inspection and quality control, may have a representation on the advisory committee. Likewise the women's organizations involved in voluntary social and rehabilitation work should be among the representatives on the advisory committee.
4. Administrative committee. This committee has an overall responsibility for determining the objectives of the course; formulating criteria for the selection of students; developing course outlines; selecting institutions and departments for conducting the required courses; selecting personnel for teaching the various courses; and planning orientation and evaluation programs. This committee also assumes responsibility for serving as

a placement agency for the trained food service supervisors and presents certificates and diplomas to the students upon completion of the course.

5. Recruitment committee. The committee for the recruitment of students would invite and process applications, interview applicants, conduct aptitude or similar tests, evaluate and select the applicants, and notify the individuals chosen for the training course.
6. Curriculum committee. This committee should be responsible for the following: the selection of units or courses of study; decisions as to the amount of time to be allotted to each unit of instruction; the selection of books and teaching materials; and the location of adequate facilities for the training program.

QUALIFICATIONS FOR STAFF MEMBERS

FOR THE TRAINING PROGRAM

A desired qualification for members of the teaching staff is a master's degree in Institutional Management or a related field. A sound knowledge of food and nutrition is also recommended. The instructors should have experience in different phases of institutional food service, including supervision and training of employees. Some teaching

experience at the graduate level is desirable. In addition to the regular teaching staff or instructors, some resource individuals from various community groups and organizations may be invited to participate in the program. These resource individuals may include dietitians, hospital administrators, personnel directors, public health personnel, representatives of food and equipment industries, and research workers.

FACILITIES AND EQUIPMENT

Certain physical facilities and equipment are essential to implement the training program. These include provision for classroom facilities for lectures and discussions, laboratory facilities for practical work, provision for audio-visual materials, and access to a reference library. In addition, opportunities should be provided for field work.

TRAINING MANUAL FOR FOOD SERVICE SUPERVISORS

PART I. OVERALL PLAN

FOR TRAINING PROGRAM

Training is a major manpower function and is a line responsibility, conducted at various levels of organization and with different degrees of complexity. Because of the dynamic nature of work organization, training is a continuous process. Training provides one of the best problem solving devices in any type of organizational structure. However, before any training is initiated or a program for training outlined, there must be recognition of the need for such a program. The need should be defined in the form of specific problems for which the training is to be planned. These problems may be the ones that currently exist or may be ones anticipated in the future.

Training depends upon and is closely related to the following factors: job requirements, selection of workers, and evaluation of programs and other employment procedures. Therefore, the training goals should be specifically listed in order to determine the kind and amount of training to be provided and the type of training programs to be developed.

To determine the need for training, one must carefully analyze job requirements and evaluate the potentiality of the individuals to be trained. A simple formula to determine the training need is given by Sandell (88). According to this author, "Training equals job requirements minus the individuals' present skills." Training therefore requires an analysis of the job to be performed as well as an analysis of the individual's abilities. It is difficult to evaluate the individual's capacity for a given job and to provide the individual training needed. However, training can be categorized using similar groups of jobs and/or groups of similar employees.

The individuals responsible for supervision of the training program need certain characteristics. It is one thing to be effective in doing a job yourself and quite another to know how to develop the ability of someone else to do a similar job. Therefore, in order to be effective a supervisory instructor needs training in teaching methods. In addition, skills in instructional teaching are needed if one is to obtain the best results from those under his training and supervision. To train efficient and capable instructors, the training program should provide for the maximum amount of training in a minimum period of time. Trainees should be conscious of their responsibilities and be prepared to assume these responsibilities. To increase efficiency, adequate skills and techniques should be developed.

Two goals of the training program are to improve the overall efficiency of each employee and to insure greater job satisfaction. Another goal of the training program is to provide a better work force for institutions employing the trainees. The training program should help to minimize employee turnover. In addition, the training program should assist in building good morale and create a healthy team spirit among the employees.

For effective implementation and good results, every training program must be carefully planned. The training plan can be divided into two parts, the pre-training period and the actual training period. Planning for training begins before the actual program starts. A graphic presentation of the plan for the proposed training program may be found in Figure 10.

Training is the responsibility of management, and should be arranged for and supported by the management. For implementation of any training program certain decisions should be made. An outline of the areas in which decisions need to be made and the type of decisions to be made follows:

1. Training Policies.

- Basic objectives for the training program.

- The relative priorities for each objective.

- Ways to implement the training program.

