

DEVELOPMENT OF DATA BASES AND RECIPE ADJUSTMENT BY
PERCENTAGE METHOD USING ELECTRONIC DATA PROCESSING
IN A COLLEGE RESIDENCE HALL FOODSERVICE SYSTEM

by

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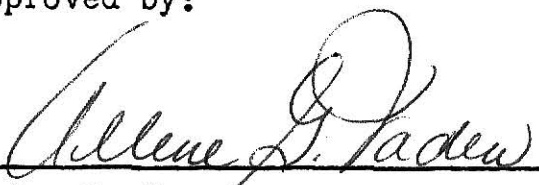
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INTRODUCTION

Over the last several decades electronic data processing (EDP) has increased in foodservice institutions because of the need for sophisticated techniques to achieve effective management (1). High food costs, high labor costs and high labor turnover rates are all problems facing foodservice managers (2). EDP has been used to provide timely information for management decisions and to reduce non-professional as well as professional time in data collecting activities (1-4). There have not been reports of computerized food production systems developed specifically for college foodservices. All of the systems currently discussed in the literature were developed for hospital foodservice systems (2,4).

Brown (5) and Sager (6) stated that recipes or food production formulas are the basic input into a quantity food production system. Usually a dietitian, a foodservice manager or supervisor determines the number of servings of each menu item to be prepared for a meal; then the recipe is selected, based on the menu, and adjusted to the forecasted amounts (7). Andrews (8) indicated that recipes have a great influence on the cost of the operation and on the quality level and nutrient contribution of the products. Also these formulas are the basis for purchasing raw food supplies and the means for controlling production (8).

The basic components for a EDP recipe conversion program are the food item file and recipe file (8). These data files

are difficult to compile because of the continual changes in the food supply (9). No two harvests are the same; therefore the nutrient values for any food differ to some degree. No two employees handle food in the same manner, whether in food production or food service. A decision must be made as to what value will be used for various ingredient measures, usually based on information from more than one source (10). The compilation of necessary information for maintenance of accurate information and current food item and recipe files for a particular foodservice operation must be an on-going process (6). Often it is impossible to make changes manually to keep records current or to correct all recipes for each ingredient change. Through the use of computer technology, these tasks can be achieved with relative ease, following development of the system (7,11). Many daily and repetitive procedures are connected with recipe adjustment and these can be accomplished via EDP faster and more accurately than by manual methods.

A standardized recipe system is extremely important in any foodservice for control of quality, quantity and cost (12). Such control can be achieved only by careful, accurate adjustment of standardized recipes to provide the forecasted yield (13). A standardized recipe system is the foundation for any computer-assisted food production system (8,11). x

The conventional factor method, using either decimals or fractions, has been the tool used for adjustment of recipes traditionally by many foodservice operations (13). Another

method, that of recipe adjustment by percentages, has been used successfully at Kansas State University (12). This method, which involves the use of the percentage of each individual ingredient to the total weight of the recipe, was first developed at Michigan State University by Callahan and Aldrich (13).

The objectives of this study were to develop two EDP data bases, a food item file and a recipe file, and to evaluate the feasibility of computerized recipe adjustment by percentages. Literature reviewed relevant to the objectives included: electronic data processing, recipe standardization and expansion and quality food.

REVIEW OF LITERATURE

Electronic Data Processing

Food Production Data Processing Systems

The increased usage and adaptability of electronic data processing (EDP) presents a partial solution to the problem in the foodservice industry of need versus time (6). Andrews (8) and Sager (14) pointed out one of the major areas for EDP use in foodservice is with the quantity and quality control and adjustment of recipes. This is due to the speed, compiling ability and summarizing ability of EDP. Sager and Ostenso (6) and Manchester and Sager (14) further indicated that computer computation and output can be no more accurate than the data provided for the calculations; therefore the data gathered should be organized, valid and valuable to ensure that the results are merited by the costs involved.

Before any decision is made about the computer printing of formulas, Sager (7) noted that the foodservice operation and the use of the formulas within that operation should be defined. The different uses of the formulas throughout the foodservice unit should also be determined to ensure that the computer-printed formulas will meet the varied needs of those who use them (7).

Sager and Manchester (14) described the complete data processing system as including two major areas, the computer-support area, which is made up of the computer programs and

procedures that provides information for the foodservice management, and the foodservice operation area, which is the food production system responsible to the computer support. Successful data processing system development and implementation can be accomplished only through the cooperation of these two areas (14). In order to utilize any computer system to generate output detailing food production requirements Sager and Manchester (14) stressed that the formulas must be realistically standardized and the ingredients be in the quantities indicated.

Recipe and Ingredient Data

The basic components for an EDP recipe conversion program are the food item file and recipe file (8). These two files are used together to provide the necessary recipe data for food production. The amount and type of recipe data required for these files depend upon the objectives and functions of a foodservice operation (15). The American Dietetic Association (ADA) (15) described the two main segments of recipe data as the recipe identification data (recipe file), which applies to the recipe as a whole, and the ingredient data (item file), which applies to each ingredient within the recipes. ADA (15) divided each of these areas into required data, necessary regardless of its application, and optional data, necessary only under certain situations. The required recipe file identification data uses listed by ADA (15) included:

1. Title of recipe, for alphabetic listing and use on documents,

2. Yield in servings, for recipe expansion, computing food purchase requirements, determining nutrient values and cost values,
3. Portion size for determination of serving size.

The optional recipe file identification data uses listed were (15):

1. Yield in weight or measure, for verification of the actual yield or for a guide to distribution to different service areas,
2. Number of ingredients, for editing process to assure no ingredients are inadvertently omitted,
3. Standardization status, for evaluation of recipe in food production,
4. Maximum batch, for determination of number of recipes to be printed,
5. Minimum batch, for automatic conversion of number of servings forecasted to a regular production unit,
6. Source code, to indicate original source of recipe,
7. Diet type, for indicating a modified or regular diet,
8. Frequency of service, for placement of item on menu,
9. Preference rating for controlling acceptability of item on the menu,
10. Meal and course, for menu planning by computer,
11. Early preparation code, to determine what day the recipe will be extended and when the ingredients will be requisitioned.

The required recipe file ingredient data listed were (15):

1. Ingredient sequence number, which controls the sequence of the items within a recipe and identifies each ingredient in the recipe,
2. Ingredient number, for compilation of daily food requisition and correlation with inventory and cost data,
3. Ingredient recipe nomenclature, to identify the item to the user,

4. Quantity of ingredient, for use in extending the recipe, determine nutrient values, recipe costs and ingredient requirements.

Optional ingredient data were stated as (15):

1. Ingredient preparation designation,
2. Referenced recipe,
3. Early preparation code,
4. Preparation instruction reference,
5. Amount of unit size,
6. Cost adjustment factor,
7. Nutrient adjustment factor,
8. Nutrient value reference,
9. Alternate ingredient designation.

When developing codes for ingredients or recipes, virtually any scheme can be used (15). ADA (15) noted two possible options for coding schemes, the categorized sequential number, which divides the number into two parts, the first part indicating the general category of the recipe and the second part indicating the sequence number of the recipe within that category, and the sequential number scheme where the first recipe is assigned the number 1 and the remainder of the recipes are assigned successively higher numbers.

EDP Recipe Adjustment Systems

EDP systems for recipe adjustment have been developed by the United States Army, United States Army Hospital Food Service Data Processing System (14) and the University of Missouri-Columbia Computer-Assisted Food Management System (2)

and are in the following subsections.

United States Army Data Processing System. The purposes behind the development of the United States Army data processing management system were to reduce expenditures in foodservice operations, to provide accurate, current cost figures, to provide specific nutrient data and to improve utilization of the dietitian's professional services (14). The most important objective, however, was the development of foodservice information system responsive to the needs of the dietitian and the physician (14).

The computer program was written and tested for accuracy of recipe adjustment (6). The food type coding developed in the Army system used both numeric and alphabetic characters (6). The recipe numbering system is also a combination of alphabetic characters (6).

All of the formulas stored in the Army recipe file are based on 100 portions. Thirty-two recipes were tested to illustrate the computer program's versatility in computing accurately any number of recipe ingredients, including deletions and substitutions and in compiling the adjusted formula amount in a usable format (6). A unit size was established for each ingredient, coded and used each time the ingredient appeared in a recipe (6).

The information required by the Army recipe computer program was a census figure for each food type within each food category, day, date, meal, recipe identification, daily use information, and ingredient information. Sager (6) stated that

evaluation of computer program model indicated formula adjustments were mathematically accurate as validated by manual calculation. The Army formula was designed for easy readability and use (7). The ingredients were stated in quantities of an assortment of units rather than the use of weight units only (7).

Two factors to consider with formula extension were uncovered by the Army system. In planning the computer adjustment of the ingredient amount and units used, Sager (7) stated that if possible all numbers resulting from multiplication of the ingredient amounts be converted to meaningful amounts and units and that the final format of a formula contain all necessary information. Sager and Ostenso (6) stated that the data, logically arranged on the page, is more easily read.

Missouri-Columbia Food Management System. The computer-assisted food management system developed at the University of Missouri Medical Center was programmed to adjust formulas to the batch size requested for production (2). The recipes are stored on file in 100 portion yields (2). Accuracy of ingredients, recipe yield, waste and procedures were factors considered in evaluation of recipes stored in the recipe data file (8). Andrews (8) stated that the predicted loss due to waste was determined for each formula by allowing for unavoidable waste (evaporation), scrape waste and waste due to human error. Abnormal waste was not considered, to encourage employees to work at their greatest efficiency (8).

Andrews (8) noted that two approaches to standardizing formulas were used at the University of Missouri Medical Center.

Some of the formulas were tested and standardized before coding and some of the formulas were coded and then evaluated and updated (8). The second method proved to be more satisfactory because the first method resulted in too much delay before the benefits of the computer could be used (8). Therefore the majority of formulas was evaluated by a panel of dietitians. when the formulas appeared on the menu (8).

Before coding, each formula was examined on the basis of the criteria established for formula standards that included (a) portion size, (b) amount of meat or meat equivalent used, (c) edible portion or ready-to-cook weight of ingredient rather than AP weight, (d) ingredients grouped according to preparation procedure, (e) preparation procedures placed directly to the right of the ingredients, (f) standardizing procedures which incorporated work simplification methods (8).

Information used in the adjustment of formulas by computer at the University of Missouri was divided into three categories described by Andrews (8) as (a) general information - data about the formula as a whole such as name, portion size and total cooking yield; (b) ingredient information - data about each individual ingredient of the formula; and (c) preparation information - instructions for assembling or cooking the menu item.

Recipe Standardization and Expansion

Caleva (16) stated that the creation of a dish or method of preparation is an art but the everyday mechanics of food

production is a science. Aldrich (17) pointed out that in quantity food production one needs to have a healthy respect for scientific methods because without them there can be no assurance of consistently high quality food preparation in the right amounts for every recipe produced. Standardized formulas for food production, that have been carefully tested so that they can be used by inexperienced people and still result at the quality and yield desired, are necessary to retain control over production, quality and cost. These formulas were described by Miller (18) as the products' road maps. Cranmore (19) stated that a standardized recipe is an approved recipe pattern that establishes ingredient amounts and procedure and that will assure consistently high quality food of proven acceptance to patrons.

Total formula standardization is more than a "well-written" recipe, however (20,21). Ericson (20) and Aldrich (21) described standardized formulas as those that have been revised to be practical for a particular operation. They should be based on the portion size and yield requirements of the individual operation and adapted to the equipment and purchasing procedure of an operation (20,21). The advantages of using standardized formulas are that they relieve the mental strain of preparation of food from memory, provide information needed by the cook, save time for the cook and manager, eliminate guesswork and waste due to poor estimation, eliminate variation in quality and quantity of production, prevent dependence on any one cook, assist in portion and food cost control and result in greater

customer and employee satisfaction (22,23).

Characteristics of Standardized Formulas

Cranmore (19) described a good standardized formula as being as simple as possible to prepare and serve, as good to look at as to taste, nutritious, within the food cost allowance, and highly acceptable to patrons. Cranmore (19) further stated that a recipe is only as good as the information it contains and that a formula should contain all of the useful information that may be needed, or referred to, during the production and service of the menu item.

Characteristics of a standardized formula, summarized from several sources, include (11,19-21, 24):

1. well arranged uncluttered format,
2. neat columns for ingredients,
3. chronological listing of ingredients for a predetermined quantity,
4. limited number of yield columns,
5. step by step simplified but detailed procedure for preparation,
6. careful work choice,
7. exact specification of preparation, cookery and serving containers to use,
8. use of descriptive terms (eg: chopped onions),
9. use of applicable terminology.

Ericson (20) and Macfarlane (11) described some general principles to follow when expanding formulas: never use a measurement for which the worker does not have a measurement tool;

specify all directions in detailed written form; transpose ingredients into weights whenever possible, as weights are more accurate than measurement; use EP weight unless both AP and EP are used; state weights in pounds or ounces or a standard portion; use common abbreviations; simplify measuring procedures; qualify type of product used (eg; cake flour); and write the procedure in the order in which preparation is to be performed.

Callahan (25) stated that the key to quality food can be lost in the process of expanding formula yields because of the mathematics involved in the changing of yields. Errors can result and cause waste or a poor product (25). Tsamasfros and Tuthill (26) agreed that accuracy is vital when adjusting formulas.

Formula Adjustment

There are two procedures used for the adjustment of formulas, the factor method and the percentage method. Callahan (23) noted that the factor method takes a great deal of time which is often a stumbling block that leads to expansion of formulas using guesswork, which defeats the purpose of standardized formulas. Aldrich (27) stated that with the factor method of adjustment, the formulas should be set up in terms of the number of even pans, each with a specified weight and number of portions and a definite portion size. To increase a recipe using the factor method all of the ingredients are changed from measurements to weights, multiplied by the conver-

sion factor and then compared with the total of the converted ingredient weights. If the two total weights do not match then an error was made in some of the calculations (27-29).

The second method of adjustment of formulas is the percentage method. In this method of adjustment measurements for the ingredients are converted to weights and then listed by the percentage of the total weight that they represent, instead of by weight or volume, and a portion size is established. Using the portion size, number of portions forecasted and the percentage of each ingredient, the different ingredient weights are calculated (12,13,25). Callahan (25) and Aldrich (13) agreed that formulas which have been converted to percentages need never be recalculated. This method allows adjustment to the portion size or a shift of ingredients without changing the entire recipe. In 1972 this method was restructured at Kansas State University by McManis (12) so it could be used with a desk calculator to facilitate faster more accurate results.

When expanding formulas from home to quantity size or when testing a formula the following suggestions were found in the literature (20,28):

1. know exactly what ingredients are used and in what quantity,
2. check the proportions of ingredients against a standard large quantity recipe for a product of similar type,
3. make the recipe first in the original amount following the instructions exactly and record observations then proceed by slow stages in building up the recipe, keeping in mind the appearance of the original product,
4. check scales for accuracy,

5. not be misled by broad generalities about the building up of quantity sized recipes from low sized recipes,
6. evaluate the quality of product at every increasing stage,
7. select recipe and evaluate it as to proportions, methods, yield and cost to be sure it is practical and adaptable to operate,
8. decide on modifications necessary to suit your operation,
9. have a skilled worker make a recipe for 25 and judge the product,
10. make a larger quantity and judge quality by using a standard rating scale and judging panel,
11. have the department test the formula and report the results.

Sager and Ostenso (6) stated that any formula adjustment method requires time consuming, repetitive mathematical calculations. Macfarlane (11) noted that if the calculations of formula adjustment are correct to the smallest fraction then there should be no change in the percentages or proportions of the ingredients when a formula is expanded to a larger quantity.

Quality Food

Potter (31) stated that the food people choose and the amount they eat depend upon the quality of the food. He defined quality as the degree of excellence or the composite of characteristics that have significance and affect acceptability. Paul and Palmer (32) purported that food quality can be evaluated by sensory, chemical and physical methods.

Sensory Evaluations

Sensory methods of evaluation are used to determine whether foods differ in quality such as taste, odor, juiciness, tenderness and the extent and direction of the difference found (32). Peckham (33) described three types of sensory tests: (a) those designed to reflect consumer preference, (b) those designed to investigate the influence of factors in production, (c) those designed to maintain quality of a product at a given standard. Sensory evaluation is difficult because the results are based on human judgement, which is individual and not always consistent (34).

Griswold (34) stated that only food prepared in a reproducible manner is worth the effort of scoring. The conditions of preparation must be carefully controlled and defined for a difference in quality to be attributed to the known variables (34). Griswold also discussed the importance of all of the samples in a series being the same temperature when judged. The usual serving temperature is best. Samples are best presented in containers of the same size, shape and color, identified by a code and with the sample size being sufficient to provide each judge with at least two or three bites (34).

Twigg and Kramer (35) stated that a proper environment for testing is important to insure that each panelist is provided with privacy so that the results may be arrived at independently and not be influenced by the other panelists. These authors also stressed that clear and precise instructions, of the

scoring system and a description of the traits to be judged should be provided to each panelist. Griswold (34) indicated that talking should be avoided and that tasters should be seated so they can not see the grading charts of other judges. The room in which the judging takes place should be ventilated, well-lighted and free from distractions.

The results of sensory judging can be studied by tabulating the data (34). Griswold (34) noted that some variability will be due to the samples themselves, a combination of differences in raw material and in the method of preparation. Sources of error in the judging includes variability in the performance of one judge on duplicate samples as well as among several judges on the same sample.

METHODOLOGY

Two basic EDP data files were developed for the Kansas State University Residence Hall Foodservice (KSU): an item file and a master recipe file. Weekly meetings were held with a system analyst, who was responsible for the computer programming and routines for these two systems; to insure that both the foodservice and EDP needs and constraints were met. The programs, routines and coding systems were planned jointly by the researcher and system analyst.

