THE USE OF SOME LABOUR SAVING KITCHEN DEVICES IN RELATION TO THE TIME MANAGEMENT OF SELECTED URBAN HOUSEWIVES.

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I. INTRODUCTION

Indian women today are fortunate to be living in an age which has guaranteed to them political freedom, educational opportunities and equality of social, economic and legal status. They have been given encouragement not only for advancement of their own families, but also to play their rightful part in nation-building as partners of men fulfilling Gandhiji's (1933)[1] forecast: "Man and Woman are of equal rank but they are not identical. They are a peerless pair, being supplementary to one another."

Vinoba Bhave (1962)[2] says there is a special need today for Indian women to turn their attention to public affairs. As the opportunities are great, so are their responsibilities. Unless they are equipped to the fullest to meet satisfactorily the obligations of homemaking and nation-building, they will not be able to contribute their best to the country.

Devadas (1961)[3] observes that the Indian women function in diverse capacities as homemakers, mothers, farmers, wage earners, labourers in the fields, mills, cottage or small scale industries and community. The homemakers therefore need to manage their time efficiently in order to meet all the demands of the home and career and derive maximum satisfaction from discharging their duties, without strain. Thus many women are taking up

outside careers, because of professional interest or economic interest.

Among all the resources available to the homemakers, time is the most precious, since it is limited to only 24 hours a day, regardless of a person's birth or status. Therefore, time management, that is doing a work with minimum expenditure of time, is important. The homemakers spend much of their time in doing various household work such as cooking and serving food, cleaning, arranging articles and others. It has been estimated that 70 per cent of their time ( )[4] is spent in the kitchen. The urgent need therefore, is to find ways and means to reduce the time spent on cooking.

One of the methods of cutting down the time spent in the kitchen is the use of labour saving devices. Thabat (1957)[5] defines a labour saving device as that which helps to get a job done in the best possible way with the least expenditure of time and energy. The use of suitable labour saving kitchen device minimises greatly the strain in household work and increases production and leisure in the home. The homemakers can then have the much desired free time for community activities.

It is doubtful whether any study has been made in India with regard to the types of labour saving devices available, their uses and limitations, although all the

universities offering Home Science have included the topic "Labour Saving Devices" in their Home Management curricula. Hence the topic is taught without Indian references.

The study of labour saving devices which are suitable to Indian homes has become an urgent need. This study has been undertaken to fulfil this need to the extent possible. Information on the availability of labour saving kitchen devices in selected homes, and selected markets in Coimbatore City; the time spent by the homemakers in various household activities, particularly for food preparation has been obtained. Through standardised experiments the suitability and effectiveness in time management of eight commonly available labour saving devices, namely; electric mixer, steam cooker, vegetable peeler, 'aruvamanai', vegetable slicer, vegetable grater, coffee percolator and 'poori' cutter, have been assessed.

It is hoped that the findings of this study will be useful for homemakers, teachers and students of Home Science, extension workers and manufacturers of labour saving devices in stimulating their interest towards proper selection and promotion of labour saving devices for effective time management.

II. REVIEW OF LITERATURE

As this study is on the use of labour saving kitchen devices in relation to time management, the available literature has been reviewed under the following headings:

A) The homemakers' use of time in the past and present

B) Time as a resource

C) Time management in the home

D) Methods for studying time management of homemakers

E) Surveys conducted on the use of time by the homemakers

F) Use of labour saving kitchen devices in time management

G) Evaluation of labour saving kitchen devices

and H) Conducting palatability tests for evaluating labour saving kitchen devices

A. Homemakers' Use of Time in the Past and Present:

Women's role as homemakers has been established from the beginnings of civilization. Thiruvalluvar, the revered ancient poet of Tamil Nad, has stated 2,000 years back, "The ideal homemaker guards her purity, looks after her husband and family, within the available resources and is truthful and never discouraged" - (Thirukkural).[6] Devadas (1959)[7] enumerates the roles of the homemakers as the doctor, nurse, psychologist, banker, tailor, cook, nutritionist, gardener, companion of the family and above all she is the loving wife and mother. Murthy (1962)[8] regards the women as the pivot

of their families. As a homemakers and mothers, they give a specific message to the world. Their power is the source of strength to the family as well as the community. Deshpande (1962)[9] extols that the great women of India from Gargi of the Vedic period to Kasturba of modern times, had left their foot prints on the sands of time through their devotion to home and their community.

Bengupta (1960)[10] traces the activities of women from the Pre-Vedic period to the present century. Long before the Aryans came to India, the homemakers were mainly domestic in their occupation. They were responsible almost entirely for such activities as weaving, spinning, fashioning of pottery and designing of jewellery. In the Vedic period, women were skilled in arts and crafts, apart from their domestic activities. They played an active part in the simple pastoral life and the administration of the country. However in the medieval times, which were marked by various foreign invasions, women were reduced from such a lofty position to nothing more than domestic drudges. In the nineteenth century, movement for women's emancipation championed by Raja Ram Mohan Roy, resulted in a more equitable treatment of women (Vasi, 1958)[11]. The inspiring verses of Bharathy (1955)[12] in Tamil Nad infused fresh spirit into them. The freedom movement led by Gandhiji (1948)[13] brought out many a woman to the political and social fronts. Menon (1960)[14] points out that since independence, women have gained equal rights in the field of politics.

Lam (1960)[15] stresses that women are taking greater interest in civic affairs. Women are keen to devote much of their time and energy in the national building activities.

According to Verma (1962)[16], the educated women came to be employed in large numbers in various offices during second world war. Gupta (1961)[17] states that apart from carrying out household duties they are found working in the offices, hospitals, factories, schools and colleges. Devadas (1953)[18] mentions that in the field of Home Science women take up several careers such as these of teachers, extension workers, social service workers, dietitians and nursery school teachers. Uppal (1960)[19] observes that there are women scientists, engineers, economists, research scholars, administrative officials in armed forces and social workers. Deshmukh (1962)[20] believes that women are more suited to certain types of work, particularly social work, nursing and teaching. Nanda (1962)[21] estimates that the number of women employed in private and public sector, in teaching and nursing professions, and in industries has increased. However as Menon (1962)[22] points out women have to do many jobs as homemakers and fulfil several obligations to the members of their family and to the members of the community. Management of time is very important, as Hargreaves (1961)[23] stresses specially if the homemakers are gainfully employed outside the home as well as are running their homes.

3. Time as a Resource:

Proverbs such as "Time and tide tarry for no man", "Time flies" and "He that has most time has none to lose", "Time is the measure of business, as money is of wares", reveal the wisdom of the past. (Smith, 1957)[24] According to Nickel and Dorsey (1954)[25] time is one of the material resources of the family. Goodyear and Klohr (1954)[26] bring out the importance of time as "Time is an intangible resource available in equal amounts to every one".

Warren (1957)[27] observes that time has alternate uses and is not transferrable. Time may be the measure used to test the use of other resources. Moore (1957)[28] stresses that time is a 'constant' in the life of man, though the use of it may be varied. Hours cannot be expanded, but they may be highly productive or tragically empty. He further points out that man's contribution to himself, and to others may well be measured in his management of time. Narayan (1962)[29] states, time management for women has become even more important because of the part to be played by them in political, social and cultural fields along with their home life.

C. Time Management in the Home:

Goodyear and Klohr (1954)[26] define management "as the process of realising values and goals through the effective use of human and material resources". Gross (1948)[30] lists the six aspects of management as use of time and energy: use of money, household production, conservation of goods, preservation of goods for the future and incentive of home management. According to Nickel and Dorsey (1954)[25], time management involves both making plan which shows that one expects to do in a given period of time during a whole day, and carrying it out. Gross and Crandall (1954)[31] signify that management of time has concerned itself chiefly with minimising work time. According to them, the aids to effective management of time, come from the knowledge of the time spent on each activity and the use of work simplification principles, which include the use of labour saving devices. Time management is facilitated by the use of labour saving devices.

D. Methods for Studying Time Management of Homemakers:

Davidson (1928)[32] explains 'Survey' as a type of research often adopted to secure information concerning present day practices. Yang (1957)[33] points out that a survey is usually an enquiry into the composition, activities and living conditions of a group of people. Survey is concerned with social life as it exists now, gives the prevailing conditions, is focussed upon a particular locality

and helps to reform the locality with necessary improvements and means.

The survey may be conducted through case studies, diaries, questionnaire or by interviews. Hamilton (1959)[34] states that a case study is a time consuming method and is applicable only to a very few samples, to obtain desired information. According to Young (1956)[35], questionnaires help in collecting objective and quantitative data from large diverse and widely scattered groups of people. Gross et al (1940)[36] report that on comparing three methods of obtaining information namely, the interview, the questionnaire and the diary, through survey of 41 homemakers, revealing that 'interview' method is the best for collecting information and clarity of responses. Diary is useful in getting vivid answers, but it could be used only with educated women. Good and Scates (1954)[37] recommend the 'interview' method to secure such information as personal habits, characteristics, opinions and beliefs of the interviewee. Burchinal and Hawkes (1957)[38] assert that interview method is likely to be correct than the information obtained by means of other techniques. George (1962)[39] gives the purposes of interview methods as: to gain information, to give information and to motivate. He suggests that for a successful interview the list of questions should not be too long. To begin with, the interviewee should be put at ease, in an informal setting with

tactful approach. Small courtesies should be practised and the development of the topic during the conversation should be carefully watched.

Good and Scates (1954)[37] indicate that the tools useful for conducting interviews are check list and interview schedule. The checklist is essentially a list of items with appropriate columns to check "yes" or "no" against each. The interview schedule consists of questions under various categories with space for answers.

E. Surveys Conducted on the Use of Time by Homemaker:

A few studies were conducted in the U.S.A. A study conducted by Bailey (1915)[40] on management of the farm houses is reported in which 32 homemakers were interviewed and asked to keep daily records of the management of time for one year. The information showed that the farm women spent nine hours per day in sleep, 10 to 13 hours per day in actual work in the homes. Rowe (1917)[41] has recorded the time spent by one family on house work for one year, which was seven hours per day on an average, of which three hours were spent on cooking, one hour for household cleaning and one hour for cleaning utensils. Woodbury (1918)[42] reports a survey where the homemakers spent three hours for kitchen duties, one hour for special tasks such as laundering, Red Cross work, 15 minutes for making beds and 15 minutes for attending phone or some other household duties.

Wilson (1932)[43] observes that the studies on time spent on meal preparation, are important because it is the major activity in the time schedule. The schedule in the form of diaries were kept by 533 homemakers in the U.S.A. for seven consecutive days. Information concerning the size and the composition of the household and the equipment used in the home, was also gathered. From this study it was observed that for preparing food more time was spent in farm homes, as compared to town homes, where commercial foods were available. In the average household 98 hours or more per week were spent on homemaking activities in which meal preparation took only 20 per cent. Sorokin and Berger (1939)[44] report a study based on the collection of systematic records of all activities by 100 individuals for four weeks. From the study it was observed that sleep occupied first place and activities such as eating, household work and personal care come next.

Cowles and Dietz (1956)[45] conclude from their studies in the U.S.A. that the time spent on home making activities by farm homemakers, increased as the number of members of the household increased. Among all the homemaking activities, food preparation consumed the largest portion of the homemakers' time. They also noted that as the homemaker's age increased the time spent on homemaking activities decreased because in large households the grown up children assumed responsibilities for the household tasks.

Yamamoto (1956)[46] records that Japanese homemaker of rural area spent 41 per cent of her time on farming and 29 per cent on house keeping of which 15 per cent was spent on cooking during the busy farming season. In the slack farming season 60 per cent of time was spent on housekeeping of which 17 per cent was spent on cooking. Thus when she was busy in outside career she spent nearly 50 per cent of her housekeeping time on cooking and when she was not busy with the outside career, she spent only 31 per cent of her housekeeping time on cooking.

In India not many studies have been conducted on home-making activities. The only available literature is that of a case study on two families in Uttar Pradesh conducted by Geldens (1957)[47]. She found that the home-maker spent two and a half hours per day for preparing a frugal meal consisting of 'roti' and a side-dish.

F. Use of Labour Saving Kitchen Devices in Time Management:

Washburne (1960)[48] reports that investigation and archeological excavations have proved that tools have been found in association even with such primitive creatures such as, man apes about a half a million years ago. The earliest tools were stone chips or large pebbles which were used for pounding or digging or scraping. Braidwood (1960)[49] states, that even as early as 9,000 years ago men appeared to have used milling and pounding stones. He considers

that it was the success of the simplest tool that started the whole trend of human evolution paving the way for today's civilization.