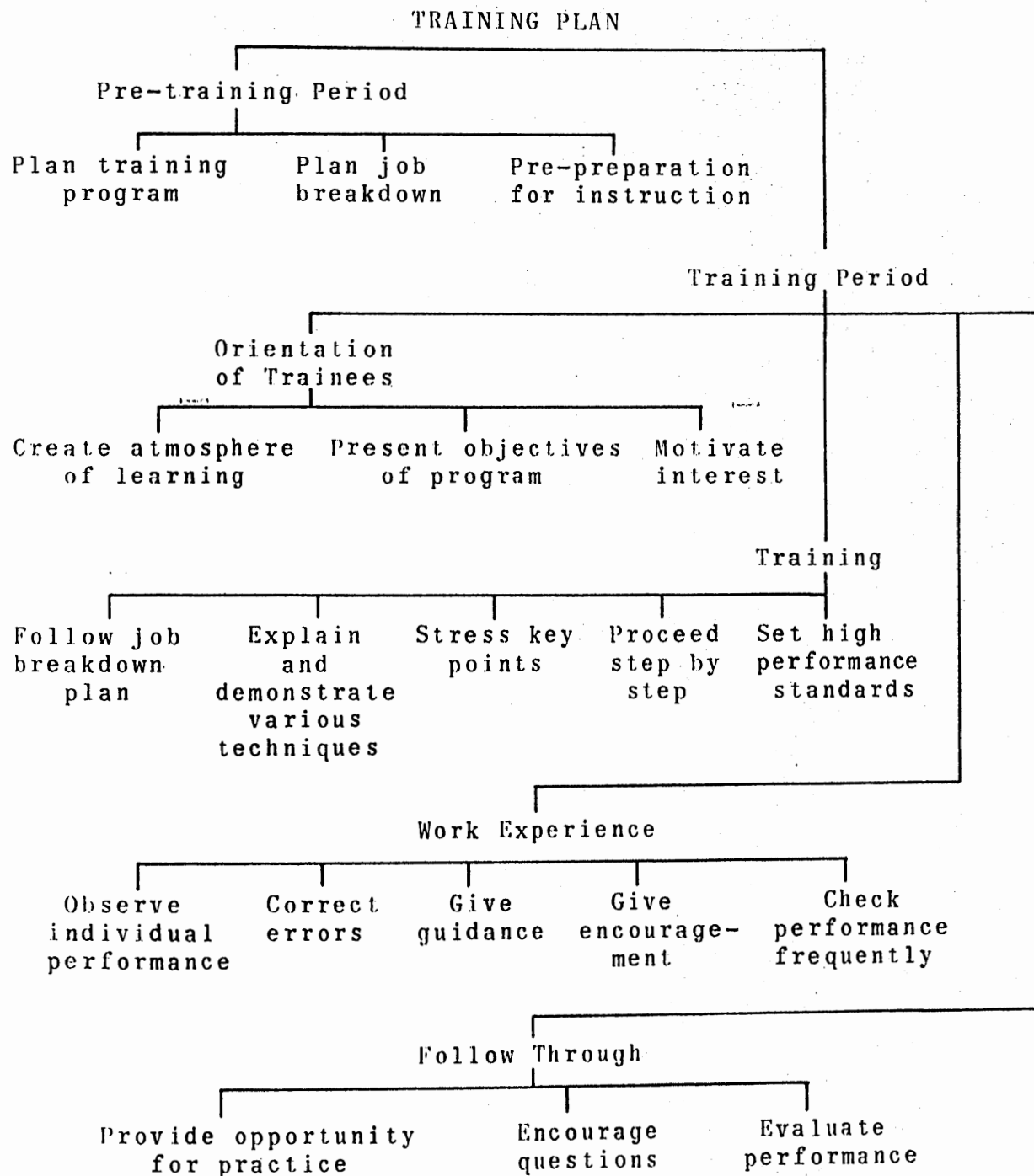


FIGURE 10

GRAPHIC PRESENTATION OF THE OVERALL PLAN FOR PROPOSED
TRAINING PROGRAM FOR FOOD SERVICE SUPERVISORS

2. Type of Training.

Who will be trained?

What will be taught?

How much training will be required?

Where will the training be given?

When should the training commence?

3. Training Principles.

Types of motivation to stimulate the
trainees.

How to relate teaching to the process of
learning.

The types of activities to be planned.

How to reinforce training and evaluate
achievement.

4. Training Methods.

How to organize on-the-job training.

What apprenticeship programs are to be
offered?

Shall special tutoring be provided?

What areas should be covered by programmed
instruction?

How should job rotation be utilized in
training?

What areas should be covered by organized
group programs?

What opportunities shall be provided for off campus observations?

How shall supervisory training through conferences with the trainee be provided?

Learning is one of the most important aspects of any program. The broad principles of learning provide the supervisor with a valuable insight into the area of personnel management, whether it be on-the-job training, group training, or individual instruction. These learning principles are:

1. Motivation. Learning and motivation are closely related. No matter how good the instruction, the desired results cannot be obtained unless there is conscious cooperation and a favorable attitude from the employees. Motivation is different for each individual and may be influenced by factors such as age, sex, marital status, and racial or social background. Knowledge of these factors on the part of the supervisor is basic to effective instruction. In other words, a good instructor should know the individuals who are to be instructed.
2. Reinforcement. Individuals learn best when they can see themselves approaching their goals. The feeling of doing better than before the training started is very important if the learning process

is to continue. This continuation of motivation is termed "reinforcement" by psychologists.

