STANDARDIZATION AND PRODUCTION CONTROL IN QUANTITY FOOD SERVICE

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STANDARDIZATION AND PRODUCTION CONTROL

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INTRODUCTION

During recent years there has been a trend toward the standardization of recipes to facilitate production control in food service units. A standardized recipe in this connotation means a cost control tool which gives a predictable yield and a product of consistent quality.

The development and use of standardized recipes is closely allied with the desire of operators to prepare and serve high quality food. With this tool, foods can be prepared in quantities needed, and the proficiency of the production staff may be increased by eliminating waste of time, food, and labor.

Customer satisfaction may also be an indirect result of the use of standard recipes, because he can depend on well prepared foods of a given quality. Many food services with fine reputations have built up their business on the basis of repeat customers. Such customers return time after time because their expectations of consistently high quality food are met through the diligent attention given by the operator to production control and standardization.

Even in the view of the benefits of standardized recipes, many food service units do not have a production control program. The reasons often given are lack of labor and time to develop a standardized recipe system.

This problem is concerned with substantiating the need for standardized recipes and with developing a proposed outline for teaching production control methods. Data were collected in an actual food service operation and used as evidence of the need for establishing a course of action to introduce standardization into the production area of a food service operation.

PRODUCTION CONTROL IN FOOD SERVICE OPERATIONS

Management's goals in a food service unit are to please the consumer and to control the costs of the operation. Greenaway (4) reported that management wants to serve a quality product day in and day out at a known cost; the standardized recipe is the vehicle for accomplishing this. Quality control and cost control, according to Greenaway (4), are the big dividends available when standardized recipes are adopted and used.

Eliason (5) stated that whether we are in foods work in restaurants, hospitals, or schools, our aims are the same -- satisfying our customers. Lasting customer satisfaction cannot be achieved without good food. Consumer satisfaction is achieved when consistently high quality food, prepared under sanitary conditions, is attractively served at a reasonable price.

Reasons for Control

Production control implies using the tools of food preparation. One of the important tools of food production is standardized recipes. Detailed information about pan sizes, temperatures, yield, and cutting or other portioning directions should be included in addition to an accurate ingredient list and specific instructions.

There is less waste from product failure when standardized recipes are used. Standardized recipes are also an aid in menu pricing, since the same product will be made in the same way with the same kind of ingredients every time. Standardized recipes are essential for producing a specific number of portions of the desired size; and this, in turn, is an aid to food cost control. Greenaway (4) stated that the heart of the food service problem is to produce a high grade, uniformly-sized portion of food at a known and consistently determinable cost.

Production control is a continuing process. A standard recipe is the basis for the production of a given quality and quantity of food. After a recipe is standardized, it must be used with skill and judgment. Eliason (6) has outlined the value of standardized recipes:

(a) When standardized recipes are followed to the letter, the patron is assured high quality food day after day. This means repeat business for the operation.

(b) The employee benefits by having the guess-work taken out of his job. He is trained to apply scientific procedures to the job at hand, and eventually he becomes a skilled worker. In the production of quality food, he greatly assists in maintaining or increasing the volume of business, which means greater job security for himself and others.

(c) Management benefits by having established a definite and constant cost as well as a standard of quality. This means the quality and profit have been predetermined in advance of featuring the item.

(d) Workers can be more quickly trained in proper cooking procedures. Nothing is left to chance or the development of haphazard methods. Each step is planned and set forth in detail. Accuracy becomes the watchword. Even skilled cooks and bakers find that standardized recipes greatly lighten their work. The danger of one or more ingredients being forgotten is eliminated as well as the use of incorrect amounts which would vary the product. Many now say that they could not work in an operation where such recipes were not available.

(e) With standards of quality established, any deviation can be quickly spotted by management, and the cause ascertained.

A standardized recipe which has been carefully tested results in control of yield, quality, and raw food cost. The use of standard equipment facilitates the use of standardized recipes. Giving specific instructions to employees and providing standardized recipes increases the assurance of producing standard products. The standardized recipe can become an important tool for production people, but top management must be willing to take the necessary steps to establish a system of standard recipes and procedures.

Problems of Establishing Controls

Many operators avoid or postpone standardizing their own recipes, because it appears to be an insurmountable task requiring the adjustment and/or increase of time, materials, and labor. Yet, the operators who do use standardized recipes show large dividends in decreased costs of operation and increased customer satisfaction.

Before the establishment of production control, there are preliminary decisions to be made which are the responsibility of management. Eliason (6) stated that this entails the purchasing of proper ingredients with specific qualities commensurate with the purpose for which the ingredients are to be used.

Another problem involved is planning realistically in terms of the available equipment. Aldrich (1) reported that this means planning to bake cakes, casserole dishes, pan desserts, and breads in pans which will yield a specific number of portions of a designated size.

Still other factors of establishing production controls are the possible misinterpretation of the program by supervisors and employees in the operation. The objection frequently made by supervisors is that a control program takes away their originality. Inwardly, supervisors may feel that they can no longer initiate ideas in food preparation. The employees object to control because they feel it removes their opportunity to express individuality. They may also feel they will lose pride in their jobs if they are not able to add their "personal touch" to the food.

Greenaway (4) reported that chefs and food production managers often view standardized recipes as some sort of a check on what they are doing or perhaps as an attempt on the part of management to change the old, familiar cooking methods to something which only management desires. An illustration, described by Whyte (11), shows the implications of the problem of human relations in establishing control production: Operating without standard recipes, the chef was king of the kitchen. If recipes were provided, management could supervise the chef more closely. Management could check to see that the recipes were being followed and could bring in new ones and revise old ones. Furthermore, this standardization would tend to minimize the skill necessary to perform the job and take away much prestige. The chef had taken years to learn his craft; and now, in a restaurant down the street, cooks were being trained in production through standard recipes in a matter of weeks. This presented a very disturbing picture to the old-line chefs or head cooks.

The operator gradually realized that every standardization procedure involved important changes in work routines and human relations. According to Whyte (11), unless these changes were skillfully made, the morale of the organization could deteriorate. Because standardization, within limits, was clearly necessary for business reasons, the operator faced another problem. How could he gain the benefits of standardization without lowering employee morale and losing cooperation? Standardizing recipes involves more than filling out a set of cards with the necessary information: it involves people, understanding, and time.

Methods of Establishing Production Control Programs

There are certain advantages in establishing a standardization program in an active business operation: all personnel may be involved and the available facilities and equipment may be used. The early involvement of personnel is important, because it means that they take an active part at the beginning of the program when decisions are being made. Management must develop and direct the program so that personnel will learn how to take active, interested roles.

Supervisors will need to be encouraged to initiate parts of the program if they are expected to have a sense of being active participants. Management should delegate responsible areas of the program to the supervisory level in order that they may make contributions to the program. In a production control program the responsibilities of the supervisors, as listed by Mitchell (7) are: (a) good raw products are on hand at just the right time; (b) careful procedures for handling food are followed; (c) the value of good timing is recognized in cooking and serving for quality ; (d) a training program is established to develop good cooks; (e) a taste-test program for food quality control is carried on for every meal.

Every employee must be trained to believe in the importance of the production control program. Each must be made to feel that he has a part in it and has a responsibility for it.

Training accelerates correct learning, according to Mitchell (8), and gives a worker greater respect for his job and greater pride and satisfaction in his work. Mitchell (8) stated that the very basis of training is understanding. She maintained that until a person understands what his responsibilities are, he cannot be expected to give a good performance.

Employees should be encouraged to make suggestions and contributions in the program. The employees are often an invaluable source of sound advice on recipe procedures. Furthermore, employees should be encouraged to reveal their "personal touch", if it adds to the quality of the product. Recipe adjustments can then be made in accord with these special ideas.

There are other advantages for the personnel in controlled production. The use of standardized recipes enables the employees to produce a standard product of a given quality. Being able to produce consistently high quality food increases job satisfaction. Revealing to the employees how stabilizing costs affects the food service operation can also strengthen the feeling of job security.

The starting point in production control is a good recipe. Aldrich (1) described a good recipe as one that contains all of the information needed to make a top quality product every time. According to Aldrich (1), some of the essentials of a dependable recipe, if it is to become an effective tool, are:

(a) The decisions of how many portions are to be produced and how much is to be served per portion are the responsibilities of management, not the cooks.

(b) Every ingredient should be added in the amount and at the stage of mixing at which it will best fulfill its function.

(c) Only by accurately weighing or measuring each ingredient can consistently high quality and desired yield be achieved.

(d) In adapting recipes for exact yield, management should plan in terms of how ingredients are purchased and the equipment available for use.

Callahan (3) reported that the big weakness in most recipe systems is figuring varying yields, and he has developed the "Recipe Magician" method of calculating recipe yields.

Eliason (5) stated that there is no compromise in achieving quality: the operator must purchase good food to work with in order to produce good food as an end product. To be able to follow standardized recipes, Eliason (5) also pointed out that the same brands of flour, salt, vanilla, baking powder, cornstarch and countless other items must be purchased each time or there will be no uniformity in the products.

A similar idea is implied for equipment by Aldrich (1), who reported that for food products which must be portioned or cut out of a counter pan or sheet pan, it is better to set up recipes in terms of the pan to be used and the number of servings to be obtained from a pan than in arbitrary numbers which may have no relation to serving equipment or procedures.

Recipe sources

In approaching the problem of recipe standardization, it is well to evaluate the recipes which are on hand in terms of desired recipe yield, good flavor, ease of preparation, and cost. Other recipes may be found in cookbooks, trade publications, booklets of food and equipment manufacturers, women's magazines, women's pages in daily newspapers, and government and educational publications. Still other sources suggested by Eliason (6) may be developed from home recipes or recipes developed by working with the employee on the standardization of items he or she makes well from memory, even though the ingredients and method have never been accurately set down. Although there are many good quantity recipes available, they need to be adapted to the needs of a particular institution.

Preliminary steps

One procedure, useful in establishing a standardization program and in saving time in the initial stages, is a survey of the materials written by test kitchens. Many colleges and food processors have testing laboratories which develop and standardize recipes. Learning about the procedure and the controlled conditions of testing can save time for an operation by reviewing the essential steps in a sound standardization program. However, almost without exception, the information from these sources will have to be adapted to the actual operation by considering the ability of the employees, the budget, and the available equipment.

Test kitchen

Questionnaires were sent to eight commercial food services and educational institutions and seven replies were received. The questions included:

(1) What steps or procedure do you use to develop a standardized quantity recipe ?