The encyclopaedia ( )[50] defines 'device' as a scheme or simple mechanical contrivances that may be used for doing some work. Hunts (1953)[51] observes, that using modern equipment and new materials, the homemaker has changed from the slave of back-aching, tedious, time consuming jobs to the career girl who manages her home and job too. The modern piece of equipment not only saves time and energy but it will do it in such a way that most disliked jobs become glamorous. Beveridge (1956)[52] explains that household device is the product of the desire of the people to find better and more effective ways of doing the work in the home. Gilbreth et al (1960)[53] describes a device as "An extension of yourself. It lengthens your reach. It does things your finger can't do. It gives you added strength and power". Menon (1962)[22] points out that many time saving as well as labour saving devices and equipment help to make big jobs light and easy.

The description of a few devices are found in literature. Jervais (1960)[54] has described that the steam cooker saves time, labour, fuel and foodstuffs as well. Peet and Thye (1955)[55] describe coffee percolator, rotary beater, grater, slicer and peeler as useful labour saving kitchen devices.

Electric mixer, as described by Ehrenkrans and Inman (1958)[56], is an amazing labour saving device.

6. Evaluation of Labour Saving Kitchen Devices:

Labour saving kitchen devices may be evaluated from technological point of view or the homemaker's point of view. The physical principles such as force, friction, wheel and axle system, lever and steam power, are applied in the working of the labour saving kitchen devices. For example, for the peeler, slicer and grater, principles of the second order lever, force and friction are applied. Force is defined by Whitman (1951)[57] as a push or pull which tends to cause motion. Friction according to Avery (1957)[58] is the resisting force which opposes any effort to roll or slide one body over or through another. In the case of rotary beater, principle of wheel and axle is applied. This machine consists of two wheels on the same axis or one wheel is replaced by a crank with a handle at the end.

Ryan and Weaver (1959)[59] remark that in the evaluation of labour saving kitchen devices, designers and engineers have not always been aware of all the problems in use and performance. Gilbreth et al (1960)[5$] point out that the homemaker may evaluate the labour saving kitchen devices by judging whether or not they are easy to operate, clean and the products prepared are good. The safety in use multipurpose action, and durability are also to be considered.

The durability of the labour saving kitchen devices depends on material used. Ehrenkrans and Inman (1958)[56] list the material used in devices as stainless steel, aluminium, steel, tin, glass, plastic and wood. Among these, stainless steel and aluminium are most commonly used materials. Peet and Thye (1955)[58] indicate that steel resists sagging under heat, and tin is readily affected by food acids and darkens with use. Glass is comparatively a poor conductor of heat but has high absorption power. Plastic is light in weight, colourful, easy to clean and durable. Ehrenkrans and Inman (1958)[56] recommend that hard wood with smooth finish are useful, easier to clean and bad conducter of heat. Borum (1957)[60] states that aluminium is a light metal with bluish tinge, capable of taking a high polish. Aluminium does not corrode easily but is affected by alkalies and certain acids. Harpin et al (1959)[61] consider the stainless steel as popular because of its resistance to corrosion, and brightness although the disadvantage according to Grolarie (1957)[62] is that it is a poor conductor of heat. Broughton (1961)[63] states that stainless steel is a solid metal does not chip, peel or flake away and is increasingly resistent to rusting or staining.

With expanding programme for finished steel product under the First Five Year Plan and starting of Heavy industry, there is scope for the greater production of labour saving devices in the near future (India 1962)[64]. A report issued

by the Inventions Promotion Board (1961)[65] indicates that in order to achieve progress in designing of equipment and to secure ideas regarding useful invention, the Government of India has established a number of its own research organisations. One such is the Council of Scientific and Industrial Research and through this council the Inventions Promotion Board came into existence in 1960. This board is mainly to recognise outstanding invention through awarding prizes, to assist promising inventors by financial assistance or grants. The Inventions Promotion Board (1962)[66] has awarded prizes for a 'battery-cum-electric household mixer' and a device for extruding flour in paste form with the use of simple disc. Sarin (1963)[67] communicates that other invention such as 'Automatic tea kettle with mixer', 'Improvement in automatic electric steam cooker', 'Tankar Hand Squeeze moulding machine' have been awarded prizes for the year 1962-63.

Attempts to manufacture simple labour saving kitchen devices at cottage scale is being tried at the Education Training centres at Kallupatti and Darwar as mentioned by Shetty (1963)[68]. Such attempts would help the homemaker both as a producer and as a consumer.

5. Conducting Palatability Tests for Evaluating Labour Saving Kitchen Devices:

An important criteria for a cooking device is that the food prepared with it should be palatable. Mason (1939)[69]

states, in the study the foods, they are evaluated by applying palatability test, and the method of testing the palatability of cooked foods are classified as 'subjective' and 'objective' methods. In the objective methods, the quality is determined by means of various measuring devices, such as colour comparators or photographs. Food is rated subjectively by a panel of judges by means of score cards. One of the limitations of subjective method according to Mark (1949)[70] is the variability of the individual response to a stimulus at different times. But such variability can be decreased through careful selection and training of the panel of judges.

Lowe (1955)[71] outlines various methods of conducting the tests, for which the judges should be carefully selected. One method is by means of 'Triangle Test' comprising of a test unit which consists of three samples, two of which are aliquots of the same sample. All these samples are labelled by the person who is administering it. The members of the panel are requested to pick the different samples with reasons. Those who had been consistingly pointing out the 'different' sample correctly are selected for the panel. The cooked products are given to the judges on white porcelain quarter plates in well lighted and well ventilated room, with a code number for each product.

Score cards for testing the acceptability of the products

have to be developed in order to help the judges to score the products. As enumerated by Love,[7] the scorer is expected to detect the differences in the sample and assign a quantity factor to these ratings. A numerical scale from three to one points followed by descriptive terms in a graded manner are listed in the score cards. The terminology used is clear, and the scorer has to mark the score, she wishes to give to a particular quality. Thus, judging by the use of a score card, requires critical examination and recorded judgment of the product.

III. METHODS AND MATERIALS

This study on the use of labour saving kitchen devices in relation to time management of urban homemakers was carried out in the following steps:

A. Selection of eight labour saving kitchen devices for the study

and B. Experiment on the effect of using the selected eight labour saving kitchen devices on time management and palatability of food.

A. Selection of Eight Labour Saving Kitchen Devices for the Study:

The selection of eight labour saving kitchen devices for use in the study involved:

1. A survey on the availability of labour saving kitchen devices in 70 selected households;

2. A survey on the availability of labour saving kitchen devices in the local markets;

and 3. Pretesting of the commonly used labour saving kitchen devices and selection of the eight labour saving kitchen devices.

1. A Survey on the Availability of the Labour Saving Kitchen Devices in 70 Selected Households:

The various steps in conducting the survey on the availability of labour saving kitchen devices in the households were:-

a. Selection of the survey method,

b. Selection of the sample,

c. Developing the interview schedule,

and d. Conducting the interview.

a. Selection of the survey method:

The interview method was selected for the survey because of its several advantages as mentioned on page 18.

b. Selection of the sample:

All the households with the per capita income range of Rs.100 to 150 per month in one locality of Coimbatore were selected after visiting the entire area, to constitute the sample of homemakers to represent the middle class.* At this income range the cooking is usually done by the homemakers themselves and the meals prepared are varied enough to justify the use of labour saving kitchen devices. It was found that 140 households came under this income range of which 70 were selected for the study by random sampling.

c. Developing the Interview Schedule:

An interview schedule was prepared to gather information on (i) the general background of the family such as, composition, educational level and total monthly income of the family members, (ii) specific information regarding the types of labour saving kitchen devices possessed by the homemakers, reason for possessing, the frequency of use and from where they had purchased. The interview schedule thus developed is given in Appendix I.

d. Conducting the Interview:

The questions listed on the interview schedule were

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* According to India (1962)[64] the families with a per capita income of Rs.80 to 200 per month are classified as middle class.

posed to the homemakers one by one and their replies noted. It was found that the homemakers were in possession of the labour saving kitchen devices as listed in Table I.

TABLE I.

NUMBER AND PERCENTAGE OF THE FAMILIES POSSESSING DIFFERENT TYPES OF LABOUR SAVING KITCHEN DEVICES.

Types of labour saving kitchen devices		Families	
		Number	Percentage
1. 'Aruvamanai'	..	70	100
2. 'Maruku' mould	..	70	100
3. Wooden churner	..	70	100
4. Vegetable slicer	..	56	80
5. Vegetable grater	..	53	76
6. Coffee filter	..	41	59
7. 'Kevi' mould	..	37	54
8. Vegetable peeler	..	34	49
9. Coffee bean roaster	..	33	47
10. Steam cooker	..	25	36
11. 'Puttu' cutter	..	24	34
12. Coffee percolator	..	19	27
13. Pressure cooker	..	12	17
14. Coffee bean grinder	..	10	14
15. Bread toaster	..	9	13
16. Fruit squeezer	..	8	11
17. Electric mixer	..	5	7
18. Rotary beater	..	4	6

From Table I, it is seen that all households possessed 'Aruvamanai', 'muruku' mould and wooden churner. Vegetable

slicer, vegetable grater, coffee filter and 'sevi' mould were available in many of the households whereas fruit squeezer, electric mixer and rotary beater were available only in a few households.

2. A Survey on the Availability of Labour Saving Kitchen Devices in the Local Markets:

The availability of labour saving kitchen devices in the markets in Coimbatore was studied using another interview schedule formulated for the purpose as shown in the Appendix II. Ten shops in Coimbatore City from where the homemakers under survey, usually purchased their devices, were selected as the sample for the market survey.

From the information supplied by the shopkeepers, it was found that all the 18 labour saving kitchen devices used by the homemakers were available for sale in the markets, at the prices shown in Appendix III. Foreign made electric mixer, pressure cooker, coffee bean grinder, coffee percolator and rotary beater were also available in the local marketsbut the costs were higher compared to local made articles.

3. Pretesting of the Commonly Used Labour Saving Kitchen Devices and Selection of the Right Labour Saving Kitchen Devices:

Among the 18 labour saving kitchen devices commonly used by the homemakers, great variety of designs and forms were observed in the case of several devices. For example, the

vegetable grater was found to be flat, with or without stand, upright or rectangular. Therefore, all the available designs in each of the labour saving kitchen devices were pretested, to determine the time consumed, quality of the product obtained and ease of operation while in use, keeping the other conditions such as, the type of food, its quantities constant. The design which was most efficient for each device was assessed. From the 18 labour saving kitchen devices the following eight were selected for the study based on the extent of availability and usefulness, namely, electric mixer, steam cooker, vegetable peeler, 'aruvamanai', vegetable slicer, vegetable grater, coffee percolator and 'poori' cutter. For each of these labour saving kitchen devices a corresponding ordinary device* was selected as control to perform a definite task as shown in the Table II.

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* For the purpose of this study, an ordinary device is defined as one that was less labour saving although it might be included in labour saving devices, for example wooden churner is selected as an ordinary device.

TABLE II

SELECTED EIGHT LABOUR SAVING KITCHEN DEVICES AND ORDINARY CONTROL DEVICES.

No.	Labour Saving Kitchen Devices	Ordinary Control Devices	Selected Tasks
1.	Electric mixer	a. Grinding stone	Grinding rice and blackgram dhal for 'idli
		b. Wooden churner	Churning curds
2.	Steam cooker	Dekshies	Cooking rice, dhal, drumstic and raw banana
3.	Vegetable peeler	Knife	Peeling raw banana
4.	'Aruvamanai'	Knife	Cutting raw banana
5.	Vegetable slicer	Knife	Slicing potato
6.	Vegetable grater	Knife	Grating carrot
7.	Percolator	Coffee pot	Preparing decoction
8.	'Poori' cutter	Rolling pin	Shaping 'poori'

The tasks mentioned in Table II were selected on the basis of suitability of the device for the task, frequency of use in the household, cost and acceptability of food.

Brief description of the eight labour saving kitchen devices are given with Figures on Pages 25 - 36.

a. Electric Mixer:

The electric mixer selected in this study, as illustrated in Figure 1, consisted of an unit of four steel blades A, set into bottom of glass, metal or plastic container B, the motor unit C and "on and off" switch D.

