THE REDUCTION OF COST OF LIVING BY SUBSTITUTION OF NUT PROTEIN FOR MEAT PROTEIN

THESIS FOR DEGREE OF M. H. E.

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THESIS

There are a great many ways suggested to reduce the cost of living. Many problems enter into this great subject. In considering the question for the present we will trace it at least briefly through history.

The Chinese have always used rice as their principal article of food. Scientists attribute their small stature to this fact. We are to be congratulated that the attempts of the early colonists at growing rice in the Carolinas were unsuccessful. It is to be feared that had our hardy English and Scotch-Irish settlers of the Carolinas found that rice could be readily grown, the cotton and corn industries of those states would have been undeveloped, and instead of our staunch well developed Carolinians, we would have had a small race like that of the Chinese. Rice can be successfully grown in these states today but, fortunately, does not form the major part of the diet.

The "Poor whites" of Arkansas subsist chief-

ly on the rice grown in their marsh lands. These people are, also, known for their small stature, which may be partially attributed to their diet. The laxity of morals among the Romans at the time of Nero is ascribed to their free use of meats and wines. Not only can we cite the example of the Romans but also that of the Egyptians as well, both of whom suffered from these same causes.

The early Teutons lived principally on meat which was eaten raw or only partially cooked. The scientists hold that this had much to do with their fierce natures. It is said that the necessary change of diet brought about at the time of the conversion of cannibals to christianity has had much to do with the softening of their dispositions.

Again the irresponsible nature of the American negro may be largely attributed to his diet. Now that he is his own master and obliged to keep no regular hours, he eats all he can get, when he can procure it. He may feast one day and fast the next seven.

Among scientists it is commonly admitted that the average American eats too much meat. Such eminent authorities as Professor Wiedersheim of Freiburg, Germany, one of the world's greatest authorities on comparative anatomy, Dr. J. H. Kellogg, Lauder Brunton, Benge, of Basel, and Sherman, of Columbia, tell us that wherever race degeneracy exists, it is largely due to the eating of too much meat.(a) We are especially fond of the meat which contains a high percentage of uric acid, and there is scarcely a family which uses meat regularly without having one or more of its members suffer from rheumatism or catarrh in some form. Hall ascribes the former trouble to uric acid in our systems, while Dr. Emmet Welch, of Grand Rapids, Michigan, an eminent throat specialist, finds that nature will take care of a very severe case

(a) Tendencies Toward Race Degeneracy, by Dr. J. H. Kellogg, published in New York Medical Journal, September 2d and 9th, 1911, and reprinted as Senate Document No. 648. See pages 20 and 25.

of sore throat if the sufferer will desist from the use of meat. In England, meat is charged with being one of the causes of a national disease, gout.

The class of people who are not using meat is constantly growing. It has been proven by hundreds of people that nuts can be advantageously substituted for meat in their diet. We find this class of people to be gentle and kind. In fact, their gentleness is a noticeable characteristic. That they are capable of great, both mental and physical endurance is amply shown by the amount of both kinds of work which they perform.

In considering the cost of living, we must take into account the purchase price and the cost of preparation in comparison with energy derived. The purchase price which is the initial cost, will depend largely upon the supply and the cost of shipping if the product is not home grown.

In the writer's experiment, she purposely used the highest priced nut grown in the United States.

If pecans at thirty cents per pound were found to provide a cheaper food supply than does meat at twenty-five or thirty cents per pound, it could be reasoned that Persian walnuts at twenty cents per pound, black walnuts and hickory nuts at two and one-half cents per pound, (often the latter two named nuts may be had for the gathering) might also be cheaper sources of protein than are beef, mutton or pork. It is probable that because of the extensive planting of the pecan the price of that nut will not increase materially during the next few years, as has the price of meat during the last few years. Just compare the quantity of nuts consumed as food during the past decade with that used for the same purpose the previous decade, or make a comparison of five year periods and we will find that a surprising increase is steadily taking place. Cook books issued ten years ago, contain few recipes calling for nuts. At that time it seemed an innovation and doubtful experiment to insert even a half dozen recipes. The Southern Cookbook by S. Thomas Bivins, principal of

