EVALUATION OF THREE METHODS OF BEAN COOKERY AND STANDARDIZATION OF QUANTITY RECIPES FOR USE IN THE PHILIPPINES

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CHAPTER I

INTRODUCTION

Such pressing problems as rising food costs are just one of the many problems of any food administrator. This results in the serving of meat substitutes. In the Philippines, it is very common to serve dried beans at least once a week. The purpose of this study is to determine: (1) the nutritive contribution of three varieties of cooked beans, (2) the acceptability of bean dishes in relation to three methods of preparation, (3) to determine the preparation time, and (4) the standardization of quantity recipes using the method of preparation determined to be most desirable.

Methods used in cooking beans are: (1) soaking overnight and simmering on top of the stove for the whole day so that this dish is most often served for dinner, (2) soaking the dried beans overnight in soda water and simmering them in soda water on top of the stove, which is not advisable because of the loss of the ascorbic acid (Vitamin C) in the food, and (3) pressure cooking in a pressure saucepan.

A survey of literature concerning opinions of experts in the fields of food, nutrition, and biochemistry is being used

to estimate the biologic value of protein in the beans as compared with the protein of whole egg.

This study was prompted by the writer's interest in the use of dried beans as a means of supplying proteins at low cost. Some experiences with a tasting panel, which will be employed in determining the best methods of bean cookery, and the standardization of recipes is desired.

Experience in the standardization of quantity bean recipes is also needed so that recipes may be developed using principles of cookery which are practical, yield an acceptable product and conserve a maximum of nutrients in the legumes.

CHAPTER II

REVIEW OF LITERATURE

Nutritive Value of Legumes

In human nutritional studies and in international public health, this has been a protein decade. It is profitable to take stock of rapidly advancing knowledge and the possibility of its application to the welfare of man.

The stocktaking can be introduced by asking two mutually dependent questions: (1) How is man's health adversely affected by poor quantity and quality of proteins and how can the incorrect trends be recognized and identified? This question is inseparable from the second question, since the term "poor quantity and quality of proteins" assumes that there is a minimum, and maximum and a desirable range of intake of a defined protein-rich food for a "reference man".

Equivalent figures are given for alternative protein-rich foods. (2) What quantity and quality of proteins does man require at different ages and under different environmental circumstances in order to achieve optimum health - or in more direct words, to ensure that his health

could not be improved by altering either the quantity or quality of protein in his diet?

It is unlikely that either question can be answered without answering the other or that they will be answered in the present discussion.

Requirements and allowances of protein

The term "minimal requirements" may mean three different things to three different people: (1) the lowest requirement which has ever been sufficient for an individual, (2) the minimal requirement for the average individual of a group, and (3) the minimal requirement for the great majority of individuals in a group. The last definition is the one that will be used here. By minimal requirement is meant the minimal requirement for health rather than for survival.

Optimal requirements are more difficult to evaluate, since there may be a wide zone between the minimal requirement for health and the point where toxicity from a surfeit makes its appearance.

A specific recommended allowance represents some arbitrarily chosen point in the optimal zone. A margin of safety is usually allowed above the minimum. How large this margin of safety will be depends on the availability of the nutrient and the judgements or prejudices of those who do the recommending in regard to the dangers of inadequate or of excessive intake.

There seems to be a general agreement at present that a daily intake of 0.5 g./kg. of body weight is sufficient for the adult to maintain his nitrogen balance. However, studies done by Rose (46) revealed that about 0.35 g./kg./day should be enough if the quality of protein is good enough to provide a safe level of all the essential amino acids. On the other hand, since Folin's work (13), it is generally recognized that the protein balance may be maintained with a low-protein intake adaptation, that is, by reducing the reserve protein in the body, and by decreasing the rate of protein catabolism. Therefore, it is a dispute whether or not such a low protein intake is a minimum to maintain the protein balance, which may be considered to satisfy physiological need.

By taking a surplus intake over the maximum protein requirement into consideration as a desirable factor of safety, the League of Nations recommended in 1935 that the protein intake for all adults should not fall below one gram of protein/kg. body weight. From advances in knowledge accumulated during twenty years thereafter, the FAO Committee of Protein Requirements (14) adopted a new approach to estimation of protein requirement. They defined, first, a reference protein of high nutritive value in order to relate protein requirement to its quality, and adopted 0.35 g./kg./day as a minimum requirement of reference protein for maintenance of balance in the adult. From calculation of the safe practical allowance of the protein requirement,

they recommended an allowance which provided for individual variation and for quality of the protein contained in diets, and abundance to take account of reserve protein, while they justified adopting a liberal approach in allowing for protein reserve.

How to explain and evaluate the difference between the protein requirement and the practical allowance for protein, that is, the safe intake, is the problem which is the most important but most unclarified in the present knowledge of protein requirement.

Nitrogen balances and imbalances

Studies in nitrogen balances and imbalances extend the investigations of the protein requirements. Salmon (47) suggested that when a single amino acid is inadequate in amount for maximum production of tissue protein, any surplus of amino acid added must be excreted or disposed of in some way; in the process there is a wasting of the limiting essential amino acid which increases the severity of the deficiency. Supporting this hypothesis are data that show a greater excretion of amino acid from incomplete or imbalanced protein than from complete protein.

Kunta (29) stated that there are two ways of creating nitrogen imbalances. The most consistent and reproducible manner is by adding a fairly large amount (3 to 20 per cent of the diet) of an unbalanced protein or an amino acid mixture lacking one indispensable amino acid to a diet

which is low in protein. Occasionally, however, a small supplement (0.2 to 1.0 per cent of the diet) of one or two amino acids has been found to cause an imbalance that is quite severe.

There is evidence that the requirement for the most limiting amino acid in a diet rises as the dietary level of protein is increased. Manaver and Harper's studies (35) showed that essential amino acid requirements for arginine, tryptophan, lysine, and methionine of a growing chick have been reported to rise as the level of a protein deficiency in these amino acids is increased in the diet. However, Manaver and Harper further state that the extent of utilization of one essential amino acid is limited if the diet is deficient in another.

The effect of increasing all the essential amino acids above the minimum level was determined by Rama Roa and coworkers (43). They concluded that the difference in the rate of availability of amino acids due to their enzymatic release from a protein during digestion may be significant.

It is evident that proteins differ in their value and that such differences are due to amino acid composition. Further studies demonstrated the importance of considering species and age in amino acid investigation.

The term "amino acid imbalance" has arisen from studies which revealed that a diet usually low in protein has been thrown out of balance by the addition of amino acids or a quantity of an unbalanced protein. (21)(33). In order to reverse

Amino Acid	Minimum Daily Requirement (gram)	Recommended Daily Intake (gram)
L-Tryptophan	0.25	0.5
L-Phenylalanine	1.10	2.2
L-Lysine	0.80	1.6
L-Threonine	0.50	1.0
L-Valine	0.80	1.6
L-Methionine	1.10	2.2
L-Leucine	1.10	2.2
L-Isoleucine	0.70	1.4

The amino acids needed for growth are needed mainly for the synthesis of the protein molecules entering into the structure of protoplasm. For this function, the simultaneous presence in the tissue is required of all the amino acids that the body cannot manufacture itself from dietary constituents. The absence of any one will block the synthetic processes. The amino acids needed for maintenance are needed mainly for the formation of creatine, carnosine, glutathionine, ergothionine, thyroxine, adrenalin and other nitrogenous tissue constituents or tissue products destroyed in metabolism. For these replacement functions, the assortment of amino acids needed is simple and will vary from one type of synthetic reaction to the other. The absence from the diet of any one essential amino acid will block one or more of these anabolic

reactions, but not all.

Requirements set for amino acid needs are basic to further research in this area. They represent laborious effort on the part of the investigators and real self-sacrifice by the subjects. In order that these results may be most valuable, it is important to recognize their limitations as well as their contribution.

Protein reserves

Some individuals require more protein than the amount recommended and others may need less, but the optimum is unknown. Thus, the determination of dietary protein requirements is dependent upon the knowledge of the magnitude and function of the protein reserves and labile nitrogen as well as of the amino acid pattern presented to the body.

Emphasis is placed upon the protein reserves because of the dynamic interrelationship between many of the cellular proteins and the so-called non-protein labile nitrogen which includes the metabolic pool of amino acids. Cellular proteins are stored in special compartments to be utilized as reserves in the same sense as fat is stored. Cellular proteins, however, do contribute amino acids to a metabolic pool and, if the diet is deficient in nitrogen, the body is depleted in many tissue proteins. Those proteins that can be depleted to contribute amino acid to the metabolic pool have been considered as reserves. Plasma albumin, for

example, is a reserve that is depleted during a period of protein starvation, but some of the plasma globulins are not reduced, even tending to increase in the depleted individual. Many cellular proteins are parts of enzyme systems, so that depletion in so-called protein reserves results in a reduction in activity of some enzyme systems, but others may increase. The possibility exists that some cellular proteins may function as reserve supplies for amino acids during periods of depletion either from illness or starvation. Attention must be centered, therefore, on the amino acid metabolic pool and cellular protein synthesis. (38).

Protein deficiency

Physiological effects of protein deficiency have been extensively studied in connection with famine occurring during and after the war: From this knowledge, the widespread existence of malnutrition diseases due to protein deficiency have been recognized. Researches on protein malnutrition have thrown new light on the problem of protein requirement, and it has come, at present, to the forefront of interest among nutritionists.

Striking effects of protein deficiency are reduction of haemoglobin and serum albumin; volume of body fluid, especially that of extracellular fluid, increases in protein deficiency, and a slight edema frequently appears; body weight fluctuates and this fluctuation is associated

with variation of urine volume; urobilinogen in urine appeared shortly after low protein diet indicating an impairment of the liver function. There are many evidences that low protein intake may also influence hormonal activities, even when nitrogen balance is well maintained. (6)

Clinical evidences found in protein malnutrition are: (a) Kwashiorkor, (b) distrofia da farinacei. Advanced cases are characterized by nutritional edema and acute dermatosis. (28).

In practice, every conceivable gradation and combination of deficient diets will be encountered from balanced undernutrition, through unbalanced undernutrition and malnutrition including protein malnutrition. The main justification for singling out protein malnutrition for special attention is its very wide prevalence in underdeveloped areas of the world and public health importance. Again, it is a variable type of unbalanced malnutrition (often unbalanced undernutrition), but it has two distinguishing factors: (a) it is due to overdependence on starchy foods at the expense of protein-rich foods; and (b) no combination of nutrients will achieve initiation of cure unless it contains a suitable pattern of amino acids.

Up to this point, the discussion of protein deficiency has centered on diet, but this does not imply that non-dietary factors are not important. Climatic stresses, psychic stresses, disturbances of the gastrointestinal tract and of metabolism all help to condition malnutrition

resulting from a marginal diet. Some of the disturbances of the gastrointestinal tract and of metabolism will themselves be due originally to malnutrition and will aggravate it, forming a vicious circle mechanism. This is especially true of diarrhoea. (6).

From the clinical description and from the concept of protein malnutrition and unbalanced undernutrition, it is apparent that metabolic and biochemical tests are needed to identify the effects of deficiency of nitrogen or of specific amino acids among the mixed picture of malnutrition, which results from deficiency of vitamins, minerals and even calories.

Laboratory studies of the level of vitamins in urine and blood have given greater precision to clinical diagnosis and, with many vitamin deficiencies, it is possible at least to exclude (if not to confirm) by laboratory methods, a deficiency state which has been clinically suspected. Tests like plasma amino acid levels, and urinary urea help in diagnosis of protein deficiency.

Amino acids in food

Minimum quantitative amino acid requirements of human subjects have been determined with diets containing mixtures of highly purified amino acid in place of protein. Likewise, statement that amino acids from certain foods may be utilized less efficiently than purified amino acids has been indicated by the results of numerous animal

studies. (20)(34). Since the ultimate goal of amino acid requirement studies is to make possible the translation of these requirements into quantitative terms related to particular foods, the desirability of determining availability to man of individual amino acids from specific foods is apparent.

A test was done by Linkswiler (33) and his co-workers to determine whether or not subjects do respond in like manner to the two types of diet; namely, a diet of natural food and a diet with purified amino acids. It was demonstrated that each of the basal diets of purified amino acids supported nitrogen equilibrium and that the responses to the diets containing natural food were comparable to those of the corresponding basal diets. This suggests that the presence of a small amount of natural food in a semi-synthetic diet does not profoundly affect nitrogen balance. It seems that man is able to use efficiently a combination of bound and of purified amino acid.

The nutritive value of a protein is determined, not only by its amino acid composition, but also by the availability of the individual amino acids in the protein fed to the animal.

Studies on individual amino acids were done on certain foods to determine their biological availability, the PER (protein efficiency ratio). Morrison and Campbell (36) studied factors influencing the protein efficiency ratio of foods. Groups of male, and female weanling rats received otherwise adequate diets containing 7, 10, and 15

per cent protein supplied by casein or by a mixture of plant protein (whole wheat and soy bean flour). In both sexes, the PER tended to decline as the experiment progressed.

Studies indicated that lysine is unique among the essential amino acids in that the rate, and in some cases the extent of its release from a protein, is decreased considerably when the dry protein is heated at high temperature. The availability of lysine in beef was 76 per cent and wheat 70 per cent. (19).

Supplementation of vegetable diets with proteins and amino acids

Means of markedly improving protein efficiency by applying modern knowledge of protein and amino acid supplementation are at hand, either already known or in the process of being worked out. There is a crying need for immediate application of this knowledge for the benefit of a protein-hungry world.

How are we to raise the efficiency of protein in our diets? There are three principle ways. The first is to supplement a low-efficiency protein with another protein whose amino acid pattern is complimentary so that each tends to make up the other's deficiency. Second, add some man-made amino acid to the low-efficiency protein. A third method is to use both protein supplement and amino acid simultaneously.

Protein malnutrition is recognized as a serious problem in many parts of the world. One finds in the protein-deficient regions high general morbidity, high mortality from infectious diseases of childhood, high incidence of gastro-intestinal disorders, abnormal heights and weights in the population at large and, in general, conditions of ill health. While it is difficult to relate all these conditions specifically to protein deficiency, authorities are in general agreement that protein malnutrition is at least an important factor.

The Philippines is no exception to this "protein malnutrition" part of the world. A survey of the Armed Forces of the Philippines by Darby and his co-workers (11) revealed the diet, according to the ICNND Standards, has acceptable levels of thiamine and niacin, but is borderline in protein.[1]

The Filipino diet contains a predominance of rice - in fact, this cereal supplies nearly half the total calories. Thus, a problem of how to raise the efficiency of protein in the Filipino rice-diet needs to be solved.

As already mentioned, dried beans are easy to secure in the Philippines. They are sold in neighboring stores and markets. Bean vines are also easily planted in the backyards, along the fences. They are easy to raise and require very little care. This makes beans available and cheap for meat

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[1]Interdepartmental Committee on Nutrition for National Defense of the United States.

substitutes whenever the budget has to be cut on food cost. The bean most commonly consumed is the mung bean or mungo bean (Phaseolus aureus) known locally to the Filipinos as the "Mungo". Beans are most often served in a dish that has meat in it.

Beans are considered a fairly good source of vegetable protein. Essential amino acids of three legumes most commonly used in the Philippines verus essential amino acid of egg are given below. (56, p. 54)

Essential Amino Acid Content of Three Legumes Versus Whole Egg (100 gms. Raw Weight)

Essential Amino Acid	Navy Beans Gms.	Chick Peas Gms.	Mung Beans Gms.	Whole Eggs Gms.
Trytophan	0.199	0.170	0.180	0.211
Phenylalanine	1.181	1.012	1.167	0.739
Lysine	1.589	1.434	1.667	0.819
Threonine	0.923	0.739	0.765	0.637
Valine	1.298	1.025	1.444	0.950
Methionine	0.216	0.276	0.265	0.401
Leucine	1.839	1.538	2.202	1.126
Isoleucine	1.216	1.195	1.351	0.850

In recommending the supplementation of predominantly vegetable diets with proteins of animal origin, the greater the proportion of animal to vegetable protein, the higher the nutritive value, although beyond a certain point there is no practical advantage. When adding protein-rich foods of vegetable origin to a diet, however, there is an optimum proportion above or below which biological value is decreased.

It is obvious that in addition to having a high protein quality, such a mixture should be a relatively concentrated source of protein. Preliminary estimates of the protein quality of a vegetable mixture may be made from a comparison of the amino acid composition with a theoretical amino acid pattern such as that of the FAO Reference Protein or a good animal protein such as supplied by whole egg.

Methods of Cookery

To develop methods and controls in quantity cookery it is necessary to understand scientific and economic principles involved in processing changes. Many problems and common errors could be avoided or easily corrected if these principles of cooking were understood and applied to the techniques in quantity food preparation and service.

When cooking was first discovered, the primary object was to make food more appetizing than when in the raw state. It is now known that proper cooking, in addition to making food more appetizing and easier to chew, makes it more

digestible and also destroys many disease germs or parasites which may be present in the food.

Skillful cooking is an art, acquired by experience and training. The experienced and skillful cook does more than apply heat to food. An expert cook knows how to blend various food substances so that appetizing flavors are developed; how to season for the same results; and how to use food supplies to the best advantage.

Although it requires experience and training to become an expert cook, everyone, after having learned the principles of cooking, can cook a satisfactory and appetizing meal by following recipes. These principles of cooking are simple but all-important. Two of them which should be carefully observed are use of the proper temperatures and proper working times for different foods. All foods cannot be cooked at the same temperature and for the same length of time. From the foregoing it will be seen how important it is to learn the basic principles of cooking before starting to work.

The term "cooking" is often used to mean the preparation of food for cooking as well as the actual cooking. This preparation may be merely peeling, as in the case of onions, potatoes, etc., or it may include cutting, slicing, chopping and some others. While preparation changes the form of food, the actual cooking may not only change the form but may also change the flavor or chemical composition, thus rendering the food more appetizing and digestible. (3).

In the case of dried beans, preparation means washing, soaking or pre-cooking by a short heat treatment.

Preparation of foods for cooking

Scrupulous cleanliness is the first consideration in the preparation of foods. The food should be inspected and sorted and all decayed or unfit portions eliminated, followed by the necessary cleaning, trimming, soaking or other operation preliminary to the actual cooking. (3).

Dry beans require a longer cooking period than fresh vegetables to replace the water lost during drying and to soften the cell structure. To shorten the cooking time, dry beans are soaked to absorb some of this water before cooking. (15). Swelling can be hastened by bringing the soaking liquid to boil and then withdrawing the heat and allowing the legumes to stand for a few hours in the warm liquid. (54). Morris, Olson and Bean (37) advocate a short heat treatment in either hot water or steam. The hot water greatly accelerates the rate of water uptake and reduces the percentage of hardshell beans markedly.