3. Individual differences. Recognition of individual differences is very important in the process of imparting instruction. Individual differences prevent uniformity in learning and teaching. If only one individual is to be taught, the teaching can be adapted to his learning ability, but in a group situation, the speed of the program must be suited to the group as a whole. The fast learners can, however, be challenged and motivated by special projects assigned to them as an individual or as a part of a small group.
4. Learning by doing. The speed of learning increases when individuals actually become involved in the process. The use of visual aids helps in the teaching-learning process, but relying on one type of teaching material to the exclusion of others is not satisfactory. Learning by doing, especially when someone is present to help correct mistakes, is a far better method and the resulting learning is more lasting.
5. Learning units. Learning is better when imparted in doses small enough to be assimilated by individuals. Learning in small units of varying

complexity and in the proper sequence ultimately results in a unified whole. Therefore, the learning units should be planned in a logical sequence and involve steps from the simple to the complex. There is no hard and fast rule as to the optimal size of a learning unit. Unit size depends upon factors such as the complexity of the task, the learners' ability, the amount of perfection desired, and the time available. The primary criterion is that each unit be a self-contained unit, and yet part of a smooth, continuous sequence.

6. Practice in skills. Nothing worthwhile can be accomplished unless there is opportunity for practice. Some tasks require frequent repeat performances, while other tasks can be spread over a period of time. However, experience has shown that for most tasks, short repeat performances at frequent intervals result in more efficient learning than does continuous practice.

PART II. TRAINING SESSIONS
FOR FOOD SERVICE SUPERVISORS

Lesson I. Orientation of the Food Service Department

The management of the food service department has five major functions to perform. These functions are: planning the various activities of the department; purchasing food, equipment, and other necessary items; food preparation; food service and distribution; and elimination of waste.

The food service department, as a part of the school lunch program, plays a vitally important role in improving the health of children. This improvement is achieved by providing nutritious and wholesome meals and by providing nutrition education for the school children.

The initial planning for physical facilities for any food service department is the responsibility of the administration. However, the establishment of standards of quality is jointly shared by the administration and the food service supervisor. The success of the food service department depends on the efficiency with which the food service supervisor plans each phase of the activity.

Standards may be easily formulated but the maintenance of these standards under day to day working conditions is one of the important goals of supervision. Standards must

be maintained in the choice of equipment, in menu planning, in the purchase and procurement of food, and in the preparation and serving of food. Equally important is the planning of time schedules and work organization charts to insure maximum output of labor.

Planning the use of left-over food items, both cooked and uncooked, helps to minimize food waste and decrease cost. Adequate planning is especially beneficial when new foods are being introduced and their acceptance is uncertain.

The proper storage of food, including the holding of certain foods at desirable temperatures, prevents food spoilage. Sanitation in handling will minimize the spread of food infection and food-borne diseases, a factor which is especially important when feeding groups of children.

Lesson II. Job Description for Food Service Supervisors

The food service supervisor instructs and supervises the employees engaged in the different aspects of food preparation in the school lunch kitchens, or in the school or college canteens and cafeterias; instructs and supervises the employees in maintaining high standards of sanitation and safety; instructs and supervises the employees in the use and care of equipment; and assists in maintaining and improving standards for food preparation and service. For large institutions and centralized kitchens, the food service supervisor

may specialize in one area or one aspect of supervision, but in smaller organizations the supervisors are responsible for the overall food service operation.

Job Requirements. Some of the important requirements for a food service supervisor are listed below:

1. Physical fitness with the ability to stand during most of the working hours.
2. Is able to adhere to the safety and sanitation regulations in the preparation and serving of foods.
3. Is able to supervise all the different areas of food preparation.
4. Is friendly and able to secure cooperation of those working under her supervision.
5. Is tactful in working with professional and administrative officials, other supervisors, and teachers.
6. Has initiative and is able to use judgment in assigning tasks to various workers.
7. Is able to delegate responsibility to employees.
8. Can assume administrative responsibility and is able to make frequent independent decisions.
9. Can evaluate problems and make recommendations.

Job Qualifications. Some basic qualifications needed for the food service supervisors are given below:

1. A high school degree or its equivalent.
2. Some experience in working in a food service department.
3. Ability to give verbal and written instructions in both Hindi, the national language, and the state language.
4. Knowledge of work requirements.
5. Understanding of human nature and needs.

OR

A graduate of a food service supervisory course approved by the government of India.

OR

A diploma in home economics with courses in foods and nutrition, personnel management, and/or methods of supervision.

Job Knowledge. Certain basic knowledge is necessary for efficient performance of the duties as a supervisor.

Requirements include:

1. Basic principles of nutrition in relation to menu planning, the preparation of quality food, food service standards, and large scale purchasing, and the storage of food.
2. Some understanding of the basic principles of bacteriology and/or food sanitation.