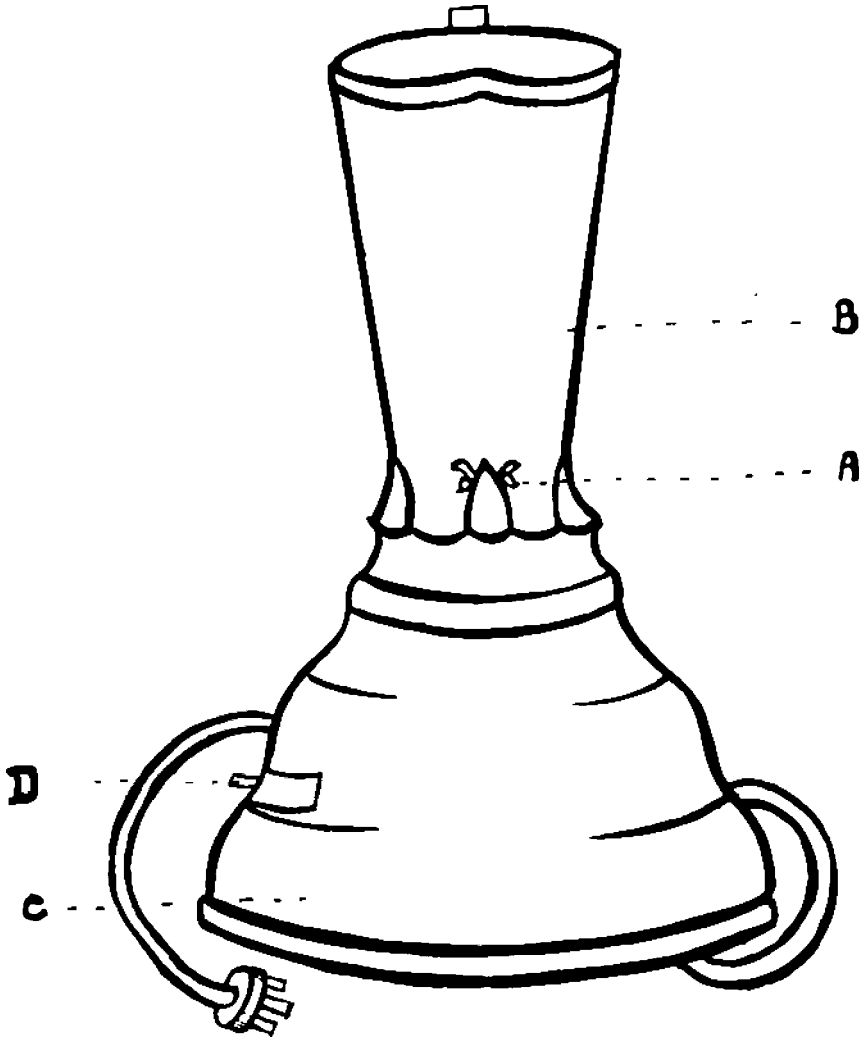
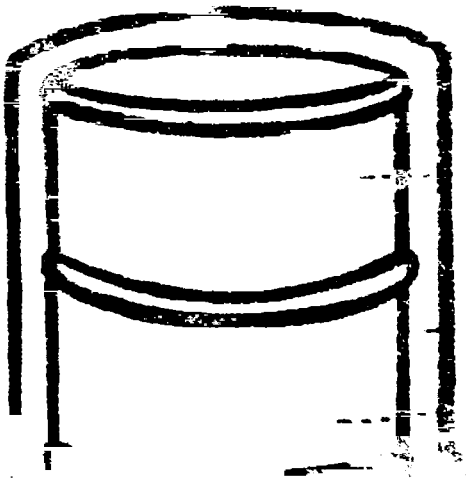


FIGURE 1

ELECTRIC MIXER

A. UPPER BOWL B. LOWER BOWL

C. MOTOR UNIT D. SWITCH



b. Steam Cooker:

The steam cooker used in this study is shown in Figure 2. It consisted of a pair of outer vessels A with a cover B, for producing steam; in which may be placed containers, for cooking dhal, D_1 rice, D_1 and vegetables E and E_1. A 'ladle' for seasoning, tongs for holding the vessels and spoon for serving cooked foods from the steam cooker were also provided.

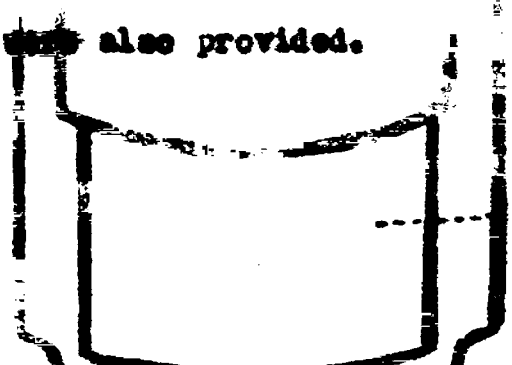


FIGURE - 2

STEAM COOKER

A OUTER VESSEL

B COVER

DHAL CONTAINER

D - RICE CONTAINER

E, E_1 - VEGETABLE CONTAINERS

c. Vegetable peeler:

The vegetable peeler selected consisted of a blade with serrated edge A_1 and sharp edged slits B and B_1, and wooden handle C. (Figure 3)

FIGURE - 3

d. 'Aruvamanai':

'Aruvamanai' selected for this study consisted of an upright steel blade A, that was bent into the form of an arc, fixed on a plank B (Figure 4). The outer edge facing the user of the device was sharpened. The position of the plank was such that while cutting any vegetable using the blade edge, the person could sit on the plank and use.

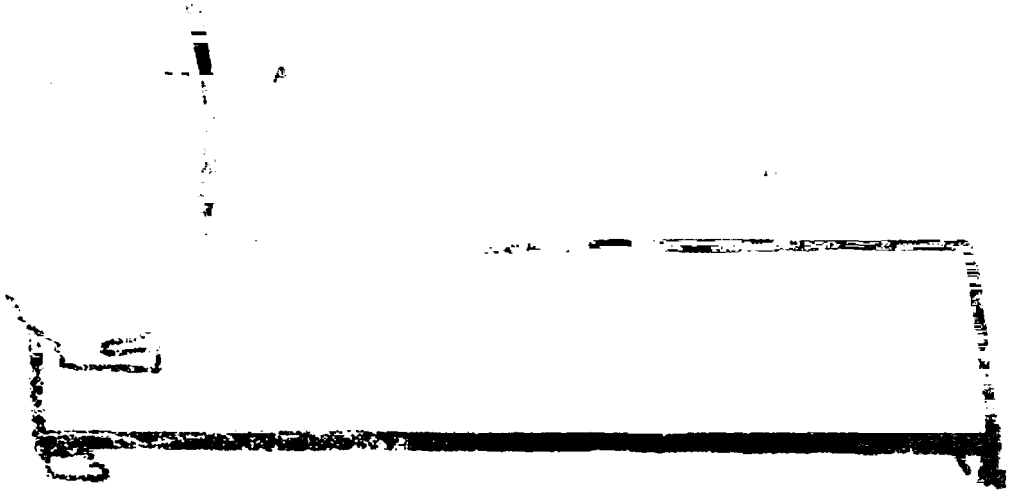


FIGURE 4

ARUVAMANAI

A - STEEL BLADE B - PLANK

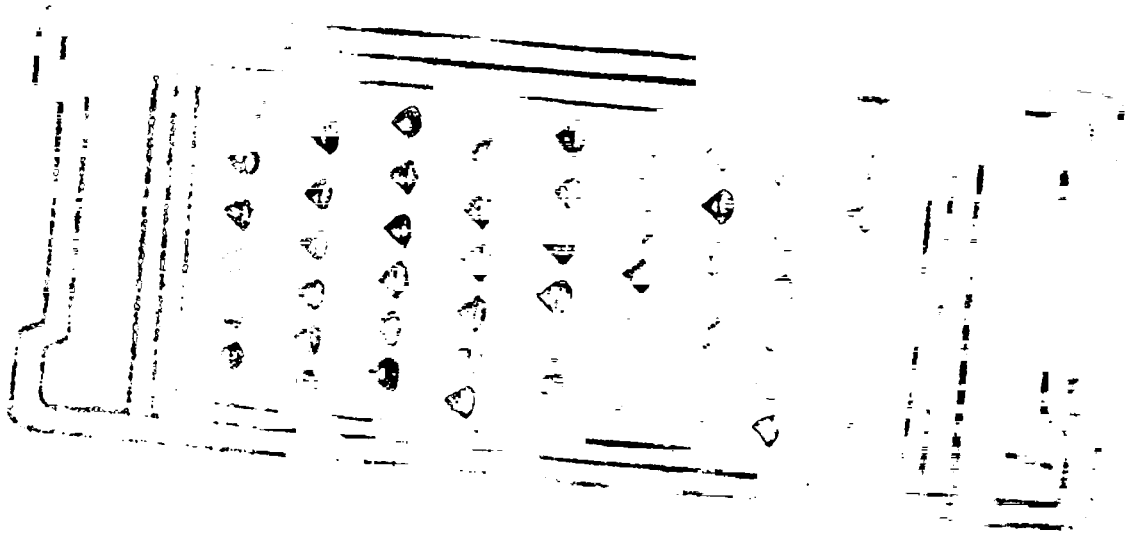
e. Vegetable Slicer:

The Vegetable slicer with stand was selected for experiment. This slicer consisted of a slender knife edge A, fixed to a wooden board B, was at the line of joint with the knife edge (Figure 5).

FIGURE 5

f. Vegetable Grater:

The flat type vegetable grater which was selected for the study consisted of a handle A and drilled holes B, for grating. (Figure 6)



8. Coffee Percolator:

Coffee percolator (Figure 7) consisted of the upper bowl A, with an insulated wooden handle C, to facilitate lifting of the bowl. The upper bowl was provided with lid D, and spout E, for pouring out coffee. In the mouth of the lower bowl B was fitted a perforated metal basket F, which held the ground coffee and a hollow tube G, which extended from the bottom to the upper bowl A.

FIGURE - 1

COFFEE PERCOLATOR

A. UPPER BOWL
B. LOWER BOWL
C. HANDLE
D. LID
E SPOUT
F BASKET

h. 'Poori' Cutter:

The 'poori' cutter consisted of two semi circular discs A and A_1 made of stainless steel sheet of three inches diameter, attached, by means of thick metal wire B to, a wooden handle C. (Figure 8) The discs were placed with their concavity facing outside touching each other at the centre. When one disc completed one circle, the other disc started another circle.

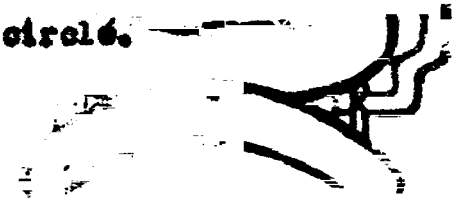


FIGURE 8

POORI CUTTER

[illegible]R DISCS B METAL WIRE

C WOODEN HANDLE

B. Experiments of the Effects of Using the Selected Eight Labour Saving Kitchen Devices on Time Management and Palatability of Foods:

This study on the time expenditure and palatability of foods, involved in the use of the eight selected labour saving kitchen devices, as compared against the controls and to find how far these devices would be helpful in saving time for the middle class homemakers, the following investigations were carried out:

1. A survey on utilisation of time by selected homemakers,
2. Selection and standardisation of the reference meal for the experiments with the eight selected labour saving kitchen devices,
3. Carrying out the experiments,

and 4. Judging the palatability of the foods.

1. A Survey on the Utilisation of Time by Selected Homemakers:

As in the previous cases, this survey also involved the following steps: selection of the survey methods; selection of the sample, framing the interview schedule and the diary and collecting the data. The interview cum diary method as followed by Joules and Pletz (1956)[45] was selected for the survey. The interview schedule and diary are given in Appendix IV.

The sample for this study consisted of 35 homemakers among 40 who were willing to co-operate among the 70 interviewed

with reference to the survey of the labour saving kitchen devices used in the middle class households.

The investigator visited the homemakers individually issued diary sheets and instructed them as how to fill the diary for three consecutive days. They were requested to note the time spent on each household activity as and when performed, without attempting to make the entires from memory. On the following day, the investigator visited each of the homemakers to check the accuracy of the diary recorded and to clear any doubts. The three days' records were collected in person on the fourth day and checked over with the homemakers. It was found that only 35 homemakers were maintaining complete diaries.

2. Selection and Standardisation of the Reference Meal for the Experiments with the Eight Selected Labour Saving Kitchen Devices:

In order to compare the labour saving kitchen devices with the ordinary control devices it was necessary to have all other conditions identical through standardised meals of a day for a reference family consisting of three members.

One set of standardised meals was cooked using the ordinary devices as control and the other identical set by using the selected labour saving kitchen devices. The procedure consisted of:

a. Selection and calculation of the foods required and planning the day's menu.

b. Selection of other equipment and cleaning materials.

c. Preliminary steps for meal preparation.

d. Standardisation of food preparation procedures.

and e. Cleaning of devices and utensils.

a. Selection and Calculation of the Foods Required and Planning the Day's Menu:

From the foods used commonly by the average middle class homemakers in South India, those which were nutritious were selected for inclusion in the meals to be standardised.

The reference family was assumed to consist of one male and two female normal adults doing moderate work. A day's nutritional requirements for this family were calculated from the allowances recommended by Swaminathan et al (1960)[72], shown in the Table III.

TABLE III

DAILY NUTRITIONAL REQUIREMENTS FOR A FAMILY OF THREE ADULT MEMBERS: ONE MALE AND TWO FEMALES ALL DOING MODERATE WORK.