For proper rehydration of legumes, special precautions should be practiced. They are as follows (3 and 54):

1. Measurement of Water.

Measurement or weight of the water to be used. Careful measurement is necessary since insufficient water will result in an unsatisfactory finished product. Too much water will result in wastage of food value through the

necessity of pouring off the surplus. All measurements should be level.

2. Proper Proportion of Vegetables.

Measure the vegetable into the previously measured water. All measurements should be level. The water should be either cool or lukewarm.

Processing changes on cooking

Cooking is necessary for complete digestion and to soften the unusually hard texture of legumes.

Foods change physically and chemically during cooking. If the composition and structure of the food is known, control of these changes can be made. (15).

Proteins, fats, and carbohydrates are the major allies (and maybe, problems) in cooking.

Vegetables are made up chiefly of cellulose, hemicelluse, and pectic substances that give them texture and form. Starch, sugar, acids, minerals, and vitamins are present in varying amounts. (15).

In cooking, the texture of the vegetable is modified, for cooking softens the cellulose; it may change the hemicellulose to soluble form, and it tends to separate the individual cells, rendering other constituents more available. Cooking does not, at least not in all vegetables, rupture the cell walls, as is frequently stated. However, the starch granules swell and are more palatable after cooking. Some starch may be changed to soluble form and

some may be hydrolyzed. Some of the proteins may be coagulated and some dissolved. If the vegetables are cooked in water, part of the sugar and part of the minerals are extracted and frequently from 30 to 50 per cent of the water-soluble vitamins may be found in the cooking water. (27).

The probable destruction of the vitamins is also important. Vitamin A is little affected by heat; and destruction of thiamine may be insignificant with ordinary cooking methods. Ascorbic acid is the vitamin most affected, being in some cases almost entirely lost. (27).

Cooking destroys any active micro-organisms present and may completely sterilize vegetables which require long cooking.

Cooking modifies the flavor and often alters the color and appearance of vegetables. It renders other constituents more quickly digestible, probably because of the partial disintegration of the cellulose. Loss of flavor or development of a strong, unpleasant or bitter flavor may result from over-cooking, use of improper cooking procedures or too long holding of foods. (52).

When vegetables are cooked, factors such as the use of hard water, the use of soda, the time for adding salt, exert an influence. The hull of the legumes is primarily undigestible cellulose and becomes toughened with certain salts, sugar, and acids. Distilled water makes more tender products than most tap water. Both table salt and sugar harden textures. If the beans are salted at the

end of the cooking period, they will be softer than if salted at the beginning. (54).

Baking soda added to the water in which beans are soaked or cooked makes them become tender sooner. (27). But the destruction of Vitamin C, and of thiamine and riboflavin (in the presence of light), tends to increase, other conditions being the same, with any increase in alkalinity or with any decrease of acidity. Soda should never be added in the cooking of vegetables. (51).

Legumes are good sources of thiamine. (53). Although soda, when added to the water in which the beans are soaked or cooked, would hasten the cooking time, the purpose will be defeated, because the thiamine content of the legumes will be destroyed. Aughey and Daniel (4) say that the addition of a small amount of sodium bicarbonate markedly increases the destruction of thiamine in grean peas and snap beans. Thiamine losses due to different cooking procedures were determined by the rat growth method. In the same experiment they also found out that soda has different effects on different kinds of legumes. They found no significant effect of soda upon the thiamine content of boiled navy beans.

Dawson and co-workers (12) have studied the rapid methods of soaking and cooking dry beans. This study was undertaken primarily to develop more rapid basic methods of cooking dry beans than those commonly used by homemakers. Varieties of beans studied were pea, great northern, large

lima, pinto and red kidney. The effect of different soaking and cooking conditions on rate of rehydration, cooking time, and palatability was investigated for all five varieties of beans.

The findings show that a short method of soaking in which the beans are added to boiling water, boiled two minutes, removed from the heat, and allowed to soak for one hour in the hot water gives satisfactory results.

Exclusive of heating up and cooling down time, cooking in a four-quart pressure saucepan at 250° F. (15 pounds steam pressure) resulted in the following reduction in cooking time from that required for cooking in boiling water in a covered glass saucepan: for great northern beans, from 90 to three minutes; for large limas, from 60 to three minutes; for red kidney beans, from 105 to three minutes; for pea beans from 90 to five minutes; and for pinto beans from 120 to ten minutes. In addition to cooling times at 250° F. and cool down to 212° F. Palatability scores were very similar for beans cooked in a covered glass saucepan and in a pressure saucepan.

Three methods mentioned in this review of literature will be used in a pressure saucepan, soaking overnight and simmering on top of the stove, and soaking with soda water overnight and simmering on top of the stove with soda water.

Tasting Panel

Sensory flavor testing, as the term implies, is based on the use of panels or groups of people whose function is to measure flavor. Human tasters are necessary because no known mechanical or physical devices can do the combined work of the human mouth, nose, and brain in detecting and evaluating flavor.

The path of sensory flavor testing is far from clear-cut. Its history is entangled in food acceptance, psychology, biology, chemistry, pharmacy, anthropology, and some others. However, the gradual crystallization of the field has paralled closely the growth and trends of the food industry. In the embryonic state of the industry, when commercial agriculture and production of manufactured foodstuffs on a quantitative scale was just beginning, relatively informal taste testing was employed to meet what could be considered simple demands for flavor quality control. As the industry gradually expanded, more detailed, formalized techniques were used.

Beginning in the 1920's, emphasis on scientific food analysis and on food-acceptance research had a definite influence on the course of analytical taste testing. Two forces were seemingly at opposite ends of the pole - the food analysis seemed to call for extremely precise flavor measurement (objective); whereas food-acceptance research focused on preference tests (subjective). Because this taste-test field was still in an amorphous state, these two forces may account for much of the confusion over the use

of sensory-testing for preference and/or analysis. Currently the trend is toward restricting analytical sensory flavor tests to laboratory and production phases of the food industry, and utilization of consumer tests for preference work.

Difference tests are relatively recent in origin and are milestones in the course of development in the field of taste testing. The difference tests were brought into use in the late 1920's and the 1930's, when there was an apparent effort to systematize and organize the field. They were developed to meet demands for precision flavor testing, to cope with problems gradually building up to a turning point in large-scale production, processing, storage, and quality control. (9).

Although procedures of difference testing vary, the objectives are basically similar: to determine by statistical analysis if detectable differences exist between two samples. Difference tests are geared to precision, for they were designed to control all extraneous variables and their use of statistics endeavors to eliminate the false importance of observations due solely to chance.

The use of difference tests presupposes a thorough knowledge on the part of the person conducting the test, of flavor in general and of the flavor of the products under test. Having such knowledge, he can find out if the products are merely different or in what respects they differ. One characteristic is considered per test. Depending

upon predetermined test objectives, his panel may consist of untrained tasters or trained. With trained tasters, he can obtain more precise information.

Because of the adaptability of the difference tests (owing to non-specialized panels) their use has spread to many branches of the food field. However, in flavor analysis they are perhaps best suited to: (1) determining accuracy and reliability of tasters; (2) training of tasters; and (3) quality control. (9).

Ranking tests, another form of flavor test, vary from the simple to the complex. As applied to flavor analysis, they require that the panel members be thoroughly familiar with the particular flavor characteristics under study. Their purpose is to obtain an index for a series of samples without requiring the tasters to assign a particular score but to rank the samples. Of course, it is possible to obtain a rank order for a series by aligning the individual scores, and this is often done.

For the simple ranking test the investigator asks his panel members to arrange a set of samples in decreasing or increasing order of a specified characteristic. The characteristic may be a taste, a flavor, or an odor, or even color, texture, or apparent density.

If the differences among the samples are relatively large, there will be excellent agreement among the judges. Small relative differences among samples will be reflected by some disagreement. In the latter instance, the investi-

gator can apply a time-honored technique for the purpose of obtaining the approximate rank order. (1) Assign rank numbers to the samples as aligned by each judge; (2) add the numbers for each sample; and (3) arrange samples according to their numerical values. (9).

In complex ranking tests statistical analysis is applied to the panel results obtained from many difference tests. The basic philosophy of the statistical approach is a refinement of that stated for the simple ranking test: the greater the difference between the two samples, the higher the probability that the panel members will detect the differences. (9).

Thus, it can be seen that although the methods are similar in many respects, they could be classified in groups defined by the primary objective of each test. Sensory taste tests seek answers to three general questions:

1. Is there a detectable difference between two food samples? Difference tests fall in this category and are closely related to psychophysics.

2. How well do people like this product?

Two general approaches to this question are pointed out: (a) preference tests or ratings made by large consumer groups or somewhat smaller representative panels (this falls outside analytical sensory flavor testing), and (b) quality ratings made by a small panel selected and trained for evaluating the general acceptability of a class of substances (scoring of this expert taster logically fit

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into this second group). This group of methods is related to psychometrics.

3. What is the flavor of this product?

The flavor profile falls into this group. Methods in this group are in the field of phenomenological description. (9).

Selection of panel members

The members of a panel may be selected from technical staffs, congenial personnel or from any other groups.

All varieties of profile panels require three general qualifications for panel membership: normal taste-smell abilities, interest, and intellectual integrity. For practical purposes, the normality of the taste and smell abilities of a potential panel member is rather easily defined. He should be able to recognize sweetness and sourness, saltiness, and bitterness - the four taste factors that he has encountered all his life. He also should be able to perceive odors. (9).

Three tests are given to screen the taste-smell abilities of the candidates: taste sensitivity, odor perception, and odor recognition.

A. Basic Tastes Test.

Prospective panel members are not tested for actual taste thresholds, but rather on their ability to differentiate among the basic factors - recognition in effect. A 100 per cent score is, of course, necessary.

B. Odor Perception Test.

The prospective panel members' ability to perceive odors is tested simply by the Elsberg Technique. (9). The apparatus consists of a single or double glass nosepiece attached to a reservoir containing an odorant which in turn is connected to a 30 or 50 cc. syringe. The amount of odorant detected by the subject is recorded by the machine.

C. Odor Recognition Series.

An odor recognition series is given to determine aptitude for identifying odors. (9).

One of the major problems is the amount of pretesting work required to effect reliable selection of taste panel members. A further difficulty may be the experimenter's inability to specify accurately the nature of the panel members' task. "Quickie" methods, based upon a few tests, even complex ones, generally have not been very satisfactory. The tedious process of selecting on the basis of sensitivity to the four basic tastes is often recommended, and has been tried, but the method is of doubtful value. Sensitivity is only one factor; successful performance requires such skills as the ability to remember flavors and to compare flavors and flavor strengths in spite of the time lag between samples. (39).

Peryam says (39):

> With difference testing, panel selection appears somewhat more feasible than with other types of tests, because an objective criterion of performance is possible. All panel members take essentially the

> same tests and individual performances are continually evaluated. Those who are right most often stay on the panel, the less skillful are dropped. Potential new members are simply started in the system and are retained only if their relative skill so merits. Thus, in effect, future performance is predicted from past performance.

Although it is commonly assumed that a person needs some training, there is little information available which bears specifically on this point. Experience in flavor quality control work seems to show that training is helpful; however, the improvement in over-all panel performance that is usually noted may be due to the selection process rather than to training as such. Another possibility is that a subject's performance will improve because he becomes more familiar with the product being tested, but not because he develops a general skill. Too little is known to be dogmatic about how much and what kind of training is necessary to fully qualify a panel member; while not discounting the value of having experienced people, one should be aware of the possibility that only a small amount of training may be required in a given instance. (39).

The literature is in general agreement that tasters should be in good health, because ill health may impair accuracy and will certainly reduce the individual's power to concentrate.

There is less consistency in the literature with regard to the effects of age, sex, and smoking on the competence of a panel candidate. Some observers feel that accuracy decreases with age; others state that maximum taste accuracy

as shown in threshold determinations, is attained during the third decade. (9). However, it is believed that ample sensitivity remains at least throughout most people's span of active life. Taste buds of both adults and children are not equally developed, thus it is essential that children's opinions are obtained and weighed most carefully.

Panel training

Because a trained panel is necessary for profiling, members selected to be on panels are schooled not only in the fundamental concepts and procedure of profiling, but also in the physical and physiological aspects of tasting and smelling, proposed theories on taste and odor perception, and the chemical constitution correlated with taste and odor. The schooling follows a general pattern: (1) formal sessions to establish a foundation which includes lectures on background material and the profile technique, demonstrations by experienced panel members, and practice sessions for the trainees; (2) periodic discussions and reviews held by the faculty with novice panels after the trainees begin to apply the profile method to the problem; and (3) a counseling service in which the trained panels guide trainee panels by working jointly with them on problems. Depending on the amount of time allotted by management to the novice panel, the entire training session usually extends from six months to a year. (9).

Panel leader

The panel leader is a key figure in profile panels. He or she is responsible for organizing, conducting, and directing the panels. He is in charge of all the mechanics of panel operation, such as scheduling panels, sample preparation, standardization of testing techniques, recording and reporting results, guiding the discussions and directing the course of the study. The job of panel leader, which is usually full time, requires not only normal sensory abilities but meticulousness, understanding of people, patience, and the ability to plan and execute flavor tests. (9).

It is the panel leader who makes certain that the samples will be properly stored and representative of their batches or lots. He makes certain that there is a proper atmosphere for making flavor measurements. His job is to ascertain that utensils are odor free, that temperatures of samples during tasting are uniform and consistent, that panel members are given time by management to be an effective panel, and that panel schedules are announced beforehand. He frequently has to act as a buffer, absorbing the pressure waves given off by groups who are impatient to have the information that only the panel can supply. (9).

Test environment

What is wanted is a set of accurate and repeatable human judgments, and it is the investigator's task to provide a proper setting for these judgments. Human judgments are used as instrument pointer readings, and one must

therefore consider what judgments a person can make, and what setting will permit him to make his judgments with the greatest efficiency. Of course, the kinds of judgment a cooperative judge will make is virtually unlimited. (9).

The specific problems encountered in the practical situation may be considered under three headings: (1) control of the setting in which the judgments are made; (2) control of the samples to be judged; and (3) control of the judge himself. (24).

By "control of the setting" we refer to the physical surroundings of the judges, and to other externally controllable general conditions such as time of day or method of recording results.

The physical conditions under which a flavor test is conducted are important. This is due to the need for good experimental control, for mechanical efficiency, and for anticipating, to the extent possible, the effects of surrounding environment in test results. In the planning of tests attention should be paid to the place where taste tests are to be held and to reducing or eliminating obstructions which may occur during the test. (24).

Pettit (41) found out from his tests that presence of generalized sound, which was typical of a large restaurant as contrasted with quietude, did not affect the preference results obtained.

The phrase "control of samples to be judged" refers to the condition of the samples themselves. Probably the

most important problem under this heading is the control of irrelevant characteristics of the samples.

Samples must be labeled in such a way as to carry no biasing information. Sometimes the coding of samples can be biasing. Reversing the labels for half the judges will control this. (24).

Results in tests done by Pettit (40) indicated that some types of information affect the panel preference and others do not. He concluded that if the information conveyed to tasters has meaning within terms of their experiences, it may influence their preference, but if the information does not have meaning it may not affect the preference judgment.

Control of judges concerns such factors as selection, training and motivation of the judges as has already been mentioned previously.

Standardization of Recipes

The establishment and maintenance of high standards of food products should, of course, be regarded as of primary importance by the institutional food director. The importance of good food preparation in institutions can hardly be over-stressed.

In food preparation, many characteristics may be included in definitions of quality for specific items. Appearance, color, tenderness, texture, moisutre, flavor, and size of portions may be important enough to affect the

quality of the product.

Food administrators take these steps to achieve quality: They rely on research, specifications (formula), production and inspection.

In formula cooking, checking conformity to set standards constitutes the main job of inspection by both the chef and the dietitian. Quality must necessarily be worked into the prepared food item by control of the processes of cooking.

If the prepared food item fails to attain the expected standards of quality, it can be directly attributed to: (1) faulty or inadequate formula or (2) failure of the kitchen to prepare the item according to specific formula procedures. (7).

Evelyn Smith states that (52, p. 113):

> Cooking is an art and the cook is the artist. It is possible in quantity cookery to preserve both the art and artistry of preparation. Standardization does not eliminate the use of intelligent artistry and skill on the part of the worker and need not take away the individual touch and interest. In order to achieve quality products consistently, methods, equipment, purchasing, procedures, recipes, and portions must be standardized.

Formula cooking using standardized recipes substitutes science for the individual judgment of the cook and still preserves the art and artistry of preparation. It permits management to select and train the cook instead of allowing them to develop in a haphazard way. (42). Through standardized recipes there is closer cooperation between

management and kitchen employees. They have the opportunity of working together in accordance with scientific principles instead of leaving matters to chance, with employees guessing at solutions.

Profits through formula cooking may be summarized as follows (8, p. 182):

1. Increased inventory turnover resulting in less capital tied up in inventories.

2. More economical food preparation through:
   (a) higher rate of individual production
   (b) accurate and correct forecasting for production
   (c) better stock control
   (d) less expensive handling of food stock
   (e) reduced clinical overhead
   (f) more accurate cost accounting

3. Improved labor efficiency due to:
   (a) less labor idle
   (b) increased skill by repetition
   (c) simplified processes
   (d) better training of employees

4. Better service to the patrons because of:
   (a) improved product quality
   (b) more prompt service
   (c) more desirable menu items
   (d) better values

5. Predetermined results because of established

procedures, fixed formula and portions.

6. Improved operational methods and reduced cost of preparation and service.

It is therefore desirable for each food service unit to establish its own file of standard recipes. No manager can do an efficient job with scattered and untested recipes. Selected recipes may be in books, on separate sheets, or on cards.

Before writing recipes, Smith (52, p. 113) advocates that all operations and equipment be standardized.

1. Equipment and techniques for weighing
2. Size of pans in relation to yield
3. Yields or size of servings
4. Serving equipment
5. Ingredients
6. Methods and techniques of mixing.

Recipes can be obtained from several sources. There are available quantity recipes which are tested. These are given in books or recognized journals. Small recipes are also available, but these will need to be tested and enlarged. Prepared mixes also have quantity recipes available for large institutions.

In selecting any recipe, analysis and evaluation of the recipe is very important. First of all, select a basic recipe from a reliable source. Evaluate it as to proportions, methods, yield and cost to be sure the recipe is practical, suitable and scientifically sound.

In analyzing and evaluating recipes, changes can often be made to simplify them, to improve the quality, to increase the nutritive value (making use of newer findings), or perhaps to obtain different results which may be more acceptable to some people. (26).