(2) In developing new recipe formulas, what methods are used to determine recipe yields?

(3) Do you find similar percentages of cooking and handling losses in repeated trials of the same recipe?

(4) In making different size batches of the same recipes, are the percentages of cooking and handling losses comparable?

Because of the type of questionnaire used and differences in the types of operations contacted, the questions were interpreted in several ways.

Steps used to develop a recipe. The procedures outlined for developing standardized recipes were: Test kitchen R indicated that controlled ingredients (quality, size, color, yield, packaging) and controlled equipment and utensils were used to prepare all recipes in their operation. A standardized method for format and wording was used for all recipes written in this unit.

The usefulness of a new recipe was evaluated by testing in small quantity and taste-testing according to the dietitian from test kitchen _M_. Taste-testing was emphasized from test kitchen _M_ as necessary for each recipe trial.

After starting with a recipe idea, test kitchen _Q_'s director suggested developing the recipe in small quantity so that adjustments of basic ingredients and relative proportions could be improved. Then she advised adjusting the tested small quantity recipe for large quantity preparation.

Some of the steps listed from test kitchen _O_ for developing quantity recipes were: (a) determine total yield desired; (b) determine size portions desired; (c) determine number of portions desired; (d) scale recipe to standardized pans and/or casseroles.

Test kitchen _I_ reported that institutional equipment and methods are necessary in developing large quantity standardized recipes. The director of consumer services from test kitchen _L_ also stressed the importance of determining recipe ingredient proportions by weight and using measures only when convenient and applicable.

Methods used to determine recipe yields. Basically three methods are used by these test kitchens for determining recipe yields. Test kitchen _Q_ listed volume, weight, and dimension, whichever was most appropriate for the food product. Total weight and volume, divided into predetermined average portions, was reported from test kitchen P. Test kitchen N and O suggested a comparison of new recipe with similar recipes already in use or available in published form.

Cooking and handling losses in repeated trials of the same recipe. From test kitchen Q similar percentages of cooking and handling losses in repeated trials of the same recipe were reported. Controlling size of cooking utensil and cooking temperature were emphasized as important factors in these observations. Kitchen N indicated that inaccuracies in measuring and weighing as well as unskilled manipulation of ingredients caused the yield and quality of the final product to vary somewhat.

According to the director of test kitchen O, there were similar percentages of cooking and handling losses in repeated trials of the same recipe provided the same pans, ovens, and equipment were used. If the sources are the same for the raw products used, the head of the department from test kitchen M found similar percentages of cooking and handling losses in repeated trials of the same recipe. The director of test kitchen R indicated that with controlled ingredients and methods, cooking and handling losses are kept to a minimum. The dietitian of test kitchen R reported the following percentages of cooking and handling losses for these dishes: meat loaf (beef, pork, and veal) was 23%; baked macaroni and cheese was 7%; shrinkage of the meat used in beef stew was 45%.

Cooking and handling losses of different size batches of the same recipe. Several different ideas about the effect of batch size on cooking and handling losses were expressed from these test kitchens. From test kitchen R, only time fluctuations were noted when different amounts of a mixture were cooked in a steam-jacketed kettle. This variation was attributed by test kitchen R to variations in the rate of cooking, variation in the amount of contact the mixture had with the sides of the kettle, and variations in the amount of exposed surface of the mixture. Test kitchen O stated that smaller percentages of loss were noted as batch size increased. According to the dietitian of test kitchen M, the percentages of cooking and handling losses of different size batches of the same recipe are comparable. However, she suggested that the adjustment of the original recipe yield be limited to four times increase or decrease. Also test kitchen Q reported that cooking and handling losses are comparable for different size batches of the same recipe; any variations which occurred they believed were largely attributable to variations of cooking time.

Rewards of Production Control

Aldrich (2) reported that cost control depends on accurate yield and portion control and cited this example of serving 1500 people an 8-ounce portion of macaroni and cheese, at $.12 per portion. If the product is over-portioned so that 9 ounces instead of 8-ounces were served, then the actual yield was 1,312 servings. Since the raw food cost of the batch of macaroni and cheese remained the same, the cost for each of the 1,312 servings was $.1372 per portion, which represented an increase in raw food cost of more than 14% for the item. Further, Aldrich pointed out that the remainder of the group, 188 people, still had to be fed something which would add still more to the cost.

Cost control and quality control are the big dividends available when standardized recipes are used, stated Greenaway (4). From the management point of view, Mitchell (7) listed these rewards for using standardized recipes: (a) Improved quality and more consistent quality. (b) No frustration if a cook leaves suddenly. With standardized recipes, the new cook can produce the same products, and quality service to the patrons continues. (c) Improved cost controls, because guess-work is eliminated. (d) A food production system of which management can be proud.

Sullivan (9) reported that a "brand new" recipe, tried out and developed into a usable quantity one, adds interest and zest to the regular routine of food production. In a production control program, the standard recipe tool means closer cooperation between management and employee. Standardized recipes bring to the employee a knowledge of the best procedures known to the operation, according to Eliason (6), and assist him in putting this knowledge into action so that he is able to produce high quality food continually.

Eliason (5) suggested that the most important factor in customer satisfaction is food which has the superlative taste which makes people talk and come back for more. Quality food is judged by its acceptability to the consumer, according to Sullivan (10), whether he is the customer in the restaurant, the patient in the hospital, or the student in the school or college.

OBJECTIVES OF STUDY

An efficient food service operation strives to realize maximum development of resources. The use of standardized recipes is one method of reducing waste of time, food, and labor. This study is concerned with substantiating the need for using standardized recipes, supplemented by control of preparation and serving procedures.

Initial Approach

The original approach to the problem established two purposes: (1) to develop a program for standardizing yields by systematic study of cooking and handling losses in selected quantity recipes for meat extender and meat substitute items, and (2) to develop a positive attitude within the personnel toward a production control program.

The development of a program for standardizing yields of meat extender and meat substitute recipes included several parts. The standardizing procedures included: (a) determining the total as-purchased weight of all ingredients and ready-to-serve weights of the product for each recipe tested; (b) determining weight and volume losses during actual preparation of each product before and after cooking; (c) calculating handling losses during actual portioning of each product; (d) determining the number of portions of specified size for each product tested.

Authorities emphasize the importance of creating a positive attitude within the personnel toward a production control program by (a) developing good human relations with personnel involved; (b) orientating the personnel toward a production control program; (c) helping the employees understand the function of their work in a standardization program; (d) explaining to the personnel their responsibilities; (e) supervising the employees in their work toward a production control program; (f) showing and explaining the results of the standardization program to the personnel.

Adjusting Plan to Situation

The adjustment of the initial plan became necessary during the observations of the preparation of the menu items. The basic problem of the study soon became that of working with large quantity recipes that had not been standardized for quality and yield. To determine a range of cooking and handling losses for a particular recipe in a given situation, concise, specific information about the recipe is essential.

The yields for the recipes in use in the operation being studied were not consistent during repeated trials because of uncontrolled variables. Variations in proportions of recipe ingredients in a product caused differences in product quality, yield, and cost. Cooking times and temperatures were not specified in recipe procedures. Scheduling of preparation was limited by equipment (one 30-gallon steam-jacketed kettle and one 32-gallon braiser). Serving procedures were not based on controlled methods of portioning products.

On the positive side of the picture, the employees were willing and cooperative in making the observations and seemed to have a good understanding of the situation. The transfer of a supervisor during the study increased the difficulty of having standard ingredients and controlled proportional amounts ordered and requisitioned to the range area.

It was necessary early in the study to standardize the selected recipes for the actual operation, because in many cases the finished products prepared according to the recipes available were not acceptable. The process of adjusting recipe ingredients to improve the acceptability of the product caused differences from one trial to the next. Therefore, instead of being primarily involved with the observation of cooking and handling losses, the study became principally one of standardizing the recipes for quality and yield. Consequently, exact replications of each recipe tested were not possible. The results point out the differences for each trial of each product studied and the reasons for these differences.

However, the observations were recorded as originally planned. The weights of ingredients, both as-purchased and ready-to-serve, were taken. The yield was recorded in terms of weight and volume during actual preparation of each product, before and after cooking. The results of the observations emphasize why standard recipes for products are a necessary tool for maintaining cost, quality, and yield.

BACKGROUND OF OBSERVATIONS

The study extended over a period of six months. All the observations were confined to selected entree items in a food service unit which had adopted a selective cycle menu, offering a choice between two or more items in each menu classification. Since each cycle menu was selective, the required number of portions of an item varied each time it was served, according to the popularity of the item offered as an alternative. The entree items observed were beef stew, barbecue beef (sloppy joes), macaroni and cheese, creamed chipped beef, and meat loaf.

All of the meats ordered by the food service establishment were prefabricated at the Food Stores. Produce, staples, canned goods, frozen foods, cheese, and miscellaneous items were also supplied by this source.

The employees who cooperated in the study included the head range cook, assistant range cook, relief cook, and storeroom and vegetable preparation personnel.

Procedure of Preparation

A meeting was arranged with the staff to be involved in the food service unit. The purpose of the meeting was to orientate the supervisors and employees to the problem and the purpose of the study. An explanation of the function of the investigator and the methods to be used in the study was given to this group. After a discussion of the possibility of recording the number of portions served on the line, it was decided that the data could be collected by one person to eliminate problems on the serving line.

A list was made of the equipment available in the food service operation for use in the study. The capacity of the steam equipment was determined. The measured capacity of the steam-jacketed kettle was 30 gallons and of the braiser, 32 gallons. The scales to be used were checked for accuracy. A scale, calibrated in 2-ounce divisions from 1 to 50 pounds, and a balance scale, calibrated in $\frac{1}{4}$-ounce divisions, were used. Standardized measuring equipment was used for liquids and ingredients which could not be accurately weighed. The volume of all products made in the steam equipment was measured by a metal measuring stick especially calibrated for the kettle and braiser.

Measuring stick

Although this food service unit had been using metal measuring sticks calibrated with indentations for the steam-jacketed kettle and braiser, the sticks were found to be inaccurately marked. A disadvantage of this method of measuring is the difficulty in finding the center of the equipment when opaque mixtures are being measured. Mixtures, such as macaroni and cheese, are also difficult to measure because they are not always level across the surface. Using a measuring stick is a quick and reasonably accurate method for determining volume in steam-jacketed kettles and braisers. The investigator found that at least two trial measurings were needed for comparison to assure accuracy. In this way, the errors of measurement were reduced.