Nutrients	Male	Two females	Total
Calories	3000.0	5000.0	8000.0
Protein in gm.	70.0	130.0	200.0
Calcium in gm.	0.8	1.6	2.4
Vitamin A in I.U.	5000.0	10000.0	15000.0
Vitamin C in mg.	50.0	100.0	150.0
Iron in mg.	15.0	40.0	55.0
Thiamine in mg.	1.0	2.0	3.0
Riboflavin in mg.	1.4	2.4	3.8
Nicotinic acid in mg.	1.0	2.0	3.0

The quantities of foods which would supply the requirements mentioned in Table III, were calculated using Health Bulletin 23, (1962)[73] keeping in view the prevailing cost of foods in Coimbatore markets, as shown in Table IV.

TABLE IV

QUALITY AND COST OF THE FOODS CHOSEN FOR THE DAILY MEALS

Sl. No.	Foods	Quantity	Cost Rs. nP.
1.	Parboiled rice	495 gm.	0-18
2.	Black gram dhal	65 gm	0-10
3.	Curry leaves		0-06
4.	Milk	1½ litre	1-00
5.	Red gram dhal	96 gm.	0-15
6.	Drumstick	96 gm.	0-06
7.	Tamarind	12 gm.	0-06
8.	Raw banana	70 gm.	0-05
9.	Carrot	50 gm.	0-06
10.	Potato	80 gm.	0-10
11.	Coffee powder	30 gm.	0-25
12.	Sugar	50 gm.	0-14
13.	Wheat flour	35 gm.	0-10
14.	Oil	125 gm.	0-70
15.	Condiments: mustard, salt, turmeric powder, dry chillies and bengal gram dhal		0-05
	Total cost		3-07

Using the foods mentioned in the Table IV, the day's menu was drawn, and the labour saving kitchen devices and ordinary control devices to be used were noted as shown in Table V.

Thus it can be seen from the Table V, that all the

Table V

MENU FOR A DAY FOR THE REFERENCE FAMILY

Meals	Items of menu	Labour saving kitchen devices	Ordinary (control) devices
Breakfast:			
	'Idli'	Electric mixer	Grinding stone
	Curry leaves 'podi'	-	-
Lunch:			
	Rice	Steam cooker	Dekshi
	Drumstic 'sambar'	Steam cooker	Dekshi
	Raw banana curry	Vegetable peeler	Knife
		'Aruvamanai'	Knife
		Steam cooker	Dekshi
	Potato chips	Vegetable slicer	Knife
	Carrot salad	Vegetable grater	Knife
	Buttermilk	Electric mixer	Wooden churner
Tea:			
	Coffee	Coffee percolator	Coffee pot
Dinner:			
	'Poori'	'Poori' cutter	Rolling pin and board
	'Sambar' (left over)	-	-
	Milk	-	-

Thus it can be seen from the Table V, that all the preparations in the day's meals excepting milk and curry

leaves 'podi' required the use of labour saving kitchen devices.

b. Selection of Other Equipment and Cleaning Materials:

The equipment needed were: (i) stoves, (ii) measuring equipment and (iii) utensils and cleaning agents.

(i) Stoves: The kerosene stoves identical in all respects costing Rs. 10-50 each were selected since they were used by all the housemakers surveyed. Moreover, their flames could be easily controlled and no fanning or other adjustments were needed.

(ii) Measuring Equipment: The description and purpose of the measuring equipment are given in Table VI.

TABLE VI

DESCRIPTION AND PURPOSE OF MEASURING EQUIPMENT SELECTED FOR THE EXPERIMENT.

Measuring Device	Capacity	Purpose
Hanson's Dietetic Scale	Graduated to 50 grams	Weighing ingredients
Glass Measuring cup	Graduated to 250 millilitres	Measuring the volume of liquids
One set of plastic Measuring spoons	¼ teaspoon to 1 tablespoon	Measuring seasonings
Time piece with second hand	—	Measuring time

From the Table VI, it may be noted that measurements of weight, volume and time were done as accurately as possible.

(iii) Utensils and Cleaning Agents: Description of the basic utensils used for the experiment and cleaning agents used for the utensils selected for the experiment are given in the Table VII.

TABLE VII

DESCRIPTION OF THE UTENSILS AND CLEANING AGENTS SELECTED FOR THE EXPERIMENT.

Utensil	Metal	Number	Capacity in litres	Diameter in cm.	Purpose	Cleaning agents
1. Dekshi	Stainless steel	1	1.5	15	Boiling milk and churning	Soapnut powder, sifted ash and 'vim'.
2. Dekshi	-do-	1	0.9	8	Soaking and washing rice, and black gram dhal	-do-
3. Dekshi	-do-	1	0.9	8		-do-
4. Vanali	Cast iron	1	0.3	22	Steaming 'idli' and frying 'poori'	-do-
5. Dome shaped lid	Brass	1	—	22	Covering vanali	Tamarind, sifted ash and soapnut powder
6. Idli Plate	Brass - tinned	1	—	20	Steaming 'idli'	-do-
7. Frying pan	Aluminium	1	0.75	17	Seasoning	Soapnut powder
8. Dekshi	Stainless steel	1	1.8	16	For washing rice	Soapnut powder and 'vim'
9. Ladles	-do-	4	—	—	Stirring, mixing food, removing 'poori'	-do-
10. 'Katori'	-do-	1	0.15	4	Keeping butter	-do-
11. Rolling board	Marble	1	—	24	Rolling 'poori'	Soapnut powder
12. Rolling pin	Wood	1	—	—	Rolling 'poori'	-do-

From the Table VII it may be seen that only the minimum number of the basic utensils were selected for the experiment. The common household cleaners such as soapnut powder, 'vim', sifted ash and tamarind were used for cleaning the utensils. Figure 9 presents the further description of the basic equipment.

9. Preliminary Steps for Meal Preparation:

The preliminary steps for meal preparation procedure consisted of standardisation of

i. Purchasing the foods and fuel for the period of experimentation

and ii. Regulation of stoves.

i. Purchasing of foods and fuel for the period of experimentation: It was estimated that 20 sets of daily meals would require to be prepared for standardisation and experimentation with and without the use of labour saving kitchen devices. On this basis, the required quantities of par boiled rice, red gram dhal, black gram dhal, bengal gram dhal, whole wheat flour, coffee powder, salt, sugar, turmeric powder, dry chillies, mustard, tamarind, oil and potatoes were purchased in one lot as shown in Appendix V. The provisions after cleaning were stored in containers, and potatoes in a basket.

Milk, raw banana, carrot, drumstick, curry leaves

and green chillies were purchased daily because of their perishable quality. Kerosene was bought in a sealed tin of four litre capacity.

ii. Regulation of Stoves: At the beginning of the experiments, both the stoves were filled with the same quantity of kerosene, and length of each wick was adjusted.

As described by Pushpa (1962)[74] the regulation of flame was done by adjusting the wick regulator to the mid position of the groove of the wick control as shown in the Figure 10. At the tip, the wicks were adjusted to be in level with the tips of the wick tube in which the wicks were inserted so that they were visible outside and were trimmed. The wick regulator was then raised on the groove as shown in Figure 10a. That was the maximum intensity to which the flame could be raised when the need arose. The wick regulator was then lowered as shown in the Figure 10 b, whenever the flame had to be maintained at the minimum intensity. From the trial experiments conducted, it was noted that the middle point was the ideal position of the wick to get the blue flame. (10c)

d. Standardisation of Food Preparation Procedures:

The procedures for preparing the individual items of daily meals were standardised as follows, using labour saving devices and the ordinary devices as control.

i. Separating butter: Milk was boiled and cooled and two teaspoons of curds were added to it. This mixture was divided into two equal portions and allowed to set for 12 hours. One portion was churned using the electric mixer and the time taken to separate the mixture, quantity of butter, which was 32 grams were noted and recorded. The other portion was churned with the wooden churner until 32 grams of butter was separated and the time taken noted.

ii. 'Idli': Rice weighing 195 grams, and black gram dhal weighing 65 grams, the established proportion of 3:1 were soaked separately in one litre of cold water which was sufficient. The preliminary trials showed that, soaking for four hours gave the softness required for grinding. After four hours of soaking, the rice was washed three times, using three litres of water, and the black gram dhal washed eight times to remove all the black husk, using eight litres of water.

In the electric mixture, rice was ground with 250 millilitres of water, until the required texture was obtained and the time taken was noted. The black gram dhal was ground similarly using 125 millilitres of water.

For the control, same quantity of rice and black gram dhal were soaked and washed in the same manner and ground in the grinding stone separately, using the same amount of water. The number of revolutions and time taken for grinding were recorded.

USED

ONE SET OF BASIC UTENSILS FOR THE EXPERIMENT

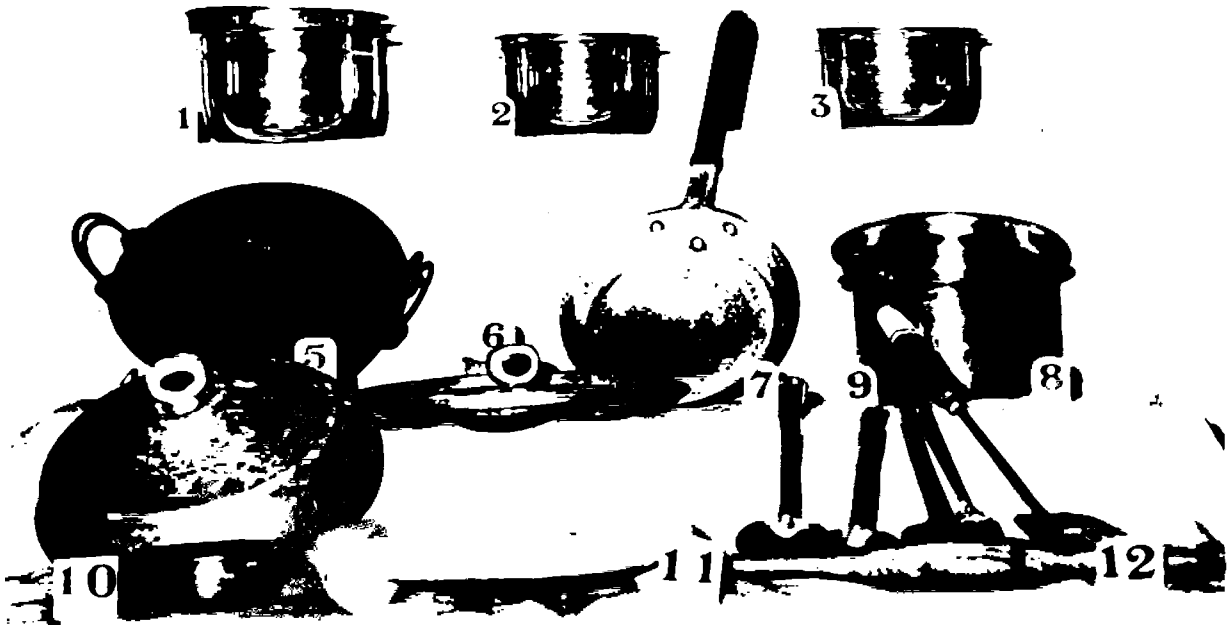


FIGURE 9

1,2,3 and 8	- Dekshies	4	- 'Vanali'
5	- Dome shaped lid	6	- 'Idli' plate
7	- Frying pen	9	- Laddles
10	- 'Katori'	11	- Rolling board
12	- Rolling pin		