3. Some understanding of employee relationships.
4. Knowledge of how to maintain records and inventories and/or some knowledge of bookkeeping.

Job Relationships. Understanding the importance of maintaining good relationships with others is important. Some individuals with whom good relations are essential are:

1. Good relationships with the administration.
2. Cordial relationships with other food service supervisors of school lunch program, child care center personnel, and school and college food service supervisors.
3. Effective communication with those under her supervision.

Job Responsibilities. In addition to the responsibility for the overall performance of the food service department, the food service supervisor should assume responsibility for the following:

1. Orientation and training of new employees.
2. In-service and on-the-job training of all employees.
3. Assigning duties and delegating responsibilities to others.
4. Training employees in the care and maintenance of equipment and other physical facilities of the food service department.

5. Coordinating the activities of the department.
6. Making work schedules and organization charts.
7. Maintaining records of stores, equipment, employees, and purchasing and sales accounts.

Lessons III and IV. Human Relations and Communications

One of the most important and rewarding functions performed by the food service supervisors is to coordinate the work of the food service department and to bring about harmonious relations between the administration and the employees. Good relations with other institutions and departments such as the education and health departments will help the food service department to keep up-to-date and in close contact with those from whom benefits may be derived and to whom services may be rendered.

An understanding of the employees and their needs is a very important task of good supervision. If full cooperation is to be sought, the food service supervisor must make each of the employees feel important in his or her job. Imparting to the employees a feeling of importance and giving recognition of good performance will help morale and build loyalty to the food service department.

Clear and effective communication at all levels will insure satisfactory work performance. Every task that is performed in the food service department results from either

written or spoken orders. Instructions should be communicated in a language that is easily understood. A combination of written and oral instructions will increase the effectiveness of communication. Giving reasons for an order helps make the order more meaningful. Upward communication, that is communication with administrators and policy makers, will produce greater efficiency in the administration and clarification of the goals of the food service department.

An understanding of human nature and making allowances for individual difference are important. Each employee will react differently to different situations; therefore, employee performance is not always uniform. Employees should be treated as human beings and not as machines. The job of maintaining good human relations throughout the food service department is a real challenge to the food service supervisor. A good training program therefore prepares the supervisor for meeting the job requirements in a satisfactory manner.

Certain guiding principles are essential in maintaining good relationships in the food service department. Some guiding principles are listed below:

1. Have an open mind and sincere interest in your employees.
2. Treat complaints as suggestions and show appreciation.
3. Make only promises that you can fulfill and keep.

4. Take necessary time to collect all the facts in case of differences or disputes.
5. Have a favorable approach to the problems of others.
6. Tell "Why" and "Why Not," giving explanations for various procedures or tasks.
7. Admit your mistakes, do not hold others responsible for your shortcomings.
8. Be reasonable in what you expect of others.
9. Be prompt in dealing with any situation.
10. Whenever possible give the individual a choice of decisions.
11. Encourage others to make decisions within their respective areas of responsibility.
12. Give authority when designating responsibility.
13. Give commendations when deserved.
14. Criticize constructively and not in the presence of others.
15. Prepare employees in advance for anticipated changes.
16. Evaluate your own work as well as that of others regularly.

Guiding principles for good communications involve some basic understanding of what effective communication can accomplish. Some of these principles are listed below:

1. Plan your own ideas before communicating to others. Many communications fail because of inadequate planning.
2. Consider the exact purpose of your communication. Consider your objectives or purposes in order of priority.
3. Seek help and advice from others while planning communication.
4. Limit the amount to be communicated at one time.
5. Use appropriate and effective language in all communications. The tone of voice is an important factor in achieving your objectives.
6. Use opportunities as they arise to convey matters of value to the listeners.
7. Follow up your communications when there is an opportunity to strengthen goals or objectives.
8. Consider physical facilities and human factors when communicating with others.
9. Communicate in a manner that will fulfill both short term objectives and long term goals.
10. Physical actions must support verbal communications.
11. Good communication is a two way process. Try not only to communicate but to understand as well.
12. Select an opportune time when communicating with others.

Lesson V. Guiding Principles in Motivating Employees

The success of any operation, small or large, simple or complex, depends to a great extent on the productivity of the workers. Every operation or organization that employs workers expects the work force to be highly enthusiastic and highly productive.

Motivation is a very complex process. Motivation is an impulse that grows within each individual. Because of the complexity of human nature, no two individuals react the same to a given situation. Therefore, it is not possible to set any hard and fast rules in promoting employee motivation. The effective supervisor must improve his own ability to motivate those under his supervision. Some basic knowledge, concepts, principles, and techniques, however, may be acquired to increase work output and productivity of the employees and the success of the operation.

Motivation grows from within and is the result of an individual's reactions to his work environment. These reactions are, to a large extent, dependent upon and involve satisfaction of the physical, social, and psychological needs of the individual. Individual needs, both mental and material, play an important role in the total productivity of the worker. Therefore, the responsibility of providing harmonious external stimuli rests with the management and with the immediate

supervisor. To be effective in motivating workers, one should have:

1. Knowledge of himself (supervisor);
2. Knowledge of his workers (employees); and
3. Understanding of human nature and the ever-changing reactions and attitudes towards the environment.