A new stick was calibrated in gallon units in the steam-jacketed kettle and braiser by marking the accumulative increase of each gallon of water with a marking crayon on the measuring stick. The gallon markings were measured with a transparent plastic ruler and the corresponding inches and fractions thereof were recorded. The measured markings were reproduced on paper and each gallon unit was divided into eight equal parts.

The volumes of the entree items were determined by placing the measuring stick in a specified position in the steam equipment and marking the stick at the surface point of the product with a marking crayon. The distance from the tip of the measuring stick to the marking was measured and recorded. The measurements were converted into gallons and fractions thereof from the chart.

Menu items

Copies of the menus were provided by the food service manager each term. The menu items were selected from an institutional cycle menu so that repeated trials of the product were possible. Because the observations were in an operating food service unit, recipes were provided by the establishment.

A standard form for recording the collected data was developed for each entree item. The data included all ingredient weights for each recipe, final yield in volume and weight, average number of portions of specified size, and miscellaneous observations.

Vegetable preparation

So that as-purchased weights of the fresh vegetables could be determined, a preparation chart was developed for the employee who peeled and cut the vegetables. Constant as-purchased weights of onions, celery, carrots, and potatoes were peeled or trimmed, cut in the same form, and weighed to determine the usable weights of each product. The average of 3 replications was used in estimating the as-purchased weights of the ingredients to be ordered for the various entree items.

Beef stew

The original recipe of beef stew was reviewed with a supervisor who stated that the vegetables were not ordered in the amount indicated in the recipe because smaller amounts were preferred. The amounts of vegetable ingredients were adjusted accordingly by the supervisor. However, the supervisor also varied the kind and amount of vegetables used in the beef stew when it re-occurred on the menu which caused proportional changes of ingredients on repeated trials. The ingredients of beef stew were altered for each trial with the intention of increasing consumer acceptance. Before the study began, lamb stew had been served to this group who thought they were choosing beef stew from the menu at the time. After this experience, the beef stew recipe was changed by using less vegetables so that the beef stew would not be mistaken by the customers for lamb stew.

The beef for the stew was received in the food service unit cut into $1\frac{1}{2}$-inch pieces ready for cooking. The fresh vegetables were peeled and cut before actual preparation of the stew began. Both frozen and canned peas were used. Although the remaining ingredients of fat, water, flour, and seasonings were used throughout the study, the proportions of these ingredients were varied, also.

The data sheet for beef stew was organized to record recipe ingredient weights before cooking, time of browning beef cubes, volume measure and average weight of a gallon of the mixture after all ingredients were combined, time of cooking, volume measure after cooking, average weight and number of servings per gallon of the finished product, and average weight of serving. The portioning tool used to serve beef stew in this operation was an 8-ounce ladle.

However, the ingredient changes affected the quality of the product for each trial. Not all of the above data could be compared, because each trial recipe was different. Average portion weights were observed and are discussed under Results and Discussion.

Barbecue beef

The data form for barbecue beef (sloppy joes) was developed to record the ingredient weights before cooking, time of browning ground beef, volume yield and average weight per gallon of mixture after combining ingredients, time of cooking, volume of yield after cooking, average weight and number of portions per gallon of the final product, average weight of portion. The portioning tool for serving barbecue beef was a 4-ounce ladle.

The first trial of barbecue beef produced a thick, grayish, off-flavored product. Because the original recipe was not acceptable, additional ingredients were added. Since the percentages of the recipe ingredients were altered for each trial, the quality of the product varied throughout the study.

Creamed chipped beef

The color, consistency, and flavor of the creamed chipped beef varied for each trial. The first trial was considered too salty by the manager; the cook suggested that half of the chipped beef be soaked in warm water before combining with the cream sauce for the next trial. After this change was made, the product was not salty enough. For subsequent trials the chipped beef was not soaked.

The form used for recording the data for creamed chipped beef was changed during the study because of ingredient and method of procedure changes. The original cream sauce recipe was not a satisfactory product. Both whole milk solids and nonfat milk solids were tried before a satisfactory cream sauce recipe was developed. A sauce recipe, using nonfat milk solids, which had been standardized in another food service unit, was then used. The new recipe produced a product of satisfactory color and flavor, but the amount of the thickening agent had to be adjusted for the finished product. The last trial of this recipe was not standardized because the proportion of dried beef to the amount of cream sauce per serving was less than one ounce of chipped beef, which is equivalent to two ounces of edible portion fresh meat protein.

The data for creamed chipped beef included weights of ingredients for each trial, the gallons of measured yield, the average weight per gallon of creamed chipped beef, and the time required for thickening the product. The method of procedure for the new cream sauce recipe was different from the original recipe; and the time of cooking was not included, because it was not recorded at the same intervals during the preparation of the product. One trial of creamed chipped beef was not measured and weighed after combining the ingredients because of insufficient time. The tool used for portioning creamed chipped beef was a 4-ounce ladle.

Macaroni and cheese

The consistency, flavor, and color of macaroni and cheese were variable because of changes in ingredients and proportions of ingredients. The original recipe did not produce a quality product. There appeared to be too much cheese sauce for the amount of cooked macaroni. Two quarts of the cheese sauce, of the total of 44 quarts, were drained off, which affected the total yield of trial one.

After the first trial, a new recipe, which had been standardized in another food service unit, was used. However, the dry weights of macaroni did not produce consistent cooked weights. The cooked weights of the macaroni were used in figuring the percentages of ingredients.

The type of milk solids was not specified in the original recipe. Milk solids in the original recipe were changed after the first trial from whole milk solids to nonfat milk solids. Also different kinds and proportions of cheese were purchased during the study for the macaroni and cheese. Cheddar cheese was used in the first trial, processed cheese in the second, cheddar cheese in the third, and half processed and half cheddar cheese in the final trial. The first and third trials were not identical because of other ingredient changes.

The information collected at repeated trials of the preparation of macaroni and cheese included weights of ingredients before cooking, time of cooking in steam-jacketed kettle, volume measure and average weight per gallon of mixture after combining ingredients, average weight of a standard counter pan of mixture before baking, time of baking, and the average weight of pan of mixture after baking. The portioning tool used for serving macaroni and cheese was a 6-ounce ladle. The average weight of macaroni and cheese portion was observed and is discussed under Results and Discussion.

Meat loaf

The data collected for the meat loaf were the most nearly consistent for all the products observed. The form used to collect data for the meat loaf was developed during a small quantity experiment prior to the observation of quantity preparation. The small quantity trials made it possible to standardize the recipe procedure and the method for collecting the information. Thus the first trial of meat loaf in the study was sufficient for adjusting the recipe quality.

Fresh onions were used in the first trial; an adjustment to dry onions was made at the request of the manager in the remaining trials.

One problem encountered in collecting the data on meat loaf was the difficulty in weighing the ground meat ingredients before cooking. The ground meat, composed of beef, pork, and veal, was received already combined from food stores, with the exception of one trial.

The time of baking meat loaves was recorded for each trial. Oven thermometers were centrally placed in the oven and oven temperatures were recorded at the beginning and the end of baking time. Thermometers were inserted in the three control meat loaves and the internal temperature of the meat loaves was recorded. The internal temperature of the three meat loaves of each trial varied slightly, because all of the meat loaves were baked in water baths in the same oven because of the heavy oven load of other menu items during the trials. Therefore, it was not possible to remove the meat loaves until all the loaves reached the desired internal temperature of 85°C.

Other data collected from the meat loaf trials were: recipe ingredient weights before combining, total weight of raw mixture, average weight of raw mixture per loaf pan, average weight of drained meat loaf, and the average weight of the sliced meat loaf ready for serving. The meat loaves were portioned into a uniform number of servings for a standard pullman pan but even when the loaf was divided into the same number of parts, the portioning of meat loaf with a slicing knife required considerable skill to obtain uniform servings.

The portioned weight desired in the food service unit was 3½ ounces of cooked meat loaf per serving. The average portion weight observed is discussed under Results and Discussion.

Procedure for Interpretation

The data collected were interpreted in terms of yield, portion cost, standard quality, protein source content per portion, and general acceptability of each product.

Yield

The yields of beef stew, barbecue beef, and creamed chipped beef were recorded in a similar manner. The weight per gallon of mixture for each trial of the products was averaged from three samples. The average weight per gallon of mixture for each trial was multiplied by an arbitrarily designated number of servings per pound of mixture. The result was the estimated number of servings of specified weight per gallon of mixture for each trial. The gallons of measured yield were determined by measuring the final volume with the measuring stick. The measured yield in gallons and decimals thereof was then multiplied by the estimated number of portions per gallon of mixture to obtain the estimated number of servings for the batch size for each trial. However, the estimated number of servings of yield for beef stew, barbecue beef, creamed chipped beef, and macaroni and cheese does not include handling losses for serving the products.

After all the ingredients of macaroni and cheese were combined, the measuring stick was used to measure the gallons of yield. The average weight per gallon of the combined product was recorded for three samples. The number of standard counter pans of macaroni and cheese produced at each trial was found by multiplying the gallons of measured yield by the average weight of gallon and dividing the result by the weight of mixture scaled per pan. Observations were made after baking on three counter pans of macaroni and cheese from each trial. After baking, the three samples were weighed to find the average weight of ready-to-serve mixture per pan. To obtain the number of servings per counter pan, the ready-to-serve weight per pan was divided by a designated portion size. The estimated number of servings of total yield was then found by multiplying the number of servings per pan by the total number of pans. The time of cooking in the steam-jacketed kettle and the time of baking were recorded.

Each batch size of raw meat loaf was weighed after all ingredients were combined. A constant weight of unbaked mixture was used for a standard loaf in each trial. The number of loaves per batch was found by dividing the specified weight per loaf into the total weight of the meat loaf mixture. Three loaves were used to find the average weight of sliced, baked meat loaf ready for serving. A portion size was designated and divided into the weight of the baked loaf to determine the number of servings per loaf. This was multiplied by the number of loaves to determine the total number of servings for each batch.

All percentages of yield for meat loaf were found by weighing three sample loaves to determine the average weight per meat loaf at various intervals and dividing by the weight of the meat loaf before baking. The observations of yield were recorded immediately after baking, after standing at room temperature in the pan for 30 minutes, after draining for 10 minutes, and after loaves were sliced and ready for service.

The actual portion weight for each trial of the products was averaged from three samples. A portion tool of a designated size was used for beef stew, barbecue beef, creamed chipped beef, and macaroni and cheese. A predetermined number of servings per standard loaf was used for portioning meat loaf. Each standard loaf was sliced into a designated number of portions.