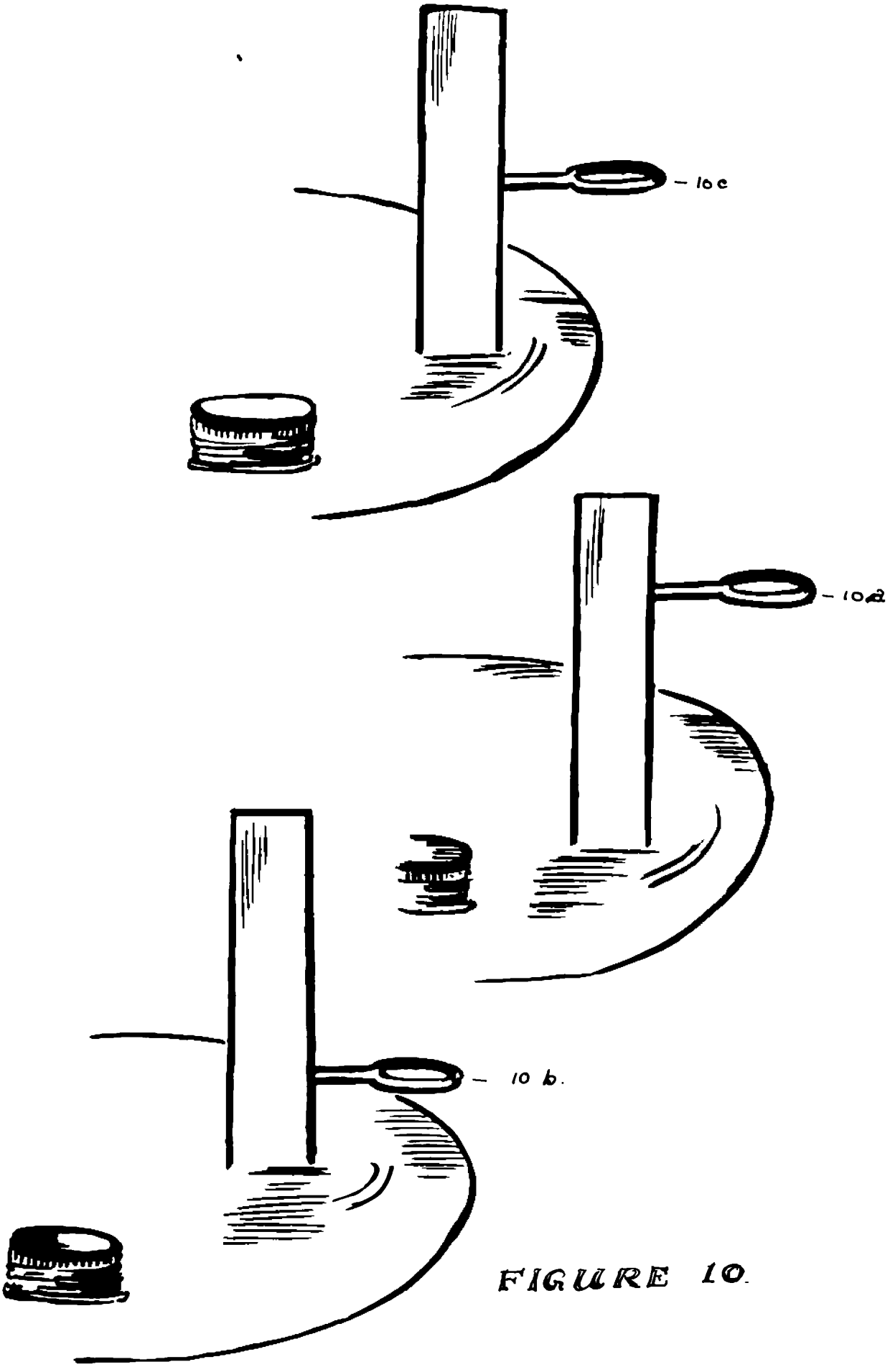


FIGURE 10.

REGULATION OF THE FLAME OF THE STOVE.

In both the cases, the ground rice and black gram dhal were mixed well with the salt and allowed to ferment for 18 hours. At the conclusion of 18 hours, 'idlies' were steamed in the following manner:

Three cups of water were taken in the 'vanali' and placed on the fire. A clean white wet cloth was spread over the 'idli' plate, one third cup of batter was poured in the three depressions. When water in the 'vanali' started boiling the 'idli' plate with the batter was placed in the 'vanali' and closed tightly with the dome shaped lid. The plate was removed from the 'vanali' when the steaming of 'idli' was complete, which took 25 minutes.

iii. Rice, 'Sambar' and raw banana curry: For experiment, rice 'sambar' and raw banana curry were cooked simultaneously. In the outer vessel A of the steam cooker (Figure 2), one third litres of cold water was taken. Rice weighing 300 grams was washed three times with two litres of cold water. It was placed in the rice container 'B' of the steam cooker, adding one litre of cold water. For 'sambar', red gram dhal weighing 96 grams was taken with ⅓ one third litre of water in the dhal container 'C' of steam the cooker. Tamarind juice extracted from 12 grams of tamarind and quarter litre of water was boiled for 10 minutes. Drumstick was cut into five centimeter pieces with the 'aruvamanai', mixed with tamarind juice and sambar powder (Appendix VI) and taken in

the container E (Figure 2). Raw banana weighing about 70 grams was taken and cut vertically into two equal halves. The skin of one piece of raw banana was peeled off by using the peeler and time was noted. The weight of the peelings was approximately 10 grams. The peeled raw banana was cut into pieces of approximately one cubic centimeter in size using the 'aruvamanai'. The time consumed was noted and recorded. Oil was heated in a frying pan and mustard seeds were added. When the mustard seeds burst the black gram dhal and dry chillies were added. Then salt solution and cut banana were added and the contents were transferred to the container E (Figure 2). The containers of the steam cooker were arranged in order, dhal rice drumstick and raw banana from bottom to top and covered with covering vessel and placed over the fire. The sambar after removing from the steam cooker was seasoned and boiled for 10 more minutes.

Rice, sambar, and raw banana curry were prepared individually using the ordinary control devices as described below:

Rice was cooked as described by Pearson (1954)[75] using only enough amount of water which will be absorbed so that the maximum of nutrients would be preserved (F.A.O., 1957)[76]. The quantity of water required for cooking was standardised as one and a quarter litres for 300 grams of rice. Washed and drained rice was added to the cold water in a dekshi and placed

on fire for cooking. Cooking was started in cold water to similate the conditions of steam cooker. The utensil was kept partially covered while cooking to prevent cooking water boiling over.

Sambar was prepared as per the recipe given in Appendix VII. The pieces of raw banana kept aside was peeled using the knife. The weight of peelings was about 21 grams. Raw banana was cut into one cubic centimeter pieces by using the knife and the time consumed for it was noted. Raw banana curry was prepared as given in the Appendix VIII. Time taken was noted.

iv. Carrot Salad: The volume of the whole carrot was determined by the method of displacement of water. The carrot was grated by using the grater. The volume of the grated carrot, and the time taken for grating were noted. Another carrot of the same volume was chopped by using the knife till the volume of the chopped carrot was about the same as that of the grated carrot. The time consumed was recorded. The grated carrot, in both cases, was seasoned with mustard, salt mixed with and 125 millilitres of curds.

v. Potato Chips: Potato weighing about 80 grams was sliced. Approximately 33 slices were obtained by using the slicer as labour saving kitchen device. Another potato of the same weight was sliced into the same number of slices of the same thickness by using the knife. The time for slicing was also noted.

The potato slices in both cases were fried in oil. Chilli powder and salt were sprinkled over the chips.

vi. Coffee: Coffee powder weighing 30 grams was taken in the perforated metal basket of the percolator. A quarter litre of water was taken in the lower bowl of the percolator and kept on the fire. After about eight to ten minutes, the decoction came to the upper bowl and the percolator was removed from the fire. In the coffee pot, 30 grams of coffee powder was taken, and quarter litre of boiling water poured on the coffee powder and allowed to settle till a clear decoction was obtained. The time taken was noted.

vii. 'poori': Whole wheat flour weighing 190 grams, eight grams of salt and half litre water were mixed thoroughly to make dough for 'poori'. Time taken for mixing was recorded. Then the dough was kept aside for half an hour. The dough was divided into two equal portions. One portion was spread wholly on the rolling board to cut into 'poori' by using the 'poori' cutter. The number of 'pooris' made and the time consumed were noted. The other portion of the dough was made into the same number of 'pooris' as in the first case using the rolling pin as ordinary control device. The time taken was noted. The 'pooris' were fried in oil in both cases.

8. Cleaning of Devices and Utensils:

Vegetable peeler, 'aruvamanai', vegetable grater, vegetable slicer and 'poori' cutter were soaked in a suspension

of soap nut powder in water, using six teaspoons of soap nut powder and eight litres of soft water, for three minutes. These were rinsed in cold, soft water and 'vim' was applied on them and scrubbed twice. Then the devices were washed and rinsed thoroughly in cold water and dried.

Steam cooker was cleaned by applying tamarind, sifted ash and soap nut powder, and by scrubbing till it became bright and clean. Stainless steel plates and other utensils were also cleaned in the same way. Finally, all devices and utensils were rinsed in soft cold water. The quantities of cleaning agents used and the time taken for these various washing and cleaning activities were standardised as shown in the Appendix IXa and IXb.

5. Carrying Out the Experiments:

Thus two identical standardised meals were cooked, one using the selected labour saving kitchen devices and the other using the ordinary control device. The time taken to cook each item as well as the entire meals, and time taken to clean the equipment were recorded. Four replicates were carried out and the products were tasted by a panel of five judges. The ease of operation of each device was recorded.

6. Judging the Palatability of the Foods:

Any food to be satisfactory must be palatable, whatever may be the device used or method of cooking applied. The

different steps used to carry out the test were selection of taste panel, forming score cards and administering the palatability test.

A panel of five judges was selected for judging the palatability of cooked foods after administering 'Triangular Test' as described by Love (1955)[71] with cooked red gram dhal, to ten Home Science graduates of age range 25 to 30.

Score cards as shown in the Appendices X to XVII were developed on a three point scale, for each preparation.

The judges were seated in a well lighted and well ventilated room, the foods were served on white porcelain quarter plates. The score cards were given to judges and they were instructed to test the product for the different qualities and mark on the score cards according to the directions given to them. The scores were consolidated and analysed.

IV. RESULTS AND DISCUSSIONS

The data analysed are discussed under the following heads:

A. The labour saving kitchen devices used by the homemakers.

B. The utilisation of time by homemakers.

C. Comparison of eight selected labour saving kitchen devices with ordinary devices as control.

A. Use of labour saving kitchen devices used by the homemakers:

The study of the pattern of use of devices by homemakers three aspects are considered namely, 1. The cost of devices, 2. Age of the homemaker, and 3. Trend in use.

1. Cost of the devices:

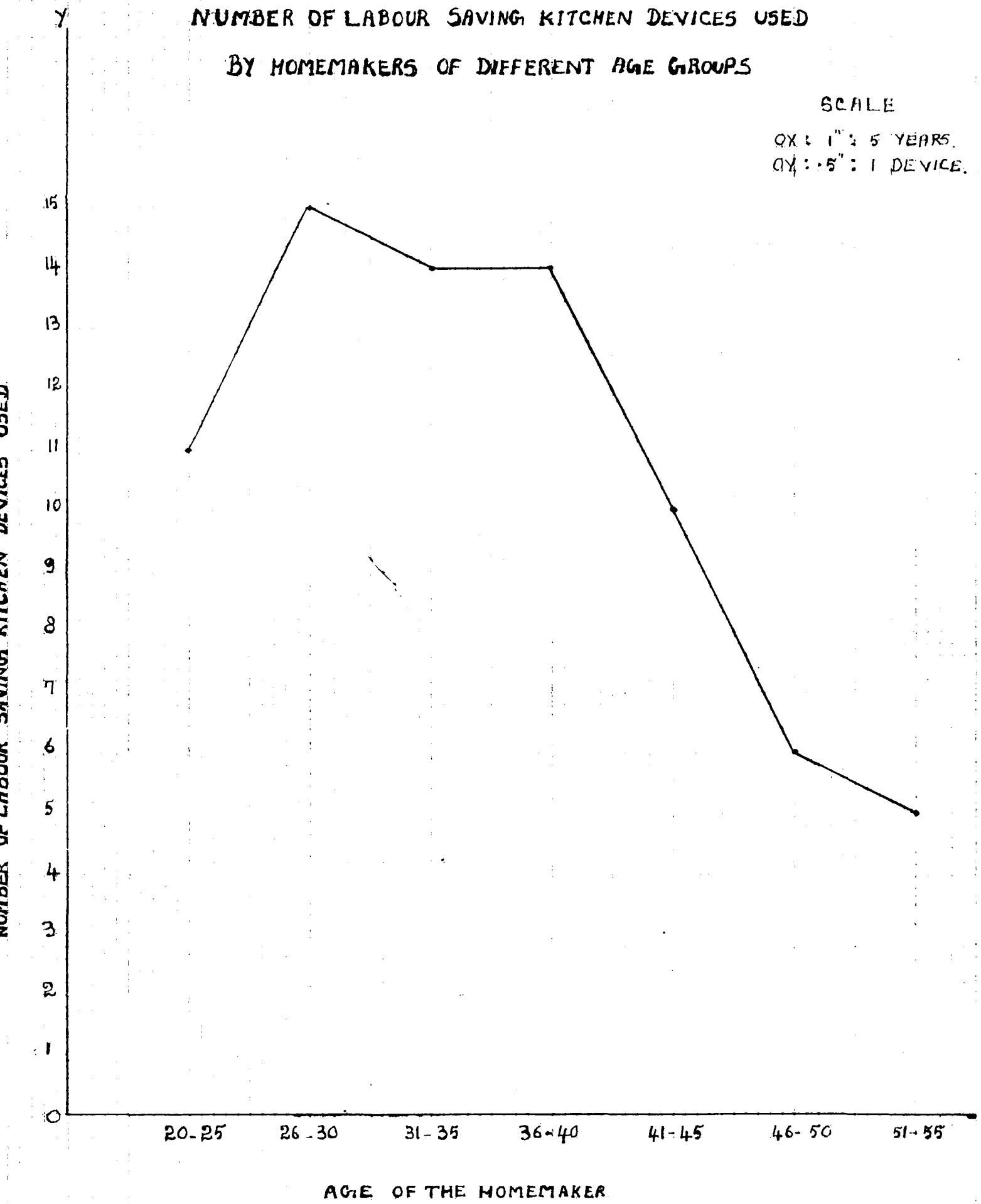
Results indicate that the less expensive the devices, the greater is the number of homemakers using it. The rank correlation coefficient computed for the number of devices available in the home correlated with the cost of the device is significant at one per cent level as given in the Appendix XVIII. Hence cost seems to be an important criteria in selection of the labour saving kitchen devices.