Decide on modifications necessary or desirable to make the recipe more suitable to the institution.

If an available quantity recipe is being added to the file, this should first be tested and adapted to the unit. Modify the recipe according to the unit's needs. A skilled worker can make a recipe for 25 and a food director can judge the finished product. Several tests can be made if necessary. A larger quantity can be made and judged by using a standard rating scale by a carefully selected judging panel. If results are satisfactory, the recipe may be incorporated in the file.

In adapting home-size recipes for quantity production, careful observations should be the guide in changing proportions of ingredients.

Points to be considered in increasing yield of a recipe for quantity production are as follows (48, p. 366):

1. Knowing exactly what ingredients are used and in what quantities. The palatability of some home-made products stems from large amounts of ingredients which add richness, delicacy and fine flavor. For similar quality, the production manager must know exactly what original ingredients were used and duplicate them.

2. Checking the proportions of ingredients with a standard large quantity recipe of a product of similar type.

3. Making the recipe first in the original amount, following instructions exactly, and recording observations carefully. Balancing a recipe, rather than being a simple mathematical equation, involves a fairly complex inter-relationship based on limited variation of tolerance range among ingredients.

4. Progressing by slow stages in building up the recipe, keeping in mind the appearance of the product of the original "trial run" at every stage of production. Mixing time and speeds must be adapted to produce a comparable product at the different stages of mixing the larger quantity.

5. Checking scales for accuracy at frequent intervals. Discrepancies in weight may result in wrong proportions among ingredients and can make a perfect recipe fail.

After the recipe has been tested and evaluated, it has to be written and filed. A recipe form has to be decided upon. The form of writing a recipe is important. Janssen (25) recommends numbered steps with each step starting on a new line. This form is easier to use and there is less chance of overlooking a direction. Directions given with one sentence following another, often long and involved with lines written close together, are hard to follow.

Cups, quarts, or any larger measurements should be used rather than using the smaller measurements more than

is necessary. All quantities should be expressed in usable figures, fractions are to be avoided. It is recommended that dry ingredients be weighed and liquid ones be measured.

Ingredients are listed in the order used, using correct terminology and any necessary qualifying statements.

Directions should be given in detail and concisely. Simplification of procedures in recipes can be accomplished by eliminating a step or steps based on the knowledge of the principles of food preparation as well as experiments to see if the results are as expected.

For all recipes evaluated, tested and written, a testing committee or a tasting panel should be set up. The following points should be checked in evaluating a recipe (52, p. 117):

1. Is the recipe clear, concise, accurate, and readable as to:
   (a) amounts in weights or measures
   (b) ingredients, type or kind
   (c) instructions for method
   (d) serving directions - size of serving, garnish to use, if any?
2. Does it produce a quality product as determined by the score card?
3. Is the product nutritious?
4. Is it economical in time, energy and material?
5. Does it eliminate as far as possible the factor of human error?

6. Is the recipe suited to

(a) clientele

(b) available equipment

(c) workers

(d) type of service?

7. If the per capita cost of the product in line with the selling price?

If all the above points are answered with a "yes", then the recipe may be added to the file of standard recipes.

Standardization is a continuing process; one should never lose interest in standardizing new recipes, and, after being standardized, a recipe must be used with skill and judgment. (18).

CHAPTER III

METHOD OF PROCEDURE

Computation of the Nutritional Value

Data on amino acid requirements which provide a basis for describing a pattern for a provisional reference protein, has been proposed as a means of determining the biologic value of the protein. This has been found to agree quite closely with biologic determinations.

The nutritive quality of whole egg proteins is so high that its limitation by amino acid deficiency, if such exists, would be expected to be slight.

Computations of the biologic value of essential amino acids in the protein of mung beans, navy beans, and garbanzo beans were made. This was done to determine the place of these legumes in the diet in meeting the essential amino acid requirements.

Considering the quantity of essential amino acids in 100 grams of raw weight of these three legumes as given in a table in the Home Economics Handbook 4 (40), computations were made to determine the percentage of the recommended daily intake of essential amino acids each provides when three-fourths of a cup of the cook beans were considered as one

serving. The weight of the cooked beans was determined by actual cooking, measuring, and weighing.[1] If A is the value taken from the table mentioned above; B the weight of three-fourths cup of the cooked beans and X the grams of the particular essential amino acid being determined, the proportion 100:A::B:X was used to calculate the weight of the essential amino acids present in each of three kinds of legumes. Using these values for the essential amino acids, the percentage of each in three-fourths cup of cooked beans was calculated.

Evaluation of the Three Methods of Bean Cookery

Simultaneously with the calculations, preparation for a tasting panel was made. Pre-testing of panel members was decided upon. Letters, as shown in the Appendix B, Page 98, were sent to nine staff members, six graduate students and five senior students of the Food, Nutrition, and Institution Administration Department. The purpose of this letter was to find out if prospective panel members could come at a designated time on Wednesdays, which was the day set for the preliminary tasting.

It was decided to hold the preliminary testing for the

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[1] Navy Beans - 1 cup raw (190 grams) = $2\frac{1}{2}$ cups cooked (640 grams).

Mung Beans - 1 cup raw (220 grams) = $3\frac{1}{4}$ cups cooked (784 grams).

Garbanzo Beans - 1 cup raw (196 grams) = $2\frac{1}{4}$ cups cooked (352 grams).

panel members on Wednesday between 11 and 12 o'clock in the morning and one and four o'clock in the afternoon. Eighteen people agreed to participate in the preliminary tasting panel to evaluate their ability to consistently judge texture and flavor of navy beans cooked by three different methods.

A second letter, Appendix B, Page 99, was sent to these panel members telling them of the exact time and the day the preliminary tasting was to be held.

A diagram of the proposed arrangement of the kitchen and food service areas and a score sheet were made. See Appendix B, Pages 100 and 101.

The proposed recipes for cooking the navy beans by the three methods to be tested are in Appendix B, Pages 102, 103, 104. These three methods include: soaking beans overnight in distilled water and simmering on top of the stove; soaking beans overnight in soda water and simmering on top of the stove in soda water, and pressure cooking unsoaked beans in a pressure saucepan.

The correct proportions of water to beans, and the length of time of cooking until tender were determined in a pre-cooking experiment to test the proposed recipes.

The day of recipe testing, three samples of 302 grams each were weighed. One was soaked with enough water to cover the beans and have an inch of water above the bean level. The other was soaked with the same amount of water but with an addition of one teaspoon of soda. The third sample was set aside in the dry state in readiness to be cooked the

next day.

The day for recipe testing, the original recipes were followed and the length of time for cooking was recorded. Necessary adjustments in amount of water and time of cooking were made.

Preliminary tasting panel

Three meetings were scheduled for pre-testing the 18 panel members. The purpose of these meetings was to choose at least six and at most ten members who proved to be most consistent in their sensitivity, as indicated by their scores, to flavor and texture of the navy beans cooked by three different methods.

Most of the panel members were Americans so that the navy beans, with which they were familiar, were chosen. Navy beans, cooked by three different methods, were scored by panel members on three different days. Code letters were assigned to each sample of beans and were interchanged after each meeting to prevent bias. The manner of scoring the beans and of tabulating scores of members of the preliminary taste panel are shown in Appendix B, Pages 105, 106, 107.

Ten panel members were chosen to be in the final evaluation. Again, a letter was sent to these ten members informing them of definite times and a definite day of the final evaluation. See Appendix B, Page 108.

Final evaluation

For the final evaluation, the beans cooked by the three methods were incorporated into three different dishes of family size (12 servings). These dishes are dishes popular in the Philippines. The three dishes were: (1) Navy Beans with Chicken, (2) Mongo Guisado, (3) Garbanzo Beans in Syrup. Recipes for these dishes are included in Appendix B, Pages 109, 110, 111.

The same kind of score sheet used in the pre-testing was utilized in the final evaluation.

Out of the ten final panel members, one missed one of the three meetings and another missed two. Eight panel members had a 100 per cent attendance.

Scores of panel members on flavor and texture of the samples were totaled and from these scores, the most desirable method of cookery of each of the three kinds of beans was determined. The average of the ratings of the eight judges on flavor and texture was computed for each of the three days. Then the average scores of all judges for each of three days were averaged to determine the most desirable method of cookery as indicated by the panel members.

Standardization of Recipes

The method used in the standardization of bean recipes followed the same steps used for the evaluation of bean

cookery.

A tasting panel was again utilized. The pressure cookery method, evaluated by the tasting panel to be the best in the first part of this paper, was used in pre-cooking the beans before incorporating them into dishes. The three bean dish recipes utilized in the final evaluation of bean cookery were used as the basic recipes. These were family-size recipes so that increasing the amounts of ingredients was necessary. Mathematically, the amounts were increased from 12 servings to 25 servings. See Appendix C, pages 119, 120, and 121. After analyzing the procedures and ingredients, the procedures were given in numbered steps to facilitate following them. The pork in the Mung Bean Guisado was changed to beef.[1] Fresh green pepper and red pimiento were added to the navy beans to add color.

The pork in the mung bean dish which was changed to beef did not change the food value or flavor of the recipe much, and beef is often used in this dish.

The panel was carried out together with a Pakistani graduate student who was also working on the standardization of four Pakistani recipes. The author would have preferred all Filipino panel members, but due to the fact that there was only one Filipino student available, the Pakistani students who were asked to participate as tasting panel members

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[1]This was adapted to fit the religious practices of the Moslem tasting panel members.

for the Pakistani dishes were most welcome to evaluate the Filipino dishes.

The author is aware that pre-testing is very important in the selection of reliable panel members. As mentioned in the review of literature, these panel members were those who consistently showed their ability to remember flavors and to compare flavors and flavor strengths in spite of the time lag between samples. Due to some factors, over which the author had no control, it was impractical to do so. These factors are the desire to have Filipino, or at best Asian panel members who were familiar with the dishes to be evaluated and second, the limited number of these students who were available and were willing to cooperate. If Americans had been invited to participate, pre-testing would have been possible. However, they would have been unfamiliar with these Asian dishes, and their evaluations would have been very different from that obtained from Asian students. It was decided to take all the available Asian students as panel members, and as the evaluation went on, their consistency was especially noted. Inconsistency of evaluation did not appear to be great enough to consider the results unusable. Although Pakistani dishes are more spicy than Filipino dishes, similar food standards and cooking procedures are practiced in these two countries. These factors, therefore, permitted the Pakistani students to be judges for the recipes in question. The author is aware that Filipino tasters would be the ideal.

In preparation for the tasting panel, a letter of request was sent to forty Pakistani students, one Filipino student, and an Indonesian student. The letter was constructed to give consideration to the convenience of the student in replying. (See Appendix C, page 122). Nineteen Pakistanis, one Filipino, and one Indonesian student agreed to participate in the tasting panel.

The score sheet shown in Appendix C, page 123, was used for all the dishes in question. The pattern used was the score sheet utilized in testing the best method of cooking beans with modifications to suit scoring of the bean dishes.

Five qualities, namely, color, texture, consistency, flavor, and acceptability, were examined and scored using the following scale:

Extremely poor. 1
Very poor 2
Poor. 3
Below fair - above poor 4
Fair. 5
Below good. 6
Good. 7
Very good 8
Excellent 9

A column for comments was provided for the panel members to give their reasons for the scores they assigned. Suggestions for improvement were also requested from the panel members as an aid in the next evaluation.

Tasting panels were scheduled to meet every Tuesday and Thursday of the week for three weeks, and personal requests were made for other meetings if they were necessary. Each dish was submitted to three taste panel evaluations.

Plans were made to present the dishes to be tested in a well-balanced meal. One or two dishes prepared by each panel leader were presented. The menus consisted of a meat dish, a vegetable dish, a dessert, if possible, and steamed rice. Bland steamed rice was used as a medium to aid in the accuracy of the scores of panel members.

The planned menus for the entire experimental period are as follows:

TABLE I

MENUS PRESENTED TO THE TASTE PANEL FOR EVALUATION

Days	Meat Dish	Vegetable Dish	Rice	Dessert
1	Kurma	Mongo Guisado[1]	Steamed Rice	
2		Vegetable Curry	Steamed Rice	Garbanzo Bean Dessert[1]
3	Navy Beans with chicken[1]		Steamed Rice	Puri
4	Kurma	Mongo Guisado[1]	Steamed Rice	Firni
5	Navy Beans with chicken[1]	Vegetable Curry	Steamed Rice	Garbanzo Bean Dessert[1]
6	Kurma	Mongo Guisado[1]	Steamed Rice	Firni
7	Navy Beans with chicken[1]	Vegetable Curry	Steamed Rice	Garbanzo Bean Dessert[1]

[1]Filipino dishes in menus.

The panel members were always asked to taste and score the Filipino dish first. This was done to avoid the possible "bland" taste of the Filipino dish after tasting the strong, highly seasoned Pakistani dish. Also, they were instructed to taste and score each dish to be evaluated before they ate the whole meal.

During each experiment, the kind of ingredients used, correct amount of each ingredient used, procedures in cooking, and the time of cooking were recorded accurately. The total yield of the final product, total cooking time, number of servings, size of each serving in terms of serving spoons, and all important equipment necessary for cooking were noted.

After each meeting, scores of all panel members were recorded. Comments and suggestions were also noted and these were found to be of great help to the author as to what to do for the next trial. The recipe was also modified after each meeting, taking into consideration the scores, suggestions, and comments of the panel members as well as the panel leader's own personal judgments.

The aim of the author, or panel leader, was to obtain an average rating score between 7.0 and 8.5 which means a rating score ranging from "good" to "very good". (See Appendix C, page 123).

All recipes took a drastic change after the first trial. The change proved to be very satisfactory to the panel members so that these recipes were again tried with no

further changes. Again they were proven to be very good.

The average scores of all dishes in each meeting was computed, and recorded.

CHAPTER IV

RESULTS AND DISCUSSION

Computation of Nutritional Values

Calculations, based on the essential amino acid content of the three legumes as given by the Home Economics Research Report No. 4 (40), indicate that one serving (three-fourths cup) of cook navy beans (192 grams), mung beans (181 grams), and garbanzo beans (117.3 grams) contains the following quantity of essential amino acids as shown in Table II: The proportion 100:A::B:X was used to determine this.[1]

To determine the biological value of the beans, comparison was made of the essential amino acid content of one serving (three-fourths cup, cooked) of each of the three kinds of legumes with the essential amino acid content of one serving (two) of eggs. It was revealed that the navy and the garbanzo beans have more lysine than eggs and that these three legumes are deficient in all of the other essential amino acids, especially in methionine. Deficiency in methionine is also true of the mung bean, but this legume is rich in leucine and lysine.

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[1]See page 44 of this study.

TABLE II

QUANTITY OF ESSENTIAL AMINO ACIDS
IN BEANS AND WHOLE EGG

	Navy Beans 192 g.[1]	Mung Beans 181 g.[1]	Garbanzo Beans 117.3 g.[1]	Whole Egg 100 g.[2]
	Gms.	Gms.	Gms.	Gms.
tryptophan	.113	.091	.111	.211
phenylalanine	.670	.593	.661	.739
lysine	.901	.846	.936	.819
threonine	.526	.388	.483	.637
valine	.736	.733	.699	.950
methionine	.122	.134	.180	.401
leucine	1.042	1.118	1.004	1.126
isoleucine	.689	.686	.780	.850

[1] Weights for each of the beans is equivalent to 3/4 cup cooked beans.
[2] Weight of the whole egg is equivalent to two medium eggs.

If the essential amino acid content of a serving of whole egg is considered 100 per cent, then navy beans are deficient in tryptophan by 47.5 per cent, phenylalanine by 19.3 per cent, threonine by 17.1 per cent, methionine by 69.6 per cent, 22.5 per cent deficient in valine, 6.6 per cent in leucine, and 19 per cent in isoleucine. Navy beans have ten per cent more lysine than whole eggs.

One serving of mung beans, as compared to a serving of whole eggs, is demonstrated to be deficient in tryptophan by 56.9 per cent, phenylalanine by 19.9 per cent, threonine

by 39.1 per cent, valine by 27 per cent, 66.6 per cent in methionine, and isoleucine by 19.3 per cent. Leucine content is almost equal to the amount in a serving of whole egg. It is only deficient by 1.6 per cent. Again lysine is high in this legume. It is 3.3 per cent above the amount in a serving of whole egg.

Compared to essential amino acids in a serving of whole egg tryptophan in three-fourths cup of Garbanzo beans is 47.4 per cent deficient, phenylalanine is 10.5 per cent, threonine is 24.1 per cent, valine is 26.4 per cent, 55.1 per cent in methionine, 11 per cent in leucine, and 8.2 per cent deficient in isoleucine. This bean has 15.5 per cent more of lysine than whole egg.

A graphical representation of these comparisons is presented in Figures 1, 2, and 3.

Using the Recommended Daily Intake of essential amino acids of Rose (46) as 100 per cent, results of computations of the percentage furnished by one serving (three-fourths cup) of each legume emphasizes the deficiency of the legumes in tryptophan, phenylalanine, threonine, valine, methionine, and isoleucine. Table III and Figures 4, 5, and 6 give the results of these computations.