Portion cost

The costs of recipes were calculated from prices furnished by Michigan State University Food Stores. The estimated total number of servings for each trial of beef stew, barbecue beef, creamed chipped beef, macaroni and cheese, and meat loaf was divided into the total recipe cost. The result was the portion cost for each trial of the products. In order to compare portion cost differences due to variations of recipe composition, an arbitrarily designated portion weight was used for these calculations.

Standard quality

The quality of the products was affected by the varying ingredients and percentages of ingredients, variation in cooking times and temperatures, and changes in recipe procedures. The edible portion weight of each ingredient for each recipe trial was recorded. These were then converted into percentages of the total weight of ingredients in the product. The only variances of recipe procedures observed were in the modification of creamed chipped beef and macaroni and cheese recipes.

Some data on cooking time were collected. It should be noted that food products prepared in the steam equipment remained in the equipment after cooking, because there were no other facilities for keeping the food hot for serving. Cooking time was recorded only when steam was turned into the cooking equipment, even though the food products were not removed from the steam equipment immediately after cooking ceased.

Portion composition

The portion composition for each product was calculated by dividing the estimated number of servings of specified size into the weight of each ingredient.

The 2-ounce edible portion protein-food requirement (or the equivalent of meat substitutes) was used as a guide for evaluating protein adequacy per serving of each product. The portion content for the vegetables of the beef stew and the cooked macaroni of the macaroni and cheese were compared also.

General acceptability

Standardizing recipe yield is of little value without standardizing the product quality first. Recipe ingredients and proportions of ingredients were adjusted in many of the trials of the products observed because the original recipe did not produce a standard quality product. Since these products were to be served, they were "dressed up" so that reasonably satisfactory products were served. Thus, most of the trials of the products involved variations in appearance, color, flavor, consistency, and texture. The desire to serve acceptable food was greater than the desire to reproduce poor quality products in order to standardize yields.

The consumer acceptance of the products was not recorded. The number of servings prepared for each trial does not seem a good index for consumer acceptance, because the paired menu items varied during the study. Consequently, the yields of the products made were adjusted for the different menu listings.

DISCUSSION OF RESULTS

The findings of the study are discussed according to the selected items observed: beef stew, barbecue beef, creamed chipped beef, macaroni and cheese, and meat loaf.

Beef Stew

Beef stew was prepared five times during the study. Variations were noted in yield, cost, quality, ingredient proportions, and acceptability of the stew.

Yield

The yield and the estimated number of portions during the five trials ranged from 4.00 to 9.19 gallons and 69 to 158 servings, respectively (Table 1). An 8-ounce serving size was selected and used in the calculations for beef stew.

The recipe ingredient changes did not seem to affect the weight per gallon of beef stew mixture appreciably. The average weight per gallon of beef stew varied from 8.53 pounds to 8.70 pounds (Table 1). There were variations in recipe procedures as illustrated by differences in cooking time. The total cooking time of beef stew ranged from 128 to 164 minutes, a difference of 36 minutes (Table 1).

Three actual portions, dished with an 8-ounce ladle, were weighed

Table 1. Summary of observations of beef stew.

	Trial Number				
	1	2	3	4	5
Ave. wt. per gal.* (lbs.)	8.70	8.59	8.53	8.67	8.59
No. 8-oz. serv. per gal.	17.40	17.18	17.06	17.34	17.18
Measured yield (gal.)	4.88	9.19	4.94	5.25	4.00
Total No. 8-oz.serv.	85	158	84	91	69
Total cost of recipe	$14.25	$24.76	$15.05	$14.31	$11.51
Cost per 8-oz. serv.	$ 0.168	$ 0.157	$ 0.179	$ 0.157	$ 0.167
Min. to brown meat	65	50	40	50	57
Min. of simmering	91	78	78	99	92
Min. of thickening	8	12	10	5	8
Total cooking time (min.)	164	140	128	154	157

* Averages were calculated from three actual samples for each trial.

from each batch of beef stew by the same person. The averages of the three portions ranged in the five trials from 8.17 ounces to 8.67 ounces. However, three portions per batch is inconclusive evidence for determining a valid average portion weight. It does, however, illustrate that portion size may vary even when a portion tool is provided unless great care is taken. Frequent weight checks or weighing each portion of the product will improve portion control during the serving period.

Portion cost

The edible-portion weights of fresh vegetable ingredients were converted into as-purchased weights, which were multiplied by the market cost per pound. The total cost of the ingredients for each trial of beef stew was divided by the estimated number of portions of yield. Since the same portion weight was used in calculating each trial of beef stew, the variations in portion cost reflect differences in composition of the mixture.

The lowest portion cost was $0.157 and the highest was $0.179 (Table 1). The lack of production control methods is not only expensive to management; it is also undesirable from the standpoint of guests, who pay a standard price for a dish which varies greatly in uniformity of quality.

Standard quality

The customer is conscious of the price of the item and is interested in products which are consistently high in quality. The appearance and the flavor of the beef stew were sufficiently different from one time to the next to be noticed by the consumer. The data from Tables 2 and 3 indicate that the consumer ate a different quality product every time he selected beef stew from the menu.

The kind and amount of ingredients varied each time the stew was produced. The percentage of meat ranged from 19.89 to 27.78%, vegetables from 19.98 to 37.61%, seasonings from 0.66 to 0.93%. The amount of water in the beef stew was a variable, and this affected the ratio of meat and vegetables to gravy. These variations in the percentage of ingredients also resulted in stews with different flavors (Table 2).

Portion composition

Portion composition was significant in the beef stew. The amount of vegetables and meat per portion was noticeably different for each trial of beef stew. The ounces of raw beef cubes per serving ranged from 3 to $3\frac{3}{4}$ ounces; the raw vegetables per serving ranged from 3 to $4\frac{1}{2}$ ounces (Table 3).

General acceptability

The color, flavor, and consistency of the beef stew made from the original recipe was not an acceptable product. The kind and amount of ingredients in the recipe were changed during the study. Standardizing yield of the recipe was not feasible until the quality of the beef stew was considered acceptable.

Table 2. Percentages of raw ingredients of beef stew.

	Trial Number				
	1	2	3	4	5
Beef	24.72	27.78	26.03	21.00	19.89
Vegetables	33.29	37.61	19.98	26.27	24.78
Total solids	58.01	65.39	46.01	47.27	44.67
Seasonings	0.84	0.93	0.84	0.69	0.66
Water	38.33	31.88	49.96	49.91	52.62
Remaining ingredients	2.83	1.82	3.20	2.10	2.05
Total (%)	100.01	100.02	100.01	99.97	100.00
Batch wt. (raw lbs.)	70.78	110.48	76.13	83.02	70.70

Table 3. Weight of raw edible ingredients per portion (ounces).

	Trial Number				
	1	2	3	4	5
Beef	$3\frac{1}{4}$	3	$3\frac{3}{4}$	3	$3\frac{1}{4}$
Vegetables	$4\frac{1}{2}$	$4\frac{1}{4}$	3	$3\frac{3}{4}$	4
Total solids per portion	$7\frac{3}{4}$	$7\frac{1}{4}$	$6\frac{3}{4}$	$6\frac{3}{4}$	$7\frac{1}{4}$

Barbecue Beef (Sloppy Joes)

The observations of barbecue beef showed product quality to be inconsistent and portion cost to be variable with each menu listing of this item. The barbecue beef was prepared five times during the study.

Yield

The average weight per gallon from each trial of barbecue beef ranged from 8.66 pounds to 8.76 pounds (Table 4). The number of servings designated for a pound of mixture was four. The estimated number of servings per gallon of barbecue beef ranged from 34.64 to 35.04 servings. The yield and the estimated number of portions of total yield ranged from 2.00 to 4.44 gallons and 69 to 155 portions, respectively (Table 4). The number of servings needed in the operation varied for each menu listing, which indicated a need for quick and accurate yield adjustments of the recipe.

Three actual servings from each trial were weighed and averaged. The range in averaged portion weight among the trials was 4.50 to 5.25 ounces. The 0.75 ounce difference indicates that portion weight is likely to vary unless a portioning tool is provided and portion control is constantly emphasized. Portion cost can be appreciably increased by even small variations in the amount of the product served for a portion.

One explanation for some of the variations noted among trials is the difference of cooking times. The total cooking times for the product varied from 70 to 93 minutes among the five trials (Table 4).

Table 4. Summary of observations of barbecue beef.

	Trial Number				
	1	2	3	4	5
Ave. wt. per gal.* (lbs.)	8.76	8.72	8.74	8.66	8.74
No. 4-oz. serv. per gal.	35.04	34.88	34.96	34.64	34.96
Measured yield (gal.)	2.88	4.44	2.44	2.00+	3.88
Total No. 4-oz. serv.	101	155	85	69+	136
Total cost of recipe	$12.95	$16.30	$10.55	$10.66	$13.34
Cost per 4-oz. serv.	$0.128	$0.105	$0.124	($0.154+)	$0.098
Wt. of raw ground beef per serv.(oz.)	3.25	2.60	3.01	(3.77+)	2.37
Min. to brown beef	60	60	54	50	40
Min. of simmering	33	30	37	30	30
Total cooking time (min.)	93	90	91	80	70

* Averages were calculated from three actual samples from each trial.

+ See explanation of Trial 4 on pages 41 and 43.

Portion cost

The edible portion weights of celery and onions were converted to as-purchased weights. The as-purchased weights were used to calculate ingredient cost. The ingredient costs were added for each trial, and divided by the estimated number of servings of yield to find the portion cost of each trial of barbecue beef.

A plausible explanation for the high portion cost of Trial 4 is that the final yield was probably measured incorrectly. If the final yield was greater than the measure recorded, the cost per portion would be lower. A comparison of the weights of the batch size of raw ingredients to the measured yield between Trials 3 and 4 indicates that the measured yield of Trial 4 was less than might have been expected.

Disregarding the portion cost of Trial 4, the variation of portion cost was $0.098 to $0.128, a difference of three cents or approximately a 30 percent increase in the raw food cost of the item (Table 4). Since a specified portion weight was used in calculating the estimated total portions of each trial of barbecue beef, the portion cost reflects the difference in recipe composition for each trial. Certainly standardized recipes play an important part in maintaining a constant portion cost.

Standard quality

The varying ingredient percentages affected the cost and the quality of the barbecue beef (Table 5). The percentages of ingredients of the first trial included the additional ingredients used for

Table 5. Percentages of raw ingredients of barbecue beef.