The Research Site

The study was conducted in the Department of Housing at Kansas State University, a large midwestern, land-grant university. The university has a total enrollment of approximately 16,400 students who are enrolled in eight colleges and the Graduate School. There are nine residence halls on campus housing approximately 4,100 students. Each residence hall has close access to a foodservice; two residence halls are served by a central foodservice; a complex of four residence halls is served by one central foodservice; and three small residence halls have self-contained foodservices. All units are under the jurisdiction of the Associate Director of Housing and the Assistant Foodservice Director who are housed, along with the Administrative Assistant in charge of Purchasing and an Administrative Dietitian in charge of menus, in a centrally located building on campus. Each foodservice has a professional

staff of dietitians, as well as full-time and student employees.

Three meals a day are served to students, except on Sunday when no evening meal is served. Employees full-time, hourly and student, and invited guests also may eat in the foodservice. The menus are centrally planned and are served by all the residence hall foodservices on campus. These menus are planned at least two months in advance of service. A copy of the tentative menu is sent to all the dietitians who review the menus, note production problem areas, and make recommendations. The menus are finalized, and copies of the final menu are distributed from the central office one month in advance of the serving date. A nine-week luncheon and dinner entree cycle with varying complementary foods is used when planning the menus.

The residence hall foodservices have as their purposes: to serve quality food that is nutritious, palatable, attractive, and safe; to assist students in the direction of good food habits; and to cooperate in and support the social and educational programs within the residence halls. These goals are met by emphasizing high quality food through the application of changing technological developments and close supervision and control of sanitation practices. Students' knowledge is increased by introducing new foods, serving attractive well-seasoned foods, and utilizing varying styles of service (36).

ILLEGIBLE DOCUMENT

**THE FOLLOWING
DOCUMENT(S) IS OF
POOR LEGIBILITY IN
THE ORIGINAL**

**THIS IS THE BEST
COPY AVAILABLE**

Development of the Item File

Information for the food item file was gathered from various sources and standardized (34, 37-42). The items used in all formulas produced in the foodservice units at KSU were listed and the following data were collected, when applicable, for each item: weight per cup, order unit and weight per order unit. Yield factors were determined for items, such as the drained weights for canned fruits and vegetables, as purchased versus edible portion yields of fresh fruits and vegetables and cooking yields. Yield studies were carried out in the KSU Residence Hall Foodservice and taken from a variety of other sources (37-42). A list of order units was developed and each unit was assigned a two digit code (Appendix A).

A system to classify and code items was developed for the food item file (Appendix A). This item code was divided into five different parts: the major category, minor category, sub-category, sequence number and check digit. The length of these different parts of the code was determined by the following constraints:

- a) the major category should be large enough to enable expansion of the file to include all of the inventory items in the Department of Housing,
- b) the meat codes should correspond with the National Association of Meat Purveyors, standardized national portion control meat cuts codes (43). These codes were being used as the meat codes for the meat processed in the central stores for the Residence Hall foodservices. These codes are four digits with the different series coded as, beef - 1100's, lamb - 1200's, veal - 1300's, and pork 1400's. Letters - a dash -

number were used to indicate a portion size (eg: "-2", two servings per pound).

- c) the parts should be large enough to enable an organized, logical classification of items for identification.

The final length of item code was established as ten digits with the different parts being: major category, three digits; minor category, one digit; sub-category, two digits; sequence number, three digits; and the check digit, one digit. The check digit used was adapted from the University of Missouri Medical Center Computer-Assisted Food Management System (1).

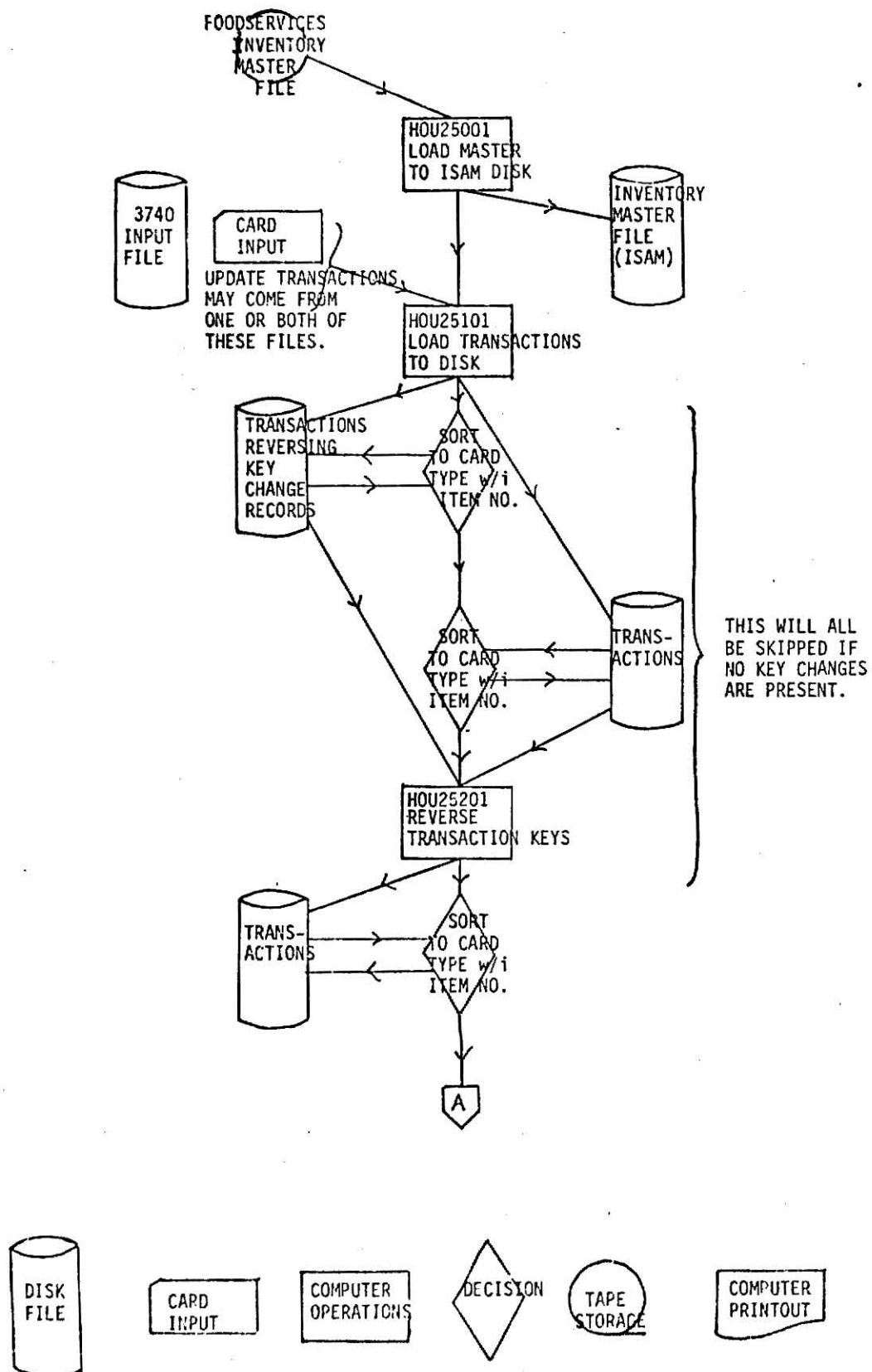
The various information determined as necessary to be included in the food item file included: item name, item code, item status, item type, inventory code, recipe number, weight per cup, order unit, weight per order unit, as purchased versus edible portion factor, storage location, order group, and group item data (Appendix A). A coding form also was developed to enable standardized entry of the item data into the file (Appendix A).

The item data system that includes programs and routines written to load coded information and provide printouts, generates a Foodservice Item Listing of all of the coded items and their related information as its output. The flow chart of the edit/update of the Housing Foodservice Item master file is shown in Figure 1. The master item file is stored on magnetic tape. When an item update is run the information on the tape is loaded onto a disk for better accessibility. The coded input is loaded onto another disk. The input is sorted by the computer by card code within item number. The

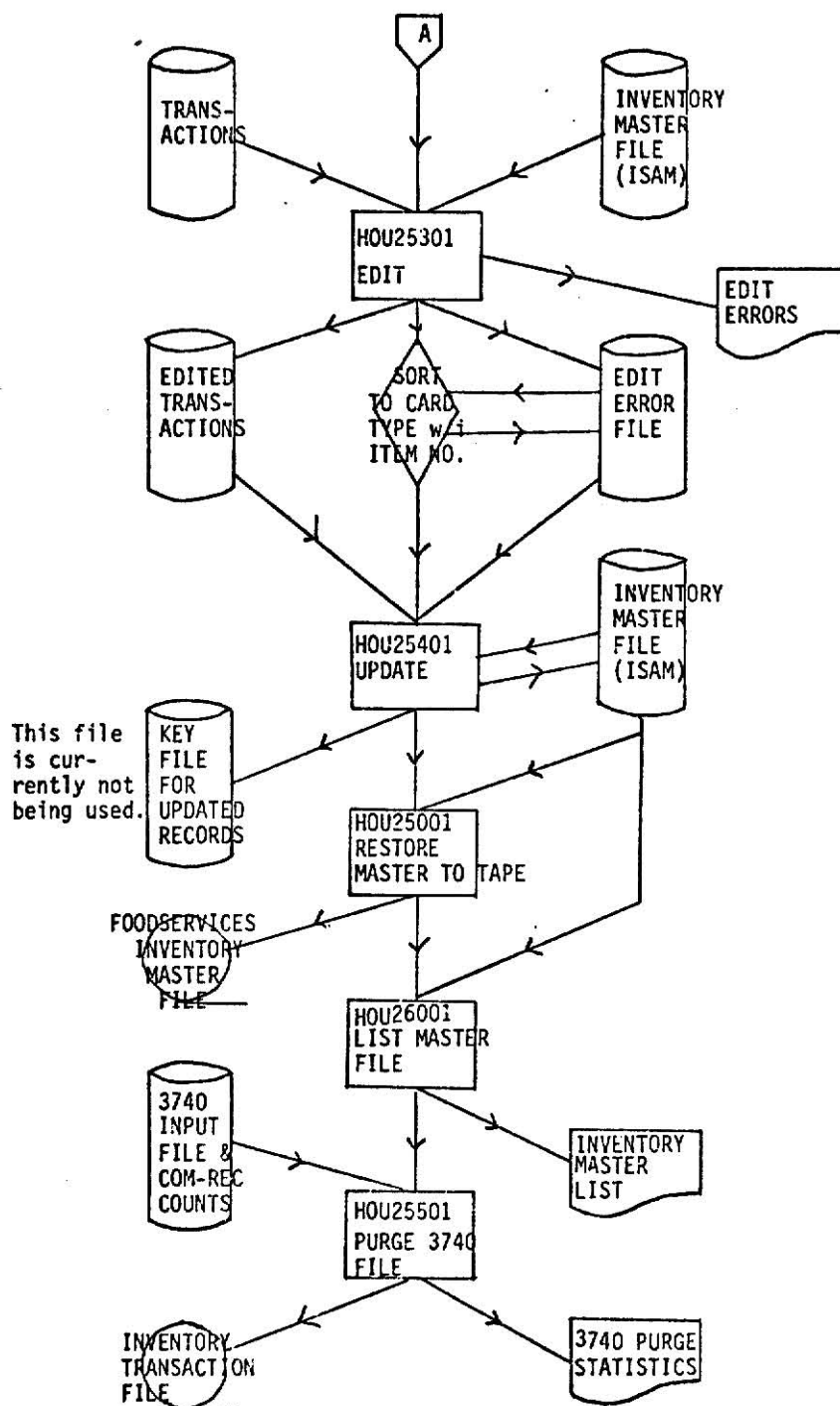
**THIS BOOK
CONTAINS
NUMEROUS PAGES
WITH DIAGRAMS
THAT ARE CROOKED
COMPARED TO THE
REST OF THE
INFORMATION ON
THE PAGE.**

**THIS IS AS
RECEIVED FROM
CUSTOMER.**

Figure 1. Housing Foodservices Inventory Master Edit/Update ¹



¹ Prepared by M.E. Lipp, Data Processing KSU, March 13, 1975



key changes, which are changes of item code numbers, are set apart for sorting. The total change transactions, including the key changes, also are set aside for sorting. This separation enables changes to be made on an item at the same time that the item code number is being changed. All of the new key changes are reversed to their old item number while the total change transactions of the input are being made. If there is no key change entered then this process will be skipped. The input is edited and changes are made. Any assumption changes, which are changes coded into the system for the computer to make if the code is left blank, are done at this stage. After this step all errors that were found in the coding are printed. The total edited transactions or changes, including the errors, are again separated; the errors also are separated into an error file to be sorted by card code within item number, and marked so no further update is done on those items with errors. The actual updating of the disk file is the next step. Then the master item disk file is restored to tape for storage. The master item listing is printed from the disk as the final output of this system. The changes made are stored on another tape for reference and the input data is erased from the disk.

Development of the Master Recipe File

KSU Residence Hall Foodservice standardized formulas were evaluated in terms of accuracy related to ingredients, formula yield and waste. Procedures were examined and re-written only

when necessary. A system to classify and code for formulas (Appendix B) was adapted from the existing method of recipe coding. The formula code was divided into five different parts: the major category, minor category, sub-category, sequence number and check digit. The length of the different code parts was determined by the following constraints:

- a) the code should be as similar as possible to the present coding system to enable a smooth change over for the people who work with the formulas,
- b) the parts should be large enough to enable an organized, logical classification of formulas for identification.

The final length of formula code was established as nine digits with the different parts being: major category, two digits; minor category, two digits; sub-category, one digit; sequence number, three digits; and check digit, one digit. The check digit used was adapted from the University of Missouri Medical Center Computer-Assisted Food Management System (1).

The recipe file contains three types of information for each formula, general formula information, ingredient information and production information (Appendix B). When applicable, the general formula information included: the formula number, name, number of portions, portion size, standardized status, maximum batch, minimum batch, recipe source, equipment needed for production, handling loss percentage, forecasting unit, suggested serving utensil, pan size, weight per pan, meal pattern allowance, and weight per cup of recipe. The ingredient information includes the individual item codes and weights required in the formula for the portion number indicated. The

production information includes the preparation instructions. A coding form was developed to enable standardized entry of all formula data into the system (Appendix B). Other general information was gathered for input data into the system; for example, ounce weight equivalents in decimals of a pound and decimal of a pound equivalents in gram measures and fractional measure equivalents.

Formula Expansion System

The percentage method (Appendix C) for formula conversion was re-defined to determine that all necessary data had been collected and to specify the essential steps to be written into the computer program. The recipe data system was programmed to generate the following reports: (a) recipe master index - a list of all formula titles in the file, their corresponding recipe code number, date of entry into the file and recipe status, (b) recipe file - a set of all recipes in the file and their corresponding data.

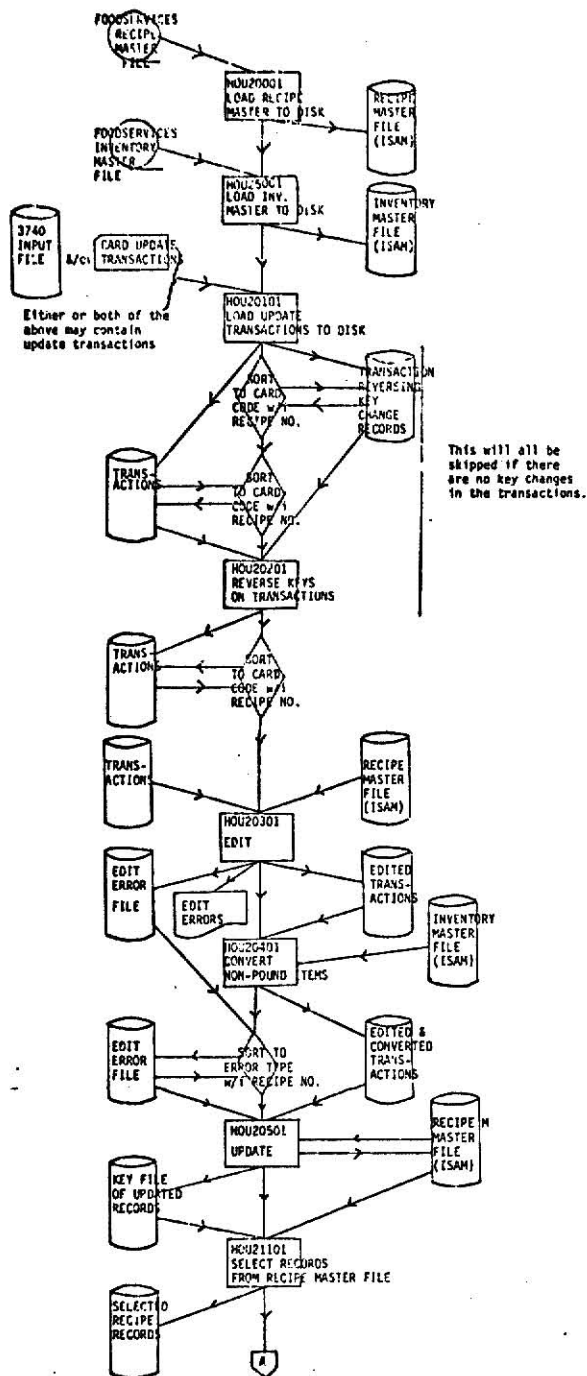
Formulas for all menu items were required, including those served in the same form as purchased, such as fresh fruit, as well as prepared menu items which used a combination of more than one ingredient. These were necessary to enable 'complete' and accurate orders to be produced from the menu using the master recipe file. To be processed by the computer, each coded formula had to contain a recipe name, correct recipe code number, portion size, number of portions, handling loss percentage and type of transaction. If the recipe status

was left blank the computer would set the code as developmental or " 2 ". All other information on the coding form could be left blank and the formula would still be processed into the system's file. If an item code was entered in a formula but was not on the item file then the formula printout would indicate that this item was "invalid" but the formula would still be processed for the correct item weights and percentage. After the program for percentage method of formula conversion was completed, 100 of the most commonly used formulas from the different major classifications were entered into the computer recipe file. The KSU standardized recipes were coded using the portion sizes already in use.