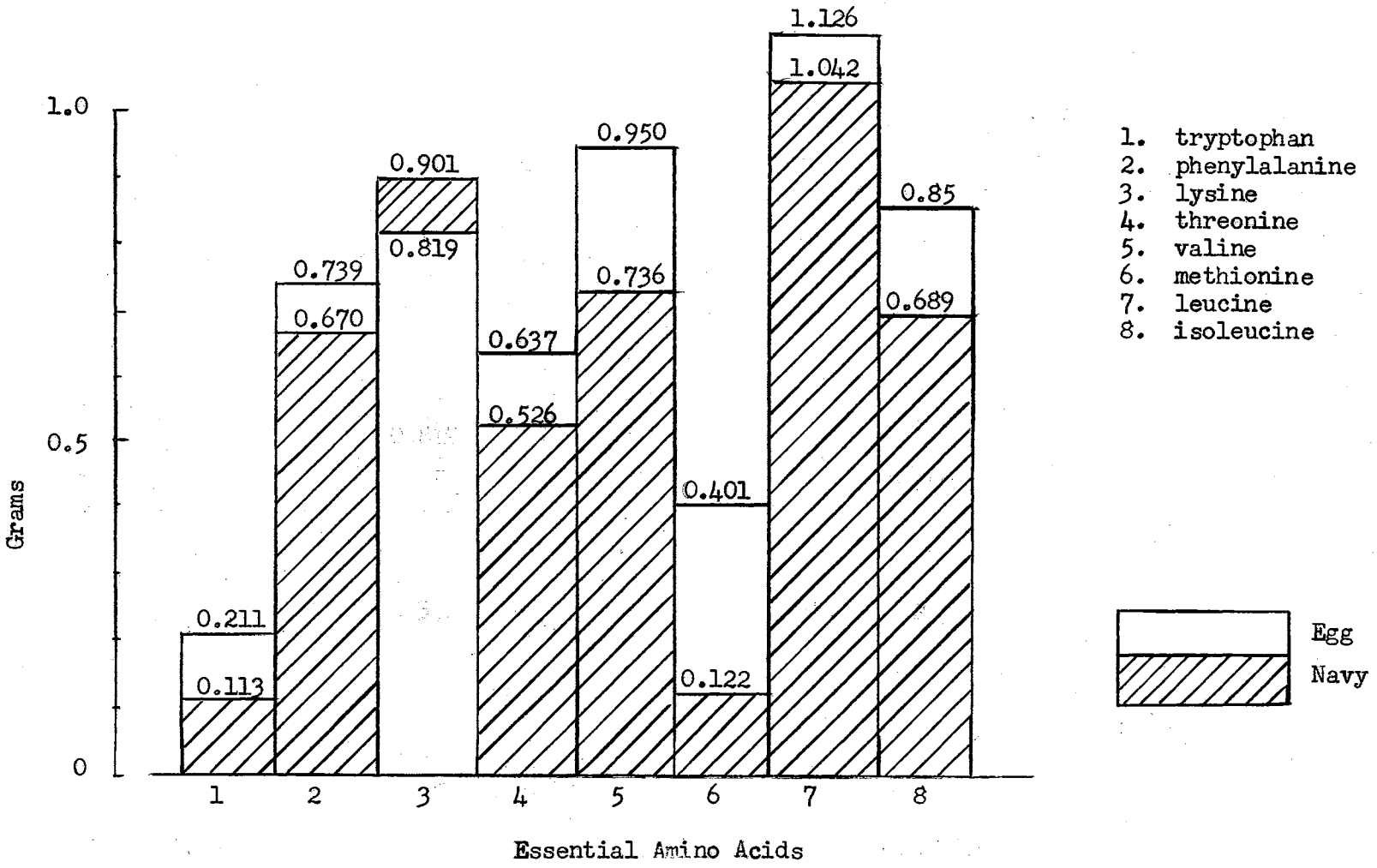

Figure 1. Essential Amino Acids of One Serving (3/4 Cups = 192 Grams Cooked Weight) of Navy Beans as Compared With One Serving of Eggs (100 Grams)

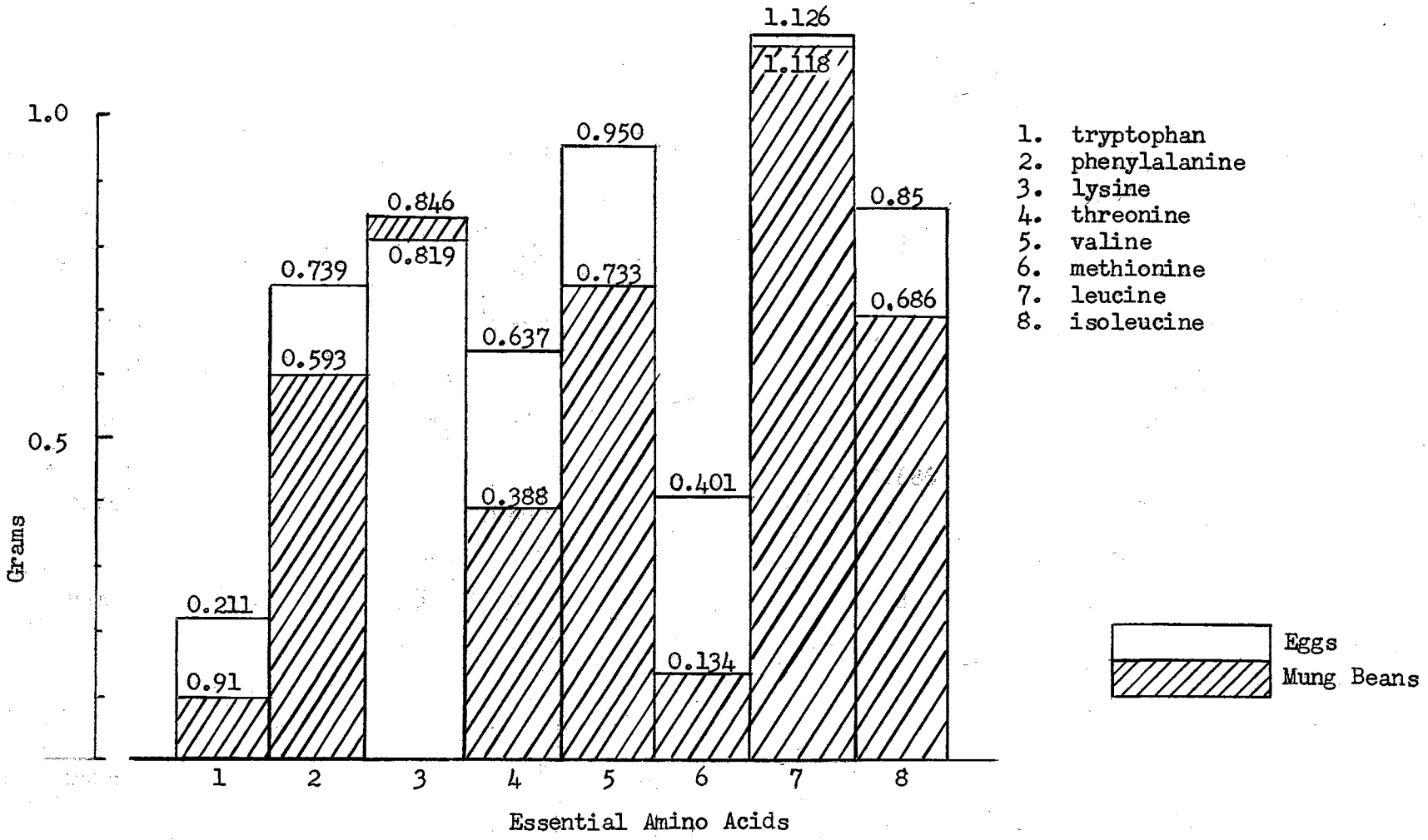

Figure 2. Essential Amino Acid of One Serving (3/4 Cups = 181 Grams Cooked Weight) of Mung Beans as Compared With One Serving of Eggs (100 Grams)

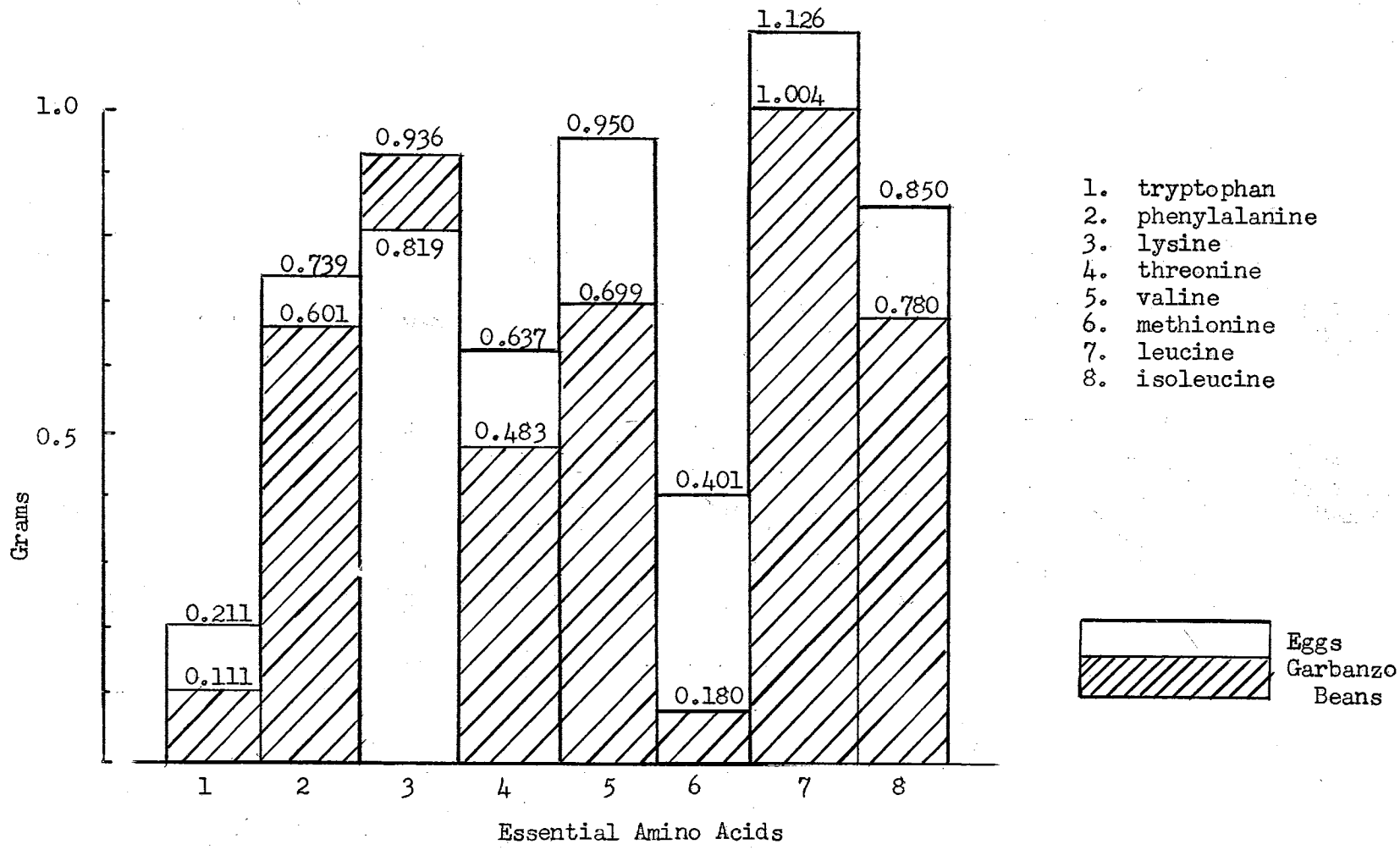

Figure 3. Essential Amino Acids of One Serving (3/4 cups = 117.3 Grams Cooked Weight) of Garbanzo Beans as Compared With One Serving of Eggs (100 Grams)

TABLE III

PERCENTAGE OF RECOMMENDED DAILY INTAKE OF ESSENTIAL AMINO ACIDS IN THE THREE KINDS OF LEGUMES

Amino Acids	Recommended Daily Intake [2]	Navy Beans 192 Gms. [1]	Mung Beans 181 Gms. [1]	Garbanzo Beans 117.3 Gms. [1]
	Gms.	%	%	%
tryptophan	0.5	22.6	18.2	22.2
phenylalanine	2.2	30.45	27	30
lysine	1.6	56.3	52.87	58.5
threonine	1.0	52.6	38.8	48.3
valine	1.6	46	45.8	43.7
methionine	2.2	5.54	6.1	8.18
leucine	2.2	47.36	50.82	45.6
isoleucine	1.4	49.2	49	55.7

[1]Weights for each of the beans is equivalent to 3/4 cup cooked beans.

[2]The Recommended Daily Intake for man is considered as 100 per cent.

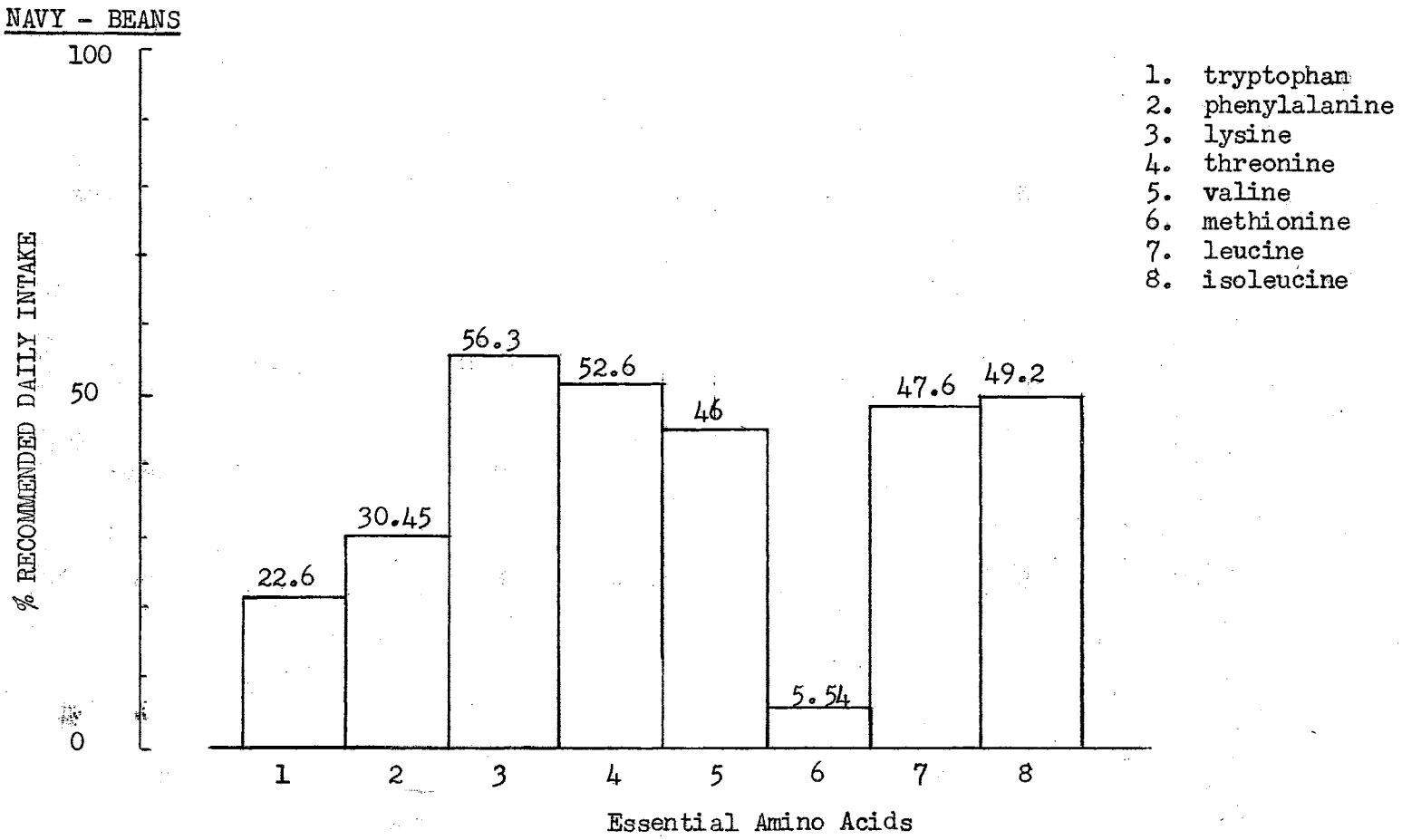

Figure 4. Percentage Recommended Daily Intake of Essential Amino Acids in One Serving (3/4 Cups = 192 Grams) of Cooked Navy Beans

MUNG - BEANS

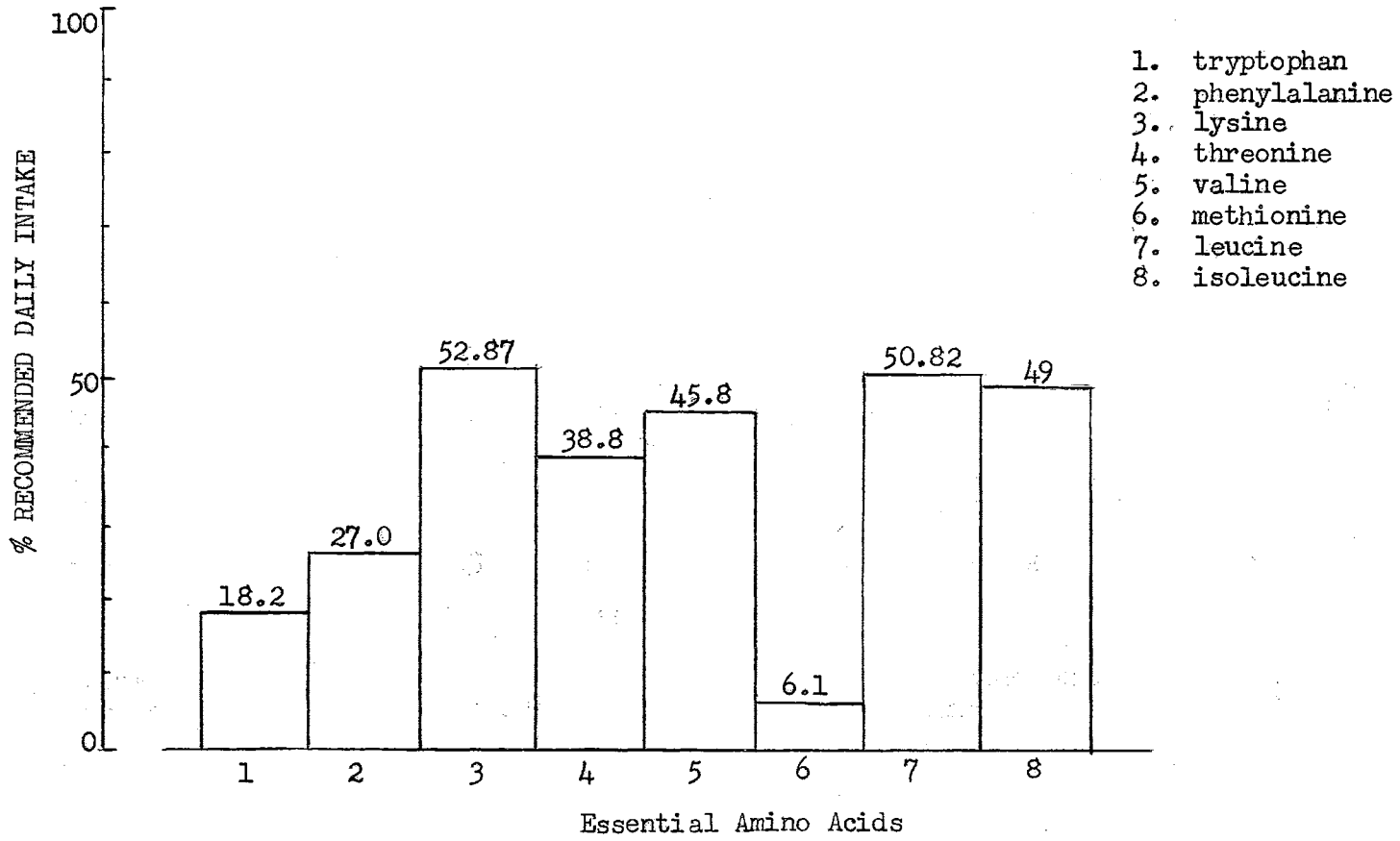

Figure 5. Percentage Recommended Daily Intake of Essential Amino Acids in One Serving (3/4 Cups = 181 Grams) of Cooked Mung Beans