2. Age of the homemakers and the number of devices used:

Figure 11 gives the number of devices used by the homemakers of different age groups. It can be noted from figure 11 that there is a relationship between the age group of the homemakers, and the number of labour saving kitchen devices

FIGURE 11

NUMBER OF LABOUR SAVING KITCHEN DEVICES USED BY HOMEMAKERS OF DIFFERENT AGE GROUPS



possessed by them. The homemakers of age 20 to 25 possess only 11 labour saving kitchen devices, which may be because they have just started their homes and are still collecting labour saving kitchen devices. They may not yet be much pressed for time or interested to save time by using labour saving kitchen devices. The homemakers of age 26 to 30, 31 to 35 and 36 to 40 possess greater number of devices. This may be because they are managing expanding families and have great demand for time and so are eager to use many new modern devices.

The homemakers of age 41 to 45, 46 to 50 and above use less number of devices, especially the devices of recent origin which may not have made an impact on them in their youth. Due to habit they may not have the incentive to buy them new. Devices such as coffee bean roaster and coffee bean grinder are available only among the elder homemakers.

The younger homemakers seem to prefer to buy coffee powder as such thus relegating some of the home preparations to commercial agencies.

3. Trend in Use:

Of the available 18 labour saving kitchen devices 'Kruvmannai', coffee filter, coffee percolator and pressure cooker are used daily. Vegetable slicer, grater and peeler,

steam cooker, coffee bean roaster, poori cutter and electric mixer are used frequently whenever the need arises. Bread toaster, fruit squeezer, rotary beater, 'muruku' mould, and 'sevi' mould are used occasionally.

B. The Utilisation of Time by Homemakers:

Time spent by 35 selected homemakers on household activities with special reference to cooking is discussed as:

1. Time spent in cooking in relation to number of members in the household.
2. Time spent in cooking in relation to three stages of family life cycle.

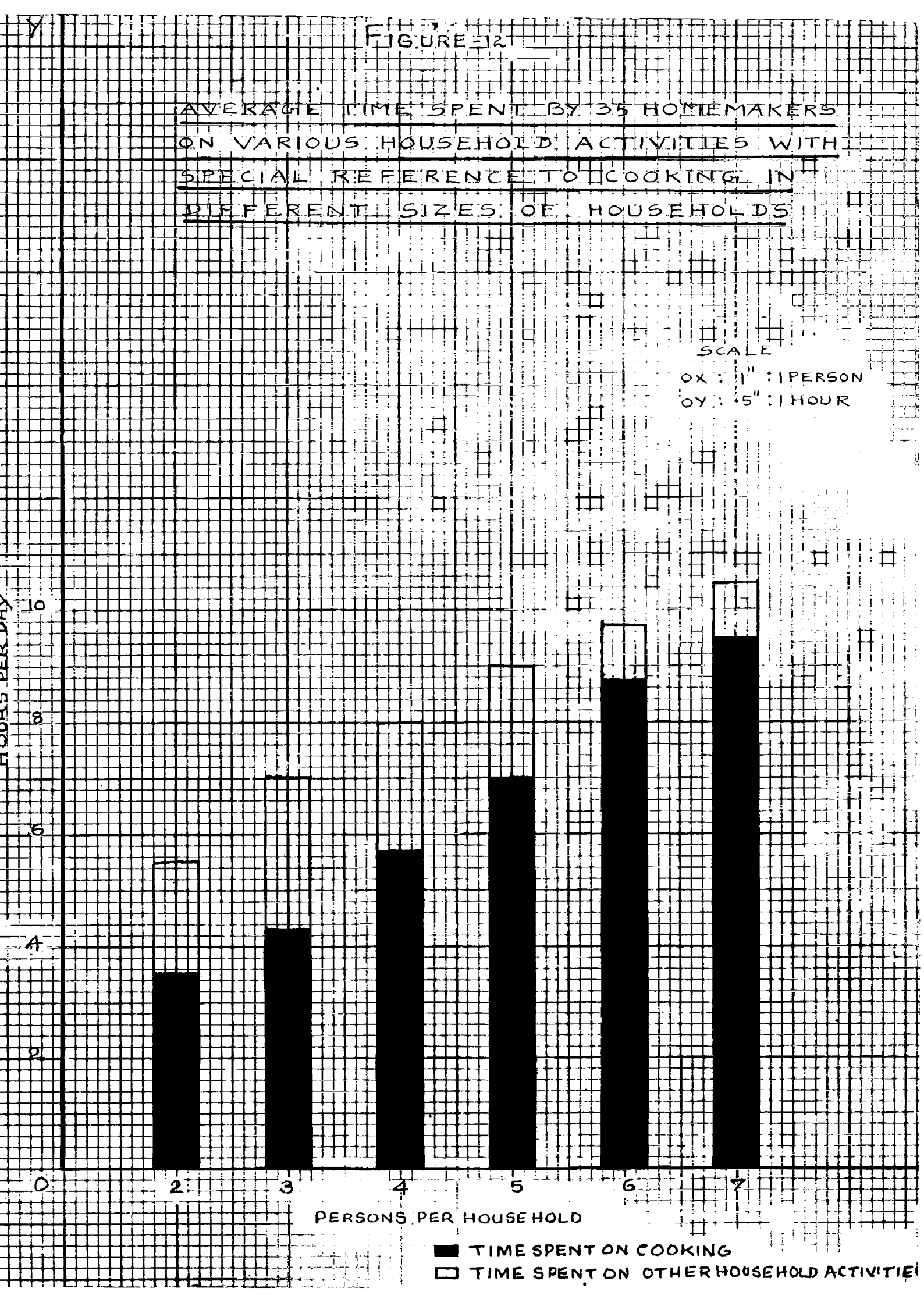
1. Time spent on Cooking in Relation to Number of Members in the Households:

The average time spent by 35 homemakers on various household activities with special reference to cooking in households of different sizes is presented in Figure 12. From Figure 12 it may be seen that the time spent on total household activities including cooking and cooking alone increases rapidly along with the number of members in the family upto five members in the household. The increase is less rapid when the household size further increases.

The increase of time may be entirely attributed to cooking alone, as seen from Figure 12. The rank correlation co-efficient computed the percentage of time spent for cooking is perfect and the value is one is given in the Appendix XIX

FIGURE-12

AVERAGE TIME SPENT BY 35 HOMEMAKERS ON VARIOUS HOUSEHOLD ACTIVITIES WITH SPECIAL REFERENCE TO COOKING IN DIFFERENT SIZES OF HOUSEHOLDS



It may be concluded that the percentage of time spent on cooking increases as the number of family members increases. This may be due to the larger quantity of foods to be cooked and special foods prepared for some members such as children and elders. The result is in keeping with the observation of Davies and Diets (1956)[45].

2. Time Spent on Cooking in Relation to the Three Stages of Family Life Cycle:

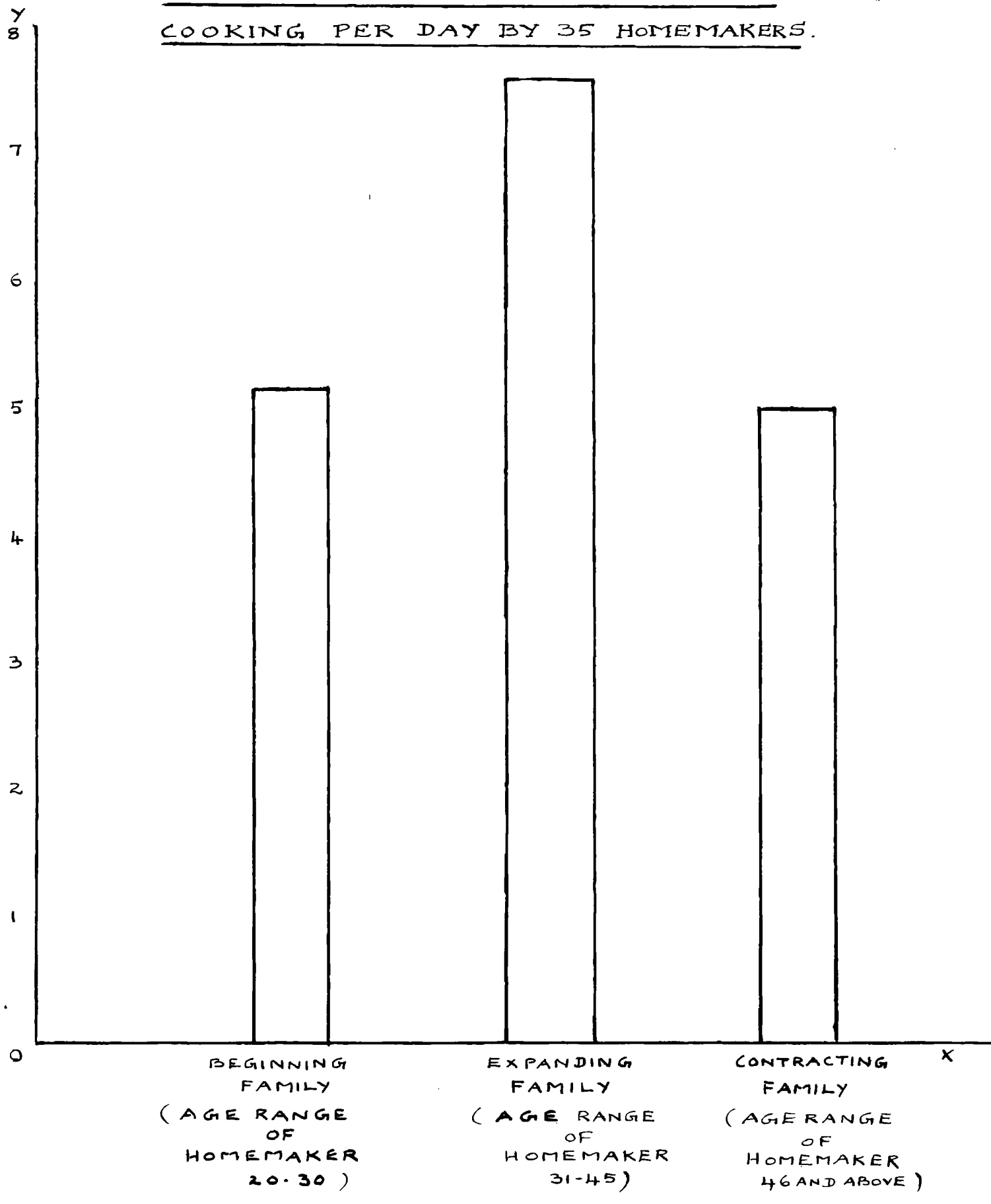
Effect of the family life cycle on the average time spent per day on cooking by 35 homemakers is presented in the Figure 13. From the Figure 13 it may be noted that the time spent on cooking by the homemakers in expanding family is significantly greater than that of the beginning and contracting family.

The value of X^2 computed for the 2 X 2 contingency Table (Guilfort, 1956)[77] establishes the fact that time spent on cooking is affected by the family life cycle (Appendix XX).

In the expanding family, the homemakers spend maximum time on cooking which is probably due to the number of family members being large, requiring larger quantity of food to be prepared. In the contracting families, the homemakers spend comparatively less time on cooking than others, probably due to less number of family members or because there may not be children needing any special food or the menu being simple to suit the elders. The shorter time may be also due to

FIGURE - 13

EFFECT OF THE FAMILY LIFE CYCLE ON THE AVERAGE TIME SPENT ON COOKING PER DAY BY 35 HOMEMAKERS.



greater skill in cooking developed by practice.

2. Comparisons of Eight Selected Labour Saving Kitchen Devices with Ordinary Devices as Control:

In order to assess the usefullness of each labour saving kitchen device comparison of the eight labour saving kitchen devices are made in relation to:

1. Time taken for cooking a reference meal,
2. Palatability of cooked food,
3. Time taken for washing

and 4. Ease of operation.

1. Time Taken for Cooking a Reference Meal:

The average time taken for preparing the standardised meals for a day for the reference family using the labour saving kitchen devices and ordinary control device is given in Table VIII.