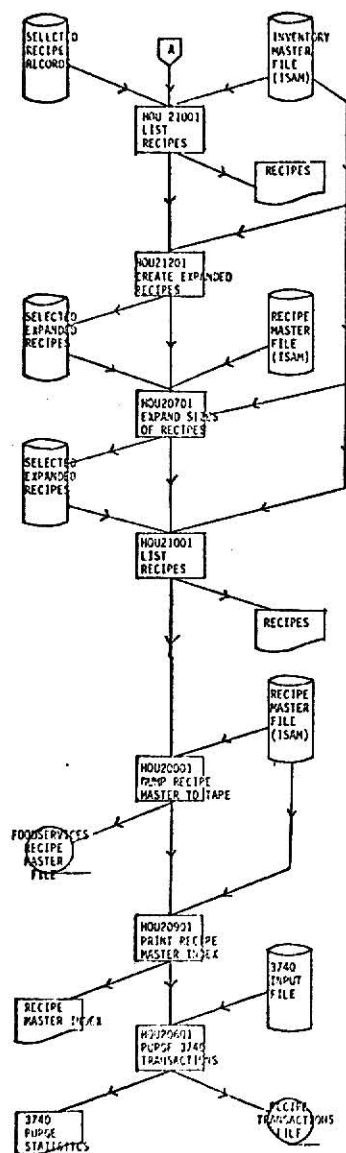
Each formula printout was examined for accuracy and completeness. This examination consisted of the comparison between the computer formula and the same formula manually adjusted to the same quantity. The format of the computer formula was based on the format currently used for manually adjusted formulas at KSU (Appendix D) to minimize the personal resistance to the change to computer adjusted recipes.

The flow chart for the edit/update for the Housing Foodservice recipe master file is shown in Figure 2. The master recipe file also is stored on magnetic tape. For a recipe update run the information on the recipe master tape and the information on the master item file tape are loaded onto separate disks for accessibility. The coded input also is loaded onto a disk. Then the input is sorted by card code

Figure 2. Mounting Foodservices Recipe Master Edit/Update¹



¹Prepared by M.E. Lipp, Data Processing KSU, March 17, 1975.



within recipe number. The key changes, which are changes of recipe code numbers, are set apart for sorting. The total change transactions, including the key changes, are also set aside. This separation enables changes to be made on a recipe at the same time that the recipe code number is being changed. All of the new key changes are reversed to their old recipe number while the total changes of the input are made. If there is no key change entered this process will be skipped. The input is edited and the changes made. At this step the general recipe errors in coding of the formulas are discovered and printed. The errors are sorted by card code within recipe number and marked so that no further update is done on those items with general recipe errors. The total edited transactions or changes, including the errors are separated, with the errors also being separated out by themselves in an error file.

The next stage converts measure units coded for items in a recipe into weight units. At this step errors in weight and measure units will be noted. Weight and measure errors will not stop further updating of a coded formula from continuing. The actual updating of the disk file is the next step. The new updated recipe records are stored on a separate disk, and the master recipe file is updated. The select records from the master recipe file are stored on a separate disk. The recipes that were updated and stored in the file of updated records are selected from the master recipe file and printed with their changes. These changed or new formulas will be scanned and any formula containing a group item, which substitutes one

or more items for another item within a recipe, will be printed again with the group item data expansion made. Then the master recipe disk file is restored to tape for storage. The recipe master index is printed from the recipe master file. The recipe master index is the list of all of the recipes stored on file and their corresponding recipe number, status and date of entry. The recipe transactions are stored on another tape for reference and the input data is erased from the disk.

Evaluation of Percentage Method of Recipe Expansion

When the formula printouts appeared to be accurate and complete two basic formulas (Appendix E) which had been evaluated to be acceptable, vanilla cream pudding and cheese and ham casserole, were added to the data set. These formulas were established as yielding an acceptable small quantity product by a panel of dietitians. The new recipes were produced in small and large quantities to be evaluated qualitatively by a panel of six dietitians. Quality standards were established for each product, prior to the testing, using several sources (31,34,39)(Appendix E). Computer adjusted recipes for each formula were printed and used for the production of the products (Appendix F).

The ham and cheese casserole was produced in quantities of twenty-five servings and 250 servings (Appendix F), by an experienced cook, within one of the KSU Residence Hall food-service units. These two quantities were produced and judged

five times, after the standards had been established. The casserole was made early in the morning, held in the refrigerator, cooked for the recommended time, held for thirty minutes in a warming oven and then served to the panelists to be judged.

The vanilla cream pudding was produced in quantities of fifty servings and 250 servings (Appendix F), by the researcher, within one of the KSU Residence Hall foodservice units. These two products were produced and judged five times after the standards had been established for the product. The pudding was produced at six o'clock in the morning, held in the refrigerator until 10:30 o'clock, dished up and again held in refrigeration until judged by the panelists, approximately two hours later.

Using a standard form (Appendix G) sensory evaluation of the products included appearance, texture or consistency, tenderness, flavor, overall eating quality and comparability of the two quantities of the two products. These qualities were scored using a seven point scale, 1 = very poor to 7 = excellent. The scores from the taste panels were analyzed for variation among the individuals, daily evaluations, individuals and daily evaluation, treatments, and treatments and individuals.

RESULTS AND DISCUSSION

The Item File

General Item Data

The master item file is composed of all ingredients used in the standardized recipes in the master recipe file. The items are divided into five groups: (a) elementary items - items that will be used in the same form as they are ordered, such as ground beef, or canned tomato paste; (b) order group items - items that will be used in a form that is modified from the ordered form, such as drained canned whole kernel corn or shredded cheese (an order group item can refer to a size or elementary item in its group item data); (c) size group items - items that are purchased by central stores in two different sizes, a larger size specifically purchased for the larger foodservice units and a smaller size specifically purchased for the smaller foodservices; (d) group items - items that will substitute different food items for the item coded, such as the substitution of non-fat dry milk solids, water and margarine, in the correct proportions, for whole milk; (e) recipe items - items that refer to another formula to be used within a formula.

The one report generated by the item system (Figure 3), the foodservice item listing (Figure 4), lists all the items in ascending order by item code and is used in coding new recipes for the master recipe file. The item code divides the items into ten major categories: (a) meat, fish and poultry, (b) eggs and cheese, (c) milk and ice cream, (d) fats and oils, (e) fresh

Figure 3. Item system

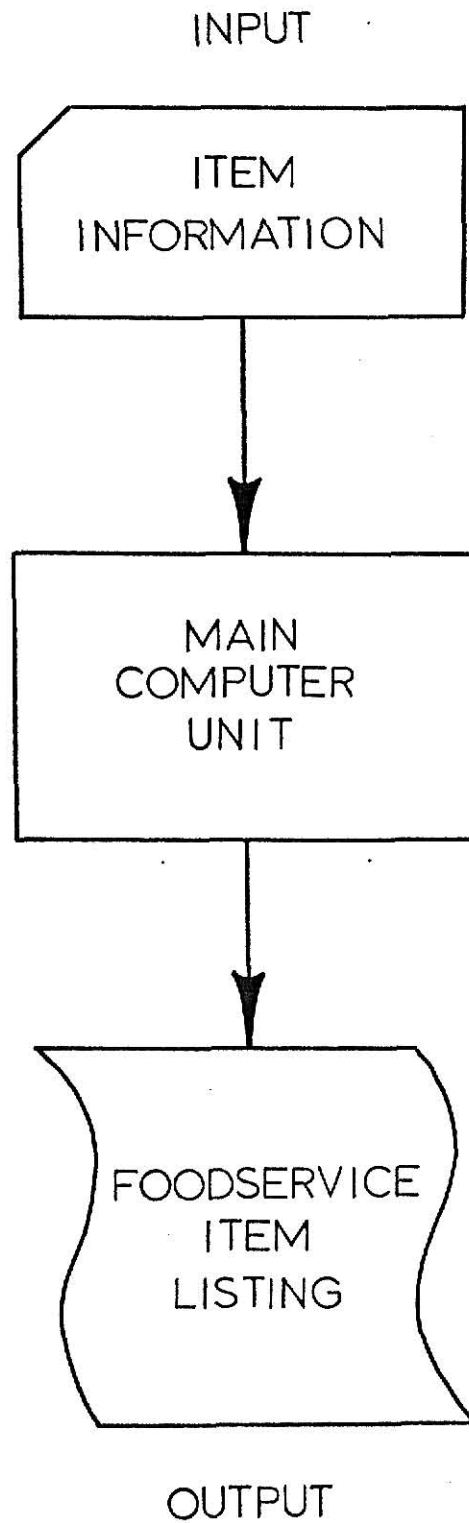


Figure 4. Foodservice item listing

018-HOU-260-01 1.6
JUNE 18, 1975

AT 10.42 AM

FOODSERVICE ITEM LISTING

PAGE 51

INVENTORY CODE STATUS	INGREDIENT NAME INVENT. RECIPE ELEMENTARY CODE	LBS/CUP	UNIT	LBS/UNIT	EP/AP	TYPE STEP ASSIGN	OC LOCATION PERCENT
006 1 00 007 8	DRAINED APPLE SLICES CHOPPED					ORDER GROUP	03
IN USE	YES		28	1.0000	1.0000		
	0061000051	AP				150.00	
006 1 00 003 6	APPLE JUICE DRAINED FROM FZ APPLES					ELEMENTARY	
IN USE	YES		28	1.0000	1.0000		
006 1 00 010 8	APRICOT HALVES FROZEN					ELEMENTARY	03
IN USE	YES		47	30.0000	1.0000	32240	
006 1 00 015 9	BLACKBERRIES, FROZEN					ELEMENTARY	03
IN USE	YES	.5309	46	30.0000	1.0000	32214	
006 1 00 020 5	BLUEBERRIES FROZEN					SIZE GROUP	03
IN USE	YES		28	1.0000	1.0000	32218	
	0061000213	AP				100.00	
	0061000221	AP				100.00	
006 1 00 021 3	BLUEBERRIES FROZEN					ELEMENTARY	03
IN USE	YES		51	10.0000	1.0000	32218	
006 1 00 022 1	BLUEBERRIES FROZEN					ELEMENTARY	03
IN USE	YES		46	30.0000	1.0000	32218	
006 1 00 023 0	DRAINED FROZEN BLUEBERRIES					ORDER GROUP	03
IN USE	NO	.3510	28	1.0000	1.0000		
	0061000205	AP				150.15	

fruit and vegetables, (f) frozen fruit and vegetables, (g) canned, dried fruits and vegetables, (h) miscellaneous (bakery and storeroom) and (i) recipe. The items listed in this file include some of the partially prepared food items, to insure that the computer recipes would be as comprehensible and clear to the foodservice workers as possible. Therefore many food items were entered into the file more than once, in different forms, such as fresh red potatoes, raw chopped potatoes, raw sliced potatoes, raw peeled potatoes and cooked potatoes, each with different corresponding information. On the top of each page of the item listing titles are printed indicating where the various item data for each item is located. This listing also is used as a reference document. All of the information coded for each item (Appendix A) on file is listed on this report.

The item name coded for each item is the name that will be printed out on the formulas or recipes in which it is used. The item code is the identifying code of the ingredients and is used in the formulas as the key code for each item. The item status indicates when the item is to be used. If the status is "in use", the item is used and ordered; if "no longer used", then the item will be reflected on the formula but will be rejected if any recipe orders it; if "suspended", the item will remain on the recipe but is temporarily suspended and will not be ordered; if "in test", the item may be ordered for a recipe that is coded developmental; if left unmarked then the computer codes "in use" as the status.

Item type indicates whether the item is an elementary, order group, group, size group or recipe item. The inventory code indicates if the item is "on inventory" in the central stores at KSU and thereby ordered on the department's meat, storeroom or frozen food order forms, or if it is "not on inventory" and thereby ordered from individual dealers, such as the potato chips, bread, dairy and produce orders, or special ordered through central stores.

The recipe number indicates what formula needs to be generated to be included with the requested formula if the item is a recipe type. For example, pizza dough is a recipe type item and the item number for pizza dough formula listed in the pizza topping formula generates the formula for pizza dough that is adjusted to the quantity listed in the pizza topping formula. The dough formula will be printed directly after the pizza topping formula.

Weight per cup of each item is coded to enable the conversion by the computer of items coded for measure units to weight units. This will save time that was spent in the manual conversions when developing and entering formulas into the file.

Ordering System Item Data

In the development of the item file it became apparent that the data for the ordering system should be included in this file initially. As the item and recipe file were being developed, the decision was made to develop an order system

coincidentally. This is explained in a later section of the report. In this section, the item coding considerations are explained. The order unit code, as purchased (AP) - edible portion (EP) factor, storage location, order group code and group item data codes were entered into the file, when appropriate, to accommodate the ordering system needs.

The order unit code utilized in the ordering system converts the number of pounds of item needed for a formula to the number of order units required to be ordered. The weight per order unit is necessary for this conversion of pounds to order units. AP/EP factor represents the percentage of the ordered amount of the item that will be left after modification has been made to make the item ready to eat (or the EP form). In the ordering process the conversion of the amount of ingredient (EP) needed in the formula to AP (needed for ordering) is done by the computer using this AP/EP factor.

The storage location code was based on the existing storage system of the central stores at KSU. The required items are listed on the meat, storeroom and frozen food orders by the storage location, in ascending order which enables the storeroom man to gather the items in the same sequence in which the items are stored thereby improving the utilization of time spent in item selection and order filling. The order group code indicates on what order form the item is to be placed: 01 - meat, 02 - storeroom, 03 - frozen food, 04 - fresh produce, 05 - bakery, 06 - dairy, 08 - potato chip and 10 - ice. If no order code is coded then the item will not appear on any

order.

The group item data is made up of the elementary code number, AP/EP code, step assignment and percentage. The elementary code number is the code number of the item(s) that is to be ordered for the specific item, for order group or size group items, or substituted for the item, for group items. The AP/EP code indicates if the item to be ordered is to be based on the elementary item AP or EP weight. AP is assumed by the computer when this code is left blank in coding. The step assignment indicates where in the formula the item should be listed which is being substituted for a group item. If left blank then the formula should be searched for an item with the same code number and placed with that item or if there is none the substitute item should be listed where the group item is coded; the Y indicates that the group item should be listed wherever the step assignment is coded on the formula; the N indicates that the item will be placed where the group ingredient was coded in the formula. The percentage code indicates how much of the elementary group item will have to be ordered so that there is enough of the group item for the formula quantity after modification.

The assumptions coded, to be made by the computer, to ease coding of food items are (a) item type, if left blank "elementary" will be coded; (b) item status, if left blank "in use" will be coded; (c) inventory code, if left blank "on inventory" will be coded; (d) if order unit is coded as "28" or pounds then weight per order unit is automatically coded "1.0". A warning error

is printed if an order code is not coded for an item. If any of the following codes are missing for an item when first entered onto the master file the entire transaction for that item will be deleted: item code, bad check digit, item type, recipe number (if a recipe type item), order unit, weight per order unit (if not coded "28" or pounds). The coding of the items is an important aspect of the system to ensure standardized recipes and a standardized ordering system. The item file data will need to be reviewed and updated at spaced intervals as the system is implemented.

The Master Recipe File

The master recipe system generates two basic reports (Figure 5): a listing of all the recipes in the file and recipe(s) adjusted to forecast quantities. An example of the recipe index is shown in Figure 6.

General Recipe Data

This file is composed of all formulas used in production in KSU Residence Hall foodservice units. The formulas were stored by the formula code numbers which are divided into fifteen categories: appetizers, beverages, breads, cereals, confections and nuts, desserts, entree breakfast, entree lunch, entree dinner, salads, salad dressings, meat and vegetable sauces and gravies, soups, vegetables and service recipes.

The recipe code is the key code for the formulas. If it is omitted or has a bad check digit then the transaction is

Figure 5. Master recipe system

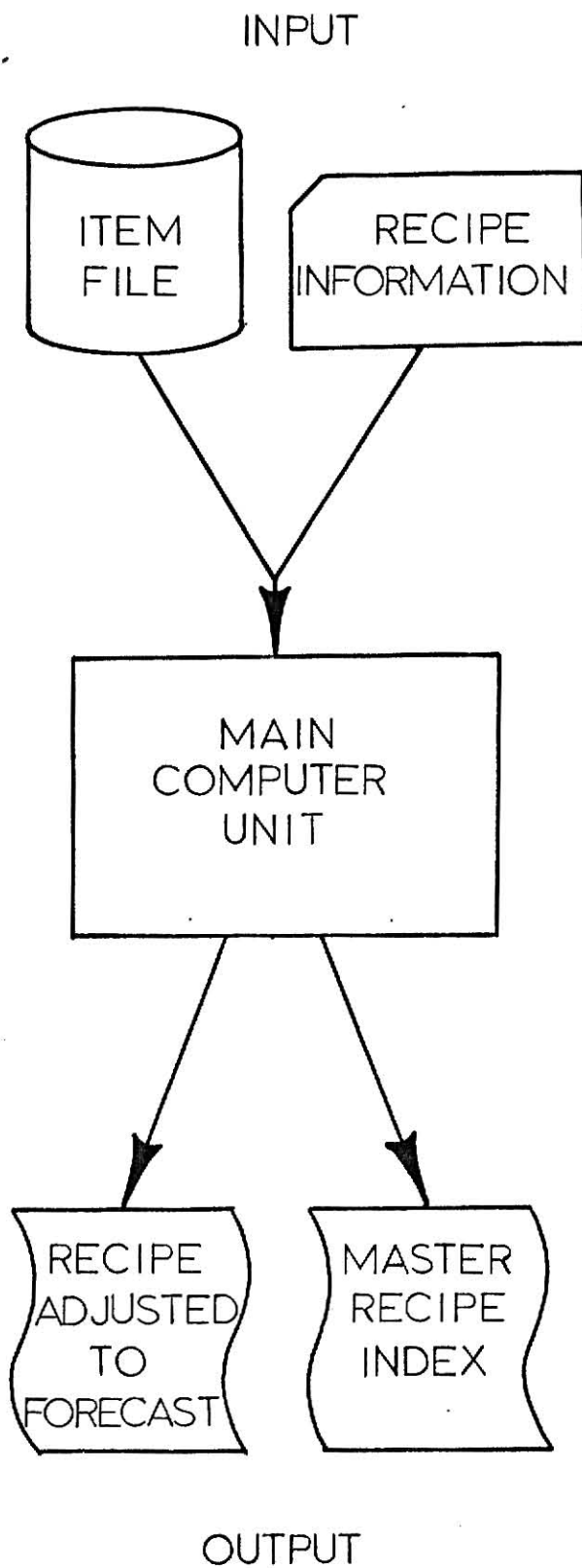


Figure 6. Recipe index

deleted. The formula status, portion size, number of portions and handling loss percentage also must be coded or the formula transaction will be deleted. The handling loss percentages differ for each formula, based on the ingredients used in the formula and the type of procedure used. The three codes, portion size, number of portions and handling loss percentage, are used to determine the percentages of the individual ingredients for the formula. In the master recipe file the percentage of the ingredients in the formula, portion size, handling loss percentage and number of portions are stored for future quantity adjustments. The actual weight and measure units coded and entered are not stored; they are used in the initial calculations of the percentages only.