Chester Domestic Training Institute, Chester, Pa. though published in 1912, contains but one recipe calling for nuts as an ingredient. The conservatism of this book shows the place the southerners put nuts in their menus. Marion Harland gives nine recipes in her Complete Cookbook, published in 1903 and 1906. Fanny Mary Farmer's Boston Cookbook, published in 1902, contains six recipes with nuts as an ingredient. In the appendix, added in 1903, three more recipes of the kind were included. Today, such of the leading magazines as have a page devoted to the culinary art, have a number of recipes which call for nuts in the making, whether the dish when finished is to be a soup, entree, bread, salad, cake or even the hearty dish of the meal. In fact so popular, and justly so, have the nut products become that many books of recipes are being comprised in which every recipe calls for nuts as one of the ingredients.

Prior to 1900, nuts had been used by Americans in confectionary, as a mid-meal lunch or at the end of

a hearty meal. The latter two uses are still quite frequent, although the last cannot be too highly condemned. The fact that nuts have not been more in use in this country may be attributed to the wasteful habits of Americans who are truly extravagant as compared with the southern Europeans. The inhabitants of southern Italy have subsisted for centuries almost entirely upon chestnuts and acorns. These nuts are boiled, then made into a bread, unleavened cake or soups. These people appear to be well nourished and healthy. Lemmo studied this acorn bread and found that it was very capable of being easily assimilated. As nut flour, when made into bread, is less palatable than wheat flour, it is doubtful whether this sort of diet will ever become popular with Americans. Acorns and chestnuts cost the Italians practically nothing, as they grow plentifully in forests which are protected for game purposes. The nuts which the peasants gather are really a by-product. At the time of harvesting the nuts, the entire family have a merry day, gathering the

nuts which are to be their supply of food for some time to come.

The French have made use of the Persian walnut almost since the beginning of the Christian era. The species thrives well on their sunny slopes. Single trees often produce a great deal of food, as well as shelter from the sun for man and beast.

In southern Spain, the almond and acorn are both utilized, though the first named nut is exported in great quantities to be used in confectionary. The poor people of southern Europe long ago realized that they could neither afford to raise beef nor other kinds of meat, nor could they buy these products which some one else had grown and slaughtered. Their climate is not adapted to the growing of cattle and the people have not the money with which to breed animals even if the climate were different. It has been found that it costs ninety-eight dollars and fifty cents to raise a beef animal that will weigh fourteen hundred pounds, then sixty-four dollars and fifty cents more is added to

the cost before it is retailed.(a) Fourteen hundred pounds of hickory nuts would cost thirty-five dollars and the labor of preparing the nuts for use would be so small as to be quite insignificant. Then after the nuts have been gathered, the trees would be left to produce nuts again the following year at practically no cost. When beef has been slaughtered and consumed, it is gone forever. In fact the great demand for veal and the demand for quick returns from money invested in cattle has lessened the supply so much that the demand for meat greatly exceeds the supply. This was not the case a few years ago. The breaking up of many of the large cattle ranges into smaller farms has forced many cattle raisers out of the business. Still another

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(a) The drovers' journals of Buffalo and Chicago quote the prices for May 17, 1913-

Beef, live weight, at seven cents per pound. Dressed beef twelve and one-half cents per pound.

(Average three year old animal weighs fourteen hundred pounds. Same animal dressed would weigh thirteen hundred pounds.)

reason for the high cost of meat has been because the meat trust has been able to withhold the product until they could sell it at their own prices. Had the labor unions, who tried a few years ago to boycott the meat trust been more intelligent in their methods and provided a substitute for meat, much good might have resulted, but with no substitute furnished him, the working man, naturally, felt that no matter whether he could really afford to buy it or not, he must have meat. He certainly needed protein in some regular form and in greater quantity than was furnished him in the "hit or miss" diet upon which he was compelled to subsist. Rice and potatoes by unintelligent cooks are often substituted for meat. Necessarily, this is not satisfying.