	Trial Number 1	2	3	4	5
Beef, ground	50.33	48.02	45.92	46.78	45.24
Chili sauce	5.79	11.77	13.50	13.49	13.42
Catsup	8.59	12.84	13.99	13.72	13.66
Tomato puree	16.57	8.22	8.21	8.23	8.68
Onion	3.53	3.99	3.86	3.60	4.39
Celery	3.53	4.38	3.86	3.64	4.18
Brown sugar	0.38	0.60	0.54	0.54	0.56
Worcestershire sauce	1.07	0.54	0.22	0.18	0.25
Water	6.21	5.78	6.01	5.89	5.73
Salt	0.46	0.63	0.67	0.63	0.70
Horseradish	0.77	0.71	0.72	0.72	0.70
Vinegar	1.92	1.79	1.79	1.80	1.76
Prepared mustard	0.77	0.71	0.72	0.72	0.70
Chili powder	0.08	0.03	0.00	0.04	0.04
Total (%)	100.00	100.01	100.01	99.98	100.01
Batch wt. (raw lbs.)	40.73	52.45	34.84	34.73	44.48

"dressing up" the product to improve flavor and color. However, other changes were desired and tried in each succeeding trial. The fifth trial produced a product considered acceptable in flavor and color by the consumer. The consistency of the product for each trial appeared to vary. Consistency of a product is subject to cooking and handling methods, times and temperatures of cooking, and the quality of the ingredients used. For example, the ground beef appeared to have a varying percentage of melted fat after browning in the various trials.

One method which can be used easily in production control to test

the consistency of the final product is a check of portion weight. If the consistency of barbecue beef is too thick, the final product can be adjusted by increasing liquid to reduce the portion weight to the desired figure.

Portion composition

For each trial, measured yield was multiplied by the number of 4-ounce servings per gallon; the estimated number of 4- ounce servings was divided into the as-purchased weight of raw ground beef to find the portion composition. If the measured yield of Trial 4 was incorrect, then the weight of raw ground beef per portion is not accurate for this trial (Table 4).

The portion composition of barbecue beef was a variable. Disregarding the portion composition of Trial 4, the raw weight of ground beef per serving varied from 2.37 to 3.25 ounces for a serving (Table 4). The meat content per portion in Trial 5 was 0.37 ounce over the recommended amount to meet protein requirements. In all other trials, the amount of meat per portion was far above requirements. The determination of portion composition is the responsibility of management and should be established before the product is prepared in the kitchen.

General acceptability

The variation in the percentages of ingredients indicated that the quality of the product had not been standardized. Again, it is not reasonable to standardize product yield before the quality is considered acceptable. The variation in the number of servings prepared for each

trial indicated the need for a quick and accurate adjustment of recipe yield so that a standard quality item could be produced in the desired quantity for each menu listing.

Creamed Chipped Beef

The observations on five trials of creamed chipped beef revealed the need for reliable recipes in the operation. The major portion of the study on creamed chipped beef was involved in developing a standard cream sauce using dried milk solids.

Yield

The total weight of the batch and the amount of raw ingredients were similar for all trials. The yields for four of the trials varied from 4.50 to 4.75 gallons (Table 6). Differences noted in cooking times may partly explain this difference of yields. The yield of Trial 3 was not recorded because not enough time was allowed for the adjustment of the new cream sauce recipe before serving time.

The designated portion size of creamed chipped beef was 6-ounces, which yielded 2.67 servings to a pound of mixture. The average weight per gallon creamed chipped beef varied from 8.20 to 8.54 pounds (Table 6). The estimated number of servings per gallon ranged from 21.89 to 22.80 servings. The estimated total number of servings for the four trials ranged from 101 to 108 servings (Table 6). The number of servings for the third trial was not calculated because no measurement of volume was obtained for this trial.

Table 6. Summary of observations of creamed chipped beef.

	Trial Number				
	1	2	3	4	5
Ave. wt. per gal.* (lbs.)	8.51	8.44	8.20	8.54	8.52
No. 6-oz. serv. per gal.	22.72	22.53	21.89	22.80	22.75
Measured yield (gal.)	4.75	4.50	...+	4.75	4.50
Total No. 6-oz. serv.	108	101	...+	108	102
Total cost of recipe	$11.22	$10.56	$10.49	$10.54	$10.52
Cost per 6-oz. serv.	$0.104	$0.105	...+	$0.098	$0.103
Dry chipped beef (lbs.)	6.03	6.03	6.03	5.94	5.94
Wt. of chipped beef per 4-oz.serv. (oz.)	0.60	0.63	...+	0.58	0.62
Wt. of chipped beef per 6-oz. serv. (oz.)	0.89	0.96	...+	0.88	0.93
Min. to thicken	13	21	...+	10	19

* Averages were calculated from three actual samples from each trial.

\+ In Trial 3, final yield was not measured because of insufficient time.

During the study a 4-ounce ladle was used to dish three sample servings from each trial. The averages of the samples ranged from 4.25 to 4.83 ounces per serving. Although three samples are not enough for a valid average portion size, the variation observed in portion sizes indicated how even slight over-portioning can affect the portion cost.

Portion cost

There is a considerable cost difference between whole fluid milk and dry milk solids. Prior to the observation, the cooks made all cream sauces from their "memory recipe file", using whole fluid milk.

The portion costs of the creamed chipped beef products were from \$0.098 ro \$0.105 (Table 6). Portion cost differences were probably attributable to variations in the cooking times and recipe composition (Tables 6 and 7).

Standard quality

The original recipe produced a poor quality cream sauce. One of the ingredients in the recipe was dry milk solids; neither whole nor nonfat solids were specified in the recipe. The two types of dry milk solids were used in the sauce at different menu listings; neither type of milk solids produced a standard product with the original recipe. In the third trial, the cream sauce formula was revised by increasing the percent of nonfat dry milk solids and decreasing the total percent of fats (Table 7). After the development of this recipe, the cooks

Table 7. Percentages of raw ingredients of creamed chipped beef.

	Trial Number				
	1	2*	3	4	5
Dry milk solids	6.93 (whole)	6.88 (nonfat)	12.46 (nonfat)	12.58 (nonfat)	12.61 (nonfat)
Warm water	66.69	66.01	60.73	61.01	61.16
Flour, cake	5.49	4.59	2.27	3.43	3.15
Cold water+	----	----	4.71	4.68	4.73
Butter	3.46	3.44	2.55	2.57	2.58
Shortening	3.46	3.44	2.12	2.14	2.15
Soaked chipped beef[x]	----	7.82	8.29	----	----
Dry chipped beef	13.93	7.82	6.87	13.58	13.61
Total (%)	100.00	100.00	100.00	99.99	99.99
Batch wt. (lbs.)	43.30	43.58	44.13	43.72	43.61

* After the second trial, a new recipe was used for cream sauce which affected the percentages of the ingredients used.

\+ In the new recipe, the cold water instead of fat was used for suspension of flour.

x In Trials 2 and 3, the chipped beef was soaked in water. The weights of the soaked chipped beef were recorded and converted into percentages.

agreed that the cream sauce was a standard product and that dry milk solids were acceptable for producing a cream sauce. The cooks soon depended on the revised recipe for preparing a standard product.

If the product is not acceptable, the tendency to "doctor" it is widespread to avoid throwing away "money". "Doctoring" a product may also increase the portion cost as well as lessen the chance of serving a product of consistently high quality. Providing a reliable recipe and introducing new products, such as dry milk, are responsibilities of management concerned with producing quality food and controlling costs.

Portion composition

An easy calculation can determine that a 4-ounce serving of the creamed chipped beef produced in these trials does not contain enough chipped beef to fulfill the equivalent of two ounces of edible fresh meat. A 4-ounce portion of creamed chipped beef contained from 0.58 to 0.63 ounces of dried beef (Table 6).

To equal the protein content of two ounces of edible fresh meat, 1 ounce of dried chipped beef is necessary for each portion. Consequently, a 4-ounce portion of creamed chipped beef, to fulfill nutritional adequacy, should contain 3 ounces of cream sauce and 1 ounce of chipped beef. In serving a 6-ounce portion of this product, cream sauce can be increased to 5 ounces of cream sauce to 1 ounce of chipped beef. The amount of chipped beef per portion can be determined before making a quantity recipe by dividing the number of expected servings

into the weight of the chipped beef.

General acceptability

There are advantages in standardizing the quality of the product in small batch sizes. Producing a batch of cream sauce made with whole fluid milk and a small batch of cream sauce made with dry milk solids gives an opportunity for the management and the production personnel to compare the products for flavor, color, consistency, and appearance. This method also facilitates introducing "new" standard recipes.

Macaroni and Cheese

The macaroni and cheese was prepared four times during the study. Variations were noted in yield, cost, quality, and composition of the product.

Yield

The total weight of the batch for the first trial included the weight of two quarts of cheese sauce not used in the product. The measured yield does not include the two quarts of drained cheese sauce for this first trial.

The average weight per gallon of mixture ranged from 8.34 to 8.59 pounds (Table 8). A designated weight per counter pan was selected for panning the macaroni and cheese before baking. The weight selected for the first trial was different from that used throughout the other trials. The average weight per pan of baked macaroni and

Table 8. Summary of observations of macaroni and cheese.

	Trial Number			
	1 +	2	3	4
Ave. wt. per gal.* (lbs.)	8.59	8.35	8.34	8.38
Measured yield in S.J. kettle (gal.)	10.50	11.00	10.88	11.44
Estimated no. of pans	9.99	7.65	7.56	7.99
Wt. per pan before baking (lbs.)	9.03	12.00	12.00	12.00
Ave. wt. per pan after baking* (lbs.)	8.85	11.75	11.70	11.71
No. 6-oz. serv. per pan	23.63	31.37	31.24	31.27
Total No. 6-oz. serv.	236	240	236	250
Total cost of recipe	$9.25	$8.71	$9.23	$9.02
Cost per 6-oz. serving	$0.039	$0.036	$0.039	$0.036
Wt. of cooked macaroni per portion (oz.)	2.62	2.25	2.48	2.54
Wt. of cheese per portion (oz.)	0.71	0.67	0.67	0.64
Min. cooked, SJ kettle	----x	30	45	24
Min. baked	20	25	34	31

* Averages were calculated from three actual samples from each trial.

+ See explanation of Trial 1 on page 49.

x Time not recorded.

cheese ranged from 11.70 to 11.75 pounds in Trials 2 through 4 (Table 8).