If the code for weight per pan of a formula is coded then this is used with the total formula weight (determined by the computer) to determine the number of pans needed for a particular number of servings requested. This number of pans information is calculated and printed out on the computer formulas (Figure 7) but is not coded into the file or stored on the master recipe file. The weight per cup data coded for a formula is utilized mainly with soups and sauces. Using this data the computer calculates the total volume of a particular formula size and prints this volume on the recipe printout.

The minimum and maximum batch size codes and forecast unit code are utilized by the system to insure that the correct production sizes are used. The minimum batch code establishes the lowest number of servings that can be requested for a

Figure 7. Computer-adjusted recipe

particular formula, in terms of the equipment used in that formula. If a smaller number is requested, the amount is automatically adjusted to the minimum level. The maximum batch code is used for batch cookery or if the equipment being used for a formula can handle only a specific total amount of that formula. If a larger number of servings is requested than the maximum batch then the number is broken down into more than one formula with one or more being the maximum batch size but with neither one being more than the maximum batch size. The forecast unit represents the number of servings per pan. The computer rounds off all requested number of servings to multiples of this code so that the formulas will be produced in only full pans. If a forecast number of servings is less than one-half of a pan the computer will round down to the next pan; if it is more than one-half of a pan the computer will round up to the next larger number of pans.

Ingredient Data

The ingredient information of each formula coded includes the item codes for each ingredient, the corresponding weight or measure units, and the AP/EP code. The item name is also typed on the coding form but this is done only to simplify the checking of the coded formulas. The item name is not entered or stored on the master recipe file. Just the item code is stored on the file to tie the individual recipe items to the item file information which includes the names of the items. The measure units can be coded as pounds or decimals of a

pound. The manually adjusted formulas also list ingredients by the pound and decimal of a pound as the employees are accustomed to this format. The measure units can be coded as whole units or decimals of whole units, such as cups, tablespoons, teaspoons, pints, quarts, gallons or half-gallons. Fractions will not be accepted by the computer; any unit of measure or weight less than one must be coded as a decimal. Weights also will only be printed out on the formulas as decimals.

If a measure unit is coded then a weight per cup amount has to be coded for that item in the item file. This information is needed for the conversion of the measure unit to weight unit for the calculation of the individual item percentages by the computer. If a weight per cup amount has not been coded then an error report will be printed to indicate that the measure unit was "undecipherable" and zero pounds will be placed in the formula for that ingredient. The undecipherable item will not be included into the total formula percentage.

If an incorrect item code has been coded in a formula, the computer will indicate on the formula that the "ingredient code is not valid". The individual percentage for the invalid item will be calculated correctly using the respective coded weight unit. The AP/EP code indicates if the weight unit for the ingredient refers to the AP or EP weight of the item. If this code is left blank AP will be assumed. If EP is coded then the computer will convert the coded EP weight to AP weight and print both weights on the computer formula. The calculated AP weight will be used in the order calculation.

Production Data

The production information coded for each recipe is step code, substep code and formula procedure. The step code indicates the major divisions of the formula and a line is drawn above each printed line coded as a step. This groups the ingredients and their respective procedure steps. The substep codes represent the step numbers of the formula.

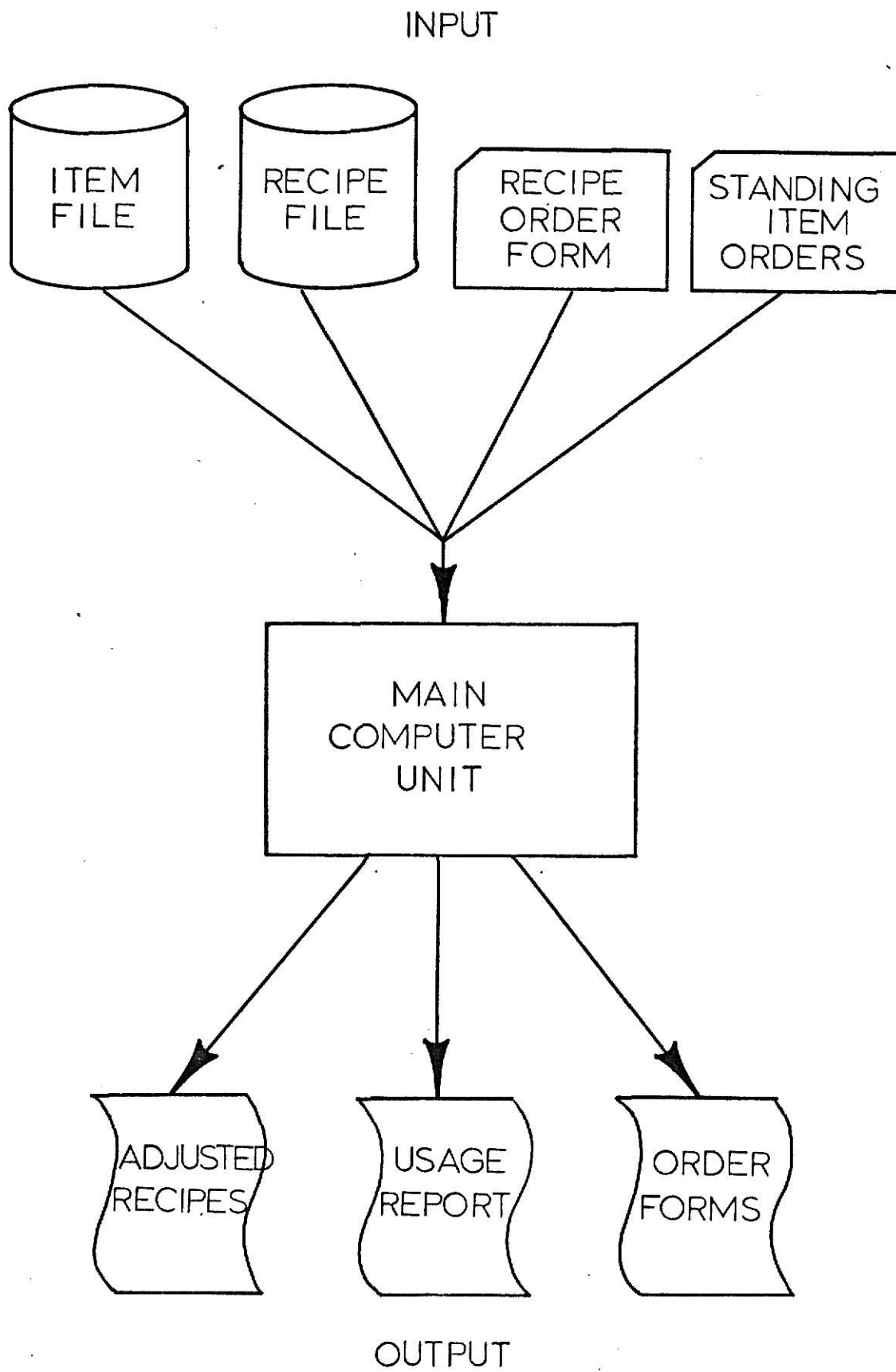
The procedure of the coded formula is typed directly onto the coding form in all capital letters. Each procedure line is thirty-five characters long, consisting of seven, five character blocks. The computer stores the procedure in these blocks to enable faster scanning and printing of the formula procedure. If more than thirty-five characters are coded on one line, the computer will simply cut off the characters extending past the thirty-fifth character. Each formula has the capacity to store fifty lines of procedure. If there are more than twenty-five lines then the coding is continued on a second formula coding form. The page number code is used only if two pages of formula coding forms are used to code one formula. If just one page is used per formula then the page number code is left blank. During the development of the recipe file many other types of data related to recipes were discovered as being useful for production. Extra space was allowed for each recipe to accommodate additional information that might be included in the future.

Ordering System

In the development of the food item and recipe files the need to design a ordering computer system (Figure 8) and to consider the constraints of an ordering system became obvious. Therefore the three systems, the food item, recipe and ordering systems, were developed somewhat simultaneously to ensure that all requirements for the three systems were met and that the systems were compatible. The item and recipe computer programs have been described. The ordering system uses both of these systems. The flow chart for the ordering system is included in Appendix H.

An order run is started with a request for formulas for a specific forecasted number of servings. At KSU forecasts cover a seven day period, Friday through Thursday. The formulas needed for production in this period are recorded on a Recipe Order Form (Appendix I) with their respective date of production, meal of service, recipe code number and number of servings forecasted to be served. This data is entered as the input into the ordering system. Both the recipe and item master files are loaded onto separate disks for use in this system.

The first stage is the selection of the recipes requested on the Recipe Order Form from the master recipe file and the expansion and printing of these recipes in the number of servings forecasted. Next, the items in all of the recipes for this order period are grouped by code number and the quantities



of each food item are printed on the Usage Report (Figure 9), ascending numerically by item code number within each meal within each day of service. At this step the different formula items listed as edible portion (EP) weight are converted to as purchased (AP) weights. Both the EP and AP weights of the ingredients are listed on the Usage Report. The usage report was designed to be utilized by an ingredient room. All of the items have been classified and coded as to what food order form on which they appear. An example for a meat order is included in Figure 10; examples of other food item groups are included in Appendix J. The schedule of the different orders and the days of production each order covers were also coded into the system. The ingredients are divided in the next step and printed on the orders for the various delivery days. A list of food items to be ordered as standing orders every week or once a month are added to the orders at this time. The number of pounds of each ingredient needed is converted into the order unit size for individual items. The orders for the seven day period are printed listing the number of pounds needed and the number of order units needed. Each of the items order units are rounded up to the next highest whole number if only part of an order unit is needed. If the weight of an item needed is so small that it cannot be rounded to one tenth of the order unit then .1 is printed with a star beside it to indicate that only a slight amount of that item is required. All items ordered from central stores are listed on the order in ascending numerical order based on their storage location

Figure 9. Usage report

018-HOU-230-01 1.3
JULY 3, 1975

AT 5.49 PM

USAGE REPORT

PAGE 3
KSU FOODSERVICES

FERRY FOOD CENTER

101520255

COCONUT CREAM PLDDING

7.90

DINNER

000000001	WATER	22.70	LBS
222000724	MEDIUM WHITE SALCE	22.70	
000000027	WARM WATER	1.10	LBS
041040261	GOOEY BUNS	1.10	
000000043	BOILING WATER	32.00	LBS
262500345	SCALLOPED POTATOES (USING INST	32.00	
000000051	HOT WATER	9.10	LBS
041040261	GOOEY BUNS	9.10	
0021020205	FROZEN WHOLE EGGS	5.30	LBS
101000057	BROWNIES	5.30	
0031021000	NON FAT DRY MILK SOLIDS	4.60	LBS
041040261	GOOEY BUNS	1.10	
222000716	WHITE SAUCE MIX	3.50	
0031031005	EVAPORATED MILK	2.00	LBS
102040095	CHOCOLATE BUTTER FROSTING	2.00	
0041000102	MARGARINE SOLIDS	5.39	LBS
041040261	GOOEY BUNS	1.70	
101000057	BROWNIES	1.80	
102040095	CHOCOLATE BUTTER FROSTING	0.96	
222000716	WHITE SAUCE MIX	0.71	
263001512	TOMATOES WITH CROUTONS	0.22	
0041002504	BAKING SHORTENING	3.91	LBS
041040261	GOOEY BUNS	1.40	
101000057	BROWNIES	1.80	
222000716	WHITE SAUCE MIX	0.71	
0052000491	CHINESE CABBAGE	2.10	LBS
182500861	COMBINATION VEGETABLE SALAD	2.10	
		1.84	EP
0052000630	CELERY SLICED	2.00	LBS

Figure 10. Example of a meat order form

PAGE 1

DIS-HUJ-231-01 1.6 AT 5.56 PM
JULY 3, 1975
1231-DEKEY FOOD CENTER

ORDER REPORT

MEAT - ORDER GROUP

07/15/75 - SHIP DATE 07/16/75 - DELIVERY DATE WEDNESDAY

STORAGE LOCATION	CODE	ITEM NAME	BRAND	QTY. (IN ORDER UNITS)	ORDER AMOUNT	DELIVERED AMOUNT	NEEDED AMOUNTS LBS.	ORDER UNITS	SUGG. ORDER UNITS	INVENTORY ON HAND
52002	001010102	FRESH WHOLE EGGS		1			12.00	0.3 CASE	1	
52004	002000117	PROCESSED CHEESE LOAF		3			2.70	2.7 POUND	3	
52004	002000115	PROCESSED RIBBON CHEESE SLICES		5			4.50	4.5 POUND	5	
52008	001414505	PULLMAN CANNED HAM		5			4.50	4.5 POUND	5	
50202	001211371	BULK GROUND BEEF		18			18.00	18.0 POUND	18	
50204	001211504	STEAK (1 INCH GRINDER PLATE)		5			4.50	4.5 POUND	5	
50208	001314538	BACON SLICED LAYOLT		12			11.30	11.3 POUND	12	

code. An inventory adjustment column appears on the computer order forms to provide the foodservice manager with space to adjust the suggested order amount depending upon the inventory already on hand. The computer order requisitions are printed in multiple copies to provide documentation for accounting and control purposes.

Evaluation of the Computer-Adjusted Recipe Formulas

Each formula coded and entered on the master recipe file was carefully checked and evaluated in terms of accuracy to ingredients and calculated formula yield as described previously. The sensory evaluation of the two test formulas is described below.

Sensory Evaluation

Two formulas, vanilla cream pudding and ham and cheese casserole, were chosen to test the accuracy of formula expansion by the computer using the percentage method. The scores from both products were statistically analyzed by panelist, day, panelist by day, treatment and panelist by treatment, for each quality judged.

The differences found for the mean scores for the ham and cheese casserole evaluations were very small (Table 1; Appendix K). No significant differences were found for tenderness and overall eating quality scores. The flavor score showed a slight significant difference between the different day scores. Consistency scores indicated a small but significant difference

Table 1: Mean scores for sensory evaluation of ham and cheese casserole.

	appearance		consistency		tenderness		flavor		overall eating acceptability	
	mean	std. error	mean	std. error	mean	std. error	mean	std. error	mean	std. error
panelists										
1	5.61	0.17	5.50	0.12	5.27	0.09	5.56	0.15	3.69	0.13
2	6.33	0.21	6.60	0.15	6.63	0.11	6.14	0.19	6.36	0.16
3	5.50	0.13	6.00	0.09	4.70	0.06	6.00	0.11	5.80	0.10
4	5.50	0.13	5.40	0.09	5.10	0.06	5.30	0.11	5.30	0.10
5	5.60	0.13	5.60	0.09	5.80	0.06	5.70	0.11	5.50	0.10
6	6.20	0.13	6.50	0.09	6.80	0.06	6.40	0.11	6.50	0.10
day										
1	4.08	0.11	5.08	0.08	5.17	0.06	5.00	0.10	4.92	0.09
2	6.33	0.11	6.08	0.08	6.00	0.06	5.92	0.10	4.92	0.09
3	6.11	0.13	6.13	0.10	6.18	0.07	5.96	0.12	6.17	0.10
4	6.09	0.15	6.06	0.11	4.87	0.08	5.87	0.14	5.63	0.12
5	6.34	0.15	6.31	0.11	6.37	0.08	6.50	0.14	6.00	0.12
treatment ¹	5.92	0.09	5.93	0.06	5.75	0.04	5.96	0.08	5.61	0.07
treatment ²	5.66	0.09	5.94	0.06	5.68	0.04	5.74	0.08	5.44	0.07

¹ 25 portion formula
² 250 portion formula

between panelist by treatment scores and a difference between day scores. The appearance scores indicated a very small difference between treatments and a larger difference between day scores. It was concluded that the two different quantities of casserole formulas were in basically the same proportions and that the computer adjusted recipe by the percentage method was acceptable. Differences were believed to result from technique rather than proportions.

The significant differences for the mean scores on sensory evaluations of the vanilla cream pudding (Table 2; Appendix K) indicated a difference between the two treatments for the four qualities judged. The differences between the means of the two treatments varied from a .40 to 1.21 difference for the four qualities judged. These differences may indicate differences in production technique rather than a difference in the proportion of the ingredients in the two formulas. The puddings - extremely delicate products to produce - were produced by the researcher, not by an experienced cook, which added a variable factor to these results not in consideration with the casserole production. On one taste panel the smaller quantity of pudding was judged the thicker of the two products, while on another taste panel the larger quantity of pudding was judged to be thicker. This also supports the supposition that the production of the product, not the proportion of the formula ingredients, caused the significant differences between the two treatments of the pudding.