GARBANZO BEANS

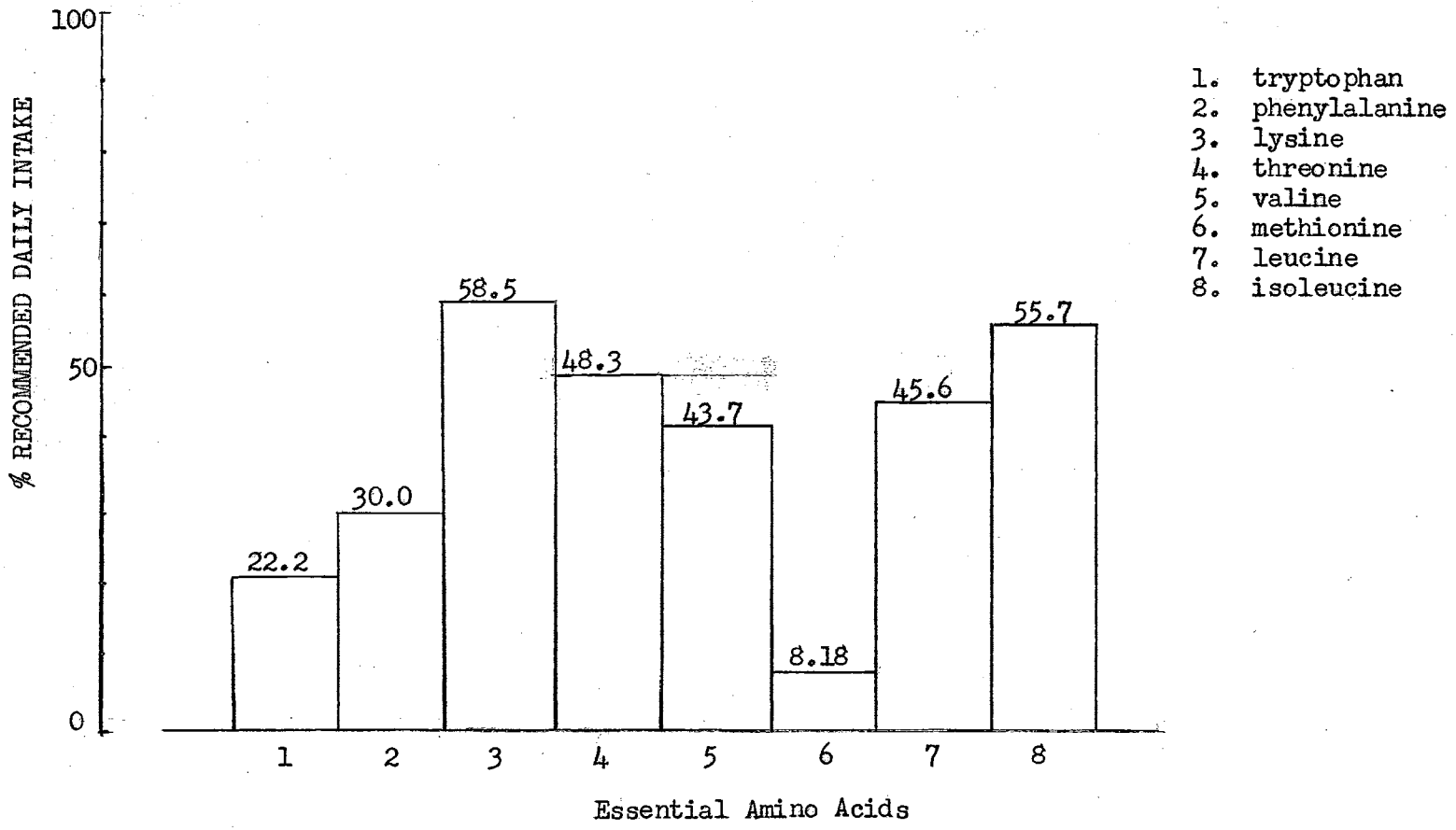

Figure 6. Percentage of Recommended Daily Intake of Essential Amino Acids in One Serving (3/4 Cups = 117 Grams) of Cooked Garbanzo Beans

When the beans were incorporated into the recipes containing animal proteins, it was expected that the amino acid content would increase per serving. All essential amino acids did increase, as demonstrated in Figures 7 and 8, when one serving consisted of 33.67 grams cooked navy beans with 60 grams chicken and 27.41 grams of cooked mung beans with 60 grams of fresh lean pork. The dessert in which the garbanzo beans in syrup were used, was found to have little increase in essential amino acids, as shown in Figure 9. This was due to the small amount of flan and whipping cream used per serving.[1] The only significant increase was in tryphotophan.

Table IV presents the results obtained from computations of the essential amino acids in the three dishes.

As is shown in Table IV, the essential amino acid content of one serving of the navy bean/chicken and mung bean/pork has more than doubled. The percentage increase per one serving, of the three dishes, was computed and the results are presented in Table V.

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[1]A "flan" is a stiff custard rich in egg. For recipe, see Figure A, page 96.

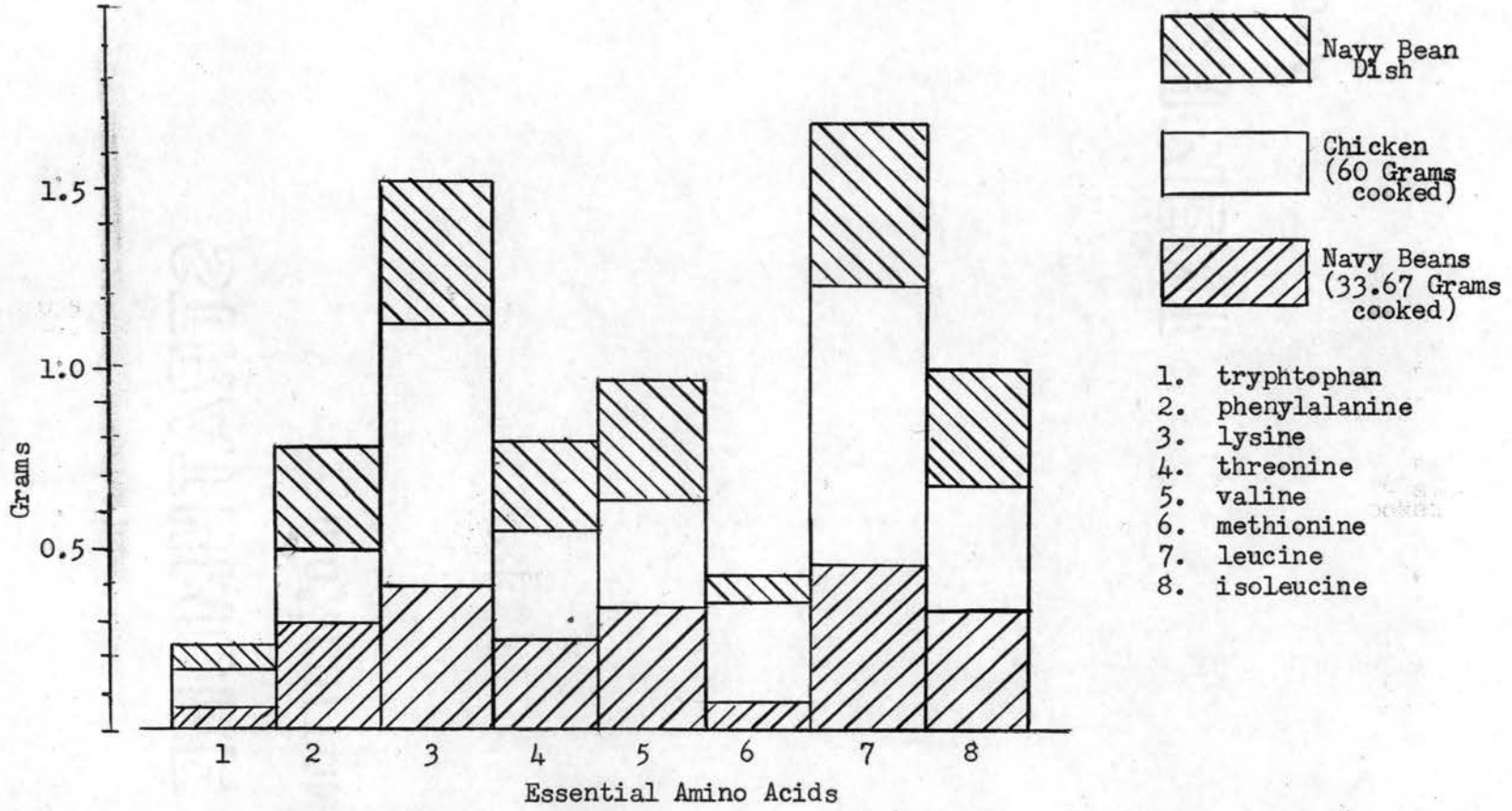

Figure 7. Essential Amino Acid Content of Protein Ingredients in One Serving of Navy Bean Dish

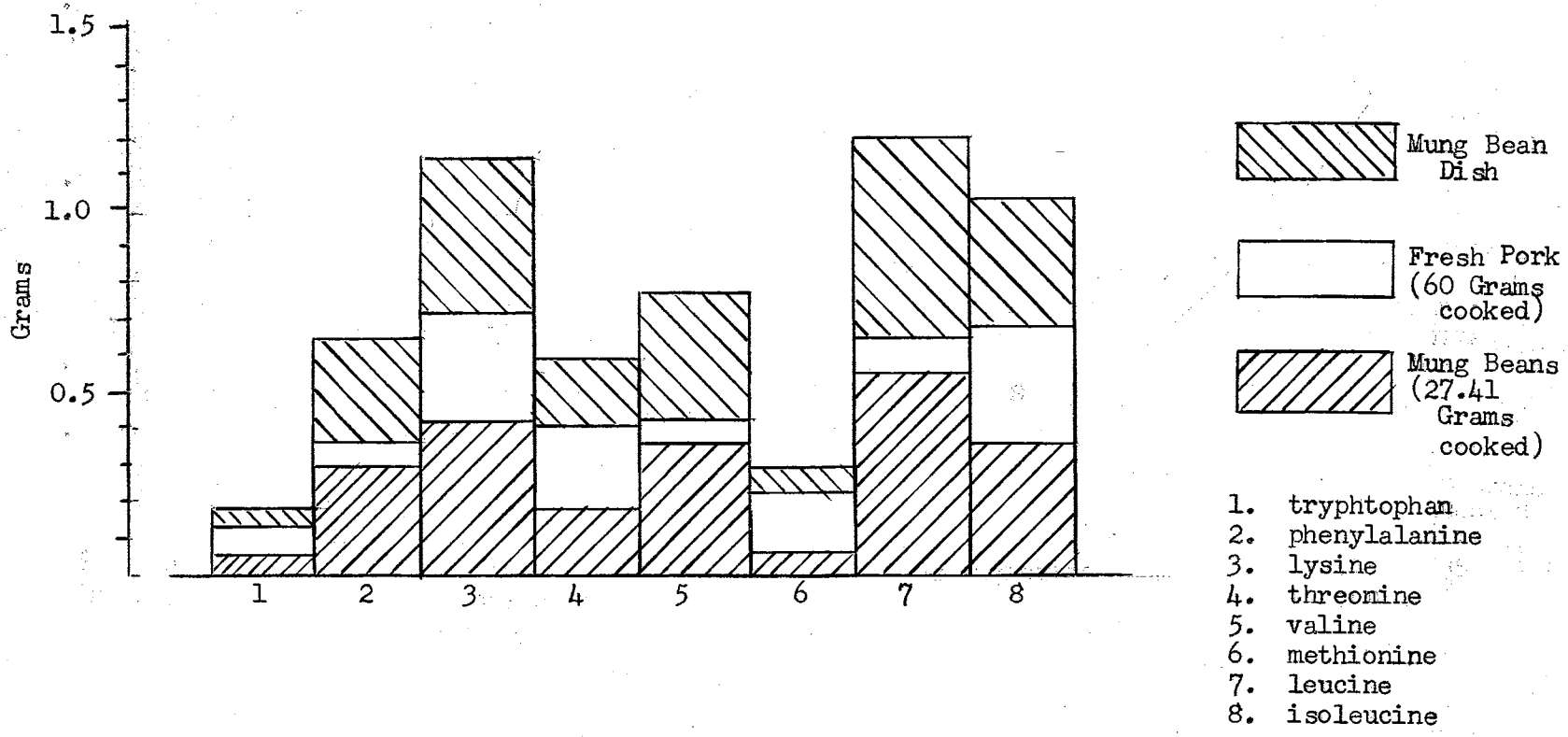

Figure 8. Essential Amino Acid Content of Protein Ingredients in One Serving of Mung Bean Dish

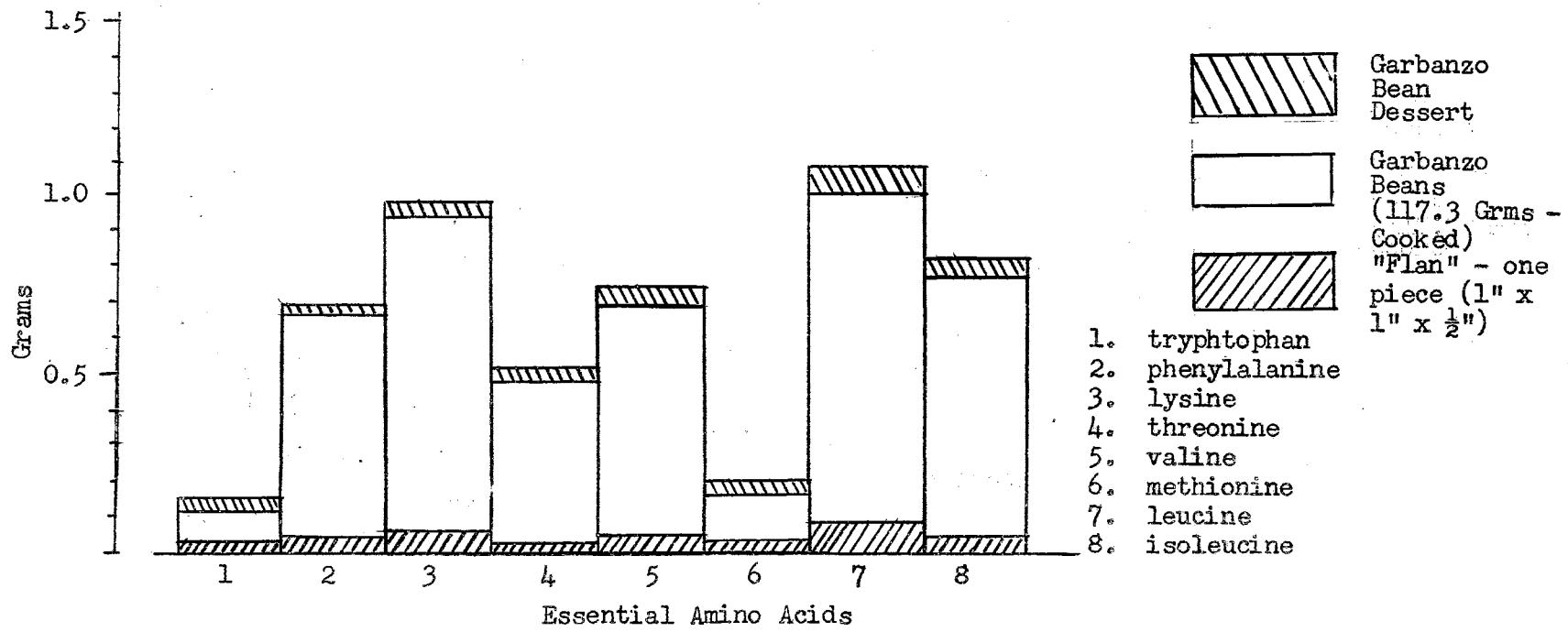

Figure 9. Essential Amino Acid Content of Protein Ingredients of One Serving of Garbanzo Bean Dish .

TABLE IV

ESSENTIAL AMINO ACID CONTENT OF THE PROTEIN IN THE THREE BEAN RECIPES

One Serving of the Dish	Cooked Weight	trypto-phan	phenyl-alanine	lysine	threo-nine	va-line	methi-onine	leu-cine	isoleu-cine
	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.	Grms.
Navy Bean Dish									
Navy Beans	33.67	0.050	.295	.397	.232	.324	.054	.460	.304
Chicken	60	.155	.497	1.123	.544	.628	.333	1.224	.675
TOTAL		0.205	.792	1.520	.776	.952	.387	1.684	.979
Mung Bean Dish									
Mung Beans	27.41	.045	.292	.419	.191	.361	.066	.550	.338
Pork	60	.113	.343	.714	.404	.412	.217	.640	.447
TOTAL		.158	.635	1.133	.595	.773	.283	1.190	.785
Garbanzo in Syrup									
Garbanzo Beans	117.3	.111	.661	.936	.483	.699	.180	1.004	.780
*"Flan" (1"x1"x½")		.024	.028	.047	.025	.038	.026	.089	.039
Whipping Cream (one tablespoon)		--	--	--	--	--	--	--	--
TOTAL		.135	.689	.983	.508	.737	.206	1.093	.819

See Appendix A, page 96.

TABLE V

PERCENTAGE INCREASE IN THE ESSENTIAL AMINO ACIDS OF ONE SERVING OF BEAN RECIPES AS COMPARED TO ONE SERVING OF PLAIN BEANS

	Navy Beans/Chicken	Mung Beans/Fresh Pork	Garbanzo Beans/Flan
	%	%	%
tryptophan	81.4	7.7	21.7
phenylalanine	18.2	7.08	4.2
lysine	68.7	33.9	5.0
threonine	47.5	53.3	5.2
valine	29.3	5.4	5.4
methionine	217.2	111.2	14.4
leucine	61.6	6.4	8.8
isoleucine	42.1	14.2	5.0

Evaluation of Bean Cookery

The proposed recipes for cooking the navy beans for the preliminary tasting, upon pre-testing, were modified. See Appendix B, pages 102, 103, and 104. Using 302 grams of navy beans, distilled water, and one teaspoon of salt in each recipe, the following changes were made:

A. Soaked overnight in distilled water and simmered in distilled water on top of the stove.
   1. Water was increased from 3 1/4 cups to 4 1/4 cups.
   2. Time of cooking was recorded as one hour and twenty minutes.