What most concerns those of us who at present are endeavoring to keep down the cost of living, is what means of doing it are now at hand. The hickories and the black walnuts are not as plentiful as they were formerly, but still there are great numbers of bearing trees.

The census reports indicate that although nut trees in the forests, had been so cut for timber purposes that there are now comparatively few about the state in comparison, that those which have been left have been given better opportunity to bear, and as a result, the production is now greater than ever before. Each year hundreds, and no doubt thousands of bushels are left ungathered and allowed to decay on the ground. A single tree in the pasture lot is apt to have as many nuts on it as a hundred trees growing in the forest. Then, too, the roadside trees seem to bear well and serve a threefold purpose, namely, food, shade and beauty. It has been observed that the most prolific nut bearers are the single trees growing in the garden or near the buildings.

True, it takes about three times as long to bring a walnut tree into bearing as it does to grow a beef animal, but the cost of the latter is much, while the cost of raising the former is little. Often times the cost of a walnut crop will be little more than that of buying and planting the tree, and the best Persian

or English walnuts may be bought at one dollar and fifty cents per tree.

The Persian walnut is a native of Persia. It grows in England, Germany, France, Spain, and Italy, as well as in the United States. Below are the records of a few famous trees with exceptional records for their size, great age and prolific yields of a particular single season: (a)

Records of Noted Trees.

Location	Age	Height	Spread	Nuts in a single season
Norfolk, Eng.	100 yrs.	90 ft.	120 ft.	5,400
" "	300 "	55 "	125 "	1,500
Crimea (b)	1,000 "	.....	.....	100,000

Of course these crop records are not their average yields. However, we might well be satisfied with a far smaller yield. It was the opinion of the members of the Northern

(a) These records are given in the pamphlet Walnut Growing Oregon, by J. C. Cooper.

(b) This tree is the property of five tartar families who subsist largely on its nuts.

Nut Growers' Association, at their last convention, held in Lancaster, Pa., December 1912, that the selected varities of Persian walnut grafted onto stock of the native black walnut could be successfully grown anywhere that the black walnut thrives. If this be true, Michigan could well afford to plant such trees. The cost of growing such trees is no more than that of a common black walnut, while the cost or preparing the nuts for use is much less.

In many sections of Michigan, there are hazel bushes growing along the fences. As the nuts from these bushes are easily gathered and furnish a food for the table which is easily prepared, great possibilities in cultivating this plant suggest themselves.

We cannot be sure our meat has always been kept clean but we can control the sanitary conditions under which nuts are prepared for the table. Nuts should be cracked at home, as it is a more or less common practice to "farm out" cracked nuts from the large cracking houses, to laboring people who pick

the kernels from the broken shells, in their homes. No questions, of course, are asked about the sanitary conditions of the homes, but that there are grave possibilities of danger from germs of disease, no one can doubt. Further, if a nut is not cracked enough, a little aid from the teeth may successfully release the kernel. The hickory and black walnut meats for sale in the confectionary stores are bought by the barrel, the meats having been picked out by the mountaineers of the eastern and northern states during their idle time in winter. The conditions of such nuts are not quite as bad. How easy to save any risk of infection of such contagious diseases as tuberculosis, etc., by cracking our own nuts!

In 1892, (a) in one of his famous lectures, Mr. George Kennan, in speaking of the conditions surrounding the Russian peasants during their terrible famine said, "If they but knew how to utilize the weeds growing around their homes, they would be well

(a) Summer Chatauqua, Bay View, Michigan.

nourished," we might paraphase the above statement in speaking of many of our poor people living near or in the country. There is no need of their starving if they would but utilize the nuts which are so often within easy reach and may be had for the gathering.