Table 2. Mean scores for sensory evaluation of vanilla cream pudding.

	appearance		consistency		flavor		overall eating acceptability	
	mean	std. error	mean	std. error	mean	std. error	mean	std. error
panelists								
1	5.30	0.27	5.41	0.27	5.78	0.16	5.84	0.20
2	5.00	0.39	4.78	0.39	6.68	0.23	5.49	0.29
3	5.40	0.23	4.90	0.23	5.70	0.14	4.40	0.17
4	4.80	0.23	5.30	0.23	5.70	0.14	5.30	0.17
5	5.70	0.23	5.80	0.23	6.10	0.14	6.00	0.17
6	6.30	0.23	6.00	0.23	6.60	0.14	6.40	0.17
day								
1	5.58	0.21	5.42	0.21	6.00	0.13	5.75	0.15
2	5.72	0.24	5.48	0.24	6.02	0.14	5.88	0.18
3	5.25	0.21	5.25	0.21	5.83	0.13	4.92	0.16
4	5.42	0.24	5.18	0.24	6.42	0.14	5.88	0.18
5	5.12	0.27	5.50	0.27	6.19	0.16	5.42	0.21
treatment ¹	5.85	0.15	5.97	0.16	6.29	0.09	5.99	0.12
treatment ²	4.99	0.15	4.76	0.16	5.89	0.09	5.15	0.12

1 25 portion formula
2 250 portion formula

SUMMARY AND FUTURE DEVELOPMENT AND IMPLEMENTATION OF THE SYSTEM

Summary

Electronic data processing is one way to provide information to management to assist in controlling increasing food and labor costs, and reducing time spent in data collection and compilation. The majority of research related to computer-assisted foodservice management systems has been applied to hospital systems. The objective of this study was to develop two EDP data bases, food item and master recipe files, adapted to a residence hall foodservice system and to evaluate the feasibility of computerized recipe adjustment by the percentage method.

Item File

Data for the development of the food item file were gathered from several sources and standardized. Each food item used in recipes produced in the foodservices of Kansas State University was coded, when applicable, for weight per cup, weight per order unit, order unit, yield factors, item number, item name, status, type, inventory code, recipe number, storage location, order group and group item data. A system to classify and code ingredients was developed with codes for meat items incorporating the standardized portion codes of the National Association of Meat Purveyors.

Master Recipe File

The standardized recipes of the KSU residence hall food-services were evaluated in terms of accuracy related to ingredient, calculated yield and waste. A system to classify and code recipes was adapted from the existing method. The recipe file consisted of three types of recipe information for each recipe: general recipe information, ingredient information and production information.

The percentage method for recipe conversion was redefined from that developed at Michigan State University and applied at Kansas State University to specify all the essential steps for the computer program. A conversion of all weight units to metric units has been built into the system which would change all of the recipes to the metric weights at one time. The recipe data system was programmed to generate a recipe master index and recipes in the file. An additional output of the system was a set of ordering forms for a specified period of production forecasts that were categorized by delivery date and classification of food items. The output was printed in multiple copies to provide documentation for accounting and control purposes. The format included production need in pounds and order units and inventory adjustment column.

Evaluation of Computer-Adjusted Formulas

After the program for the percentage method of formula conversion was completed 100 of the most commonly used recipes

were coded. Each recipe printout was examined for accuracy and completeness. This examination consisted of the comparison between the computer formula and the same recipe manually adjusted to the same quantity. The format designed for the computer recipes was based on the format currently used for manually adjusted recipes at KSU. This strategy provided one approach to reducing resistance to the new system.

When the recipe printouts appeared to be accurate and complete, two basic recipes which had been evaluated to be acceptable, vanilla cream pudding and ham and cheese casserole, were added to the data set. These recipes were evaluated qualitatively, by a panel of six dietitians for appearance, texture, tenderness, flavor and overall eating quality. To compare products two batch sizes (twenty-five or fifty and 250 portions) were prepared for each menu item. Data indicated differences between products were very small.

A recommendation is made for further study on the testing of different quantities of the same formula for similarity. In further study the panelists chosen to evaluate the product should study the product in detail before participating in the final tasting for results, to provide more standardized results. The production of quantity formulas should be done by experienced cooks, to minimize the production variable involved with delicate products. The testing of the different products also should be repeated more than five times to gather data for more realistic results for the qualities judged. The computer adaptation of the percentage method of recipe adjust-

ment was judged to be an accurate and acceptable approach.

Future Development and Implementation of the System

Future Development

The three systems developed, item, recipe and ordering, were designed to enable additional information to be added to the different EDP data files to facilitate development and implementation of a food cost accounting and inventory system and allow future improvements to the standardized recipes. Each of the items stored on the master item file have sufficient space to add food inventory and costing data such as purchase order number, vendor, date received, cost per order unit, quantity, state code number and other necessary accounting information. The master item file can be expanded to include not just the food items but the paper, cleaning, linen supplies and equipment and parts.

The master recipe file also has additional space available for each recipe. Several types of information that could be added and useful to the foodservice manager are a cost of recipe by portion and total recipe and labor/time data based on the procedure and number of portions forecasted.

Implementation of System

The testing of the computer adjusted recipes was done at one of the foodservice units during the final six weeks of the 1975 spring semester. Every recipe was checked for accuracy

before use. The foodservice workers who used the recipes wrote any changes in procedure on the recipe printout. These changes were evaluated and verified by dietitians in the various foodservice units. If accepted, then the procedural revisions were added to the master file, as well as any other changes or modifications such as portion size or recipe yield.

During the initial implementation, it became obvious the forecasting system did not allow adequate flexibility for close-to-service adjustments in forecasts. Initial forecasts are required three weeks in advance of service. A program for recipe request was developed which allows the individual foodservice managers to request one to six recipes adjusted to a specific number of portions.

The total ordering system was tested at a foodservice unit serving 1975 summer school students. Since all of the recipes included on the menus had not yet been added to the master file, manual adjustment of the order forms was necessary to include the additional ingredients needed for these recipes not on file. Checks were made to insure that correct yield and order unit conversions were being made.

Plans call for implementation of the recipe adjustment and ordering systems in all five foodservice units during the 1975-76 school year. Also, preliminary work has begun on development of the cost accounting and inventory control systems.

**THIS BOOK
CONTAINS
NUMEROUS PAGES
WITH MULTIPLE
PENCIL AND/OR
PEN MARKS
THROUGHOUT THE
TEXT.**

**THIS IS THE BEST
IMAGE AVAILABLE.**

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APPENDIXES

APPENDIX A

Coding System for Item File

1. Order Unit Codes
2. System to Classify and Code Food Items
3. Coding Instructions for Items
4. Item Coding Form

1. ORDER UNIT CODES

CODE	DESCRIPTION
01	PINT
02	QUART
03	HALF-GALLON
04	GALLON
05	BARREL (20-30 GALLON)
06	BARREL (55 GALLON)
20	BARREL (150 LB. DRY)
21	BARREL (425 LB. DRY)
22	SACK
23	BASKET
24	HALF-BUSHEL
25	BUSHEL
26	HALF-CRATE
27	CRATE
28	POUND
29	OUNCE (SOLID)
41	LUG
42	HALF-LUG
43	EACH
44	DOZEN
45	DRUM
46	CASE
47	CAN
48	PAIR
49	THOUSAND
50	HALF-BOX
51	BOX
52	HEAD
53	CARTON
54	BOTTLE
55	BUNCH
56	PACKAGE
57	LOAF
58	HALF-DOZEN

2. SYSTEM TO CLASSIFY AND CODE FOOD ITEMS

(ten digits)

Major Category XXX (three digits)	Minor Category X (one digit)	Sub-Category XX (two digits)	Sequence XXX (three digits)	Check Digit
Meat Fish Poultry 001	Wholesale 1	Beef 11		
		Lamb 12		
		Veal 13		
		Pork 14		
	Processed 2	Beef 11		
		Lamb 12		
		Veal 13		
		Pork 14		
		Fish 15		
		Poultry 16		
		Variety Meats 17		
		Cold Meats 18		
	Portion Ready 3	Beef 11		
		Lamb 12		
		Veal 13		
		Pork 14		
		Fish 15		
		Poultry 16		
		Variety Meats 17		
		Cold Meats 18		
	Canned 4	Beef 11		
		Lamb 12		
		Veal 13		
		Pork 14		
		Fish 15		
		Poultry 16		
		Variety Meats 17		
		Cold Meats 18		
		Prepared Entree 19		
Eggs Cheese 002	Eggs 1	Fresh 01		
		Frozen 02		
	Cheese 2	- 00		
Milk and Ice Cream 003	Milk 1	Fresh 01		
		Dry 02		
		Canned 03		
	Ice Cream 2	Mix 01		
		Ice Cream 02		
	Novelties 3	- 00		

Fats, Oils 004	Fats, Oils 1	-- 00
	Miscellaneous	-- 00
Fresh Fruit & Vegetables 005	Fruit 1	-- 00
	Vegetables 2	-- 00
Frozen Fruits, Vegetables 006	Fruits 1	-- 00
	Vegetables 2	-- 00
	Juices 3	Fruit 01 Vegetable 02
Canned, Dried Fruit and Vegetables 007	Fruit 1	Canned 01 Dried 02
	Vegetables 2	Canned 01 Dried 02
	Juices 3	Fruit 01 Vegetable 02
Miscellaneous 008	Bakery 1	Bread (loaves) 01 Buns and Rolls 02 Cakes, Cookies 03 Pastry, donuts 04 Pies 05 Dry Items 06
	Groceries 2	Beverages 01 Cereals 02 Condiments 03 Nuts 04 Seasonings 05 Spices 05 Prepared Desserts and Mixes 07 Soups and Bases 08 Sugar, Syrups 09 Miscellaneous 10
Recipes 009	Appetizers 1	-- 00
	Beverages 2	Hot 01 Cold 02
	Breads 3	Breakfast 01 Lunch 02 Dinner 03 Special 99

Recipes continued
009

Desserts
4

Cakes 01
Cobblers and Crisps 02
Cookies 03
Custards, Puddings 04
Fillings and Frostings 05
Frozen 06
Fruit 07
Gelatin 08
Pie Crusts 09
Pies 10
Sauces 11
Special 99

Entrees
5

Breakfast 01
Lunch 02
Dinner 03
Special 99

Vegetables
6

Dressings 01
Fritters, Pasta, Rice 02
Juice 03
Potatoes 04
Vegetables 05
Special 99

Salads and Salad
Dressings
7

Salad, Fruit 01
Salad, Frozen 02
Salad, Gelatin 03
Salad, Pasta 04
Salad, Protein 05
Salad, Vegetable 06
Salad, Fillings 07
Salad dressing, fruit 10
Salad dressing, vegetable 11
Special 99

Sauces, Gravies,
Soups
8

Sauces, brown 01
Sauces, butter 02
Sauces, hollandaise 03
Sauces, gravies 04
Sauces, white 05
Sauces, miscellaneous 06
Soups, Cream 10
Soups, Stock 11
Special 99

Miscellaneous
9

-- 00

Check digit in Food Item Code Number¹

Formula for Determining Check Digit:

- Step 1: Multiply each digit in the number by a constant number which begins at two for the right most digit and increases in increments of one for each successive digit in the code.
- Step 2: Sum the products of the above calculation and divide by a constant number (11).
- Step 3: Subtract the remainder of the division calculation from the divisor (11). The remainder of this calculation is the check digit for the particular group of numbers.

EXAMPLE: Code Number 484235721

<u>Step 1</u>	<u>Step 2</u>	<u>Step 3</u>
4 x 10 = 40		
8 x 9 = 72		
4 x 8 = 32	11) 21	11 divisor
2 x 7 = 14	237	- 6 remainder
3 x 6 = 18	22	5 check digit
5 x 5 = 25	17	
7 x 4 = 28	11	
2 x 3 = 6	6	
1 x 2 = 2		
237		

Therefore, the appropriate Food item code number is 4842357215

Note: If the value obtained from Step 3 is either 10 or 11, the right most digit is used as the check digit.

¹ Adapted from system used at the University of Missouri-Columbia Medical Center, Computer-Assisted Food Management System. Department of Nutrition and Dietetics (1).

FOR
ITEMS ¹

The item forms are to be typed in all capitals and are to be coded as follows:

ITEM NAME	The name of the item, maximum of 40 characters.
ITEM TYPE	An X is to be placed to the left of the desired type. The types are as follows: ELEMENTARY--This is an item that is not made up of other items or recipes, e.g., canned peas. GROUP--This is an item that consists of a combination of one or more other items and/or preparation steps. RECIPE--This item is actually another recipe e.g., cooked spaghetti. SIZE GROUP--This item is converted into one of two items depending upon the size of the food service unit ordering the item. ORDER GROUP--This is an item that is coded just like the GROUP item. It is treated in recipe expansion the same as an elementary item, but is treated in ordering the same as a group item. If this field is left unmarked, ELEMENTARY will be assumed.
ITEM STATUS	An X is placed to the left of the desired status. The status codes are as follows: IN USE--Self explanatory. NO LONGER USED--This item is no longer in use and will be rejected if any recipe orders it.

¹ Developed by M. Lipp, Systems Analyst, with assistance from B. Torrence:
Coding Instructions for Inventory Items. Oct. 25, 1974.

CODING INSTRUCTIONS FOR INGREDIENT ITEMS (cont.)

SUSPENDED--This item is temporarily suspended from use and will be rejected if any recipe orders it.

IN TEST--This item may be ordered only for recipes that are developmental.

If this field is left unmarked, IN USE will be assumed.

INVENTORY CODE An X is placed to the left of the desired code. The codes are as follows:

NOT ON INVENTORY--This item is not an inventory item at Central Food Stores (Pittman), e.g., water, produce, ice cream.

ON INVENTORY--This item is kept on inventory at Central Food Stores (Pittman), e.g., canned peas.

If this field is left unmarked, ON INVENTORY will be assumed.

ITEM CODE This is the code number assigned to the ingredient. It is ten numbers long. Refer to the "System to Classify and Code Food Items" for exact coding instructions.

RECIPE NUMBER If item type is RECIPE, this number must be coded. Refer to the "System to Classify and Code for Recipes" for exact coding instructions. This number must match an existing recipe number at the time of the first use of this item. 9 digits long.

WEIGHT PER CUP This is the weight in pounds of a single cup of the item. This entry is required for all items that are ever referred to as a volume. The size of this field is x.xxx pounds. Leading and trailing zeros need not be entered.

ORDER UNIT CODE This is the two-digit code specifying the normal ordering unit. This code is required for all elementary items.

WEIGHT PER ORDER UNIT	This is the weight in pounds for one order unit of the item. This item is required for all items except those coded as having the order unit of pounds, in which case this weight per order unit is one pound. The size of this field is xxx.xxxx pounds. Leading and trailing zeros need not be entered.
AP-EP FACTOR	This is the relationship between the AP weight and the EP weight of the item. For example, if the AP weight is 0.5 pounds and the EP weight is 0.4 pounds, this factor is 0.8 because 0.5 times 0.8 equals 0.4. This factor also applies to the drained/undrained food item relationship. The size of this field is x.xxxx. Leading and trailing zeros need not be entered. If this field is left blank, 1.0000 will be assumed.
STORAGE LOCATION	This field should be coded with the storage location code of the item. 5 digits.
ORDER CODE	This field should be coded with the 2 digit code representing the order form on which it should appear.
TYPE OF ACTION	The type of transaction desired is circled. ADD--if the item is not currently on the file. CHANGE--if the item is currently on the file and a change to the item is desired.
GROUP ITEM DATA	The fields in this area apply to the item types of GROUP, SIZE GROUP, and ORDER GROUP. There may be up to ten items coded here. SIZE GROUP items--exactly two items must be coded. Items may be elementary, group, size group, or order group items. The first item coded will be ordered if the food service unit ordering the item is a small food service unit. The second item

coded will be ordered if the food service unit ordering the item is a large food service unit. (See below for how to code the individual item fields.)

GROUP items--up to ten items may be coded; each item may be elementary, size group, group, or order group.

ORDER GROUP items--up to ten items may be coded.

Items must be elementary or size group items. The following discussion requires knowledge of how the STEP ASSIGNMENT field on the recipe is used.

The fields on group items are as follows:

ELEMENTARY INVENTORY CODE--This is the item code of the elementary, or size item desired.

AP OR EP--This indicates which weight of the item is desired, the AP weight or the EP weight. This field is coded by entering the letters AP or EP. If this field is left blank, AP is assumed.

% OF GROUP-- This is the percentage of the weight of the group item that is made up by this item. This field is not used for SIZE GROUP items. For example, if the group item weighs 0.8 pounds per cup and one of the items in the group makes up 0.6 pounds of that, the % OF GROUP is set to 75.0. The size of this field is xxx.xx. This field is required.

STEP ASSIGNMENT (Y OR N)--This directly ties to the STEP ASSIGNMENT field on the recipe and specifies where the individual items in the group item are to appear in the recipe. This field is relevant for GROUP ITEM only. For example, the powdered milk in whole milk will

CODING INSTRUCTIONS FOR INVENTORY ITEMS (cont.)

usually appear in the recipe at the point the whole milk was entered, but the margarine and/or water will probably appear elsewhere. This field is coded as Y, N or blank.

Y--This indicates that the item is to follow whatever step assignment is coded on the recipe. If no step assignment is coded on the recipe, this item is treated during recipe construction as if it were coded blank.

If no like item is found in the step assigned, an item will be created there with this number.

N--This indicates that this item is always to appear in the recipe at the same place the group item was coded, regardless of the presence of a step assignment on the recipe.