B. Soaked overnight in soda water and simmered on top of the stove with soda water.
   1. Water was increased from 3 1/4 cups to 3 3/4 cups.
   2. Time of cooking was determined to be 40 minutes.

C. Unsoaked beans cooked in pressure saucepan.
   1. Water was increased to 4 cups.
   2. Time of cooking decreased to 30 minutes at 15 pounds pressure.

The three modified bean recipes are in Appendix B, pages 112, 113, and 114.

Scores of panel members for the three preliminary evaluations were tabulated and are shown in Appendix B, pages 105,

106, and 107. Comparison of the scores of each judge was made to determine their consistency in evaluation of the same sample on three different days. As a result, panel members I, II, III, IV, V, VII, VIII, IX, and X were chosen to participate in the final evaluation.

After the three final evaluations of the three different kinds of beans cooked by the three different methods of bean cookery and later incorporated into bean dishes popular in the Philippines, scores of nine taste panel members were compiled. (Appendix B, pages 115, 116, and 117). The average of all the scores of the judges is presented in Table VI. It was determined that for navy beans the pressure cooked sample had the best flavor and the sample that was soaked overnight with distilled water and simmered on top of the stove had the best texture. The average score for flavor was 1.54, and for texture 1.79 points.

The lower the score number given by the panel members, the higher the score value of the sample.

For the mung beans, both flavor and texture were scored highest, 1.5 and 1.38, respectively, in the pressure-cooked sample. The bean discoloration of the pressure-cooked sample was the only objection.

Results from the garbanzo bean samples were quite contrary to the other two varieties. In this bean, both flavor and texture were scored the highest, 1.66 and 1.77, respectively, in the soda treated sample. This may be due to the effect of the syrup. Samples soaked with soda water over-

night and simmered on top of the stove in soda water, had always been the softest in texture in comparison with the two other methods. When the soda soaked and cooked beans were cooked in syrup, the sugar penetrated into the beans, improving both the flavor and texture.

TABLE VI

AVERAGES OF SCORES FOR THE THREE METHODS OF BEAN COOKERY

	S & S[1]		SS & SS[2]		PS[3]	
	Flavor	Texture	Flavor	Texture	Flavor	Texture
First Evaluation (Navy Beans)	2.00	1.77	2.44	2.33	1.22	1.89
Second Evaluation (Mung Beans)	1.88	2.12	2.12	2.38	1.50	1.38
Third Evaluation (Garbanzo Beans)	1.89	2.22	1.66	1.77	1.89	2.11
Over-all average	1.92	2.04	1.85	2.16	1.54	1.79

[1]S & S . . . . . Soaked overnight and simmered in distilled water on top of the stove.

[2]SS & SS . . . . . Soaked overnight in soda water and simmered in soda water on top of the stove.

[3]PS . . . . . Pressure cooked in pressure saucepan with distilled water.

Table VI clearly shows that pressure-cooked dried beans receiving the lowest rating score ranked highest in flavor

and texture by the taste panel members.

Standardization of Recipes

Navy Beans with Chicken

Scores obtained from each evaluation for this dish were tabulated and totaled. Averages for each quality in question were computed from these scores and later tabulated. See Appendix C, pages 124, 125, and 126.

Table VII gives the computed averages of the three evaluations of the tasting panel for the navy beans with chicken dish.

TABLE VII

AVERAGE TASTING PANEL SCORES FOR NAVY BEANS WITH CHICKEN DISH

Panel	Color	Texture	Consistency	Flavor	Acceptability
First	7.1	7.3	7.25	6.5	7.6
Second	7.2	7.6	7.6	7.5	8.0
Third	8.2	8.05	8.05	8.3	8.4

In the first tasting panel, the average scores of most qualities were high. These rating scores were interpreted as a "good" rating for the dish. The flavor of the dish was the only quality rated below the desired standard of 7.0 and above.

Although, the recipe was rated high, the panel had felt that there was some room for improvement. Comments and suggestions given by the panel members were reviewed. Personal observation during the experiment also gave clues to what qualities could be improved.

For the first evaluation, 8 1/4 cups of water used in pressure cooking the beans were found to be more than required. One cup of bean liquor had to be discarded -- poured out after saving one cup for liquid. Thirty minutes of pressure cooking at 15 pounds was just right for cooking the beans, but after it had been incorporated into a dish with the chicken, it turned out to be a little mushy so that an adjustment of shortening pressure cooking time was necessary. Suggestions from the panel members for the addition of more fresh tomaties, green pepper, salt and pepper, were also given. A comment on the over-doneness of the green pepper and paleness of the dish was also found in the sheets of the panel members.

Thus, after considering the observations while cooking and the ratings, comments and suggestions of the panel members, the following changes were made in the recipe:

1. Water for cooking beans was changed to 1 3/4 quarts.
2. Time of pressure cooking was shortened to 25 minutes.
3. One tablespoon of salt was added to the chicken before boiling, and two tablespoons of salt to the chicken-bean mixture instead of just one and one-half tablespoons.

4. One and one-half teaspoons of cayenne were substituted for the black pepper to improve the color. Paprika (1 1/2 tsp.) was also added to increase the desired red color.
5. After shortening the pressure cooking time of the beans, it was found necessary to increase the liquid (bean liquor and chicken broth) to one and one-half cups.
6. Fresh tomatoes were increased by two pounds from the original one pound.
7. Fresh green pepper was doubled to make one pound.

The modified recipe was presented to the tasting panel for the second evaluation.

The second evaluation showed improvement as indicated in the rating scores given by the panel members. This is shown in Table VII.

Ratings between seven to eight were considered to be the desirable scores for a good product. It was, therefore, decided to evaluate this same recipe a third time to find out if it was completely standardized.

Upon the third evaluation the same recipe received even better ratings (see Table VII). This could be the result of the panel leader's increasing skill in the procedure of cooking.

This recipe was therefore determined to be of a very good quality and completely standardized.

The standardized recipe is as follows:

Standard Recipe for Navy Beans with Chicken

Ingredients:

Navy beans, dry	630 grams
Water	1 3/4 quarts
Chicken	3 - 2 1/2 pound fryers
Water, hot	2 quarts
Salt	1 tablespoon
Oil	1 cup
Onions, sliced thinly	1 pound
Garlic, slightly pounded and skinned	4 cloves
Cayenne	1 1/2 teaspoons
Paprika	1 1/2 teaspoons
Fresh green pepper, cut 1"x1"	1 pound
Liquid (chicken stock and bean liquor)	1 1/2 cups
Salt	2 tablespoons
Red pimiento, cut into strips	1 can, 4 ounces
Fresh tomato, sliced 1"x1/2"	1 1/2 pounds

Procedure:

1. Put washed and drained navy beans in a pressure saucepan and add 1 3/4 quarts hot water. Pressure cook at 15 pounds for 25 minutes.
2. Cut chicken into serving pieces (10 servings/fryer) while the beans are cooking.
3. Boil chicken with 2 quarts of hot water and 1 tablespoon salt for one hour or until tender.
4. Heat oil in a 6-quart saucepan. Saute the garlic in the oil until golden brown. Add onions and saute for five minutes, or until the onions are transparent.
5. Add to onions and garlic the cayenne, paprika and salt and continue sauteing at low heat for another five minutes.
6. Add cooked chicken and continue sauteing for five minutes so the chicken can absorb the flavor. Add liquid and simmer for five minutes.
7. Add cooked beans (drain if some liquid is left in pressure saucepan and add to chicken broth). Mix.
8. Add fresh tomatoes on top. Simmer for ten minutes or until the fat of the mixture is seen on top.
9. Put on top of the bean mixture, the green pepper and pimiento strips.
10. Serve hot.

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[1]May be done the day before and kept in the refrigerator.

TOTAL YIELD: 5 1/2 quarts
TOTAL COOKING TIME: 1 1/2 hours
NUMBER OF SERVINGS: 25
SIZE OF SERVING: 1 piece of chicken and 2 serving spoons of bean mixture.
PAN SIZES: 1 - 6-quart saucepan or kettle
1 - 4-quart saucepan
1 - 6-quart pressure saucepan

Mongo Guisado

Results of all three evaluations were tabulated. For each evaluation, scores were totalled and averages were computed. This is presented in Appendix C, pages 127, 128, and 129.

The average rating scores obtained for Mongo Guisado in all three evaluations are in Table VIII.

TABLE VIII

AVERAGE TASTING PANEL SCORES
FOR MONGO GUISADO

Panel	Color	Texture	Consistency	Flavor	Acceptability
First	5.7	6.3	7.2	6.56	6.76
Second	7.2	7.6	7.9	8.05	8.0
Third	7.8	8.0	8.0	8.4	8.0

Rating scores for the first evaluation of this recipe were not as good as those for the navy beans.

Comments and personal observations revealed that the beans were too mushy, the meat was not tender, it had too much spinach, and the taste was bland. Suggestions were made to add more salt, to cook the meat longer, and to add tomatoes to improve the color as well as the flavor.

Changes were made in the recipes considering the above factors. The following are the modifications that were made:

1. Pressure cooking time was 20 minutes to allow for cooking during the sautéing.
2. Water for pressure cooking the beans was increased to ten cups.
3. Meat was simmered in water for one-half hour to make it tender. One tablespoon of salt was added.
4. Amount of spinach used was decreased to one package of 12 ounces.
5. One and one-half pounds of tomatoes were added.
6. Oil was increased to one cup.
7. Some liquid was needed in sautéing to have the right consistency. The mung beans were dry after pressure cooking; thus one quart of liquid (beef stock, obtained from the beef) was added.
8. To improve the unappealing dark green color, black pepper was substituted for the cayenne and one and one-half teaspoons of paprika was added.
9. Salt was increased to two tablespoons.

After the recipe had been modified, it was presented to the tasting panel for another evaluation.

Great improvement was noted in the second trial. Comments and rating scores of the panel members are indicated in Table VIII.

Since all characteristics were rated "good" to "very good", it was not considered necessary to modify the recipe further. It was decided to submit this same recipe to the tasting panel for one more evaluation.

At the third tasting panel evaluation, average ratings of the dish showed further improvement. Although no furthur changes were made, the rating went up. An overall rating of the dish can therefore be interpreted as being "very good".

This modified recipe was then concluded to be standard and is presented here.

Standardized Recipe
for
Mongo Guisado

Ingredients:

Mung beans, dry	630 grams
Water, hot	2 1/2 quarts
[1]Beef, cut - 1"x1"x1/4"	2 1/2 pounds
Water, hot	1 quart
Salt	1 tablespoon
Onions, sliced thinly	1/2 pound
Garlic, slightly pounded and skinned	6 cloves

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[1]Pork (lean meat) may be used instead of beef. If so, simmering is not necessary. The sliced (1"x1"x1/4") pork may be fried in the hot oil and set aside. The same fat may be used in sauteing, thus saving the nice flavor of the fried pork.

Vegetable oil	1 cup
Liquid (beef stock)	1 quart
Frozen spinach, thawed	1 12-ounce package
Fresh tomatoes, chopped	1 1/2 pounds
Salt	2 tablespoons
Cayenne	1 1/2 teaspoons
Paprika	1 1/2 teaspoons

Procedure:

1. Put washed and drained mung beans in a pressure saucepan and add 2 1/2 quarts of hot water.[2]
2. While cooking the beans, simmer the beef in one quart hot water and one tablespoon salt until tender (about 1/2 hour).[2]
3. Heat oil in a six-quart saucepan. Saute the garlic in the oil until golden brown. Add onions and saute for five minutes or until the onions are transparent.
4. Add salt, cayenne, and paprika and continue sauteing for another five minutes.
5. Add tender beef and saute for five minutes for the beef to absorb the flavors. Add one quart of liquid (beef stock) and simmer for five minutes longer.
6. Add cooked mung beans. Mix. Add tomatoes and simmer for ten minutes.
7. Add thawed frozen spinach to the mixture just before serving.
8. Serve hot in a vegetable dish.

TOTAL YIELD:	5 1/2 quarts
TOTAL COOKING TIME:	1 hour and five minutes
NUMBER OF SERVINGS:	25
SIZE OF SERVING:	2 1/2 serving spoons, or approximately three-fourths cup.
PAN SIZES:	1 - 6-quart saucepan or kettle 1 - 4-quart saucepan 1 - 6-quart pressure saucepan

Garbanzo Bean Dessert

Presented in Table IX are the average rating scores obtained from three evaluations of Garbanzo Bean Dessert. These figures for each quality in question were computed from scores of panel members.

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[2] May be done the day before and kept in the refrigerator.

TABLE IX

AVERAGE TASTING PANEL SCORES FOR GARBANZO BEAN DESSERT

Panel	Color	Texture	Consistency	Flavor	Acceptability
First	7.0	6.1	6.05	6.8	6.7
Second	7.2	7.2	7.05	7.4	7.4
Third	8.3	7.8	7.8	8.1	8.2

Tabulated scores of all panel members and their comments and suggestions are shown in Appendix C, pages 130, 131, and 132.

Comments on the hardness in texture of the beans were given in most score sheets. This was also noted by the panel leader during the experiment. It was noted, as it was in the first part of the experiment, that the syrup has a hardening effect upon the texture of the beans. The hardening of the beans affects the penetration of the syrup into them and thus affects the flavor. In pressure cooking the beans at 15 pounds for 30 minutes, the beans were mealy and tender; and if the beans were to be served in this way, the texture would be desirable. But after they have been simmerred in syrup, the texture changes and becomes hardened. Therefore, it was found necessary to increase the cooking five minutes in the pressure saucepan at the same amount of pressure.

Also, the beans after pressure cooking were dry so that in order to have a softer texture after a longer time of cooking, the water was increased to 2 1/2 quarts.

Another comment found in the score sheets concerned the sweetness of the dessert, although the beans themselves were not sweet at all. The syrup that was served with the beans gave the "too sweet" taste.

Taking into account all the above factors, the following changes were made in the recipe:

1. The cooking time in the pressure saucepan was increased to 35 minutes.
2. Water was added and a total of 2 1/2 quarts was advised.
3. Sugar for the syrup was decreased to two cups, using the same amount of water - one quart.
4. The beans were cooked in syrup the night before and stored in the refrigerator with the syrup to marinate them.
5. The syrup was not served with the beans. The beans were drained before serving.
6. The cream was chilled and whipped before serving to improve the appearance of the dish.

This modified recipe was subjected to a second evaluation by the tasting panel members.

An improvement can be noted in Table IX for the second panel evaluation of Garbanzo Bean Dessert. The changes made in the recipe produced a better product as indicated by the

second panel evaluation.

The color was improved by the whipped cream. A soft, mealy texture was obtained by the increased pressure cooking time of the beans. This also improved the flavor, because the syrup could penetrate into the beans. Flavor was also improved by marinating in syrup as well as draining before serving. Decreasing the sugar gave a lessened but more acceptable sweetness to the product.

Since a score above seven was received on all qualities, the recipe was considered to be a standard one; and therefore was listed a third time without any further changes.

The third evaluation scores, as indicated in Table IX, reveal continued improvement. Although no changes were made in the recipe, this improvement in the rating scores can be explained by the increase in the skill of the panel leader in following the procedures of this recipe. Thus the recipe was determined to be standard.

The following is the standardized recipe for Garbanzo Bean Dessert:

Standardized Recipe
for
Garbanzo Bean Dessert

Ingredients:

Garbanzo Beans, dry	630 grams
Water, hot	2 1/2 quarts
Sugar, granulated	2 cups
Water	1 quart
Eggs, fresh	3
Sugar, granulated	1 cup
Vanilla	1 teaspoon
Sugar, granulated	50 grams
Red Maraschino cherries	1 4-ounce bottle

Whipping cream	1 pint
Evaporated milk	1 14-ounce can

[1]Procedure:

1. Pre-heat oven to 300°F.
2. Make custard mixture or "flan":
   a. Stir whole eggs with a fork (do not beat) and blend in the evaporated milk (do not dilute with water)
   b. Stir one cup granulated sugar into the egg-milk mixture until the sugar is dissolved. Add the vanilla.
3. Set the custard mixture aside.
4. Caramelize 1/4 cup sugar in a square pan (5-1/2"x 5-1/2" x 1-1/2") by heating over a low fire. Line the bottom of the pan with the caramelized sugar.
5. Pour the custard mixture into the sugar-lined pan.
6. Place custard in a pan of hot water (1/2 full). Bake for one hour at 300°F. (Test doneness with a knife).
7. While the custard is baking, put washed and drained beans in a six-quart pressure saucepan and pressure cook at 15 pounds for 35 minutes.
8. After the pressure is down, let the cooked beans remain in sealed cooker for about ten minutes (to facilitate removal of skin).
9. Open pressure saucepan and cool at room temperature.
10. Meanwhile, make a syrup with two cups sugar and four cups hot water in a six-quart saucepan or kettle.
11. Put the cooled beans under running cold water (beans in the same pressure saucepan). Stir with hands and let the water overflow. This is to remove loose skins of the beans. Continue doing this until all the skins are removed. If some skins are not loose, loosen with fingers.
12. Put cooked skinless beans in the syrup and simmer until the beans are transparent (30 minutes).
13. Let bean mixture and custard cool. Marinate the beans in a jar with the syrup in the refrigerator overnight. Custard may be kept in the refrigerator, too.
14. For serving:
   a. Drain the beans and place 3/4 cup in a dessert saucer.
   b. Top each serving with whipped cream. (One tablespoon per serving)
   c. Garnish with a slice of the custard or "flan" (1-1/2"x1-1/2"x1/4") and one-half of red Maraschino cherry.

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[1]All procedures except serving must be done the day before.

TOTAL YIELD:	4 3/4 quarts drained - 5 1/2 quarts with syrup.
TOTAL COOKING TIME:	1 hour and 45 minutes.
NUMBER OF SERVINGS:	25
SIZE OF SERVING:	3/4 cup beans, one tablespoon whipped cream, one slice "flan", 1/2 red Maraschino cherry.
PAN SIZES:	1 6-quart kettle 1 6-quart pressure saucepan 1 5 1/2"x5 1/2" baking pan.