Factors that may motivate the performance of the worker are:

1. Interesting work that the worker enjoys doing.
2. Adequate training and knowledge of job expectations.
3. Respect for authority and a liking for the immediate supervisor.
4. Identification with fellow workers.
5. Material and fringe benefits that satisfy personal needs.

Many theories have been developed in an attempt to analyze why and how the worker is motivated. Some of these theories are based on factors such as:

1. Motivation through monetary benefits.
2. Self expression.
3. Inborn and inherited qualities.
4. Mastery of job or techniques of work.

5. Job enticements.
6. Use of authority, and the
7. Kind and amount of immediate supervision.

The effective supervisor should develop the ability to motivate employees. Useful hints for supervisors to use in motivating workers are the following:

1. Know yourself. In order to motivate others, the supervisor must be motivated.
2. Know your goals and objectives. The supervisor must have a clear understanding of his own goals and objectives. He should also know why he is motivating others and how best to attain desired goals.
3. Have self-confidence. The supervisor should have self-confidence and a pleasing personality.
4. Have respect for others. The supervisor should be able to give courage and inspiration to others and have respect for each worker as an individual.
5. Demonstrate leadership. The supervisor should build a feeling of teamwork and cooperation among the employees. The leader should strengthen the concept of "We" rather than "Big me" and "Small you."
6. Express appreciation. Learn to give credit with deserved and appreciate the work of others.

7. Exhibit optimism. Be optimistic in regard to the ability and performance of others.
8. Strive for self advancement. The supervisor should keep himself well informed and up-to-date in all areas related to his work.
9. Criticize with restraint. Be constructive in all criticisms.
10. Possess good moral character. The supervisor should perform well and have high moral and ethical standards.

Lesson VI. Personnel Management.

The food service supervisor should recognize the duties and the responsibilities of the job as it relates to the overall atmosphere of the food service department. The food service supervisor must constantly work with individuals and through individuals. It is important to develop a high degree of skill in both the operation of the food service and in the supervision of the employees. Success of the program is best achieved by making each employee feel that he is a part of the total organizational structure.

A job description consists of a written presentation using a regular form. Included in the job description are a list of all the different operational procedures, the duties of individuals working in various operations, pertinent work

conditions, the lines of authority, time and work schedules, and other essential facts relating to the job. A job description is a must for work efficiency. The department head or the supervisor must develop job descriptions and keep them up-to-date.

A job description is an organized, systematic, and logical approach to job analysis for the purpose of making decisions and recommendations. A job description may vary in details, depending on the purpose of intended use. A very detailed job description will help in planning a training program for new as well as for experienced employees. A less detailed job description may be required for the selection of new employees, or for the placement of present employees. These job descriptions may be used as follows:

1. To determine the departmental tasks in the proper and logical groupings.
2. To determine the pay scale of employees.
3. To determine the lines of promotion and transfer.
4. To prepare cost analyses.
5. To determine where a specialized technique may be of value.

Job descriptions involve considerable time and should be prepared over a period of time. The initial procedure is to outline each job that is to be done. The job procedures should be placed in a systematic order, and in a logical

sequence. A detailed description of each job as it is, not as one expects it to be, should be prepared. In preparing job descriptions, a list of details of the job prepared by the worker will help to insure the inclusion of all relevant items. Alterations in the procedures or in the sequence of procedures should be made to comply with expectations of the job. Job descriptions should be up-dated periodically.

A good job description should include certain important features. Among these features are:

1. The title of the job.
2. A brief summary of the overall job requirements.
3. A detailed list of the breakdown of the job requirements.
4. The nature of the equipment to be handled.
5. The amount of physical work to be required in job performance.
6. The work conditions.
7. The salary to be paid.
8. The personality factors considered including appearance and grooming.
9. The minimum basic qualifications for the job.
10. Other related duties that may be required from time to time.

Jobs of comparable overall requirements may be grouped together in a single specification form. These

groupings would be of value in personnel selection as well as in work organization.

Lesson VII. Supervisory Techniques.

Knowledge and common sense are required of a good supervisor. The two major responsibilities of a good supervisor are to follow the principles of supervision and to follow the techniques of supervision. These two responsibilities are related in such a manner that they cannot be separated.

The old-fashioned method of learning, "sink or swim," has serious faults and is costly. Experience has shown that employees develop faster and become more efficient under the watchful eye of a good supervisor. Careful and comprehensive instructions help prevent many costly errors and conserve time that might otherwise be spent in correcting mistakes.