BLANK--This indicates that the item is to search the entire recipe, regardless of the presence of a step assignment, for an item with the same code as itself. If one is not found, the item will be placed with the first item, reading from the top of the recipe.

APPENDIX B

Coding System for Formulas

1. System to Classify and Code for Recipes
2. Coding Instructions for Recipe File
3. Coding Form for Formulas

1. SYSTEM TO CLASSIFY AND CODE FOR RECIPES

(nine digits)

<u>MAJOR CATEGORY</u> (XX)	<u>MINOR CATEGORY</u> (XX)	<u>SUB CATEGORY</u> (X)	<u>SEQUENCE #</u> (XXX)	<u>CHECK DIGIT</u> (X)
Appetizers 01				
Beverages 02	Carbonated 01	0		
	Fruit, Vegetable Juice 05	0 Fruit 2 Vegetable		
	Milk 10	0		
	Water 15	0 Cold 2 Hot		
	Miscellaneous (Punches) 20	0 Cold 2 Hot		
Breads 04	Quick 01	0 Biscuits 2 Breads 4 Coffeecake 6 Muffins		
	Yeast 10	0 Bread 2 Danish 4 Rolls 6 Buns		
	Special 99	0		
Cereals 06	Cereal 01	0		
Confections & Nuts 08	Confections 01	0		
	Nuts 10	0		

SYSTEM TO CLASSIFY AND CODE FOR RECIPES cont.

<u>MAJOR CATEGORY</u> (XX)	<u>MINOR CATEGORY</u> (XX)	<u>SUB CATEGORY</u> (X)	<u>SEQUENCE #</u> (XXX)	<u>CHECK DIGIT</u> (X)
Desserts 10	Cakes, Tortes 01	0 Butter 2 Chiffon 4 Angel 6 Sponge 8 Tortes		
	Cobbler, Crisps 05	0 Cobblers 2 Crisps		
	Cookies 10	0 Bars, Squares 2 Drop 4 Shaped, Cut 6 Tea		
	Custards, Puddings 15	0 Custards 2 Puddings		
	Fillings, Frostings 20	0 Fillings 2 Torte Fillings 4 Butter Frostings 6 Cooked Frostings		
	Frozen 25			
	Fruit 30	0 Hot 6 Cold		
	Gelatin 35	0 Fruit 2 Plain 8 Whips		
	Pie Crusts, Toppings 40	0 Crusts 8 Toppings		
	Pie Fillings 45	0 Chiffon-Parfait 2 Cream 4 Custard 6 Fruit 8 Ice Cream		
	Sauces 50	0		
	Special 99			

SYSTEM TO CLASSIFY AND CODE FOR RECIPES cont.

<u>MAJOR CATEGORY</u> (XX)	<u>MINOR CATEGORY</u> (XX)	<u>SUB CATEGORY</u> (X)	<u>SEQUENCE #</u> (XXX)	<u>CHECK DIGIT</u> (X)
Entree Breakfast 12	Eggs 01			
	Meat, Cheese 05	0 Meat 2 Cheese		
	Pancakes, French Toast 10	0 Pancakes 2 French Toast		
	Sandwiches, Toast 15	0 Sandwiches 2 Toast		
	"Vegetable" entree 20	0 Fruit 2 Vegetable		
	Special 99			
Entree Lunch 14	Casserole 01	0 Beef 1 Cheese 2 Eggs 3 Fish 4 Lamb 5 Pork-cured 6 Pork fresh 7 Poultry 8 Miscellaneous 9 Combination		
	Salad Cold Plate 05	0 Cheese 1 Cheese, Meat, Eggs 2 Cheese, Egg 3 Cheese, Meat, Egg 4 Cottage Cheese 5 Cottage Cheese, Meat 6 Cottage Cheese, Egg 7 Egg 8 Egg, Meat 9 Meat		
	Sandwich 10	0 Beef 1 Cheese 2 Egg 3 Fish 4 Nuts 5 Pork-cured 6 Pork-fresh 7 Poultry 8 Miscellaneous 9 Combination		
	Special 99			

SYSTEM TO CLASSIFY AND CODE FOR RECIPES cont.

<u>MAJOR CATEGORY</u> (XX)	<u>MINOR CATEGORY</u> (XX)	<u>SUB CATEGORY</u> (X)	<u>SEQUENCE #</u> (XXX)	<u>CHECK DIGIT</u> (X)
Entree Dinner 16	Beef 01	0 Miscellaneous 1 Piece Cuts 2 Ground 3 Roast 4 Cutlets 5 Steaks, Chops 6 Variety Meat Cuts		
	Fish 05	7 Shell 8 Fish		
	Lamb 10	0 Miscellaneous 1 Piece Cuts 2 Ground 4 Cutlet		
	Pork, cured 15	0 Miscellaneous 1 Piece Cuts 2 Ground 3 Roast 5 Steak, Chops		
	Pork, fresh 20	0 Miscellaneous 1 Piece Cuts 2 Ground 3 Roast 5 Steak, Chops		
	Poultry 25	0 Miscellaneous, (quarters) 1 Pieces 2 Roasts, Rolls 4 Cutlets		
	Miscellaneous 30	9 Rabbit 0 Veal		
	Special 99			
Salads 18	Fruit 01			
	Frozen 05			
	Gelatin 10	0 Fruit 2 Plain 4 Vegetable 6 Fruit & Vegetable		

SYSTEM TO CLASSIFY AND CODE FOR RECIPES cont.

<u>MAJOR CATEGORY</u> (XX)	<u>MINOR CATEGORY</u> (XX)	<u>SUB CATEGORY</u> (X)	<u>SEQUENCE #</u> (XXX)	<u>CHECK DIGIT</u> (X)
Salads (con't.) 18	Pasta 15	0		
	Protein 20	0		
	Vegetable, Relishes 25	0		
	Fillings, Garnishes 30	0 Fillings 2 Garnishes 4 Miscellaneous		
	Special 99			
Salad Dressings 20	Fruit 05	0 Cold 2 Hot		
	Vegetable 10	0 Cold 2 Hot		
Meat & Vegetable Sauces, Gravies 22	Brown 01	0		
	Butter 05	0		
	Hollandaise 10	0		
	Gravies 15	0		
	White 20	0		
	Miscellaneous 25	0		
Soups 24	Cream 01	0		
	Stock 10	0 Poultry 2 Meat 4 Vegetable		
	Chowder 15	0		
	Special 99			

SYSTEM TO CLASSIFY AND CODE FOR RECIPES cont.

<u>MAJOR CATEGORY</u> (XX)	<u>MINOR CATEGORY</u> (XX)	<u>SUB CATEGORY</u> (X)	<u>SEQUENCE #</u> (XXX)	<u>CHECK DIGIT</u> (X)
Vegetables 26	Dressings 05	0		
	Fruit 10	0		
	Fritters, Pasta, Rice 15	0 Fritters 2 Pasta 4 Rice		
	Juice 20	0 Fruit 2 Vegetable 4 Miscellaneous		
	Potatoes 25	0		
	Vegetables 30	0		
	Special 99			

SERVICE RECIPES

28

SIXTH, SEVENTH AND EIGHTH DIGITS IN RECIPE CODE NUMBER

Assignment of the sixth, seventh and eighth digits of the recipe code number will be made grouping like items together. The three digits selected should not duplicate any recipe number already listed on the recipe file.

NINTH DIGIT IN RECIPE CODE NUMBER¹

CHECK DIGIT

Formula for determining check digit: (Modulus 11)*

- Step 1: Multiply each digit in the number by a constant number which begins at two for the right most digit and increases in increments of one for each successive digit in the code.
- Step 2: Sum the products of the above calculation and divide by a constant number (11).
- Step 3: Subtract the remainder of the division calculation from the division (11). The remainder of this calculation is the check digit for the particular group of members.

Example: Code number - 28421257

<u>Step 1</u>	<u>Step 2</u>	<u>Step 3</u>
2 x 9 = 18		
8 x 8 = 64		
4 x 7 = 28		
2 x 6 = 12		
1 x 5 = 5		
2 x 4 = 8		
5 x 3 = 15		
7 x 2 = 14		
<u>164</u>		
	14	
	11) 164	11 (divisor)
	<u>11</u>	-10 (remainder)
	54	<u>1</u> (Check Digit)
	44	
	<u>10</u> (remainder)	

Therefore: Approximate recipe # = 284212571

NOTE: If the value obtained from Step 3 is either 10 or 11, the right most digit is used as the check digit.

¹ University of Missouri - Columbia Medical Center Computer - Assisted Food Management System Department of Nutrition and Dietetics (1).

2. CODING INSTRUCTIONS

FOR

RECIPE FILE¹

The recipe forms are to be typed in all capitals and are to be coded as follows:

TYPE OF TRANSACTION	The type of transaction desired is circled. ADD means that the recipe is being entered for the first time. CHANGE means an adjustment is being made on a recipe already in the system.
RECIPE NAME	The name of the recipe, maximum fifty characters.
RECIPE CODE	This is the code number assigned to the recipe. It is 9 digits long. Refer to the "System to Classify and Code Recipes" for exact coding instructions.
EQUIPMENT	This consists of up to 6 lines of 34 characters each, which may be filled with the names of the equipment used in the production of the recipe being coded.
RECIPE STATUS	An X is placed to the left of the desired code. The codes are as follows: (1) Standardized - This recipe is considered standardized for production. (2) Developmental - This recipe is used in production but is still being adjusted to become standardized. (3) New-not developmental - This recipe is a test recipe. (4) Suspended - This recipe is still on file but is temporarily not being used. (5) No longer used- This recipe is not to be used in production but will be held in the file.
PORTION SIZE	This is the weight of one serving of the recipe listed in pounds and decimals of a pound. The size of this field is xx.xxx. Leading and trailing zeros need not be entered.

¹ Developed by M. Linn, Systems Analyst, with assistance from P. Thompson

NO. OF PORTIONS	This is the no. of serving that the recipe will produce. The size of this field is xxxx. Leading zeros need not be entered.
SUGGESTED SERVING UTENSIL	The utensil used for service of the item is listed, maximum 14 characters.
PAN SIZE	Pan size used for production of recipe. Field is 14 characters.
WEIGHT PER PAN	Weight of recipe ingredients put in a pan. Size of field is xxx.xx. Leading zeros need not be entered.
MEAL PATTERN ALLOWANCE	No. of portions allowed per student maximum of 15 characters.
WT/CUP OF RECIPE	Weight (pounds) of one cup of the recipe. Field size is xx.xxx. Leading zeros need not be listed.
HANDLING LOSS	The percentage of handling loss for the recipe. Field size is xx.
MINIMUM BATCH	The number of servings which represents the minimum batch of a recipe. Field size is xxx.
MAXIMUM BATCH	Number of servings which represents the maximum batch of a recipe. Field size is xxx.
FORECASTING UNIT RECIPE SOURCE	Number of servings per pan. Field size is xxx. Source of recipe, maximum 20 characters.
ITEM CODE	The code number assigned to the corresponding item listed in the recipe. Field size is 10 digits.
ITEM	Name of ingredient listed in recipe, maximum 40 characters (This is not coded in with the recipe, it is typed for the handler's and checker's convenience.)
WEIGHTS & MEASURES	The weight or measure of the ingredient is listed here. It can be listed in LB, CUP, TBSP, TSP, QT, GAL. Size of field is 10 numerical or alphabetic figures. Use no periods. (Code only decimals; fractions will not be accepted.)

CODING INSTRUCTIONS FOR RECIPE FILE (cont.)

AP/EP If the ingredient listed is edible portion then EP is coded. As purchased (AP) is assumed if nothing is coded. Field size is 2 characters.

STEP ASSIGNMENT (Refer to the section on STEP ASSIGNMENT in the ingredient instructions).
This field is used to indicate to which step of the recipe an elementary item coded "Y" in STEP ASSIGNMENT in a group item is to be assigned.

STEP This indicates the division line positions for the procedure and grouping of ingredients. Use capital characters, starting with 'A' and continuing in order through the alphabet, maximum 2. Use no periods.

SUB STEP This is reserved for the numbering of the procedure. Field is numerical only (two spaces), use no periods.

PROCEDURE The individual procedure is typed here, maximum of 35 characters per line. Each recipe has a maximum of 50 lines.

PAGE NO. This need only be used for multiple page recipes.

3. Coding Form for Formulas

[illegible]

APPENDIX C

Standardizing Recipes for Kansas State University
Residence Hall Foodservice

STANDARDIZING RECIPES

FOR

KANSAS STATE UNIVERSITY RESIDENCE HALL FOOD SERVICE ¹

Step 1: Convert ingredients into institutionally used form.

- A. If ingredients are marked for conversion to a different form, (example: milk, eggs, broth, butter, buttermilk) refer to Item File. Make the changes by adding and subtracting the various ingredients to equal the exact amount called for.
Go to Step 2.
- B. If ingredients are not marked for conversion to a different form, go on to Step 2.

Step 2: Note the ingredients and quantity of each required in the recipe.

- A. If the ingredient is a meat, fresh fruit or fresh vegetable item refer to Item File, (sections 001 and 005 respectively). Observe the A.P. and E.P. weight or percentage for that item. Record both the A.P. and E.P. amounts required for that recipe.
Go on to Step 3.
- B. If the ingredient is anything other than a meat or fresh fruit or fresh vegetable item go on to Step 3.

Step 3: Observe the first ingredient.

- A. If the measure of the ingredient is in pounds and/or decimals of a pound then go on to Step 4.
- B. If the measure of the ingredient is in pounds and/or ounces refer to # conversion table. Observe the ounce or ounces it is and substitute the ounce measure with the equal decimal of a pound measure. Let this decimal of a pound be added to the whole pound measure of the ingredient (0,1,2,...) and be the measurement for that ingredient from then on, round off to four decimal places. If the E.P. and A.P. weights are available from Step 1A, record both in pounds and decimals of a pound.
Go on to Step 4.

¹ Adapted from McManis, H.: Standardizing Recipes for Kansas State University Residence Hall Food Service Unpublished paper, Kansas State University 1972.

Step 3: (Cont.)

- C. If the measure of the ingredient is in a measured unit, (cup, tablespoon, teaspoon) refer to Item File. If the ingredient is a fruit or vegetable, fresh, frozen, canned or dried, refer to sections 005, 006, 007 respectively. If the ingredient is a groceries item, refer to section 008. If the ingredient is a meat, cheese, cream eggs, or milk, refer to sections 001, 002, 003 respectively. Note the weight or weight (pounds and decimals of a pound) per cup for that item or weight per item and substitute it for measure unit for that item, rounding off to 4 decimal places. If the E.P. and A.P. weight of the ingredient is available from Step 1A, record both in pounds and decimals of a pound.
Go on to Step 4.

Step 4: Observe the second ingredient in the recipe, and follow the same A or B or C in Step 3.

Step 5: Do the same (Step 4) for each ingredient.

Step 6: Add all of the ingredients (E.P.) weights, rounding off to four decimal places. (This is the net weight of the original recipe).
Go on to Step 7.

Step 7: Divide each individual ingredient weight by the net weight of the recipe, rounding off to the four decimal places. (This is the individual ingredients percent of the total recipe, stated as a decimal).
Go on to Step 8.

Step 8: Note the percentage of handling loss, (stated as a decimal). Note the portion size, note the number of portions desired.
Go on to Step 9.

Step 9: Multiply the number of servings (portions) desired by the size of the portion. (This will give the net weight needed).

Step 10: Subtract the percent of handling loss, stated as a decimal from 100. (This will give the net weight percentage of the net weight of the recipe, stated as a decimal).

Step 11: Divide the net weight of the desired sized recipe by the answer of Step 10. (This is the gross weight needed for the desired yield).

Step 12: Multiply the answer of Step 11, (gross weight needed), by the answer of Step 7, (individual ingredient percent, stated as a decimal), for the first ingredient.

Step 13: Multiply the answer of Step 7 for the second ingredient by the answer of Step 11, following Step 12's instructions.
Do the same with each ingredient.

APPENDIX D

Format for Manually Adjusted Recipes

NUTRHEAD

Breads

EQUIPMENT: Mixing bowls - flat paddles - greased loaf pans

PORTION SIZE: 0.15 lb.

SUGGESTED SERVING UTENSIL:

Meal Pattern Allowance:

PROCEDURE:

1. Combine in mixer bowl. Mix on #1 speed 1 minute.

2. Beat eggs in small mixer bowl 3 minutes on #2 speed. Reduce speed to #1.

3. Add water while still mixing.

4. Gradually add to egg-water mixture. Mix 2 minutes on #1 speed.

5. Add to dry ingredients. Mix on #1 speed only until well blended.

6. Scale 4.8 lb. into each pan.

7. Let Stand 30 minutes.

8. Bake at 350°F 1 hour.

Serving note: For sandwiches slice $\frac{1}{4}$ " thick.

INGREDIENTS: Weights and Measures

Percent			
31.81	Flour	19.3 lb.	24.1 lb.
0.64	Baking Powder	0.39 lb.	0.48 lb.
10.60	Nuts, chopped	6.4 lb.	8.0 lb.
0.53	Salt	0.32 lb.	0.4 lb.
15.91	Sugar	9.7 lb.	12.1 lb.
4.03	Non Fat Dry Milk	2.5 lb.	3.1 lb.
6.36	Frozen Whole Eggs, thawed	3.9 lb.	4.8 lb.
26.51	Water	16.1 lb.	20.1 lb.

3.61 Shortening, melted

2.2 lb.

2.7 lb.

100 % Handling loss

5 %

4 %

TOTAL YIELD

Vol.

Wt.

60.8 lb.

75.78 lb.

4.8 lb.