CHAPTER V

SUMMARY AND CONCLUSIONS

Computations of the nutritional value of the three legumes revealed that when the essential amino acids of one serving of egg was considered 100 per cent, one serving of the beans (3/4 cups) is deficient in most of the essential amino acids. Methionine and tryptophan are the essential amino acids that are most deficient. As compared to a serving of whole eggs, one serving of the navy beans, mung beans, and garbanzo beans are deficient in methione by 69.6 per cent, 66.6 per cent and 55.1 per cent respectively. In tryptophan, navy beans are deficient by 47.5 per cent, mung beans by 56.9 per cent and the garbanzo beans by 47.4 per cent.

It was also indicated that the content of lysine in all these beans is high. Per serving, the navy beans have 10.0 per cent more lysine than one serving of whole egg. Mung beans have 15.5 per cent more lysine and garbanzo beans 3.3 per cent. Leucine content of mung beans is almost equal to the amount of a serving of whole egg. It is only deficient by 1.6 per cent.

When these beans were incorporated into popular Philippine dishes, which contained some form of animal

protein, considerable increase in the essential amino acids took place. It was noted that methionine content in the navy beans with chicken dish and in the mung beans with pork dish had more than doubled. They had a percentage increase of 217.2 and 111.2 per cent respectively. Tryptophan content increased by 81.4 per cent in the navy bean dish and 7.7 per cent in the mung bean dish. Due to the very small amount of "flan" in the garbanzo bean dessert, the percentage increase of essential amino acids was quite low. The only increase of any size was in the tryptophan which was 21.7 per cent.

The scores of the tasting panel, regarding the best method of cooking beans, indicated the best method to be the pressure cooking method. This would be advantageous since cooking time would be reduced. The long cooking time of one hour and twenty minutes in the method in which the dried beans are soaked over night and simmered on top of the stove was reduced to 30 minutes by pressure cooking. The method in which soda was used proved to be very unsatisfactory for the navy and mung beans due to its mushy texture, bitter flavor and change of color.

This pressure cooking method would only be advisable when a number of relatively small pressure cookers are available as large quantities of beans, pressured at one time, usually develop an undesirable consistency.

Standardization of recipes is desirable as it assures the food production manager of a definite quantity of food

of a known and desirable quality. Family size recipes from home cookbooks can be mathematically increased, prepared and evaluated by a tasting panel. Adjustments can be made in the recipe as needed until the repeated panel scores reveal that the recipe consistently yields a known quality of highly acceptable food.

In this study, the standardization of three bean dishes, combined with some form of animal protein, permitted the author to use a method which can be applied in standardizing other quantity recipes.

In summary, the following conclusions have been made:

1. Dried beans are a good source of protein when used in combination with an animal protein.
2. The pressure cookery method is a desirable method to use when cooking dried beans.
3. Standardization of recipes assures the food production manager of receiving a known quantity of highly acceptable food.
4. In standardizing recipes, a tasting panel of not less than 10 people is a desirable method to use to determine the acceptability of the dishes.

Suggestion for Further Study

The present study was undertaken under rather severe limitations, due to limited supply of Philippine beans available, short experimental period and unavailable Filipino tasters. In the future, it is hoped that similar studies may be carried out in the Philippines with many reliable Filipino tasters as tasting panel members.

It may be desirable to investigate the effect of sodium bicarbonate on all these beans by conducting some rat growth studies as it was concluded that the effect is not the same for all varieties.

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APPENDIX A

COMPUTATIONS OF NUTRITIONAL VALUE

Amino Acid Content of One Serving of "Flan"

Flan	25 serv.	Cooked Weight	trypto-phan	phenyl-alanine	lysine	threo-nine	va-line	methi-onine	leu-cine	isoleu-cine
Eggs	3	150 grms.	.322	.111	.123	.955	.143	.601	1.689	.128
Evaporated Milk	14½ oz.	406 grms.	.4019	1.280	2.212	1.3113	1.8728	.6942	2.7932	1.8148
Sugar		--	--	--	--	--	--	--	--	--
TOTAL	50 serv.		1.2239	1.391	2.335	1.2663	1.9158	1.2952	4.4822	1.9428
One serving	1/50		.024	.028	.047	.025	.038	.026	.089	.039

Figures for eggs and milk from "Amino Acid Content of Foods," 1957, Home Economics Research Report No. 4, United States Department of Agriculture.

APPENDIX B

EVALUATION OF BEAN COOKERY

FNIA 510

Foods, Nutrition, & Inst. Adm. Dept.
Oklahoma State University
Stillwater, Oklahoma
October 28, 1960

Dear _____:

A study on different methods of cooking beans and its effect on their acceptability is being conducted. Your participation, as tasting panel member, will be greatly appreciated.

This study was prompted by my interest in the use of beans as a means of supplying protein at low cost since beans are greatly used in the Philippines as a meat substitute.

There will be three, one-hour preliminary tests and individual performances will be evaluated. Those who indicate their ability to consistently make the same choices will be asked to stay on the panel. These final panel members will be requested to taste and score three different kinds of beans, prepared in different manners and incorporated into dishes used in the Philippines. The Research Laboratory, Room 403, will be used. New Home Economics Building.

If you are willing to serve on this tasting panel, please check one or more of the hours which will be convenient for you. Place the checked letter in my mail box in Room 201 in the Old Home Economics Building by Thursday afternoon, November 3. If no suggested time is convenient, will you add any other hours on Wednesday when you could help with this evaluation.

Thank you very much for your consideration.

WEDNESDAY

11:00 - 12:00 p.m. _____
2:00 - 3:00 p.m. _____
3:00 - 4:00 p.m. _____
other suggested time _____

Sincerely,

Maria Lourdes G. Guzman
(Graduate Student)

FNIA 510

Foods, Nutrition, & Inst. Adm. Dept.
Oklahoma State University
November 7, 1960

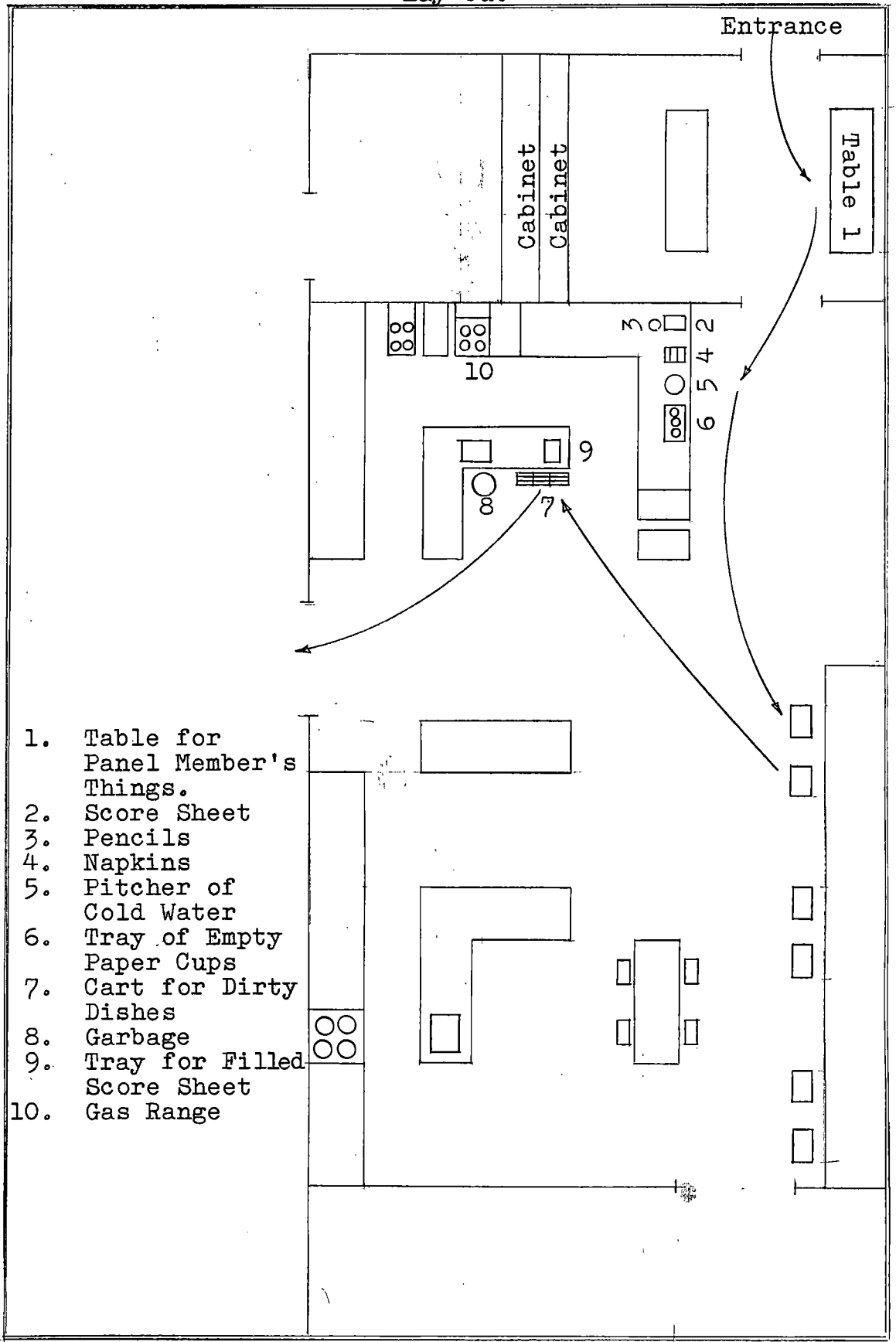
Dear _____:

Thank you very much for your prompt reply to the request to serve on my tasting panel. Your co-operation in this evaluation is very much appreciated.

Definite dates for the Preliminary tests have been set. They will be on WEDNESDAYS, November 9, 16, and 30 at the time you have checked in the previous letter. Samples will be ready at 11:00 a.m., 1:00, 2:00, and 3:00 p.m. Please come at the specific time you have checked. The entrance will be at the door of Room 401 in the New Home Economics Building.

Sincerely,

Maria Lourdes G. Guzman
Graduate Student



1. Table for Panel Member's Things.
2. Score Sheet
3. Pencils
4. Napkins
5. Pitcher of Cold Water
6. Tray of Empty Paper Cups
7. Cart for Dirty Dishes
8. Garbage
9. Tray for Filled Score Sheet
10. Gas Range

Room 401, New Home Economics Building, Oklahoma State Univ.

FNIA 510

(Project of Maria Lourdes Guzman)

SCORE SHEET

We are testing the effect on flavor and texture of different methods of cooking beans. Before you are three samples of the same beans, all treated similarly except in the method of cooking. After each sample identification, please fill in the flavor and texture columns with the appropriate numerical score.

PRODUCT _____

NAME _____ DATE _____

Examine and score with respect to the quality, using the following score:

GOOD 1

FAIR 2

POOR 3

SAMPLE IDENTIFICATION	FLAVOR	TEXTURE	COMMENTS
SAMPLE A			
SAMPLE B			
SAMPLE C			

PROPOSED BEAN RECIPE

Navy Beans - Soaked Overnight and Simmered on Top of the Stove

NAVY BEANS
(For Pretesting of Panel Members)

Procedure: SOAK AND SIMMER ON TOP OF THE STOVE

Ingredients:

Navy Beans	302 grams
Distilled water	3 1/4 cups
Salt	3/4 teaspoon

Steps:

(1) Soak navy beans overnight in distilled water enough to cover the beans.

(2) DRAIN.

(3) Add to drained navy beans 3 1/4 cups of distilled water and 3/4 teaspoon of salt.

(4) SIMMER until tender for two hours on top of the stove.

PROPOSED BEAN RECIPE

Navy Beans - Soaked Overnight with Soda Water and Simmered in Soda Water on Top of the Stove

NAVY BEANS
(For Pretesting of Panel Members)

Procedure: SOAKED IN SODA WATER AND SIMMERED IN SODA WATER

Ingredients:

Navy Beans	302 grams
Distilled water	3 1/4 cups
Salt	3/4 teaspoon
Soda	2 teaspoons (1 tsp. for soaking and 1 tsp. for simmering)

Steps:

(1) Soak navy beans in distilled water and 1 teaspoon of soda, overnight.

(2) DRAIN.

(3) Add to drained beans 3 1/4 cups distilled water, 3/4 teaspoon salt, and 1 teaspoon soda.

(4) SIMMER ON TOP of the stove for one hour until tender.

PROPOSED BEAN RECIPE

Navy Beans - Pressure Cooked in Pressure Saucepan

NAVY BEANS
(For Pretesting of Panel Members)

Procedure: PRESSURE COOKED

Ingredients:

Navy Beans	302 grams
Distilled water	3 1/4 cups
Salt	3/4 teaspoon

Steps:

(1) Add to dry navy beans 3 1/4 cups of distilled water and 3/4 teaspoon of salt.

(2) Cook in pressure sauce pan for fifty-five (55) minutes at 15 pounds pressure.

First Preliminary Evaluation of Navy Beans
November 9, 1960

Panel Member No.	Sample A		Sample B		Sample C	
	Flavor	Texture	Flavor	Texture	Flavor	Texture
I	1	1	3	2	2	3
II	1	1	1	2	2	2
III	1	1	3	3	1	2
IV	1	1	3	3	2	2
V	2	1	1	2	2	2
VI	1	1	2	2	3	3
VII	1	2	2	3	2	2
VIII	1	1	3	3	2	3
IX	2	2	2	3	1	2
X	2	2	3	3	2	1
XI	1	1	3	2	2	2
XII	1	1	3	3	2	3
XIII	1	2	3	3	2	3

CODES:

Sample A . . . . . Soaked and simmered in distilled water on top of the stove.

Sample B . . . . . Soaked in soda water and simmered in soda water on top of the stove.

Sample C . . . . . Pressure cooked in pressure sauce pan with distilled water.

Second Preliminary Evaluation of Navy Beans
November 16, 1960

Panel Member No.	Sample A		Sample B		Sample C	
	Flavor	Texture	Flavor	Texture	Flavor	Texture
I	-	-	-	-	-	-
II	2	2	2	1	1	3
III	1	2	2	1	3	2
IV	2	2	1	1	3	3
V	1	2	2	1	3	2
VI	1	1	3	3	3	3
VII	2	3	2	3	2	3
VIII	1	2	2	1	3	3
IX	1	2	2	1	3	3
X	2	1	2	3	2	3
XI	1	2	2	1	3	1
XII	-	-	-	-	-	-
XIII	3	2	1	2	2	3
XIV	1	1	2	2	3	3
XV	1	1	2	2	3	2
XVI	2	3	1	1	3	2
XVII	1	1	2	3	3	3

CODES:

Sample A . . . Pressure cooked in pressure sauce pan with distilled water.
Sample B . . . Soaked and simmered in distilled water on top of the stove.
Sample C . . . Soaked in soda water and simmered in soda water on top of the stove.

Third Preliminary Evaluation of Navy Beans
November 30, 1960

Panel Member No.	Sample A		Sample B		Sample C	
	Flavor	Texture	Flavor	Texture	Flavor	Texture
I	3	3	2	2	1	1
II	2	3	3	2	1	1
III	2	2	1	1	3	2
IV	-	-	-	-	-	-
V	1	3	1	1	2	1
VI	3	3	1	2	2	2
VII	3	3	2	3	2	2
VIII	3	3	1	2	2	1
IX	3	3	1	1	2	1
X	3	3	2	1	2	3
XI	2	2	1	1	3	2
XII	3	2	2	3	1	1
XIII	2	2	3	1	2	2
XIV	3	3	2	2	1	1
XV	3	3	2	1	1	2
XVI	3	3	2	1	1	2
XVII	3	3	1	1	1	2

CODES:

Sample A . . . Soaked in soda water and simmered in soda water on top of the stove.

Sample B . . . Pressure cooked in pressure sauce pan with distilled water.

Sample C . . . Soaked and simmered in distilled water on top of the stove.

FNIA 510

Foods, Nutrition, & Inst. Adm. Dept.
Oklahoma State University
December 5, 1960

Dear _____:

Final evaluations on bean cookery will be held on Wednesdays, December 7, 14, and 21 in the New Home Economics Building Room 401 at any time between 11:00 a.m. and 12:00 noon, and between 1:00 p.m. and 4:00 p.m.

Three different kinds of beans will be presented on three different days. These beans will be cooked by three different methods of bean cookery. These methods are the same methods used in the preliminary tasting. After the beans are cooked, they will be incorporated into bean dishes popular in the Philippines.

If you are willing to continue serving in this tasting panel, please come at any time mentioned above, which will be convenient to you.

Thank you very much for your cooperation.

Sincerely,

Maria Lourdes G. Guzman

FAMILY SIZE BEAN RECIPE

Navy Beans with Chicken

NAVY BEANS WITH CHICKEN

Approximate no. of servings - 12

Ingredients:

Navy Beans	302 grams
Distilled water	4 1/4 cups
Salt	1 teaspoon
Chicken (fryer)	1
Onion	1 medium
Garlic	3 cloves
Lard	3 tbsps.
Pepper	to taste
Fresh Tomatoes	3 sliced

Cook cut-up chicken in water until tender. While chicken is cooking, simmer the drained hydrated navy beans in 4 1/4 cups distilled water and 3/4 teaspoon of salt, until tender (1 hr., 20 min.). Saute the garlic until golden brown. Add onions, tomatoes, then the cooked chicken. Add a little of the chicken broth and simmer until a little thick. Add the cooked navy beans and pepper to taste. Simmer again until broth is thick.

FAMILY SIZE BEAN RECIPE

Mongo Guisado

MONGO GUISADO

Ingredients:

Mung Beans	302 grams
Distilled water	4 1/4 cups
Salt	1 tsp.
Fresh Pork	1/2 cup - sliced and cooked
Frozen Green Spinach	1 - 12 oz. pkg.
Lard	1 Tbsps.
Onion	1 medium
Garlic	3 cloves

Wash mongo and soak overnight. Drain and add 3 1/4 cups water and 1 teaspoon of salt. Simmer on top of the stove until tender. Saute garlic in lard. Add pork. Fry until golden brown. Add onions. Add a little of liquid in simmered mung beans. Simmer. Add cooked mongo and continue cooking. Add spinach just before serving.

FAMILY SIZE BEAN RECIPE

Garbanzo Beans in Syrup

GARBANZO BEANS IN SYRUP

Approximate no. servings (12).

Ingredients:

Garbanzo Beans	302 grams
Distilled water	4 1/4 cups
Sugar	6 cups
Evaporated milk	1 small can
Eggs	3
Maraschino Red cherries	7 halves
Cream	1/2 pt.

Wash the garbanzo beans and soak overnight. Drain and add 4 1/4 cups water and cook until done. Make a thin syrup with one cup water and one cup sugar for each sample. Simmer the cooked beans in the syrup.