Good supervision requires a knowledge of how to do the job well, and equally important, how to get others to do the same job well. Well trained workers require less constant supervision leaving the supervisor more free time to develop new ideas. A good supervisor realizes that training of the employees never stops. When a worker has understood one job, he is ready to be prepared for another. Ability to handle more complicated work makes the employee more valuable. Well planned good supervision helps to develop the potential of

each employee. Teaching is the most fascinating phase of supervision. Good supervision is not the direction of things, but rather the direction of workers.

Certain prerequisites are necessary for good supervision. The successful supervisor needs to know the job, its objectives, and the steps to accomplish these objectives. The major objective of the food service supervisor is to produce attractive, appealing, and nutritious meals that satisfy the patrons and at a price which is economically feasible. In accomplishing this objective the standards of the department must be maintained.

In order to coordinate the physical functions in the food service department, the equipment must be arranged in the kitchen in some systematic order. All work schedules should be planned so that each activity fits into a proper sequence of meal service.

Efficiency in the food service department depends upon team work. The supervisor is responsible for the development of team work through effective training and supervision. This training is a continuous on-going process. A good supervisor knows the members of the team, both as individuals and as a group. Since no two individuals are alike, a good supervisor recognizes these individual differences and plans accordingly the type of supervision best suited to individual

needs. A good supervisor must look at the job from the worker's point of view.

The human element is involved in job satisfaction. The employee must be interested in his work. A good supervisor not only helps to develop the interest of the employee but helps the employee maintain this interest. The employee must feel that he is an important part of the work team and that his job is important to the success of the overall operation.

Satisfaction of the employee with the conditions under which he works is also a factor that determines job performance. Among the work conditions that are important to the employees are: a comfortable work area, clean rest rooms, reasonable work hours, adequate wages, and fringe benefits. Each of these factors contribute to job satisfaction.

Occasionally a worker may be responsible for creating friction among the employees. A good supervisor should be sensitive to this type of situation. Immediate action on the part of a supervisor may prevent an unpleasant situation.

Good leadership and recognition for a job well done are extremely important to employee satisfaction. Good leadership demands intelligence and technical "know-how" and gives the employee a feeling of security. The supervisor who handles an unpleasant situation with confidence and

without hesitation inspires the confidence of the workers. Success depends on both the technical knowledge and the experience of the supervisor. This knowledge and skill of the supervisor is often tested when a new method or a new technique is being introduced. Sometimes the best method of teaching is by demonstration.

Many times the desired results are not obtained because the directions are not well communicated. If the desired results are to be expected the employees need to be told what to do, who is to do it, when and where the job is to be done, and why the job is to be done. If the supervisor makes a mistake in giving orders or directions, he should be willing to admit his mistake.

Lesson VIII. Personal Qualifications of Food Service Supervisors

A good supervisor must possess integrity. Employees need confidence and assurance that the supervisor will consistently support them when the need arises. This would involve the sharing of both mistakes and praise for work accomplishments. The supervisor should not take all the credit for accomplishments of employees. Occasional praising of the workers will help develop a high degree of morale among employees.

A work team appreciates discipline when it is fair and is necessary to get the job done. Discipline is necessary to good team work. A reprimand is necessary when deserved, but the purpose of the reprimand should not be misunderstood. The purpose is not to give vent to personal opinions of the employee, but rather to help the employee improve in the future.

A supervisor must learn how and when to delegate responsibility. Many supervisors feel that in order to get a job done well, they must do it themselves. However, when the supervisor has many responsibilities, this is not possible. The supervisor must, therefore, learn to delegate some responsibility to subordinates. The subordinates, when trained, should be given due respect for their knowledge and understanding. If the supervisor has confidence in the performance of the subordinates these individuals will be motivated to give better service.

A good supervisor must recognize that whenever people work together they have a tendency to organize themselves into groups, consciously or unconsciously. Each of these groups will have a natural leader, a degree of personal affinity, and group sympathy. The group leader can often unconsciously influence group behavior. The food service supervisor should recognize this informal leader and should be able to communicate with, and through, this individual.

A two-way communication between the supervisor and the group can help solve most problems and can lead to good employee-employer relationships. The employees want to be led, not driven into action.

A good supervisor will try to set a friendly atmosphere in the department. This friendly atmosphere should be maintained both within the department and in contacts with those outside the department.

PART III. SANITATION LESSONS
FOR THE EMPLOYEES OF THE
FOOD SERVICE DEPARTMENT

Lesson I. Bacteria

Bacteria are extremely minute "microbes" or germs that are so small they cannot be seen by the naked eye. In order to get an image of the smallness of these microbes, 25,000 of these bacteria laid end to end would cover an area of one inch.

Bacteria present in food may be classified as useful or harmful bacteria. Some bacteria are of value in making curd or cheese, or in the making of sauerkraut. On the other hand some bacteria are harmful and are dangerous to human beings. As many as 40 per cent of all communicable diseases are caused by a lack of sanitation or improper handling of food. Ignorance, poor personal habits, and inadequate and faulty storage facilities are frequently responsible for the spread of disease germs.