DATE: 11/72

Source:

Kansas State University

APPENDIX E

Formulas and Quality Standards for Test Recipes

VANILLA CREAM PUDDING

EQUIPMENT: Mixer Bowl - Whip Steam Jacketed Kettle 4 inch counter pan		PORTION SIZE: .19 lb	
NO. PORTIONS:		SUGGESTED SERVING UTENSIL: No. 12 disher	
PAN SIZE:		TOTAL PARTIALS ALLOWANCE: 1 or 2 Portions	
NO. PANS:		REMARKS:	
INGREDIENTS:		WEIGHTS AND MEASURES	
Percent			
HOMOGENIZED MILK	4.5 LB.		1. Heat milk in kettle.
GRANULATED SUGAR	1.7 LB.		2. Combine dry ingredients with cold milk in mixer bowl.
CORNSTARCH	.50 LB.		3. Whip until smooth.
SALT	.02 LB.		4. Add to hot milk slowly. Stirring constantly. Cook until thickened and there is no starch taste. Turn off heat.
HOMOGEN. MILK	3.3 LB.		
FROZEN EGG YOLKS	.52 LB.		5. Whip egg yolks in same mixer bowl used for cornstarch mixture 15 min. on #3 speed.
			6. Add a small amount of hot mixture to beaten egg yolks, mixing constantly.
			7. Add egg mixture slowly to hot mixture in kettle, stirring constantly.
			8. Turn on heat. Cook 2 minutes.
			9. Turn off heat.
MARGARINE SOLIDS	.21 LB.		10. Add margarine and vanilla. Stir until margarine is melted and well blended.
VANILLA EXTRACT	.06 LB.		11. Take up in 4 inch counter pans to cool.
			12. Cover to prevent a crust from forming.
Handling Loss			
TOTAL YIELD			
WT OR ADJUST PER PAN			

DATE:

CHEESE AND HAM CASSEROLE

EQUIPMENT:		Steam Jacketed Kettle 4 inch pans Oven 350 degrees F.		PORTION SIZE:		.502 lb.	
NO. PORTIONS:		50		SUGGESTED SERVING UTENSIL:		Spoon	
EST. SERV.:				REAL EATING ALLOWANCE:		1 portion	
EST. PARS:				REMARKS:			
INGREDIENTS:		QUANTITY AND MEASUREMENT					
Percent							
	COOKED MACARONI	5.6 lb.			1. Cook.		
	WHITE SAUCE	4.9 lb.			2. Prepare.		
	MED. SHREDDED PROCESSED CHEESE	1.5 lb.			3. Add to white sauce. 4. Stir until cheese has melted.		
	GROUND PICNIC GREEN PEPPER, CH. DR. CH. PIMENTO WORCHEST. SAUCE DRY GRD. MUSTARD BLACK PEPPER	1.2 lb. .18 lb. .28 lb. .04 lb. .3 TSP. .6 TSP.			5. Add to cheese mixture. 6. Combine.		
	DRY BREAD CRUMBS PARMESAN CHEESE	.26 lb. .08 lb.			7. Turn mixture into greased pans. 8. Mix crumbs with parmesan cheese. 9. Sprinkle over top of pan.		
	PAPRIKA	.02 lb.			10. Sprinkle lightly over crumbs. 11. Bake in 350 degree oven for 30 minutes.		
Handling Loss							
TOTAL YIELD							
ET OR AMOUNT PER PAN							

DATE:

WHITE SAUCE

EQUIPMENT:		PORTION SIZE:		.21 lb.	
SUGGESTED SERVING UTENSIL:		SUGGESTED SERVING UTENSIL:			
RECIPE NUMBER:		RECIPE NUMBER:			
NO. PORTIONS:		23			
EAT SIZE:					
NO. PANS:					
INGREDIENTS:		MEASUREMENTS AND MEASURES		PROCEDURES:	
Percent					
MARGARINE SOLIDS	.53 lb.			1. Melt margarine.	
ALL PURPOSE FLOUR	.40 lb.			2. Blend in margarine.	
DRY MILK SOLIDS WATER	.53 lb. 3.8 lb.			3. Heat in steam kettle over low heat to moderate temperature. Do not scald.	
SALT	.04 lb.			4. Add margarine mixture to milk. 5. Stir to blend. 6. Cook and stir over low heat until thick and smooth.	
Handling Loss					
TOTAL YIELD	VOL. WT.				
PT OR ADJUST PER PAN					

DATE:

COOKED ELBOW MACARONI FOR CASSEROLES

EQUIPMENT:		Steam Kettle Colander		PORTION SIZE:		.178 lb.	
NO. PORTIONS:		32		SUGGESTED SERVING UTMETER:			
WAX SIZE:				MEAL PATTERNS ALLOWANCE:			
NO. PANS:				REMARKS:			
INGREDIENTS:		QUANTITY AND MEASURE					
Percent							
	WATER	3.8 lb.X				1. Bring water, oil and salt to a rolling boil.	
	WATER	3.8 lb.					
	SALAD OIL	.19 lb.					
	SALT	.03 lb.					
	ELBOW MACARONI	1.9 lb.				2. Add macaroni to boiling water stirring and keep water boiling. 3. Boil 6 minutes or until tender. 4. Drain macaroni into colander, take to sink and run hot water over it. 5. Use as directed on recipes for casseroles or salads.	
Handling loss							
TOTAL YIELD							
WT OR AMOUNT PER PAN							

DATE:

QUALITY STANDARDS

Vanilla Cream Pudding

The vanilla cream pudding is to be scored on appearance, consistency, flavor and overall acceptability. The pudding's color should be an even pale yellow. The texture should be a light, creamy consistency and a smooth texture, free from lumps. The flavor should be a rich vanilla. General overall acceptability is to be based on the judges general attitude toward the product.

Ham and Cheese Casserole

The ham and macaroni casserole is to be scored on appearance, texture, tenderness, flavor and overall acceptability. The casserole's appearance should be pleasing. The texture firm but not stiff. The tenderness of the casserole should be easily chewed but not gummy. The flavor should be that of ham and cheese slightly seasoned. The overall acceptability is to be based on the judges general attitude toward the product.

APPENDIX F

Computer-adjusted Test Recipes

VANILLA CREAM PUDDING

RECIPE CODE - 10-15-2-071-9

STATUS - STANDARDIZED

1

02/24/75 3-DINNER 0771-KRAMER FOOD CENTER

EQUIPMENT-MIXER 40AL-7HIP

STEAM JACKETED KETTLE

4 INCH COUNTER PAN

***NUMBER OF PORTIONS

250

PORTION SIZE

MEAL PATTERN ALLOWANCE

SUGGESTED SERVING UTENSIL

PAN SIZE

NUMBER OF PANS

WEIGHT PER PAN

HANDLING LOSS

MINIMUM BATCH

MAXIMUM BATCH

FORECAST UNIT

*TOTAL RECIPE WEIGHT

TOTAL RECIPE VOLUME

1900 LBS.

1 OR 2 PORTIONS

NO. 12 DISHER

LBS.

12.00 PERCENT

54.0 LBS.

750203

1.17 PM

CODE	PERCENT	INGREDIENT	WEIGHTS AND MEASURES	AP/EP	STEP	PROCEDURE
001010456	41.89	HOMOGENIZED MILK FOR COOKING	22.5 LBS	A	1.	HEAT MILK IN KETTLE.
003030008	15.48	GRANULATED SUGAR	8.4 LBS	B	2.	COMBINE DRY INGREDIENTS WITH COLD MILK IN MIXER BOWL.
003021058	4.64	CORNSTARCH	2.5 LBS		3.	WHIP UNTIL SMOOTH.
003000100	0.13	SALT	0.08 LBS		4.	ADD TO HOT MILK SLOWLY. STIRRING CONSTANTLY. COOK UNTIL THICKENED AND THERE IS NO STARCH TASTE. TURN OFF HEAT.
003101058	30.70	HOMOGENIZED MILK FOR COOKING	16.6 LBS			
0021020400	4.85	FROZEN EGG YOLKS	2.6 LBS	C	5.	WHIP EGG YOLKS IN SAME MIXER BOWL USED FOR CORNSTARCH MIXTURE MINUTES ON NO. 3 SPEED.
					6.	ADD A SMALL AMOUNT OF HOT MIXTURE TO BEATEN EGG YOLKS, MIXING CONSTANTLY.
					7.	ADD EGG MIXTURE SLOWLY TO HOT MIXTURE IN KETTLE, STIRRING CONSTANTLY.
					8.	TURN ON HEAT. COOK 2 MINUTES.
					9.	TURN OFF HEAT.
0041000102	1.96	MARGARINE SOLIDS	1.1 LBS	D	10.	ADD MARGARINE AND VANILLA. STIR UNTIL MARGARINE IS MELTED AND
0050300053	0.51	VANILLA EXTRACT	0.28 LBS	E	11.	WELL BLENDED.
					12.	TAKE UP IN 4IN COUNTER PANS TO COOL
					13.	COVER PUDDING BY PLACING WAXED PAPER DIRECTLY ON PUDDING TO PREVENT A CRUST FROM FORMING

CHEESE AND HAM CASSEROLE

RECIPE CODE - 14-01-5-00045

STATUS - DEVELOPMENTAL

2

 EQUIPMENT-STEAM JACKETED KETTLE
 4 INCH PANS
 OVEN 350 DEGREES

 25
 PORTION SIZE .5020 LBS.
 MEAL PATTERN ALLOWANCE 1 PORTION
 SUGGESTED SERVING UTENSIL SPON
 PAN SIZE 12 X 20 X 4
 NUMBER OF PANS 1
 WEIGHT PER PAN 12.00 LBS.
 HANDLING LOSS 8.00 PERCENT
 MINIMUM BATCH
 MAXIMUM BATCH
 FORECAST UNIT
 *TOTAL RECIPE WEIGHT 24
 TOTAL RECIPE VOLUME 13.6 LBS.

RECIPE SOURCE-

03/13/75 4.12 PM 750313

CODE	PERCENT	INGREDIENT	WEIGHTS AND MEASURES	AP/EP	STEP	PROCEDURE
0082022062	41.27	COOKED ELBOW MACARONI	5.6 LBS	A	1.	COOK.
0098000004	35.92	WHITE SAUCE BT	4.9 LBS	B	2.	PREPARE.
0022001123	10.69	MEDIUM SHREDDED PROCESSED LOAF	1.5 LBS	C	3.	ADD TO WHITE SAUCE.
					4.	STIR UNTIL CHEESE HAS MELTED.
0012145700	8.40	GROUND PICNIC	1.2 LBS	D	5.	ADD TO CHEESE MIXTURE.
0052001369	1.29	GREEN PEPPERS CHOPPED	0.18 LBS		6.	COMBINE.
0072011114	2.06	DRAINED CHOPPED PIMENTO	0.28 LBS			
0082033200	0.30	Worcestershire SAUCE	0.04 LBS			
0082031807	0.0099	DRY GROUND MUSTARD	0.3 TSP			
0082033109	0.02	BLACK GROUND PEPPER	0.6 TSP			
0041010117	1.91	DRY BREAD CRUMBS	0.25 LBS X	E	7.	TURN MIXTURE INTO GREASED PANS.
0052001409	0.61	PARMESAN CHEESE GRATED	0.03 LBS X		8.	MIX CRUMBS WITH PARMESAN CHEESE.
					9.	SPRINKLE .3 LB. OVER TOP OF EACH PAN.
0082062901	0.15	PAPRIKA	0.02 LBS X	F	10.	SPRINKLE LIGHTLY OVER CRUMBS.
					11.	BAKE IN 350 DEGREE OVEN FOR 30 MINUTES

COOKED ELBOW MACARONI FOR CASSEROLES

RECIPE CODE - 26-15-2-010-5

STATUS - STANDARDIZED

1

EQUIPMENT-STEAM KETTLE - 60 GAL
KETTLE PADDLE
COLANDER

MEAL PATTERN ALLOWANCE
SUGGESTED SERVING UTENSIL
PAN SIZE

NUMBER OF PANS
WEIGHT PER PAN
HANDLING LOSS
MINIMUM BATCH
MAXIMUM BATCH
FORECAST UNIT

0.1780 LBS.
0.00 PERCENT
5.7 LBS.

RECIPE SOURCE-

03/13/75 4.12 PM 750120

*TOTAL RECIPE WEIGHT
TOTAL RECIPE VOLUME

WEIGHTS AND
MEASURES

CODE PERCENT INGREDIENT

AP/EP STEP

PROCEDURE

000000001	60.66	WATER	3.8 LBS	A	1. BRING WATER, OIL AND SALT TO A ROLLING BOIL.
000000001	66.66	WATER	3.8 LBS X		
000000156	3.33	SALAD OIL	0.19 LBS X		
000000100	0.53	SALT	0.03 LBS X		

000000054 33.33 ELBOW MACARONI

1.9 LBS

8

2. ADD MACARONI TO BOILING WATER

3. STIR-RING AND KEEP WATER BOILING.
4. BOIL 6 MINUTES OR UNTIL TENDER.
5. DRAIN MACARONI INTO COLANDER, TAKE TO SINK AND RUN HOT WATER OVER IT.
6. USE AS DIRECTED ON RECIPES FOR CASSEROLES OR SALADS.

WHITE SAUCE BT

RECIPE CODE - 22-20-0-000-7

STATUS - DEVELOPMENTAL

2

23

.2100 LBS.

EQUIPMENT-

MEAL PATTERN ALLOWANCE

SUGGESTED SERVING UTENSIL

LADLE

PAN SIZE

NUMBER OF PANS

WEIGHT PER PAN

HANDLING LOSS

MINIMUM BATCH

MAXIMUM BATCH

FORECAST UNIT

*TOTAL RECIPE WEIGHT

TOTAL RECIPE VOLUME

RECIPE SOURCE-

750224

03/13/75 4.12 PM

CODE	PERCENT	INGREDIENT	WEIGHTS AND MEASURES	AP/EP	STEP	PROCEDURE
004100102	10.10	MARGARINE SOLIDS	0.53 LBS	A	1.	MELT MARGARINE.
003202122	7.66	ALL PURPOSE FLOUR	0.43 LBS	B	2.	BLEND IN MARGARINE.
003102100	10.10	NON FAT DRY MILK SOLIDS	0.53 LBS	C	3.	HEAT IN STEAM KETTLE OVER LOW HEAT TO MODERATE TEMPERATURE.
006000001	71.42	WATER	3.8 LBS			DO NOT SCALD.
003205+100	0.69	SALT	0.04 LBS	D	4.	ADD MARGARINE MIXTURE TO MILK.
					5.	STIR TO BLEND
					6.	COOK AND STIR OVER LOW HEAT UNTIL THICK AND SMOOTH.

COOKED ELBOW MACARONI FOR CASSEROLES

RECIPE CODE - 26-15-2-010-5

STATUS - STANDARDIZED

1

 ***NUMBER OF PORTIONS 316
 PORTION SIZE .1780 LBS.
 MEAL PATTERN ALLOWANCE
 SUGGESTED SERVING UTENSIL
 PAN SIZE
 NUMBER OF PANS
 WEIGHT PER PAN LBS.
 HANDLING LOSS 0.00 PERCENT
 MINIMUM BATCH
 MAXIMUM BATCH
 FORECAST UNIT
 *TOTAL RECIPE WEIGHT 56.2 LBS.
 TOTAL RECIPE VOLUME

EQUIPMENT-STEAM KETTLE - 60 GAL
 KETTLE PADDLE
 COLANDER

RECIPE SOURCE-

03/13/75 4.12 PM 750120

CODE	PERCENT	INGREDIENT	WEIGHTS AND MEASURES	AP/EP	STEP	PROCEDURE
030000001	66.66	WATER	37.5 LBS	A	1.	BRING WATER, OIL AND SALT TO A ROLLING BOIL.
030000001	66.66	WATER	37.5 LBS X			
0041302156	3.33	SALAD OIL	1.9 LBS X			
0392034100	0.53	SALT	0.30 LBS X			
0392022054	33.33	✓ELBOW MACARONI	18.8 LBS	B	2.	ADD MACARONI TO BOILING WATER
						STIR-
						BRING AND KEEP WATER BOILING.
						3. BOIL 6 MINUTES OR UNTIL TENDER.
						4. DRAIN MACARONI INTO COLANDER, TAKE TO SINK AND RUN HOT WATER OVER IT.
						5. USE AS DIRECTED ON RECIPES FOR CASSEROLES OR SALADS.

WHITE SAUCE BT

RECIPE CODE - 22-20-0-000-7

STATUS - DEVELOPMENTAL

2

/ / -*****
EQUIPMENT-

NUMBER OF PORTIONS 233
PORTION SIZE .210 LBS.
MEAL PATTERN ALLOWANCE
SUGGESTED SERVING UTENSIL LADLE
PAN SIZE
NUMBER OF PANS
WEIGHT PER PAN
HANDLING LOSS
MINIMUM BATCH
MAXIMUM BATCH
FORECAST UNIT
*TOTAL RECIPE WEIGHT
TOTAL RECIPE VOLUME

LBS.
8.00 PERCENT
53.2 LBS.

RECIPE SOURCE-

05/29/75 10.14 AM 750224

CODE	PERCENT	INGREDIENT	WEIGHTS AND MEASURES	AP/EP	STEP	PROCEDURE
0341000102	10.10	MARGARINE SOLIDS	5.4 LBS	A	1.	MELT MARGARINE.
0342021252	7.67	ALL PURPOSE FLOUR	4.1 LBS	B	2.	BLEND IN MARGARINE.
0231021000	10.10	NON FAT DRY MILK SOLIDS	5.4 LBS	C	3.	FEAT IN STEAM KETTLE OVER LOW HEAT
0200000001	71.43	WATER	4.74 GAL 38.0 LBS			TO MODERATE TEMPERATURE.
						DO NOT SCALD.
0032054100	0.70	SALT	0.37 LBS	D	4.	ADD MARGARINE MIXTURE TO MILK.
					5.	STIR TO BLEND
					6.	COOK AND STIR OVER LOW HEAT UNTIL THICK AND SMOOTH.