A vital question which concerns us in the selection of any diet is the amount of energy derived for the least expenditure of time, money and physical effort. We do not feel that we can afford to experiment without looking into such a weighty matter carefully. This is one of the cases when we are willing to profit by the experience of others in attempting to find what diet is apt to be best suited to our individual needs. Not only is the ordinary thinking class of people awakened to the race's degeneracy but the problem is deeply concerning the great scientists such as Professor Wiedersheim, Dr. Forbes Winslow, one of the world's greatest authorities on mental diseases, and many other students. A few years ago, the English government created a commission known as

the Interdepartmental Committee on Physical Deterioration in Great Britain. This commission was charged with investigating the conditions indicated by its name. Eminent scholars testified before the commission. Professor Wiedersheim has pointed out the general deterioration in man's anatomy. He considers the most evident point of deterioration to be that of the teeth. This degeneration is both in size and number. The lower jaw and its muscles are becoming smaller. Though the degeneration is evident in the first teeth, it is more noticeable in the second teeth while there is no longer room for the third molar. Wiedersheim ascribes this condition entirely to our diet. We find no such deterioration in the teeth of the chimpanzee, the animal most fairly comparable in this respect with man. It does not eat meat but obtains its protein from nuts and vegetables.

The dreaded, chronic disease of cancer is rapidily increasing. The medical societies have almost universally agreed that this terrible affliction is pro-

duced by a certain kind of irritation to the muscles. We find cancer among not only human beings but also among those of our domestic animals which eat meat while the domestic animals which eat vegetables and grasses and no flesh are never afflicted with this disease. Again it seems quite evident that a great deal of suffering might be avoided by the selection of other protein than that of meat. Aside from the terrible agony that cancer causes to patients, the sympathizing friends and relatives, the only cure, the surgeon's knife, if used early enough, is very expensive. Seventy-five thousand[(a)] die annually in the United States from this disease, which means that annually three hundred thousand persons are suffering from it. According to statistics from London and Berlin hospitals for sick animals, a high percentage of both dogs and cats treated are afflicted with cancers.

The daily average consumption of meat,

(a) Dr. J. H. Kellogg's pamphlet Race Degeneracy.

including, fish and game, in the United States is two-thirds of a pound per person, and of sugar four ounces per person. With the addition of butter and fat, these four items comprise three-fourths of the food of the average individual. As all of these products are deficient in calcium, it is very evident why there is the lime starvation in the body of the average person, as lime is as necessary a disinfectant inside the body as outside.

To quote from Dr. Kellogg, "Overeating is probably doing more harm than underfeeding among civilized people." Bright's disease, cancer, and decay of the teeth are found to be more common among the well-to-do, than the poor, cancer in particular is the rich man's disorder - the result of high protein feeding and sedentary habits. Overfeeding, however, seems to be a common disorder. Take for example, the ordinary breakfast of a person engaged in a sedentary occupation; it consists of a dish of cereal with cream and sugar, one or two eggs or a small steak, a baked

potato, a piece of toast or cookie, and coffee, with possibly a half grape fruit or an orange. It is safe to say that eight out of ten persons who indulge in such heavy meals at the beginning of the day and who do not take an abundance of physical work suffer from nervous~~,~~ness, lack of energy, headache, or constipation. Now, instead of such a heavy meal, were the following menu to be substituted and used for several weeks or months there would be a noticeable improvement: one-half of a grape~~-~~fruit or an orange, Ralston with cream and sugar, whole wheat or bran bread, butter, cocoa, and a cookie if desired. Ralston is a wheat preparation which seems to be better adapted to a quick digestion than any other breakfast food the writer has ever tried. When properly prepared, it furnishes a half dish for the meal while the grape~~-~~fruit or the orange furnish the fruit juice so necessary to keep the stomach in a good condition. This breakfast is nutritious and abolishes the need for meat.