Different diseases are caused by different types of bacteria. These bacteria have different requirements for growth and reproduction. Different temperatures and media are necessary for the optimum growth and multiplication of different bacteria. Bacteria may live anywhere and everywhere. Bacteria live, take food, give off waste, grow and multiply

under suitable conditions. More bacteria may be carried on the body of one individual than there are people in all the world put together.

Food poisoning is seldom caused by eating food that has actually been poisoned. Most cases of food borne disease are caused by germs or harmful bacteria. There are three major groups of communicable diseases that must be guarded against in feeding operations, especially in the school lunch kitchens. These diseases may be grouped as respiratory diseases, intestinal diseases, and skin diseases or infections.

Disease germs are transferred to water or to food by individuals handling the food. Food and water, contaminated at the source, may be the media through which dangerous diseases are spread. Rats, roaches, flies, and mice are also carriers of disease germs. When these pests have access to food, germs will pass from their bodies to the food. It is difficult to tell by looking at a food or even by tasting a food whether or not it is safe; nevertheless, proper precautions must be taken to avoid the possibility of infection. The children who eat the school lunches assume that the food is safe. Every effort should be made to serve clean, wholesome, and safe food to the children. The food should be free from spoilage. If ever there is any doubt as to the safety of food, the food should not be served. The child's health and care are in the hands of those responsible for preparing and serving the food.

Lesson II. Storage of Food

A good system of receiving and storage will reduce food waste and spoilage to a considerable extent. The provision for adequate storage facilities is important in any food service establishment. The food storage facilities should be convenient to the receiving and preparation areas. The space allotment depends upon the kind of menus served, the number of children served, and the frequency of food purchase. To keep food off the floor, the storage area must be provided with shelves. The storage area should be kept scrupulously clean and orderly. Foods provide excellent media for the growth of bacteria and molds. The storage facilities can be divided into three major areas:

1. General storage area. This area will include the storage of items such as equipment, paper goods, cleaning materials, and other surplus stores.
2. Dry storage area. This area consists of food items that can be obtained in large quantities and must be stored for a period of time. Containers appropriate for food storage should be selected. In the storage area the shelves should be planned to fit the size and shape of the containers selected. Containers should be made of tin, aluminum, or thick plastic.

Containers that are round in shape are preferred since square corners are more difficult to clean. Unsanitary containers may harbor germs. The lids should be tight fitting. All containers should be labeled as to the contents, with a label always being present on the container. In addition, a label may be placed on the lid of the container. The size of the containers should be appropriate to the amount of food stored. Containers that are too large or too small are difficult to handle and should not be used.

3. Perishable food storage area. The area for storage of perishable food items is extremely important. Foods such as milk and milk products, and fruits and vegetables should be protected from flies, insects, and dust to preserve their safety, nutritive value, and eye appeal. A meat safe of adequate size should be provided for each school kitchen. This cabinet should be placed in the coolest area of the storeroom. Good ventilation and cleanliness in the storeroom help keep foods in good condition.

Certain conditions favor the growth of bacteria.

Body temperatures favor the growth of many harmful bacteria. High temperatures usually kill bacteria. Freezing temperatures are not favorable to the growth of bacteria but the bacteria

are not necessarily killed at freezing temperatures. Dark and dingy places favor the breeding and multiplication of bacteria. Direct sunlight kills many bacteria. Most bacteria thrive on moisture. Milk, milk products, water and left-over foods are excellent media for growth of bacteria.

To prevent the growth of any pathogenic organism certain precautionary measures should be taken. Recommendations for the school lunch programs are as follows:

1. All individuals handling food should be in a state of good health, being free of any contagious disease.
2. All fresh fruits and vegetables should be cleaned before storage.
3. All food should be protected from contamination or spoilage during preparation, serving, and storage through precautionary measures.
4. All equipment used in the lunch program should be cleaned before and after using.
5. All the food should be prepared just before serving. Avoid holding food for a long period of time.
6. Protect food at all times from dust, flies, rodents, and vermin.
7. When in doubt, discard the food item.
8. Standards for personal hygiene should be strictly enforced.

Lesson III. Rodents and Insect Control

Pest infestation presents the maximum danger to the safety and sanitation of the food service area. Most common among the pests that present danger to health through contamination of foods are rats, mice, flies, and roaches. These pests breed and multiply very rapidly, and if not eliminated can prove to be a major health hazard.

Rodent control. Any program of pest control must take into consideration the factors favoring growth and multiplication. Pests need dark and dingy breeding places, food, warmth, and moisture. Other measures of control will not be effective if conditions favoring breeding are not eliminated. Certain necessary precautions to eliminate rodents include the following:

1. Buildings must be completely rodent proof as the outer line of defense. All openings around pipes, conduits, and wires, and all cracks in the walls or floors should be closed with cement or other appropriate materials.
2. Floor drains should be covered except for the actual drainage area.
3. Windows and ventilation openings should be covered with mesh or screening.
4. Unwanted equipment and furniture and discarded materials should not be allowed to collect inside

or outside the building. Rodents find excellent hiding and harboring places when discarded materials are allowed to accumulate.