Combine evaporated milk, eggs, and one cup sugar. Bake in a baking pan in which there is one (1) cup carmelized sugar. Bake at 300°F. with a pan of water underneath.

Serve the beans in syrup with a thin slice of the custard, chipped ice, and pour 1/4 cup of cream over the dish. Garnish with a cherry.

MODIFIED BEAN RECIPE

Navy Beans - Soaked Overnight and Simmered on Top of the Stove

NAVY BEANS
(For Pretesting of Panel Members)

Procedure: SOAK AND SIMMER ON TOP OF THE STOVE

Ingredients:

Navy Beans	302 grams
Distilled water	4 1/2 cups
Salt	3/4 teaspoon

Steps:

(1) Soak navy beans overnight in distilled water enough to cover the beans.

(2) DRAIN.

(3) Add to drained navy beans 4 1/2 cups of distilled water and 3/4 teaspoon of salt.

(4) SIMMER until tender for one hour and 20 minutes on top of the stove.

MODIFIED BEAN RECIPE

Navy Beans - Soaked Overnight with Soda Water and Simmered in Soda Water on Top of the Stove

NAVY BEANS
(For Pretesting of Panel Members)

Procedure: SOAKED IN SODA WATER AND SIMMERED IN SODA WATER

Ingredients:

Navy Beans	302 grams
Distilled water	3 3/4 cups
Salt	3/4 teaspoon
Soda	2 teaspoons (1 tsp. for soaking and 1 tsp. for simmering)

Steps:

(1) Soak navy beans in distilled water and 1 teaspoon of soda, overnight.

(2) DRAIN.

(3) Add to drained beans 3 3/4 cups distilled water, 3/4 teaspoon salt, and 1 teaspoon soda.

(4) SIMMER ON TOP of the stove for 40 minutes until tender.

MODIFIED BEAN RECIPE

Navy Beans - Pressure Cooked in Pressure Saucepan

NAVY BEANS
(For Pretesting of Panel Members)

Procedure: PRESSURE COOKED

Ingredients:

Navy Beans	302 grams
Distilled water	4 cups
Salt	3/4 teaspoon

Steps:

(1) Add to dry navy beans 4 cups of distilled water and 3/4 teaspoon of salt.

(2) Cook in pressure sauce pan for thirty (30) minutes at 15 pounds pressure.

Rating Scores for

First Final Evaluation

on

NAVY BEAN DISH

Panel Members	S & S		SS & SS		P S	
	Flavor	Texture	Flavor	Texture	Flavor	Texture
I	2	1	3	3	1	2
II	1	1	3	2	2	3
III	3	3	2	1	1	2
IV	2	2	3	3	2	3
V	3	2	2	2	1	1
VI	2	2	3	3	1	2
VII	2	2	2	2	1	1
VIII	2	1	2	2	1	2
IX	1	2	2	3	1	1
AVERAGE	2.00	1.77	2.44	2.33	1.22	1.89

NOTES:

Samples S & S . . . . Soaked overnight and simmered in distilled water on top of the stove.

Samples SS & SS . . . Soaked overnight in soda water and simmered in soda water on top of the stove.

Samples P S . . . . . Pressure cooked in pressure sauce pan with distilled water.

Rating Scores for

Second Final Evaluation

on

MONGO GUISADO

Panel Members	S & S		SS & SS		P S	
	Flavor	Texture	Flavor	Texture	Flavor	Texture
I	3	2	1	1	2	1
II	1	2	2	2	1	1
III	1	2	3	3	2	1
IV	2	3	2	2	2	2
V	-	-	-	-	-	-
VI	3	3	2	3	1	1
VII	1	1	2	3	1	2
VIII	3	3	2	2	1	1
IX	1	1	3	3	2	2
AVERAGE	1.88	2.12	2.12	2.38	1.50	1.38

NOTES:

Samples S & S . . . . Soaked overnight and simmered in distilled water on top of the stove.

Samples SS & SS . . . Soaked overnight in soda water and simmered in soda water on top of the stove.

Samples P S . . . . . Pressure cooked in pressure sauce pan with distilled water.

Rating Scores for

Third Final Evaluation

on

GARBANZO BEANS IN SYRUP

Panel Members	S & S		SS & SS		P S	
	Flavor	Texture	Flavor	Texture	Flavor	Texture
I	2	3	1	1	2	2
II	2	3	1	1	2	2
III	2	2	3	1	1	3
IV	2	3	2	3	2	2
V	1	1	1	3	2	2
VI	3	3	1	1	2	2
VII	1	2	2	2	2	1
VIII	2	2	3	2	1	1
IX	2	1	1	2	3	3
AVERAGE	1.89	2.22	1.66	1.77	1.89	2.11

NOTES:

Samples S & S . . . . Soaked overnight and simmered in distilled water on top of the stove.

Samples SS & SS . . . Soaked overnight in soda water and simmered in soda water on top of the stove.

Samples P S . . . . . Pressure cooked in pressure sauce pan with distilled water.

APPENDIX C

STANDARDIZATION OF RECIPES

QUANTITY BEAN RECIPE

Navy Beans With Chicken
(to be standardized)

Ingredients:	12 servings	25 servings
Navy beans	302 grams	630 grams
Water	4 cups	8 1/4 cups
Salt	1 tsp.	1 1/2 Tbsp.
Chicken	1 2 1/2 lb. fryer	3 2lb.-2 1/2 lb. fryers
Onion	1 medium	1 lb.
Garlic	3 cloves	6 cloves
Lard or Oil	3 Tbsps.	1/3 cups
Pepper, black	1 tsp.	1 1/2 tsp.
Fresh tomatoes	3 small	1 lb.
Green pepper	--	1/2 lb.
Red pimento	--	1 small can (4 oz.)

Procedure:

1. Put washed and drained navy beans in a pressure sauce pan and add nine cups water. Pressure cook at 15 pounds for 30 minutes.
2. Cut chicken into serving pieces (10 servings/ fryer) while the beans are cooking.
3. Boil chicken with 8 cups water until tender (1 hour).
4. Heat oil. Saute the garlic in the oil until golden brown. Add onions and saute for 5 minutes or until the onions are transparent.
5. Add to onions and garlic, black pepper and salt.
6. Add cooked chicken and continue sauteing for 5 minutes.
7. Add cooked beans. Mix.
8. Add green pepper and red pimento. Simmer.
9. Serve hot.

Steps 1, 2, and 3 may be done the day before and kept in the refrigerator.

QUANTITY RECIPES

Mongo Guisado
(to be standardized)

Ingredients:	12 servings	25 servings
Mung beans	304 grams	630 grams
Water	4 cups	8 1/4 cups
Salt	1 tsp.	2 1/2 tsps.
Meat (pork or beef)	1/2 cup, cut	2 cups cooked or 2.5 lb. raw
Frozen spinach	1 12 oz. pkg.	2 12 oz. pkg.
Oil or lard	1 Tbsp.	1/2 cup
Garlic	3 cloves	6 cloves
Onion	1 medium	1/2 lb.

Procedure:

1. Put washed and drained Mung beans in a pressure sauce pan and add 8 1/4 cups of water. Pressure cook at 15 pounds for 30 minutes.
2. While cooking the beans, cut the meat into thin slices (1" x 1" x 1/2").
3. Heat the oil and pan fry the meat.
4. Remove meat and saute garlic in remaining oil. Saute until golden brown.
5. Add onions, sliced thinly and saute until transparent. Add salt and pepper.
6. Add pan fried beef and saute for 5 minutes.
7. Add cooked Mung beans. Mix.
8. Simmer for 5 minutes.
9. Serve hot.

Step 1 may be done the day before and kept in the refrigerator.

QUANTITY RECIPE

Garbanzo Beans Dessert
(to be standardized)

Ingredients:	12 servings	25 servings
Garbanzo beans	302 grams	630 grams
Water	4 cups	8 1/4 cups
Sugar	6 cups	9 1/4 cups
Evaporated milk	1 small can	1 14 oz. can
Eggs, whole	3	3
Red Maraschino cherries	7 halves	15 whole
Cream	1/2 pint	1 pint

Procedure:

1. Pre-heat oven to 300° F.
2. Make custard mixture on "Flan" by:
   (a). Stirring whole eggs with a fork (do not beat) and blending in the evaporated milk (do not dilute with water).
   (b). Stirring one cup granulated sugar into the egg-milk mixture until the sugar is dissolved. Add vanilla.
3. Set custard aside.
4. Caramelize 1/4 cup sugar in a square pan (5 1/2" x 1 1/2" x 5 1/2") by heating at low fire. Line the bottom of the pan with the caramelized sugar.
5. Pour the custard mixture into the sugar lined square pan.
6. Place the custard in a pan containing hot water (1/2 full). Bake for 1 hour at 300° F.
7. While the custard is baking, put washed and drained beans in a 6-qt. pressure sauce pan and pressure cook at 15 pounds for 30 minutes.
8. Meanwhile, make a syrup with 8 cups sugar and 4 cups water.
9. After cooling, put the beans under running water. Stir with hands and let water overflow. This is to remove the skins.
10. Put cooked skinless beans in the syrup and simmer until the beans are transparent.
11. Cool and keep in refrigerator with the syrup (marinate) overnight.
12. Serve with little syrup in a dessert saucer.
13. Serve with cream custard, and garnish with cherry.

FNIA 500

Food, Nutrition, and Inst.
Adm. Department
Oklahoma State University
Stillwater, Oklahoma
February 10, 1961

Dear _____,

A study is being conducted on the Standardization of Pakistani and Filipino Quantity Recipes. This comprises an experimental part of two theses. Your evaluation as a tasting panel member will be greatly appreciated.

Approximately four Pakistani and three Filipino dishes will be tasted. Starting from Thursday, February 16, 1961, the panel will meet between 11:00 a.m. until 12:30 p.m. in Room 401, New Home Economics Building on the following days:

Thursday, February 16
Tuesday, February 21
Thursday, February 23
Tuesday, February 28

The panel members are requested to help in the experiment by paying the raw food cost, approximately 45 cents, of a serving of the experimental dishes.

In case of necessary repetition, the panel members are requested for further cooperation. Another letter will, therefore, furnish a definite schedule for the second analysis.

Please check the following to indicate whether you can participate in the subject.

YES _____

NO _____

Your prompt reply by Saturday will be helpful. Please use the campus envelope and mail to Food, Nutrition and Institution Adm. Dept., Room 108, Old Home Economic Building.

Thanking you sincerely,

Kulsum Suleman

Maria Lourdes G. Guzman

FNIA 500
(Project of Maria Lourdes G. Guzman)

SCORE SHEET

PRODUCT _____

NAME _____ DATE _____

Before you is a sample of a bean dish popular in the Philippines. Please examine and score the sample with respect to the stated quality in question using the following scale:

Extremely poor 1
Very poor 2
Poor 3
Below fair-above poor 4
Fair 5
Below good 6
Good 7
Very good 8
Excellent 9

Qualities in question	Score	Comments
1. Color		
2. Texture		
3. Consistency		
4. Flavor		
5. Acceptability		

SUGGESTIONS FOR IMPROVEMENT:

Rating Scores for

Navy Beans With Chicken

FIRST EVALUATION

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	7	7	7	6	8	More tomatoes
II.	7	8	9	9	9	Needs more salt
III.	8	9	8	9	9	More green pepper
IV.	8	7	7	6	7	Green pepper overdone
V.	9	8	8	8	8	
VI.	7	8	7	6	8	
VII.	7	7	7	7	7	
VIII.	7	7	7	7	7	
IX.	8	7	5	6	7	
X.	6	7	8	7	8	
XI.	7	6	7	6	7	
XII.	6	6	6	6	6	
XIII.	6	7	7	4	7	
XIV.	6	7	6	6	6	
XV.	4	7	7	7	7	
XVI.	8	8	8	6	8	
XVII.	9	7	8	8	8	
XVIII.	7	8	8	8	8	
XIX.	8	8	7	7	9	
Ave. Rating	7.1	7.3	7.25	6.5	7.6	

Rating Scores for

Navy Beans With Chicken

SECOND EVALUATION

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	7	7	7	7	7	
II.	9	9	8	8	9	
III.	7	6	7	5	7	
IV.	8	8	8	8	8	
V.	8	9	9	9	9	
VI.	8	8	8	8	8	
VII.	9	9	8	9	9	
VIII.	8	7	6	8	9	
IX.	8	8	9	8	8	
X.	8	8	7	8	8	
XI.	7	8	8	7	8	
XII.	7	7	7	8	7	
XIII.	8	7	8	7	8	
XIV.	7	7	7	7	7	
XV.	7	8	8	6	8	
Ave. Rating	7.6	7.6	7.6	7.5	8.0	

Rating Scores for

Navy Beans With Chicken

THIRD EVALUATION

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	7	8	8	7	9	
II.	9	9	9	9	9	
III.	8	8	8	9	8	
IV.	8	8	8	9	8	
V.	9	9	9	9	9	
VI.	9	8	8	9	9	
VII.	9	8	8	8	8	
VIII.	7	6	7	7	7	
IX.	7	7	7	7	7	
X.	8	8	8	9	8	
XI.	9	8	8	8	9	
XII.	8	7	8	8	8	
XIII.	9	8	8	8	8	
XIV.	9	9	8	9	9	
XV.	7	8	8	8	8	
XVI.	8	9	9	9	9	
XVII.	9	9	8	8	9	
XVIII.	8	8	8	9	9	
Ave. Rating	8.2	8.05	8.05	8.3	8.4	

Rating Scores for

Mongo Guisado

FIRST EVALUATION

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	7	7	7	7	7	Meat not tender
II.	6	7	7	7	6	
III.	5	5	8	7	5	
IV.	5	6	6	5	5	
V.	6	7	8	6	8	
VI.	7	8	8	8	8	
VII.	5	4	5	6	6	
VIII.	7	6	8	5	7	
IX.	7	6	7	8	8	
X.	8	7	9	4	7	
XI.	5	8	9	9	9	
XII.	7	6	8	5	8	
XIII.	3	7	7	7	5	
XIV.	1	3	4	4	4	
XV.	7	8	7	9	8	
XVI.	5	6	7	8	7	
XVII.	-	-	-	-	-	
Ave. Rating	5.7	6.3	7.3	6.56	6.75	

Rating Scores for

Mongo Guisado

SECOND EVALUATION

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	8	8	8	9	8	
II.	8	9	9	9	9	
III.	9	9	9	9	9	
IV.	7	8	9	8	9	
V.	7	7	8	8	8	
VI.	8	8	8	8	8	
VII.	7	7	7	7	7	
VIII.	7	8	8	9	9	
IX.	7	8	8	8	8	
X.	7	8	8	8	8	
XI.	7	6	7	7	7	
XII.	8	8	8	8	8	
XIII.	8	8	8	8	8	
XIV.	7	6	8	8	9	
XV.	6	7	6	7	8	
XVI.	5	7	7	7	9	
XVII.	7	8	8	9	9	
XVIII.	7	8	8	8	7	
Ave. Rating	7.2	7.6	7.9	8.05	8.2	

Rating Scores for

Mongo Guisado

THIRD EVALUATION

Panel Member	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	7	8	8	7	9	
II.	9	9	9	9	9	
III.	8	8	8	9	8	
IV.	8	8	8	9	8	
V.	9	9	9	9	9	
VI.	9	8	8	9	9	
VII.	9	8	8	8	8	
VIII.	7	6	7	7	7	
IX.	7	7	7	7	7	
X.	8	8	8	9	8	
XI.	9	8	8	8	9	
XII.	8	7	8	8	8	
XIII.	9	8	8	8	8	
XIV.	9	9	8	9	9	
XV.	7	8	8	8	8	
XVI.	8	9	9	9	9	
XVII.	9	9	8	8	9	
XVIII.	8	8	8	9	9	
Ave. Rating	8.2	8.05	8.05	8.3	8.4	

Rating Scores for

Garbanzo Bean Dessert

FIRST EVALUATION

Panel Members	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	7	5	6	6	5	
II.	8	5	4	8	7	
III.	8	6	7	8	8	
IV.	7	8	8	7	8	
V.	6	6	6	5	6	
VI.	7	5	7	7	6	
VII.	8	9	8	9	9	
VIII.	7	6	6	5	4	
IX.	5	4	6	7	7	
X.	5	5	5	5	6	
XI.	5	6	3	5	5	
XII.	7	7	6	7	7	
XIII.	9	6	5	8	7	
XIV.	8	5	7	7	7	
XV.	9	9	7	8	9	
XVI.	8	6	7	7	7	
XVII.	6	5	5	5	5	
XVIII.	6	7	6	8	7	
Ave. Rating	7.0	6.1	6.05	6.8	6.7	

Rating Scores for

Garbanzo Bean Dessert

SECOND EVALUATION

Panel Members	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	6	7	7	7	8	
II.	7	7	7	7	7	
III.	8	8	8	7	8	
IV.	8	7	8	7	8	
V.	8	6	6	7	7	
VI.	7	8	8	7	8	
VII.	8	6	6	7	7	
VIII.	8	7	6	7	6	
IX.	8	8	8	8	8	
X.	8	7	8	8	9	
XI.	9	9	9	9	9	
XII.	8	8	8	8	8	
XIII.	7	7	7	8	9	
XIV.	9	8	9	9	9	
XV.	7	7	6	7	7	
XVI.	7	5	5	6	5	
Ave. Rating	7.2	7.2	7.4	7.4	7.4	

Rating Scores for

Garbanzo Bean Dessert

THIRD EVALUATION

Panel Members	Color	Texture	Consist-ency	Flavor	Accept-ability	Comments and Suggestions
I.	8	9	8	8	9	
II.	9	8	7	8	8	
III.	8	8	7	7	8	
IV.	9	8	9	9	9	
V.	9	7	8	8	8	
VI.	8	7	8	8	8	
VII.	8	7	7	8	8	
VIII.	9	7	8	8	9	
IX.	8	8	8	8	8	
X.	7	7	7	7	7	
XI.	7	7	8	7	7	
XII.	8	8	8	9	8	
XIII.	8	8	7	8	8	
XIV.	9	9	9	9	9	
XV.	9	8	8	9	9	
XVI.	9	9	9	9	9	
XVII.	8	7	7	8	8	
Ave. Rating	8.3	7.8	7.8	8.1	8.2	

VITA

Maria Lourdes G. Guzman

Candidate for the Degree of

Master of Science

Thesis: EVALUATION OF THREE METHODS OF BEAN COOKERY AND STANDARDIZATION OF QUANTITY RECIPES FOR USE IN THE PHILIPPINES

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Biographical:

Personal Data: Born March 23, 1935 in Manila, Philippines, the daughter of Atty. Arnaldo J. Guzman and Elvira G. Guzman.

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