APPENDIX G

Standard Form for Sensory Evaluation

EVALUATION OF PRODUCT

Name: _____

Date: _____

Points	Quality
7	Excellent
6	Very Good
5	Good
4	Medium
3	Fair
2	Poor
1	Very Poor

Directions:

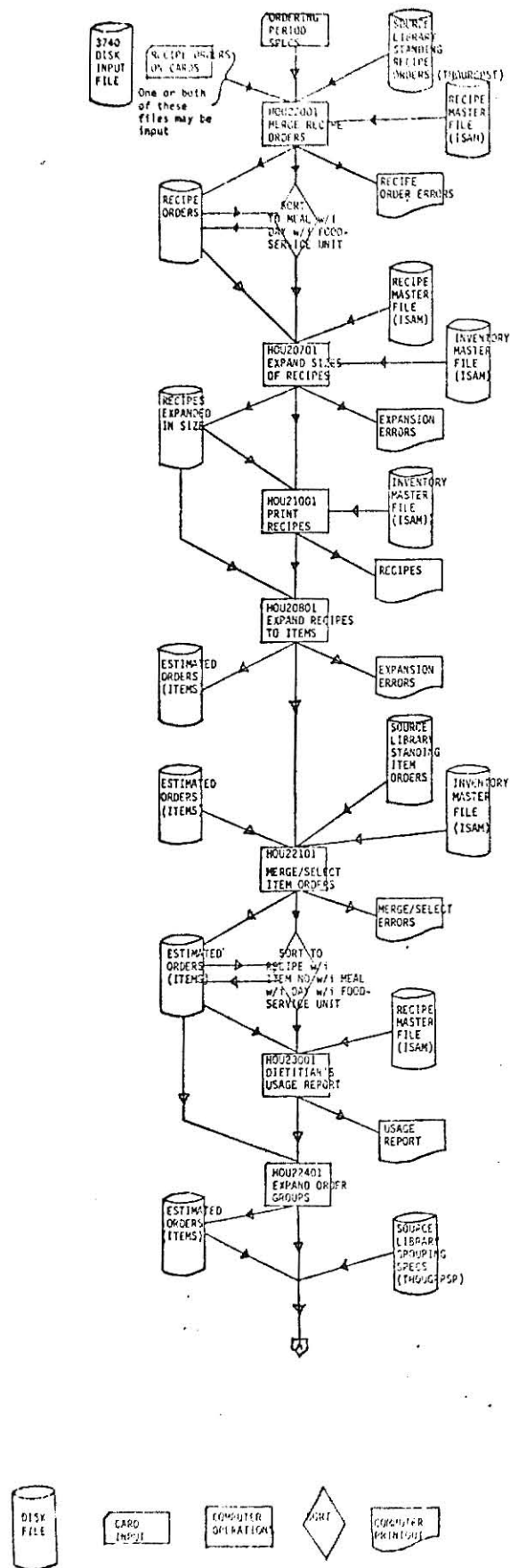
1. Place the numerical score in the box in the upper left hand corner.
2. Comments should justify the numerical score. Comments must be brief.
3. Evaluation of the food products must be on an individual basis.

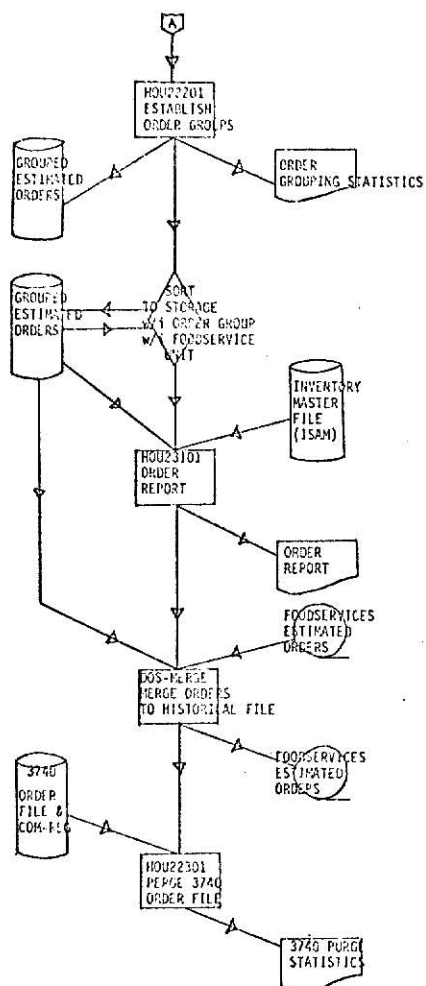
Quality Characteristic	1	2	3	4
Appearance				
Consistency or Texture				
Tenderness				
Flavor				
Overall Eating Quality				

APPENDIX H

Flow Chart of Ordering System

Housing Foodservice Recipe Ordering Process 1





APPENDIX I

Example of Recipe Order Form

FOOD SERVICE UNIT CODE: 0771

DATE: 07/25/75

NAME	DATE OF MEAL	MEAL CODE	RECIPE NUMBER	# OF SERVING
ied Eggs	7/25	B-1	120100118	600
ench Coffee cake			040140598	480
nmer Melon Plate		L-2	140590544	130
nbo Sugar Cookie			101020601	500
zza			140100636	350
rden Salad			182501299	250
sherman's Platter #1		D-3	160580102	445
at Croquettes			160120284	136
eamed Potatoes			262500132	424
llied Cherry Salad			181000245	494
ole Kernel Corn			263000842	500
tterscotch Pie			104520051	520

APPENDIX J

Examples of Order Report Printouts

ORDER REPORT

018-HOU-231-01 1.5 AT 4:47 PM
MAY 6, 1975

KRAFER FOOD CENTER

STOREROOM - ORDER GROUP

05/13/75 - SHIP DATE 05/13/75 - DELIVERY DATE TUESDAY

STORAGE LOCATION	CODE	ITEM NAME	BRAND	BIN QT.	ORDER AMOUNT (IN ORDER UNITS)	DELIVERED AMOUNT	NEEDED AMOUNTS		SUGG ORDER UNITS	INVENTORY ON HAND
							LBS.	ORDER UNITS		
12256	0082030359	PREPARED MUSTARD		4			33.28	4.0 GALLON	6	
12270	0082030057	TOMATO CATSUP		36			256.50	36.0 CAN	36	
12302	0082021155	SODA CRACKERS		6			45.00	6.0 CASE	6	
12304	0082020205	CHEERIOS		2			6.25	2.0 CASE	2	
12306	0082020329	WHEATIES		6			18.75	6.0 CASE	6	
12308	0082020302	SUGAR SHACKS		6			16.38	6.0 CASE	6	
12310	0082020299	SUGAR POPS		6			14.04	6.0 CASE	6	
12312	0082020261	SUGAR FROSTED FLAKES		6			18.75	6.0 CASE	6	
12314	0082020272	SPECIAL K		2			3.90	2.0 CASE	2	
12316	0082020264	RICE KRISPIES		2			3.90	2.0 CASE	2	
12318	0082020248	RAISIN BRAN		6			23.43	6.0 CASE	6	
12320	0082020230	LIFE		6			18.75	6.0 CASE	6	
12322	0082020213	CORN FLAKES		2			6.25	2.0 CASE	2	
12324	0082020221	GRAPENUTS		2			8.33	2.0 CASE	2	
12326	0082020256	PUFFED RICE		2			3.12	2.0 CASE	2	
12354	0082093008	GRANULATED SUGAR		8			705.75	7.1 SACK	8	
12356	0082092559	BROWN SUGAR		2			200.00	2.0 SACK	2	
12360	0082092753	CONFECTIONERS SUGAR		1			100.00	1.0 SACK	1	
12368	0082054100	SALT		1			4.82	1.0 BOX	1	
12370	0082054002	IODIZED SALT		1			1.82	1.0 BOX	1	
12372	0082010200	ICE TEA		15			46.87	15.0 BOX	15	
12378	0082010251	TEA BAGS		3			9.37	3.0 BOX	3	

018-HOU-231-01 1.5 AT 4.47 PM
MAY 6, 1975

ORDER REPORT

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KFAER FOOD CENTER

FROZEN FOOD - ORDER GROUP

05/08/75 - SHIP DATE 05/08/75 - DELIVERY DATE THURSDAY

STORAGE LOCATION	CODE	ITEM NAME	BRAND	BIN QT.	(IN ORDER UNITS)	ORDER AMOUNT	DELIVERED AMOUNT	NEEDED AMOUNTS		SUGG. ORDER UNITS	INVENTORY ON HAND
								LBS.	ORDER UNITS		
32159	0062000357	FROZEN CHIVES			1			0.12	0.1 CAN	1	
32218	0061000221	BLUEBERRIES FROZEN			1			15.00	0.5 CASE	1	
32224	0021020400	FROZEN EGG YOLKS			1			2.10	0.2 CARTON	1	
32226	0021020302	FROZEN EGG WHITES			1			10.40	1.0 CARTON	1	
32234	0021020205	FROZEN WHOLE EGGS			2			55.50	1.9 CAN	2	
32238	0061000051	FROZEN APPLES, SLICED			3			88.70	3.0 CAN	3	
32254	0063010453	LEMON CONCENTRATE			1			0.19	0.6 EACH	1	
32274	0041000102	MARGARINE SOLIDS			2			37.77	1.3 BOX	2	

013-HOU-231-01 1.5
MAY 6, 1975

ORDER REPORT

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AT 4.47 PM

KRAMER FOOD CENTER

PRODUCE - ORDER GROUP

05/12/75 - SHIP DATE 05/12/75 - DELIVERY DATE MONDAY

STORAGE LOCATION	CODE	ITEM NAME	BRAND	BIN QT.	ORDER AMOUNT QT. (IN ORDER UNITS)	DELIVERED AMOUNT	LBS.	NEEDED AMOUNTS ORDER UNITS	SUGG ORDER UNITS	INVENTORY ON HAND
	0052000109	AVOCA00S			22		21.28	21.3 EACH	22	
	0052000451	CHINESE CABBAGE			2		3.46	1.7 HEAD	2	
	0052000605	FRESH CELERY			1		33.90	0.7 CRATE	1	
	0052000648	CELERY LEAVES COARSELY CHOPPED			1		0.98	1.0 POUND	1	
	0052000656	CHICORY			13		12.80	12.8 POUND	13	
	0052000702	CUCUMBERS			20		19.31	19.3 POUND	20	
	0052000907	HEAD LETTUCE			169		252.92	168.6 HEAD	169	
	0052000958	ROMAINE LETTUCE			3		28.00	2.8 CRATE	3	
	0052001105	ONIONS GREEN			5		4.09	4.1 POUND	5	
	0052001202	ONION MATURE			1		0.46	0.5 POUND	1	
	0052001351	FRESH GREEN PEPPER			11		10.25	10.3 POUND	11	
	0052001407	FRESH POTATOES RAW			195		195.00	195.0 POUND	195	
	0052001601	RADISHES (WITHOUT TOPS)			2		14.40	1.3 BASKET	2	
	0052001652	FRESH SPINACH RAW			2		1.32	1.3 POUND	2	
	0052001806	FRESH TOMATO			2		36.59	1.8 LUG	2	

018-HQJ-231-01 1.5 AT 4.47 PM
MAY 6, 1975

KRAMER FOOD CENTER

DAIRY - ORDER GROUP

ORDER REPORT

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05/10/75 - SHIP DATE 05/10/75 - DELIVERY DATE SATURDAY

STORAGE LOCATION	CODE	ITEM NAME	BRAND	BIN QT.	ORDER AMOUNT (IN ORDER UNITS)	DELIVERED AMOUNT	NEEDED AMOUNTS		SUGG ORDER UNITS	INVENTORY ON HAND
							LBS.	ORDER UNITS		
0031010105		CHOCOLATE MILK DRINK			2		204.00	2.0 CARTON	2	
0031010458		HOMOGENIZED MILK FOR COOKING			40		39.10	39.1 POUND	40	
0031010594		HOMOGENIZED MILK			12		1,224.00	12.0 CARTON	12	
0031011501		SKIM MILK			2		204.00	2.0 CARTON	2	

018-HOU-231-01 1.5
MAY 6, 1975

AT 4:47 PM

KFARMER FOOD CENTER

BAKERY - ORDER GROUP

05/09/75 - SHIP DATE 05/09/75 - DELIVERY DATE FRIDAY

STORAGE LOCATION	CODE	ITEM NAME	BRAND	BIN QT.	ORDER AMOUNT (IN ORDER UNITS)	DELIVERED AMOUNT	LBS.	NEEDED AMOUNTS ORDER UNITS	SUGG INVENTORY ON HAND
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0081022000 HOT DOG BUNS 4-5 INCH LENGTH

127

536.80

126.3 DOZEN

127

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APPENDIX K

Analysis of Variance of Sensory Evaluations

Ham and Cheese Casserole

<u>appearance scores</u>		mean squares	F-ratio	P	<u>consistency scores</u>		mean squares	F-ratio	P
panelists	0.97	1.49	n.s.		panelists	1.98	4.60	< .05	
day	10.21	15.72	< .001		day	2.48	5.78	< .05	
panelist by day	0.65				panelist by day	0.43			
treatment	0.75	4.69	< .05		treatment	0.0003	0.004	n.s.	
panelist by treatment	0.20	1.25	n.s.		panelist by treatment	0.28	3.37	< .05	
<u>tenderness scores</u>					<u>flavor scores</u>				
panelists	5.99	1.67	n.s.		panelists	1.46	2.02	n.s.	
day	3.95	1.10	n.s.		day	2.83	3.88	< .05	
panelist by day	3.58				panelist by day	0.73			
treatment	0.05	1.25	n.s.		treatment	0.52	4.01	n.s.	
panelist by treatment	0.02	0.5	n.s.		panelist by treatment	0.31	2.40	n.s.	
<u>overall eating quality</u>									
panelists	6.49	2.32	n.s.						
day	3.30	1.20	n.s.						
panelist by day	2.75								
treatment	0.33	3.48	n.s.						
panelist by treatment	0.11	1.14	n.s.						

Vanilla Cream Pudding

<u>appearance scores</u>		<u>mean squares</u>	<u>F-ratio</u>	<u>P</u>	<u>consistency scores</u>		<u>mean squares</u>	<u>F-ratio</u>	<u>P</u>
panelist	2.59	3.12	<.05		panelist	1.82	1.49	n.s.	
day	0.56	0.72	n.s.		day	0.19	0.16	n.s.	
panelist by day	0.83				panelist by day	1.22			
treatment	8.56	15.85	<.001		treatment	16.96	31.41	<.001	
panelist by treatment	1.14	2.11	n.s.		panelist by treatment	0.57	1.06	n.s.	
<u>flavor scores</u>					<u>overall eating quality</u>				
panelist	1.50	2.27	n.s.		panelist	4.75	1.53	n.s.	
day	0.49	0.74	n.s.		day	1.85	0.60	n.s.	
panelist by day	0.66				panelist by day	3.10			
treatment	1.86	9.79	<.05		treatment	8.23	27.43	<.001	
panelist by treatment	0.43	2.26	n.s.		panelist by treatment	0.26	0.87	n.s.	

DEVELOPMENT OF DATA BASES AND RECIPE ADJUSTMENT BY
PERCENTAGE METHOD USING ELECTRONIC DATA PROCESSING
IN A COLLEGE RESIDENCE HALL FOODSERVICE SYSTEM

by

BARBARA LOUISE CHAPIN TORRENCE

B.S., Kansas State University, 1973

AN ABSTRACT OF A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Institutional Management

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1975

Electronic data processing has been used to provide timely information for management decisions and to reduce time spent in data collection activities. The majority of the research related to computer-assisted foodservice management has been applied to hospital systems. The objective of this study was to develop two electronic data processing data bases adapted to a residence hall foodservice system, a food item file and a recipe file and to evaluate the feasibility of computerized recipe adjustment by the percentage method. The factor method is the approach used in other systems.

Data for the development of the food item file was gathered from several sources and standardized. Each food item used in recipes produced in the foodservices of Kansas State University was coded for weight per cup, weight per order unit, order unit, yield factors, item number, item name, status, type, inventory code, recipe number, storage location, order group and group item data. A system to classify and code ingredients was developed with codes for meat items incorporating the standardized portion codes of the National Association of Meat Purveyors.

The standardized recipes of the residence hall foodservices were evaluated in terms of accuracy related to ingredients and calculated formula yield. A system to classify and code recipes was adapted from the present method of recipe coding. The recipe file consisted of three types of recipe information for each recipe: general recipe information, ingredient infor-

mation and production information.

The percentage method for recipe conversion was redefined from that developed at Michigan State University and applied at Kansas State University to specify all the essential steps for the computer program. The recipe data system was programmed to generate a recipe master index and recipe file listing. Recipes for all menu items were coded. An additional output of the system was a set of ordering forms for a specified period of production forecasts that were categorized by delivery date and classification of food items. The output was printed in multiple copies to provide documentation for accounting and control purposes. The format included production need in pounds and order units and inventory adjustment column.

After the program for the percentage method of formula conversion was completed, 100 of the most commonly used recipes were coded. Each recipe printed was examined for accuracy and completeness. This examination consisted of the comparison between the computer formula and the same recipe manually adjusted to the same quantity. The format designed for the computer recipes was based on the format currently used for manually adjusted recipes. This strategy provided one approach to reducing resistance to the new system.

When the recipe printout appeared to be accurate and complete, two basic recipes which had been evaluated to be acceptable, vanilla cream pudding and ham and cheese casserole, were added to the data set. These recipes were evaluated qualitatively by a panel of six dietitians for appearance,

texture, tenderness, flavor and overall eating quality. To compare products two batch sizes (Twenty-five or fifty and 250 portions) were prepared for each item. Data indicated differences between products were very small. The computer adaptation of the percentage method of recipe adjustment was judged to be an accurate and acceptable approach.