5. Local measures such as traps may be effective when the amount of infection is not great. In case of heavy infection, help may be obtained from a licensed pest control agency.
6. DDT and other commercial sprays should be used with caution and only under the supervision of trained personnel.

Insect control. The best protection against insect infestation is to seal the breeding places of insects such as roaches and silverfish. Cracks in plastered walls and wooden fillings, and leaking water pipes and faucets should be repaired immediately. Screen doors and windows protect the food area from flies. Insecticides should be used with caution and restraint. Foods, cooking surfaces, and equipment should not come in contact with the insecticides and sprays.

Lesson IV. Personal Hygiene

The health habits and personal hygiene of the individual coming in contact with food during storage, preparation, or serving are extremely important. The most important factor in maintaining a healthy body is cleanliness.

1. A daily bath with hot or cold water and soap is essential. This routine not only refreshes and relaxes the tired muscles, but also stimulates the circulation and helps the skin to eliminate body wastes.
2. The hair should be well combed at all times. Hair should be neatly braided or made into a bun to prevent loose hair or scaly particles from falling into the food.
3. Proper rest and sleep relaxes the individual and leads to better performance of the worker.
4. The consumption of a well-balanced diet and regular eating hours will contribute to good health.
5. The hands are one of the most important parts of the body, especially for those handling food. Hands are constantly in and out of food and therefore can be a most dangerous tool in food service. The hands and fingers can be the carriers of microorganisms that may be potential killers. Therefore, those working with food should make certain at all times that the hands are as clean as possible. The hands should be washed with soap and water before handling any food or clean equipment, after handling any soiled equipment, after each visit to the rest room, and after smoking.

6. The mouth should be kept clean by brushing the teeth regularly. Both the mouth and nose are areas that may be contaminated with micro-organisms. Therefore, the person handling food should avoid touching these areas while handling food.
7. Sneezing or coughing over food or equipment may spread germs. The mouth and nose should be covered with a handkerchief while sneezing or coughing. The hands should be washed immediately after touching either the mouth or the nose.
8. Smoking or the chewing of gum or pan (betel) should be prohibited while on duty.
9. A clean spoon should be used each time food is tasted.
10. Clean clothes should be worn each day. A clean apron or work coat should be provided daily for all individuals handling food.
11. Individuals may look well and still be carriers of disease germs. A sick worker not only endangers his own health but is a hazard to others.

Good health means good sanitary habits. Good sanitation is not only a reflection of the food service as a whole, but is also a reflection of the worker. Therefore, standards

should be high and each employee should work towards the maintenance of high standards.

Lesson V. Disposal of Garbage

The disposal of garbage and trash is very important. Public and personal health may be affected if proper disposal for rubbish is not provided. The proper storage, collection, and disposal of garbage can keep the public from contracting many diseases that are spread through germs. Also rubbish provides excellent breeding places for rodents and insects.

Trash and garbage should be collected in separate containers. Trash is any broken, discarded or worthless item such as paper articles, containers, cans, and glass jars. Garbage consists of the waste portions of foods. Both trash and garbage should be stored in covered containers that are cleaned daily on both the inside and the outside. Lids should be kept clean and in good shape so that the lids fit well.

Lesson VI. Care of Equipment

A substantial investment is required for cooking equipment. Therefore, it is very important that proper care of this equipment is maintained. The best way to care for equipment is to establish a regular program for cleaning.

All equipment and utensils must be cleaned properly and at regular intervals. Utensils and equipment should be stored properly after each use in order to prevent the accumulation of food particles and soil that may harbor bacteria. Utensils should be pre-soaked, pre-scraped or pre-rinsed to remove food particles and soil when necessary.

Good quality soap or detergent and plenty of hot water for washing and rinsing are essential to cleanliness of kitchen equipment. All equipment should be air dried before putting away for storage. To prevent contamination, equipment should be stored upside down on clean shelves. The equipment should be rinsed before using.

Lesson VII. Work Habits of Employees

One responsibility of management or the supervisor is to encourage the employees to develop good work habits. These habits help in maintaining the high standards of the food service department. Some of the desired habits essential in the school kitchen are the following:

1. Handle equipment correctly. Avoid touching the surface areas that come in contact with food.
2. Avoid unnecessary handling of food with the fingers and hands.
3. Use spoons, tongs, or forks for handling food when and where needed.

4. Keep work surfaces and cooking areas clean at all times. Organized and well kept areas not only promote good sanitation standards, but also aid in the successful completion of the day's work.
5. Clean up spilled food items immediately.
6. Use only clean utensils in the preparation, cooking, serving, and storage of food.
7. Cover all unused food (raw or cooked) and protect from air, dirt, and flies.
8. Handle kitchen equipment with care for safety and good performance.
9. Use a clean spoon each time a food is tasted.