TABLE VIII

AVERAGE TIME TAKEN FOR PREPARING THE MENU USING LABOUR SAVING KITCHEN DEVICES AND ORDINARY CONTROL DEVICES

Menu	Labour saving kitchen devices involved	Time taken in minutes	Ordinary control devices	Time taken in minutes	Time difference in minutes	F
Buttermilk	a. Electric mixer	11.75	Wooden churner	21.9	10.15	420**
'Idli'	b. Electric mixer	33.049	Grinding stone	116.649	17.6	14.5**
Rice, Sambar, Raw Banana Curry.	Steam cooker Vegetable peeler 'Aruvamanai'	81.390	Sekshi Knife Knife	133.038	51.218	68.8**
Potato chips	Vegetable slicer	6.466	Knife	9.15	2.684	90.8**
Carrot salad	Vegetable grater	2.735	Knife	7.86	6.065	72.34**
Coffee	Coffee percolator	13.876	Coffee Pot	14.81	0.934	0.15
'Poori'	'Poori' cutter	13.349	Rolling board and pin	13.57	-0.779	.65
		235.165		322.037	[illegible].872	

Rice, 'sambar' and raw banana curry are cooked simultaneously in steam cooker.

** Significant at .01 level.

* Significant at .05 level.

Thus the labour saving kitchen devices are significantly superior to the ordinary control devices as regards the saving of total time of cooking the whole meals as indicated in Table VIII. Saving of time is significant in the case of electric mixer , steam cooker, vegetable slicer and grater, though the saving of time is not significant in the case of coffee percolator and poori cutter, yet and the quality of the product being superior to that obtained by the use of ordinary control devices justifies its selection. Statistical analysis of data are given in the Appendix XXI.

2. Palatability of Cooked Food:

The average of scores obtained for the different qualities of the items prepared using labour saving kitchen devices are given in Table IX.

TABLE IX.

AVERAGE SCORES OF PALATABILITY OF 'IDLI', RICE, 'SAMBAR, RAW BANANA CURRY, POTATO CHIPS, CARROT SALAD, COFFEE DECOCTION AND 'POORI'.

Preparations.	Quality	Average Scores.	
		Labour Saving Kitchen Devices	Ordinary Control Devices.
'IDLI'	Colour	2.40	1.0
	Doneness	3.00	2.75
	Taste	2.60	2.25
	Odour	3.00	2.90
	Texture	2.30	1.40
	Separateness of grains	2.95	2.50
RICE	Colour	2.60	2.60
	Separateness of grains	2.50	1.95
	Doneness	2.60	2.50
	Taste	2.95	2.10
	Odour	2.85	2.45
	Fluffiness	2.15	1.45
'SAMBAR'	Colour	2.25	1.75
	Doneness	2.70	2.30
	Taste	2.65	2.50
	Odour	2.35	2.25
RAW BANANA CURRY	Taste	2.15	1.85
	Doneness	2.9	1.80
	Texture	2.45	2.05
	Odour	2.75	2.30
POTATO CHIPS	Colour	2.95	2.20
	Taste	2.90	2.15
	Thickness	2.95	2.25
	Texture	2.85	2.40
CARROT SALAD	Colour	2.43	2.40
	Shape(Carrot)	2.70	1.70
	Texture	2.30	2.80
	Taste	2.80	2.35
COFFEE DECOCTION.	Colour	2.50	2.35
	Taste	2.90	2.20
	Flavour	2.35	1.88
	Appearence	2.80	2.25
'POORI'	Colour	3.00	1.80
	Taste	2.65	2.25
	Doneness	2.90	2.35
	Shape	2.55	1.45
	Texture	2.45	2.05

From Table IX and the summary of analysis of variance, Appendix XXII, it may be noted that, in the use of labour saving kitchen device, all the products have higher scores than those prepared with ordinary control device except in case of texture of carrot salad which was grated too finely by the grater. The superiority in colour of all the products may be due to less handling of foods as when prepared with electric mixer, slicer, grater; uniformity of the product, as in case of slicer, grater, 'poori' cutter, retention of flavour in case of steam cooker and coffee percolator, produce better quality.

3. Time taken for washing:

The time taken for washing the labour saving kitchen devices and ordinary control devices, as per the procedure described on Page 54, is found to be limited. Hence the total time for washing all the devices is considered and given in Table X.

TABLE X

TIME TAKEN FOR WASHING THE LABOUR SAVING KITCHEN DEVICES AND ORDINARY CONTROL DEVICES

Replicates	Time in Minutes		
	Labour Saving Kitchen Devices	Ordinary devices	Difference
	A	B	B-A
1	17.5	16	-1.5
2	18.5	17.5	-1
3	18.5	17	-1.5
4	18	16	-2
Average	18.1	16.6	-1.5

From Table X it may be noted that the time taken to wash the labour saving kitchen devices is slightly greater though statistically not significant at 5%. The slightly higher consumption of time is due to extra attention required in cleaning the different parts of the labour saving kitchen devices to prevent food particles from lodging in the crevices. The data presented in Table X are statistically analysed and the analysis of variance applied to the scores are given in Appendix XXIII.

4. Ease of Operation:

Operating the electric mixer is recorded to the convenient and simple whereas grinding in the stone grinder is very laborious and needs special skill. The manipulation of electric mixer is simple when compared with the wooden churner which needs some experience.

Use of steam cooker is simple. As three items can be prepared simultaneously, the work place is less cluttered, and all the three foods are kept hot till serving time. The vessels in which the foods are kept could be used as serving dishes, since the outer surface is clean and bright and thus eliminating use of an extra set of serving dishes.

In the case of grater as the pressure is applied downwards in a rhythmic manner it is easier to operate than knife. When carrot is cut with knife it is first cut into strips longitudinally and later across to produce small bits involving change in movements in different directions.

Ease of use of slicer is similar to knife. However even a novice can produce uniform slices with the slicer whereas training is needed for the use of knife.

V SUMMARY AND CONCLUSIONS

1. A scientific study was undertaken to assess the use of labour saving kitchen devices.

2. The availability of labour saving kitchen devices in 70 selected households and 10 local shops formed the basis of selection. Electric mixer, steam cooker, vegetable peeler, 'Aruvamanai', vegetable slicer, vegetable grater, coffee percolator and 'poori' cutter were selected for the experimentation.

3. Experiment on the eight selected labour saving kitchen devices was conducted by preparing two sets of identical reference meals for three adult members for a day, one set using the selected labour saving kitchen devices and the other using ordinary control devices. The time taken to prepare each series of meals, palatability of the cooked foods, time taken for washing and ease of operation were noted.

4. A saving of one hour and twentyseven minutes of cooking time was obtained through the use of selected labour saving kitchen devices. The washing of labour saving kitchen devices consumed only one and a half minutes more than that of controlled devices.

5. In palatability, the foods prepared with the labour saving kitchen devices were found to be superior to those of

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APPENDIX 1

INTERVIEW SCHEDULE FOR APPRAISAL OF LABOUR SAVING KITCHEN DEVICES USED BY SELECTED GROUP OF HOMEMAKERS IN COIMBATORE

Address	Family members	Age	Sex	Educational level	Income per month
15. Percolator					
16. Rotary beater					
17. Wooden churner					
18. Electric Mixer					
19. Coffee bean roaster					

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APPENDIX II

INTERVIEW SCHEDULE FOR MARKET SURVEY.

ADDRESS:

Labour saving kitchen devices	Number of designs available	Material used	Make	Cost.
1. Steam Cooker				
2. Pressure cooker				
3. 'Iruvamanai'				
4. Knife				
5. Peeler.				
6. Vegetable Grater				
7. Vegetable Slicer				
8. Fruit squeezer.				
9. 'Poori' cutter.				
10. Bread toaster.				
11. 'Muruku' mould.				
12. 'Savi' mould.				
13. Coffee bean grinder.				
14. Coffee filter.				
15. Percolator.				
16. Rotary beater.				
17. Wooden churner.				
18. Electrical Mixer				
19. Coffee bean roaster.				

APPENDIX XII

DETAILS OF LABOUR SAVING KITCHEN DEVICES AVAILABLE IN THE MARKET.

Labour saving kitchen devices.	Designs	Material used	Cost	
			Indian make	Foreign make
			Rs. nps.	Rs. nps.
1. 'Uruvamanai'	3	Steel	1-50	---
2. 'Muruku' mould	3	Brass	3-50	---
3. Wooden churner	2	Wood	1-50	---
4. Vegetable slicer.	4	Steel	1-50	---
5. Vegetable grater.	4	Steel	0-75	---
6. Coffee filter	1	Brass	7-86	---
		Stainless Steel	18-50	---
7. 'Kavi' mould	2	Brass	5-50	---
8. Vegetable peeler	3	Stainless Steel	1-90	---
9. Coffee bean roaster	1	Steel	4-25	---
10. Steam cooker	3	Brass	65-75	---
11. 'Poori' Cutter	1	Stainless Steel	2-90	---
12. Coffee percolator	3	Aluminium	14-19	14-20
13. Pressure cooker	2	Aluminium	98-30	105-60
14. Coffee bean grinder	1	Iron	30-90	35-75
15. Bread toaster	2	Stainless Steel	2-70	3-20
16. Fruit squeezer	4	Glass	1-20	2-15
		Steel	3-20	
17. Electric mixer	1		180-80	420-20
18. Rotary beater.	2	Stainless Steel	3-20	4-75

APPENDIX IV

INTERVIEW SCHEDULE AND DIARY FOR THE HOMEMAKERS TO RECORD TIME SPENT ON HOUSEHOLD ACTIVITIES

Address	Family members	Age	Sex	Income per month

First Day _____ Date _____

Activities done	Time consumed

Second day Date

Activities done	Time consumed

Third day Date

Activities done	Time consumed

APPENDIX V.

TOTAL QUANTITY OF INGREDIENTS BOUGHT FOR THE EXPERIMENT.

Ingredients	Quantity in gms.
Par boiled rice	9900
Red gram dhal	1920
Black gram dhal	1300
Bengal gram dhal	13
Whole wheat flour	1900
Coffee powder	600
Salt	400
Sugar	1000
Turmeric powder	10
Dry chillies	10
Mustard	5
Oil	2500
Potatoes	1600

APPENDIX VI

SAMBAR POWDER.

Ingredients.	Quantity.
Asafoetida.	3 gms.
Pepper.	6 "
Red chillies.	93 "
Coriander seeds.	183 "
Black gram dhal.	61 "
Bengal gram dhal.	55 "
Red gram dhal.	55 "
Fenugreek.	6 "
Dried curry leaves.	2 "
Turmeric.	6 "

Method:-

1. Dry ingredients well in the sun for 4 hours.
2. Powder all ingredients.
3. Store in dry container.

APPENDIX VII

Preparation.	DRUMSTICK SAMBAR.
Number of Servings.	THREE.
Approximate Time.	30 MINUTES.

Ingredients.	Description.	Quantity.
Redgram dhal.	Washed.	3½ ozs.
Drumstick.	cut into 1inch piece.	66 grams.
Oil.	---	1 teaspoon.
Mustard.	---	½ teaspoon.
Tamarind.	Juice-extracted.	
'Sambar power'.		1½ tablespoon.
Salt.	---	12 grams.
Water.	---	5½ cups.

Method:-

1. Heat oil, add mustard.
2. When mustard starts bursting, add green chillies and water.
3. When water starts boiling, add dhal.
4. Add drumstick pieces when dhal is cooked.
5. After about 10 minutes add tamarind juice, salt, sambar power.
6. Allow it to boil for about 10 minutes.
7. Remove from the fire.

APPENDIX VIII

Preparation. RAW BANANA CURRY.

Number of Servings. THREE.

Approximate Time. 8 MINUTES.

Ingredients.	Description.	Quantity.
Raw banana.	Chopped into pieces of 1 cm.	70 grams.
Oil.	---	1 teaspoon.
Mustard.	---	1 gram.
Black gram dhal.	---	2 grams.
Dry chillies.	Split into pieces.	1

Method:-

1. Heat oil and add mustard.
2. When mustard bursts, add chillies and blackgram dhal.
3. Add water.
4. When water commences boiling, add raw banana pieces and water.
5. Cook till tender.