A 6-ounce portion, which gives 2.67 servings to a pound of macaroni and cheese mixture was chosen. The number of portions per pan was estimated and ranged from 31.24 to 31.37 servings in Trials 2 through 4 (Table 8). The estimated number of servings of total yield for all trials ranged from 236 to 250 servings (Table 8).

Three sample servings were weighed using a 6-ounce ladle for each trial. The averages of the portion weights observed ranged from 6.50 to 7.58 ounces. This does not indicate a valid average portion weight, but it does indicate that sizeable variances from expected yield may be due to poor portioning control.

Portion cost

The as-purchased weights of ingredients were used in determining cost of ingredients. The total cost of each batch was divided by the estimated number of servings. The portion cost of the macaroni and cheese products varied from $0.036 to $0.039 (Table 8). The difference reflects variables in procedures and composition.

Standard quality

The quality of macaroni and cheese varied for the different trials. The appearance, flavor, and color of the product were different each time. This was caused by the changes in the proportion of cooked macaroni to cheese sauce and changes in the kinds of cheese used. The weight and kind of cheese was varied for each trial and resulted in

color and flavor differences in the product. Also, ingredient changes were made after the first trial which affected the quality of the product (Table 9).

Portion composition

The amount of cooked macaroni obtained from a specified weight of dry macaroni varied with each trial. Since all of the cooked macaroni was used in each trial, the varying percentages of macaroni in the finished product altered slightly the portion content of macaroni. The weights of cooked macaroni per portion varied from 2.25 to 2.62 ounces in a 6-ounce portion of macaroni and cheese (Table 8). The weight of cheese per 6-ounce serving varied from 0.64 to 0.71 ounces (Table 8). This is not an adequate substitute for the two-ounce edible portion protein requirement. Changes in the amounts of the other ingredients also affected the portion composition (Table 9).

General acceptability

The amount of the cheese was not sufficient for acceptable color and flavor in the product. The quality of the product affects consumer acceptance. If the quality and the portion size are not consistent, the consumer may feel dissatisfied. The observations of preparing macaroni and cheese pointed to the need for specific and detailed recipes to maintain quality and yield.

Table 9. Percentages of ingredients of macaroni and cheese.

	Trial Number			
	1*	2	3	4
Cooked macaroni	39.54	36.68	39.62	40.64
Cheese	10.67	10.87	10.70	10.26
Butter	----+	1.90	1.89	1.79
Oleo	2.30			
Shortening	----+	1.42	1.42	1.34
Whole milk solids	4.86			
Nonfat milk solids	----+	7.12	7.10	6.72
Warm water	39.82	33.60	31.07	31.45
Flour, cake	2.18	2.17	2.16	2.05
Cold water	----+	5.72	5.56	5.23
Salt	0.58	0.36	0.35	0.34
Pepper	0.03	0.03	0.02	0.03
Paprika	0.02	0.03	0.02	0.03
Worcestershire sauce	----+	0.08	0.08	0.11
Total (%)	100.00	99.98	99.99	99.99
Batch wt. (lbs.)	97.67*	92.13	92.44	97.72

* See explanation of Trial 1 on pages 26 and 51.

\+ After the first trial, a new recipe was used which resulted in ingredient changes.

Meat Loaf

Data were recorded for five trials of meat loaf. The first trial was used to standardize the form for collecting the data.

Yield

Information from Food Stores indicated that similar percentages of ground meats were used for Trials 2, 4, and 5: 50% beef, 25% veal, and 25% pork. For Trials 1 and 3, the proportions were 60% beef, 20% veal, and 20% pork. The difference in the proportions of the ground meats influenced yields somewhat.

The batch for each trial was weighed after mixing (Table 10). A designated weight of mixture was placed in meat loaf pans of standard sizes. Three meat loaves from each trial were used for determining the average weights of meat loaves at the various intervals during cooking and slicing. The percent yield of the meat loaves after immediate removal from the oven ranged from 90.26 to 96.55%; after cooling 30 minutes, from 89.70 to 95.91%; after draining 10 minutes, from 82.29 to 85.65% (Table 10).

The average yield of meat loaves from Trials 2 through 5 ranged from 80.93% to 84.93%. A designated portion weight of $3\frac{1}{2}$ ounces was used for estimating the number of servings per meat loaf which ranged from 24.04 to 25.23 servings (Table 10).

The ingredient weights and percentages were the same for Trials 4 and 5. The estimated number of servings of total yield varied from

Table 10. Summary of observations of meat loaf.

	Trial Number				
	1x	2	3x	4	5
Wt. of meat loaf after mixing (lbs.)	50.92	50.75	37.45	35.66	35.55
Ave. wt. of raw loaf* (lbs.)	6.47	6.50	6.50	6.50	6.50
No. of loaves	7.83	7.81	5.76	5.49	5.47
Ave. yield of meat loaf out of oven (%)*	90.26	96.23	96.55	95.51	95.35
Ave. yield of meat loaf after 30 min.(%)*	89.70	95.75	95.91	95.03	94.55
Ave. yield of drained loaf (%)*	----+	82.29	85.65	34.45	82.69
Ave. cooking and handling yield (%)*	----+	81.49	84.93	82.29	80.93
Ave. wt. of sliced baked loaf (lbs.)*	----+	5.30	5.52	5.35	5.26
No.3.5-oz.serv. per loaf	----+	24.22	25.23	24.55	24.04
Oz. of raw ground meat per portion	----+	2.88	2.77	2.82	2.91
Total No. 3.5-oz. serv.	----+	189	145	135	131
Total cost of recipe	$19.83	$20.20	$14.97	$14.12	$14.12
Cost per 3.5 oz. serving	----+	$0.107	$0.103	$0.105	$0.108
Min. baked	135	130	106	115	130
Oven temperature: In:	340	400	410	410	415
(°F) : Out:	380	400	410	420	410
Final internal temp. of meat loaf (°C.)	----+	86	85	88	90

* Averages were calculated from three actual samples from each trial.

x The percentages of ground beef, veal, and pork were different from Trials 2, 4, and 5. See explanation on page 54.

\+ Information was not recorded from observations.

131 to 135 servings. The difference of yield may be explained by the variation of cooking time and internal temperature of meat loaves (Table 10).

The average portion weight of three samples from each trial ranged from 3.38 to 3.83 ounces. Although these were not sufficient to establish valid average portion weight, the actual portion weights indicate differences of portion content and portion cost.

Portion cost

The as-purchased weight of fresh onions in Trial 1 was included in the total recipe cost. The total recipe cost for each trial was divided by the estimated number of servings to determine portion cost. The portion cost of Trial 1 was not calculated because the average weight of sliced baked loaf was not recorded. The portion cost of the other trials ranged from $0.103 to $0.108, a difference of one-half cent (Table 10). The difference reflects the variance of recipe composition caused by the difference of percentages of ground meats. Also the difference may be partly caused by the varying cooking times and temperatures.

Standard quality

The color, texture, and flavor appeared to be similar for each menu listing. With the exception of Trial 1, the ingredient percentages were similar (Table 11). Quality, yield, and portion cost of meat loaf may be controlled from one menu listing to another by controlling

Table 11. Percentages of raw ingredients of meat loaf.

	Trial number				
	1	2*	3	4	5
Beef, ground	40.15	33.41	40.00	33.35	33.35
Veal, ground	13.38	16.65	13.33	16.67	16.67
Pork, ground	13.38	16.65	13.33	16.67	16.67
Total ground meat	66.91	66.71	66.66	66.69	66.69
Soup base (beef-like)	0.34	0.34	0.33	0.35	0.35
Water	15.53	15.91	15.92	15.93	15.93
Eggs	4.89	5.39	5.47	5.38	5.38
Bread crumbs	7.95	10.46	10.45	10.46	10.46
Fresh onions+	3.36	----	----	----	----
Dried onions	----	0.18	0.17	0.18	0.18
Salt	1.01	1.01	0.99	1.01	1.01
Total (%)	99.99	100.00	99.99	100.00	100.00
Batch wt. (raw lbs.)	51.09	51.06	37.69	35.70	35.70

* In Trial 2, the ground beef, veal, and port were received separately.

+ After the first trial, only dried onion were used.

ingredients, percentage of ingredients, and methods of procedure.

Portion composition

The portion content of raw ground meat per serving is calculated by dividing the weight of the ground meat by the estimated number of servings of yield. The portion content of raw ground meat per serving ranged from 2.77 to 2.91 ounces (Table 10). The designated portion weight of meat loaf was adequate to fulfill protein requirement.

General acceptability

Although the last two trials had the same percentages of ingredients, the cooking time and internal temperature of meat loaf have to be established before the recipe can be considered standardized. Standardizing the yield of the meat loaf is easier after the quality of the product is standardized. Cooking and handling yields can then be determined. The desired portion weight is determined in the food service operation and multiplied by the number of portions needed. The cooking and handling losses of the product can then be estimated and the exact yield desired can be produced. The portion content, quality, and portion cost are then consistent for each menu listing.

SUMMARY AND RECOMMENDATIONS

The findings common to the products observed in this study showed that unreliable recipes produce different products each time they are used. An essential tool in each food service operation is the standardized recipe which must contain complete information: specific ingredients and amounts; proper information for methods of procedure, including times and temperatures for mixing and cooking; designated equipment and sizes; and definite number of portions and size of portion.

When recipe ingredients, percentages, and methods vary each time the product is made, establishing a range for cooking and handling losses is impossible. For example, the beef stew varied in yield, portion content, quality, and cost each time it was produced. When standardized recipes are not used, inadequate recipes become sources of variable quality, uncertain yield, and uncontrolled costs in a food service operation.

The standardized recipe is also necessary for maintaining consumer acceptance. Since the price of a product is usually set in an operation, the consumer expects the product which he buys to have consistent quality and portion content.

Establishing a Program for Standardization and Production Control

Due to rising labor and overhead costs today, there is an increased need to control costs of operation. As a result, a standardization

and production control program becomes a necessity to the organization for controlling food cost. From the observations discussed in the study, these proposed steps for a standardization and production control program are recommended by the investigator.

Step 1: Establishing the recognition of need for a production control program

Recognizing the need for a standardization and production control program is the responsibility of top management. A successful undertaking of the program is dependent upon top management firmly believing in the value of such a program and reflecting this attitude within the organization. Top management must be willing to initiate and actively support the program. This involves more than passive attitudes and "lip-service" by management: It means being willing to pursue the objectives of the program.