APPENDIX IX a

THE QUANTITY OF CLEANING AGENTS USED FOR WASHING THE DEVICES

Type of devices	Cleaning agents used	Quantity
Labour saving kitchen devices		
Electric mixer (Glass container)	Seapnut powder	1 teaspoons
	Vim	1 teaspoons
Steam cooker	Tamarind	4 grams
	Seapnut powder and sifted ash	2.5 teaspoons
Vegetable peeler, 'Thuruvanaal', Vegetable slicer, Vegetable grater, Coffee percolator, 'Puttu' cutter	Seapnut powder	3 teaspoons
	'Vim'	3 teaspoons
Ordinary control devices:		
Grinding stone	-	-
'Dekshies', Knives, Coffee pot	Tamarind	4 grams
	Sifted ash and seapnut powder	3 teaspoons
Rolling pin and board	Seapnut powder	.5 teaspoons
Basic utensils:		
Dekshi, 'Vanali', 'Idli' plate and cover, Stainless steel ladles and plates	Tamarind	6 grams
	Seapnut powder	4 teaspoons
	sifted ash	6 teaspoons

APPENDIX IX b

TIME TAKEN FOR VARIOUS ACTIVITIES IN WASHING THE DEVICES

Type of devices	Activities done	Time taken in minutes
Labour saving kitchen devices:		
Electric mixer	Applying 'Vim'	.1
	Rinsing	.3
Vegetable peeler 'Koruvamanai' Vegetable slicer Vegetable grater Coffee percolator 'Puveri' cutter Rolling board	Soaking in soapnut water Rinsing Applying 'Vim' Rinsing	.3 2.1 .2 .3
Steam cooker	Applying tamarind	.1
	Scrubbing	1.5
	Rinsing	1.5
Ordinary control devices		
Grinding stone	Washing	.6
Knives	Scrubbing and Rinsing	2
Rolling pin and board	-do-	1
Dekshies	-do-	6
Coffee pot	-do-	1.5
Basic utensils		
'Vanali'	Scrubbing and rinsing	1.5
'Idli' plate and lid	-do-	2.5
Stainless steel dekshies	-do-	6.5

APPENDIX X.

SCORE CARD FOR 'IDLI'.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as the best. Please take a sip of water before judging the next sample to remove the taste of the previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Colour	a. Pure white.			3
	b. Whitish yellow.			2
	c. Blackish white.			1
2. Texture	a. Velvety.			3
	b. Soft.			2
	c. Hard.			1
3. Grain	a. Even.			3
	b. Uneven.			2
	c. Overcooked.			1
4. Doneness . . .	a. Wellcooked.			3
	b. Under cooked.			2
	c. Over cooked.			1
5. Taste	a. Good.			3
	b. Fair.			2
	c. Poor.			1
6. Flavour	a. Desirable odour.			3
	b. Foreign odour.			2
	c. Unpleasant odour.			1

APPENDIX XI

SCORE CARD FOR RICE.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as the best. Please take a sip of water before judging the next sample to remove the basis of previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Colour:	a. White.			3
	b. Fairly white.			2
	c. Not white.			1
2. Separateness of grains.	a. Each grain is separate.			3
	b. Grains stick together in lumps.			2
	c. Product is in mass.			1
3. Doneness.	a. Grains break when little pressure is applied.			3
	b. Grains break when more pressure is applied.			2
	c. Grains do not break.			1
4. Taste.	a. Good.			3
	b. Bad.			2
	c. Undesirable.			1
5. Odour.	a. Odour of well cooked rice.			3
	b. Odour of overcooked rice.			2
	c. Slight foreign odour.			1

APPENDIX XII.

SCORE CARD FOR 'SAMBAR'.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as the best. Please take a sip of water before judging the next sample to remove the taste of the previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Colour.	a. Natural colour.			3
	b. Slightly dark.			2
	c. Slightly light.			1
2. Doneness.	a. Drumstick and dhal in the sambar properly cooked.			3
	b. Only drumstick are not properly cooked.			2
	c. Only dhal not properly cooked.			1
3. Taste.	a. Pleasant.			3
	b. Just tolerable.			2
	c. Undesirable.			1
4. Smell.	a. Pleasant.			3
	b. Smell of raw tamarind.			2
	c. Smell of drumstick(raw).			1

APPENDIX XIII

SCORE CARD FOR RAW BANANA CURRY.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as the best. Please take a sip of water before judging the next sample to remove the taste of the previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Colour.	a. Natural colour.			3
	b. Pale.			2
	c. Slightly brownish.			1
2. Smell.	a. Smell of properly cooked raw banana.			3
	b. Smell of uncooked raw banana.			2
	c. Off flavour.			1
3. Taste.	a. Good.			3
	b. Bland.			2
	c. Undesirable.			1
4. Doneness.	a. Properly cooked.			3
	b. Slightly overcooked.			2
	c. Under cooked.			1

APPENDIX XIV

SCORE CARD FOR POTATO CHIPS.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as the best. Please take a sip of water before judging the next sample to remove the taste of the previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Colour.	a. Golden brown.			3
	b. Dark brown.			2
	c. Discoloured.			1
2. Texture.	a. Crisp.			3
	b. Soggy.			2
	c. Overfried.			1
3. Taste.	a. Good.			3
	b. Fair.			2
	c. Poor.			1
4. Thickness.	a. Thin.			3
	b. Thick.			2
	c. Very thick.			1

APPENDIX XV

SCORE CARD FOR CARROT SALAD.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as thebest. Please take a sip of water before judging the next sample to remove the taste of the previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Shape.	a. Uniform.			3
	b. Fairly uniform.			2
	c. Not uniform.			1
2. Colour.	a. Bright orange in white background.			3
	b. Fairly bright orange in less white background.			2
	c. Dull orange in white background.			1
3. Texture.	a. Crisp.			3
	b. Fairly crisp.			2
	c. Soft.			1

APPENDIX XVI

SCORE CARD FOR COFFEE DECOCTION.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as the best. Please take a sip of water before judging the next sample to remove the taste of the previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Appearance.	a. Sparkling.			3
	b. Clear.			2
	c. Not clean.			1
2. Colour.	a. Reddish brown.			3
	b. Dark brown.			2
	c. Brown.			1
3. Flavour.	a. Excellent.			3.
	b. Good.			2
	c. Fair.			1
4. Taste.	a. Less bitter.			3
	b. Bitter.			2
	c. Very bitter.			1

APPENDIX XVII

SCORE CARD FOR 'POORI'.

Judge: Date:

Please judge the product without any discussion and tick against the description which you think as the best. Please take a sip of water before judging the next sample to remove the taste of the previous one.

Quality.	Description.	Samples. A	Samples. B	Points.
1. Colour.	a. Golden brown.			3
	b. Dark brown.			2
	c. Light brown.			1
2. Texture.	a. Crisp.			3
	b. Fairly crisp.			2
	c. Foggy.			1
3. Doneness.	a. Well cooked.			3
	b. Over cooked.			2
	c. Under cooked.			1
4. Taste.	a. Good.			3
	b. Fair.			2
	c. Poor.			1
5. Shape.	a. Round.			3
	b. Fairly round.			2.
	c. Mis-shaped.			1

APPENDIX XVIII

RANK CORRELATION USED FOR THE NUMBER HOUSEHOLDS POSSESSING THE DEVICES AND THE COST OF THE DEVICE.

Types of labour saving Kitchen devices.	Number of families possessing the devices	Cost Rs.	R 1	R 2	D	D 2
1. 'Aruvamanai'	70	1.50	2	15.5	-13.0	132.25
2. 'Muruku' mould.	70	3.50	2	8.5	- 6.0	56.25
3. Wooden churner.	70	1.50	2	15.5	-13.0	196
4. Vegetable Slicer.	56	1.50	4	13.5	- 9.0	9
5. Vegetable Grater.	53	0.75	5	18	-13	100
6. Coffee filter.	41	18.50	6	4	2	1
7. 'Mavi' mould.	37	3.75	7	7.5	- 0.5	6.25
8. Coffee bean roaster.	33	4.25	8	6	2	
9. Steam cooker.	25	65.75	9	3	6	36
10. Vegetable peeler.	24	3.00	10.5	19.5	- 0.5	2.5
11. 'Poori' cutter.	24	3.00	10.5	10.5	0.0	20.25
12. Coffee Percolator.	19	15.00	12.5	5	7.5	110.0
13. Pressure cooker.	12	98.30	12.5	2	10.5	72.25
14. Coffee bean grinder.	10	2.70	14	12	2	4
15. Bread toaster.	9	1.20	15	13	2	0
16. Fruit squeezer.	8	3.20	16	9	3	16
17. Electric mixer.	5	180.50	17	11	6	12.25
18. Rotary beater.	4	1.75	18	13	15	289

APPENDIX XIX.

THE RANK CORRELATION USED FOR THE NUMBER OF FAMILY MEMBERS AND THE PERCENTAGE OF TIME SPENT ON COOKING BY THE HOMEMAKER.

Number of family members	Percentage of time spent on cooking	R 1	R 2	D
7	80.9	1	1	0
6	79.4	2	2	0
5	75.6	3	3	0
4	69.6	4	4	0
3	67.7	5	5	0
2	63.6	6	6	0

$$R1 - R2 = D = 0$$

$$\text{Rank correlation (Guilford, 1956)} = 1 - \frac{6 \Sigma D^2}{n(n^2-1)}$$

$$= 1$$

APPENDIX XX.

2 X 2 CONTINGENCY TABLE FOR ESTABLISHING THE INFLUENCE OF FAMILY LIFE CYCLE ON TIME SPENT ON COOKING.

	Below 5 hours	5 hours and above
Begining and contracting family	A 12	B 3
Expanding family	C 4	D 16

$$Q = \frac{AB - BC}{\sqrt{(A+B)(C+D)(B+D)(B+C)}}$$

$$Q = -.3809$$

$$\chi^2 = \frac{NQ^2}{2}$$

$$\chi^2 = 6.792.$$

APPENDIX XXII a.

ANALYSIS OF VARIANCE FOR THE PALATABILITY OF IDLI.

Quality	Sources of Variation.	d.f.	Sum of squares.	Mean square	F	F .99	F .95
Colour	Between method	1	10.00	10.0	55.555**	7.56	4.17
	Within sets	30	18.50	0.45			
Doneness	Between method	1	0.625	0.625	2.272	7.56	4.17
	Within sets	30	8.25	0.275			
Taste	Between method	1	1.60	1.6	3.018	7.56	4.17
	Within sets	30	16.00	0.533			
Texture	Between method	1	14.50	14.5	4.354*	7.56	4.17
	Within sets	30	10.75	0.333			
Grain	Between method	1	22.00	22.0	57.441**	7.56	4.17
	Within sets	30	11.50	0.383			

** Significant at 1% level

* Significant at 5% level

APPENDIX XXII.b

ANALYSIS OF VARIANCE FOR THE PALATABILITY OF RICE.

Quality	Sources of Variation	d.f.	Sum of squares	Mean square	F	F .99	F .95
Colour	Betweenmethod	1	12.9	12.9	59.68	7.56	4.17
	Within sets	30	6.5	0.216			
Separate-ness of Grain	Between method	1	6.4	6.4	5.263	7.56	4.17
	Within sets	30	38.5	1.216			
Doneness	Between method	1	29.524	29.524	122.57	7.56	4.17
	Within sets	30	7.25	0.241			
Taste	Between method	1	7.226	7.226	18.965**	7.56	4.17
	Within sets	30	11.05	0.381			
Odour	Between method	1	1.6	1.6	2.043	7.56	4.17
	Within sets	30	23.5	0.783			

** Significant at .01 level

* Significant at .05 level

APPENDIXXII e.

ANALYSIS OF VARIANCE FOR THE PALATABILITY OF SMEAR.

Quality.	Sources of variation	d.f.	Sum of squares	Mean square	F	$F_{.99}$	$F_{.95}$
Colour	Between method	1	2.5	2.5	2.98	7.56	4.17
	Within sets	30	11.5	0.838			
Doneness	Between method	1	1.6	1.6	2.461	7.56	4.17
	Within sets	30	19.50	0.65			
Taste	Between methods	1	0.9	0.95	2.45	7.56	4.17
	Within sets	30	11.0	0.3667			
Odour	Between method	1	0.1	0.1	0.166	7.65	4.17
	Within sets	30	18.0	0.6			

** Significant at 1% level

* Significant at 5% level

APPENDIX

ANALYSIS OF VARIANCE FOR THE PALATABILITY OF RAW BANANA CURRY.

Quality	Sources of Variation	d.f.	Sum of squares	Mean square	F.	F.99	F.95
Colour	Between method	1	00.9	00.9	00.51	7.56	4.1
	With sets	30	47.0	1.566			
Doneness	Between method	1	10.0	10.0	121.4**	7.56	4.1
	With sets	30	2.5	00.083			
Texture	Between method	1	0.225	00.225	2.62	7.56	4.1
	Within sets	30	0.591	0.591			
Odour	Between method	1	7.975	7.975	15.3**	7.56	4.1
	Within sets	30	15.75	0.521			

** Significant at 1% level
* Significant at 5% level

APPENDIX XXII e.

ANALYSIS OF VARIANCE FOR THE PALATABILITY OF POTATO CHIPS.

Quality.	Sources of variation	d.f.	Sum of squares	Mean square	F	F.99	F.95
Colour	Between method	1	4.9	4.9	16.33**	7.56	4.17
	Within sets	30	9.0	0.3			
Taste	Between method	1	54.226	54.226	93.008**	7.56	4.17
	Within sets	30	1.75	0.583			
Thickness	Between method	1	4.9	4.9	32.66**	7.56	4.17
	Within sets	30	4.5	0.15			
Texture	Between method	1	33.6	33.6	268.888**	7.56	4.17
	Within sets	30	6.25	00.125			

** Significant at 1% level

* Significant at 5% level