After the need has been established, the supervisory level should be included in the beginning stages of organizing and planning the program for the operation. Selling the program to supervision is the task of top management and must be well under way before the program has any real chance of success. By helping the supervisory level gain insight into the problem, management can develop their attitudes toward standardization and production control in a positive way.

At the point where initial ideas for approaches to the problem are being considered by supervision and management, the employees

should enter the picture, too. Management and supervision are responsible for explaining the reasons for the program to the employees. Furthermore, the employees can become involved by participating in decisions that affect them on the job.

Step 2: Developing plans for the program

After need and responsibility have been established, the objectives for a standardization and production control program should be developed. In planning the objectives of the program, suggestions from management, supervision, and employees should be considered. Since each group is involved in operating and maintaining the program, each should be represented in establishing the objectives of a standardization and production control program. At the same time, this representative group has the responsibility for follow-through and evaluating the progress of the program at the various stages of development.

Evaluation may be accomplished by management, supervision, and employees realistically appraising the results. Primarily the results are evaluated in terms of product quality and portion cost of each recipe tested in the program. Product quality and portion cost should become the concern of everyone involved in the program. This means that encouragement and purpose has to be fostered through the ranks by top management continually; achievements must be made known to all of the personnel so that each can realize the progress being made.

The details of the program should be planned after each person involved understands the objectives and the methods of evaluation to

be used. Specific parts of the program should be delegated according to job responsibilities already established in the organization. For example, the food production manager is usually responsible for providing recipes and ordering ingredients to be used in the kitchen. If the food production manager assumes his responsibility for standardizing recipes, then certain "paper-work" will have to be done before the recipes are used by the cooks. This means checking the recipe ingredients and amounts, method of procedure, and calculating yield carefully, and then noting what additional information needs to be found during actual preparation of the product. Thus a systematic routine can be initiated and developed by the food production manager.

The actual operation of a standardization and production control program should be gradually introduced in the work organization. If the program proceeds in a slow and orderly way, each person can become accustomed to a production control program and can learn what is expected of him on the job. This allows time for the operation of the program to become integrated within the work routine of each participant.

Step 3: Survey adequacy of physical facilities

After delegating the plans of operation for the program to the personnel, management and supervisory personnel should survey the physical facilities. Basically this means collecting pertinent information about the equipment available and determining the convenience of layout of facilities.

Information about equipment should include capacities and sizes for both large and small equipment. Essential information on mechanical equipment should be noted, also. For example, the data pertinent for mixers include: number and size of mixers, capacities of mixing bowls, kinds of beaters and other attachments for each mixer, and the number of mixing speeds for each mixer. Comparable data should be collected for all equipment in the actual operation and recorded in an easy-to-use form. The equipment data are useful in scheduling and determining recipe yields and methods of procedure. For example, the food production manager can use the information for planning number of portions per designated size pan.

In a similar manner, measuring instruments should be checked so that standardization can proceed with as few problems as possible. Thermometers, timers, scales, and measuring tools need to be checked for accuracy. Furthermore the accuracy of oven temperatures should be checked when baking with an oven load. Thermostats may require adjustment from time to time.

Another consideration in surveying the adequacy of physical facilities is the convenience of layout of large and small equipment. In a food service operation, the best sources of information about convenience of layout are the employees; the best sources of information about the needs for efficient operation are the supervisors. Equipment must be easily accessible to the employees involved in the standardization and production control program to avoid wasted time. Management should see that the equipment and materials needed are

provided. Then supervision can be responsible for placing the equipment and materials in convenient locations in the operation. Some equipment that may be needed for standardizing recipes are timers, thermometers of convenient sizes, large capacity scales, portion scales, other portioning tools, and calibrated measuring sticks or their equivalent for measuring volume yields in large equipment.

Other equipment may be needed as the program progresses; the specific requirements will depend on the product being standardized. If unfamiliar equipment is used, on-the-job training and group training will be needed to instruct the employees in its proper use and value to the operation.

To facilitate early participation of the personnel in the program, supervisors can discuss the necessity for and the methods of collecting equipment data with employees. After employees understand why and how the information will be used, they can help collect data about the equipment they use.

Step 4: Select and schedule specific items for standardization

A standardization program should not proceed in all directions at once. Specific items should be selected and scheduled for standardization in the actual operation. Since controlling food costs is important, menu items which recur frequently should be selected for standardization.

The number of recipes in the process of standardization at one time will depend on the size of operation, the adequacy of facilities, and the number of trained personnel available. Generally standardizing one recipe per a work unit at a time is recommended.

While a recipe is being standardized, better results are usually obtained if the initial trials are assigned to the same employee. However, it should be understood by trained employees of the work unit that other assignments of recipe standardization will be rotated among them. Each employee should be notified well in advance of the assignment for standardizing a particular recipe in the kitchen so that he or she may ask questions and help to plan the work.

Early undertakings in a standardization and production control program should be under constant supervision to assure a thorough job. A production control program cannot be a hurried process, and it may be slow to show results until standardization procedures are well-established within the organization.

Another area to be developed during the beginning stages of the program is selection of a recipe format that fits the actual operation. Selection of the recipe format should be made jointly by management, supervision, and employees, because standard recipe writing is a part of the total program for production control. Management and supervision can review sources of information for writing recipes. Several sources are listed at the end of this report. These authorities have suggested many worthwhile ideas for developing and writing easy-to-read recipes. After studying the possibilities for recipe format, management should consider additional suggestions which fit the needs of the operation. Employees can help to evaluate clarity and completeness of the recipe format for the recipe being standardized.

After the personnel have contributed their suggestions, a final

decision should be made about the format to be adopted. For recipe writing during the initial stages of the program, a systematic procedure will save the time of the staff in developing standard recipes and will lessen the chance of error of misreading the recipe by the cook. However, recipe writing should be continuously evaluated for further improvement within the organization.

Step 5: Recommended procedure for testing and developing selected recipes.

When the product to be standardized is determined, a recipe should be selected by management and supervision. Recipes can be selected from several sources. The recipe may be one already in use, a family-sized recipe, or one selected from a variety of sources of published large quantity recipes.

After the recipe is selected for testing, adjustments in yield may be necessary. If the recipe is for small quantity, yield adjustments may not be needed. However, if the recipe is for large quantity, then the recipe needs to be reduced to a small batch size for initial testing.

A preliminary trial to determine the worth of the recipe is recommended. Particular attention in the first trial is important in following recipe ingredients, amounts, and instructions carefully. Any changes of recipe ingredients, amounts, or production procedure during the trial should be carefully recorded on the recipe. If quality of the product is to be controlled from one trial to the next, the exact ingredients and procedures used in previous trials must be known.

If the preliminary trial does not produce a satisfactory product, the recipe ingredients should be adjusted in systematic steps or another recipe can be selected for testing.

When the quality of the product is considered acceptable, a data form should be planned for collecting the information needed for developing the standardized recipe. The data form should incorporate the procedure already established for standard recipe writing and be organized to include pertinent information for standardization: (1) what ingredients are used in what quantities, giving ready-to-cook and as-purchased weights; (2) quality of each ingredient; (3) clear and concise instructions at every step of recipe production; (4) recipe yield in volume measure and weight of final product; (5) size and weight of portion. The format of the data form should be developed so that it is easy-to-read and understand by supervisors and employees.

The data collected are used for checking the recipe during the "trial runs" of standardization. Duplications of quality, proportions of ingredients, and procedure of the recipe can then be made. Group training may facilitate these purposes and provide involvement for all the members of the organization.

The number of trials in small batch size will depend on the quality of the product produced. Adjustments may be necessary during these initial trials to improve the product quality. The final determination of a standard product is the responsibility of management. However, much may be gained with the involvement of supervisors and employees in the evaluation of a standard product. Taste-testing, for

example, is an opportunity for management to indicate the desired standards of quality for color, appearance, flavor, texture, and consistency of a food product.

After a standard product has been produced, the recipe should be evaluated in terms of portion cost. In addition, nutritive value of the product may need to be evaluated in terms of consumer needs: for example, specific requirements may be a concern in feeding young children, elderly people, or patients with special dietary problems.

Recipe costing can be done by supervisors from the incoming invoices of food deliveries. If the ingredients have been weighed during the testing, costing of the recipe becomes a less time consuming process. The total recipe cost should be divided by the number of portions of specified size obtained.

Determining portion size is a decision for management, but all the members of the operation can be involved. If different size portions are dished up, the group can evaluate what the best size is for consumer acceptance. Also management should provide information on actual portion cost of each size in this kind of meeting. Both supervision and employees can benefit from seeing how much the different portions cost and realizing how important it is to maintain the same size portion for customer satisfaction and cost control.

Management will need to evaluate portion cost and quality of the product realistically in making the final decision to accept or reject a recipe for use in the operation. However, supervision and employees can also make recommendations about the feasibility of the product in the operation.

After the recipe has been accepted for use in the operation, it is advisable to have an employee who had not previously used the recipe, make the product with a minimum of supervision. The employee should be asked to point out anything which is not clear and to suggest any additional instructions needed in the recipe procedure. Thus the recipe is checked for clarity and accuracy, and the final standard recipe for small batch size can be written by supervision.

Step 6. Calculating and standardizing recipe yield

After the recipe in small batch size is accepted for the operation, it is ready to be produced in increasing batch sizes. Eliason (6) suggested tripling the small batch size yield so that it would be large enough to use in large quantity equipment. It seems advisable to increase yield gradually. Then the recipe should be produced and the data collected.

During the trials of increased yield, the method of procedure may need to be adjusted; mixing and cooking times will be increased from smaller to larger batch sizes, although final cooking temperature can be established in the trials of small batch size. Each step of the procedure will need to be carefully checked and adjusted in the tests. If an increased batch size does not produce a standard product, the recipe should be checked again in small yield before proceeding.

The advantage of testing a recipe in small batch lies in establishing at minimum cost the quality of each ingredient and the

proportions of ingredients in the recipe for a standard product. Consequently, the proportion and quality of the ingredients in the recipe need to be maintained in each trial, whether the batch is small or large; only in this way product quality and composition are controlled. Otherwise, exact replications of the product cannot be produced; the quality, portion composition, and cost of the recipe will vary constantly. In addition, repeated yields of the same theoretical batch size will be a variable. Thus a standard method of adjusting recipe yield is imperative to the maintenance of quality and cost.

A review of two methods for adjusting recipe yields is recommended. The "Recipe Magician" is a new method of calculating yield of recipes which can save considerable time and still give the accurate results of the conventional method. The new method is a plan which can also be taught by management and supervision to well-trained cooks.

In a food service operation the popularity of alternative menu items may point up the need for a quick accurate method for recipe yield adjustments. Requirements of different portion sizes of the same product may also emphasize the necessity for frequent yield adjustments. For example, meat loaf may be used in a sandwich on a luncheon menu and also listed as a dinner entree. Different portion sizes for meat loaf for the two menu listings may pose special problems in adjusting recipe yields.

Recipe yield may be increased systematically until the batch size is large enough for operational use. The recipe in quantity batch size should be produced again by another employee so that recipe

procedure, yield, quality, portion composition, and cost may be rechecked for accuracy. Weight and volume measure of the operational batch size should be recorded on the recipe. At this point a standardized recipe of operational yield can be written by supervision.

Production control is a continuous program. For example, future menu listings of a standardized product may mean additional adjusting of recipe yields. A system should be planned for providing extra space on the standard recipe or a clip-on card for calculating additional recipe yields.

Step 7: Emphasizing the merits of a continuous production control program

It is the responsibility of management to inform the group about the progress of the program. The results should be interpreted and reported in a meaningful way to all members of the organization. Management can point out how standardization and production control can increase job satisfaction by helping the employee to produce a product of consistently high quality. They might also emphasize that controlling portion size of products helps to stabilize cost with resulting increase in job security for each member of the operation. They can point out that standardization and production control removes the "hit and miss" methods of preparation.

At this time, management can also emphasize to supervision and employees that a great amount of their initiative is needed to plan the work and produce the desired results. Management should encourage standardizing other selected recipes and explain how the data

collected for a product may be helpful in comparing and setting up similar food products for standardization of other recipes.

By emphasizing the merits of a continuous production control program, management can provide an atmosphere for accomplishing the goals and maintaining the standards of the food service unit. Each member of the organization must be made aware of the importance of recipe standardization for producing top quality food each time a particular item is prepared. Management must demonstrate how and why standardized recipes can be regarded as reliable kitchen tools which can help lessen the problems involved in large quantity production. Only through the cooperation of all persons in the organization can a production control program become an integral part of the food service operation.

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APPENDIX

The replies from seven commercial food and educational institutions are listed by code letters for each question.

(1) What steps or procedure do you use to develop standardized quantity recipes?

Test Kitchen L

We undertake no quantity testing or developments except with institutional equipment and methods and always by weight. Where measures are convenient and applicable we report measures, but the laboratory work is kept completely out of home-kitchen concepts and operations (techniques).

We have a "rule of thumb" for our laboratory technicians and that is "if it can't be made 95% right by the second run don't use it." In other words this is likely to be the dud..., and economics dictates doing no more work on that particular recipe if it involves any testing beyond the third and final run.

I would not consider this "rule" even a fair one if we were involved in flour mixture developments, where 6 and 8 or more repeats is not unreasonable. But since we deal chiefly with everything but flour mixtures, it has its merits as a laboratory-time and schedule control.

Test Kitchen M

(a) Test in small quantity to establish worth of recipe.
(b) Increase to desired quantity -- approximately 50 or 100.
(c) Taste-test to establish any needed changes in amounts of ingredients used for quality preparation.
(d) Taste-test revised quantity recipe as many times as necessary.
(e) Establish yield by measure or servings.

Test Kitchen N

(a) Compare the new recipe to be tried with a similar standardized recipe already in use.
(b) Readjust quantities of ingredients in recipe to be tried to correspond as near as possible with a similar standardized recipe.
(c) Try the new recipe deciding if it is acceptable to the patron.
(d) Readjust quantities of ingredients to achieve a total yield already in use: as for instance, our pie fillings are standardized for eight pies of 1 qt. each; meat loaf recipes to yield 8 loaves of 4 lb. each and a final yield of 96 portions.
(e) Try the recipe in revised form readjusting it again for seasoning, etc.

Test Kitchen O

(a) Determine total yield desired.
(b) Determine size portions desired.
(c) Determine number of portions desired - 50 or 100.
(d) Scale all ingredients to even weights (preferably measurements) and/or institutional cans or package sizes.
(e) Scale recipe to standardized pans and/or casseroles.

Test Kitchen P

(a) Decide on amount per serving - average taken from available data.
(b) Calculation of 24 and 48 serving amounts
(c) Testing of the recipe in proper size pans
(d) Portioning of the food according to amount per serving previously determined
(e) Writing of the recipe, carefully checking the steps involved and keeping it easy to read and follow

Test Kitchen Q

The procedure we follow for developing the standard quantity recipe is as follows: First, we start with the idea. This may come from a meat dish one of our staff members has eaten and thought good; the development of a recipe from one of our small quantity recipes or ideas which our staff have for meat and fruit or vegetable, or cereal combinations which we believe will produce a good recipe. (continued)

After we have the basic ingredients and relative proportions in small quantity form, we begin adjusting for the large quantity preparation.

Test Kitchen R

(a) We have controlled ingredients - as to quality, size, color, yield, packaging, etc.
(b) We have controlled equipment and other utensils used to prepare recipes.
(c) We have a standardized method of writing recipes as to set up and wording, etc.

The recipes are developed using methods which coincide with those which will be used in actual store operation as noted in the above points.

Sometimes the recipes are developed from home-sized recipes, sometimes we adopt what we consider the better qualities from several available recipes for the item in which we are interested working these points together into a new recipe - other times we have only an idea to work from.

(2) In developing new recipe formulas, what methods are used to determine recipe yields?

Test Kitchen L

Yields are reported by total weight then the product is scaled into standardized serving units to get portion yield.

Test Kitchen M

(a) Servings are counted or marked off or measured.
(b) If baked in steamtable pans, averaged sized servings are marked off and counted.
(c) If mixture is liquid servings are measured in cups or ounces.
(d) If individual loaves or cutlets are involved, weight of raw serving is measured or a size dipper is specified.

Test Kitchen N

(a) Compare new recipe with a similar recipe already in use ... as to quantity of ingredients and total yield.
(b) For vegetables, meats and soups, portions served are recorded using a portion counter at the cafeteria counter. For pies, cakes and puddings, etc. the number of standard pans, etc. are recorded. For salads we record the yield of standard portions at the time of salad set-up.
(c) We always keep a record of actual quantities of food prepared and the amount left over each lunch and dinner. For most of the meals served we record the number of portions served for most of the menu items.

Test Kitchen O

Comparison to similar recipes served in various type establishments.

Test Kitchen P

Total weight and volume, then divided into predetermined portions which are thought of as average from several sources.

Test Kitchen Q

In developing new recipe formulas, three methods are used for determining recipe yields-- volume, weight and dimensional, depending upon the dish. If it is a stew, we would figure on the basis of the volume of the serving if the vegetables were prepared in small portions; if the vegetables, potatoes, carrots, etc., are to be served whole, half or in quarters, we would use numbers.

Test Kitchen R

The recipes are actually yielded - at various steps in the procedue - if possible - and at the end (in weight or measure whichever is practical). Portions are also yielded - in weight or measure or both.

(3) Do you find similar percentages of cooking and handling losses in repeated trials of the same recipe? (If so, what percentages of cooking and handling losses do you find for beef stew, meat

loaf, barbecue ground beef, creamed chipped beef, and baked macaroni and cheese?)

Test Kitchen L

If we find that handling losses exceed 6 ounces per 50 servings we check on the weighing and scaling (portioning techniques! Cooking losses such as evaporation, etc. are reflected in the portion size and/or count.

Test Kitchen M

If the resources are the same for the raw products used.

Test Kitchen N

When our full-time cooks, bakers and serving personnel make the products and are careful to use the checks we have set up for control from the time of preparation until the food is served, we find that volume and yields are consistent. However, our kitchen is used as a teaching laboratory for college students in quantity food preparation. Because of inaccuracies in measuring and weighing as well as unskilled manipulation of ingredients, I have found that recipes may vary somewhat in yield and quality of final product.

Most of our recipes have been in use many years with only minor changes. We may change ingredients slightly for variation and interest but find that if directions are carefully followed yields are consistent.

We have done no controlled studies on cooking and handling losses. Through practice and experience, we find that we get variations in yield when comparing products of different consistency as for instance, stews as compared with creamed dishes where the pieces of solids are different in size.

Test Kitchen O

Yes - providing same pans, ovens, etc. are used.

Test Kitchen P

Suggest contacting actual restaurant for this information as it is dependent upon employee training, etc.

Test Kitchen Q

We do find similar percentages of cooking and handling losses in repeated trials of the same recipe; however, if ever the percentages would be similar, certainly this would be true in a test kitchen since you can control the size of the cooking utensil and the cooking temperature -- which are two very important factors.

Test Kitchen R

Some recipes, such as cakes, are always the same. In recipes where ingredients are cooked before being combined or where the entire mixture is cooked there may be slight differences from time to time in shrinkages, rate of cooking, etc. which can affect the yield. With controlled ingredients and methods such as we use, this is kept to a minimum.

(a) Beef stew - closest we make to this is Beef Steak Cubes in Gravy - shrinkage of meat only is approximately 45%.
(b) Meat loaf - 23%.
(c) Barbecue ground beef - no figures available.
(d) Creamed chipped beef - no figures available.
(e) Baked macaroni and cheese - 7% shrinkage.

(4) In making different size batches of the same recipes, are the percentages of cooking and handling losses comparable?

Test Kitchen L

We do not test in amounts less than 50 servings as a rule - occasionally for 25, so we are not dealing with "different size batches of the same recipe."

Test Kitchen M

To the point of about 4 times increase or decrease.

Test Kitchen N

Because of the type of service we find that under most circumstances we prepare about the same amount of certain types of food each time they appear on the menu, and as our recipes are set up generally do not have to multiply them many times. Multiplying a recipe once or twice does not seem to change the yield appreciably.

Test Kitchen O

No - the larger the batch, the percentage loss is smaller.

Test Kitchen P

Suggest contacting actual restaurant for this information as it is dependent upon employee training, etc.

Test Kitchen Q

The cooking and handling losses are comparable for different size batches of the same recipe, but do vary depending mainly upon the possible variation in cooking time.

Test Kitchen R

The only time we notice fluctuation is in cooking different amounts of a mixture in a steamjacketed kettle. This we attribute to variations in the rate of cooking, variation in the amount of contact the mixture has with the sides of the kettle and variations in the amount of surface exposure of the mixture.

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