The luncheon is not apt to be as heavy as the

breakfast. The writer has found for herself, that a very simple luncheon of the right combination affords more energy, therefore she adheres very closely to the same menu day after day. The use of meat for luncheon has fewer bad effects than for breakfast, but the use of meat is quite unnecessary as a source of protein or fat at any time. Excess of meat gives our digestive organs extra work to do in trying to utilize material for which there is no need. This necessarily detracts from the energy we have for regular work. The strenuous efforts of our overworked digestive organs are invariably felt sooner or later by the very noticeable feeling of exhaustion which follows the eating of a too hearty luncheon. While the process of digestion is going on, the blood is called away from the brain, and until it can be restored, that organ will necessarily fag. It will require two or three hours' time for the digestion to be complete and, if so, there will be but a short time left in which the digestive organs can relax before receiving another meal. Instead of having a sufficient quantity of lime, when meat has been taken in-

to the system in liberal quantities, the diet has provided scarcely any. It seems advisable for most persons to have the heaviest meal at night, as this allows more time for relaxation. Should nuts be substituted for meat as the heartiest dish, and not as a confection, protein, lime, and cellulose would be naturally introduced into the system. There are no records showing the ease and rapidity with which nuts may be digested. Mr. M. E. Jaffa, U. S. Professor of Nutrition, University of California, says that it is fair to assume that the protein of nuts would be as rapidily digested as any other form of protein. In a report published in 1906, by the United States government, Professor Jaffa lays special emphasis upon the necessity of thorough mastication in order to obtain the highest coefficient of digestibility. Professor Jaffa observed that there was a great difference in the coefficient of digestibility of the food of one man who ate largely of nuts but did not properly masticate his food and that of other subjects who chewed their food thoroughly. In Professor Jaffa's opinion, nuts are

as easily digested as are our most common articles of diet - bread and milk. Too much emphasis cannot be placed on the right use of nuts in the diet. It is not surprising that persons who eat a quantity of nuts at the end of a hearty meal or between meals, should complain of indigestion. What is wrong, however, is their conception that they are unable to use nuts at all, because nuts are indigestible. Should they eat a large extra piece of beefsteak after a hearty meal or between meals, they would experience quite as severe cases of indigestion, as when they had burdened their stomachs with nuts at a similar time. In preparing nuts for the table, we must remember that they only contain three to five percent water, while meat contains fifty to seventy percent water.

Professor Jaffa gives some very interesting items. He says, "If ten cents be spent for peanuts, it will purchase more than twice the protein and six times the energy that could be bought for the same expenditure for porterhouse steak. It is of more than passing interest to note that ten cents worth of peanuts will contain about four ounces (20 grams) of protein and 2.767 calories of energy, which is more

protein and energy than is furnished by many rations regarded as adequate for the day."

Great factors in favor of nut protein should be, the ease with which they are handled and preserved without necessary injury or deterioration, for the unbroken shells furnish receptacles which are practically injury proof and, at the same time, are sterile for long periods. They are easily handled, and in this country, require no refrigeration while being transported. Under refrigerated conditions they will keep in good condition for indefinite lengths of time.

Professor Jaffa made a great many experiments with different diets and their effects upon the persons subsisting upon them. He says, "The results of investigation carried on with fruit and nut diets at the California Experiment Station afford tentative conclusions regarding the thoroughness of digestion which should be of

value to those who wish to use nuts as a staple article of food rather than as an occasional article of diet. This work has comprised fifteen dietary studies and about one hundred digestion experiments, with elderly men, young men, women and children of whom some had been vegatarians for years and some had even limited their diet almost exclusively to fruit and nuts, others had previously lived on the usual mixed diet. The average coefficients of digestibility reported for 28 experiments with two men and one woman on a fruit and nut diet were: Protein, ninety percent; fat, eighty-five percent; sugars, starch, etc., ninety-six percent; crude fiber, fifty-four percent; and ash sixty-eight percent; with eighty-six percent of energy available. The corresponding figures for three experiments with the same subjects in which no fruit or nuts were used are: Protein, ninety-four percent; fat, ninety-two percent; sugar, starch, etc., ninety-six percent; crude fiber, forty-nine percent; with eighty-eight percent of energy available. The latter coefficients agree very closely with those in

the average of nealy five hundred experiments with different sorts of mixed diet, namely: Protein, ninety-two percent; fat, ninety-five percent; and carbohydrates, ninety-seven percent. Nuts were the main source of protein for the fruitarians, and it will be noted that this constituent had practically the same coefficient of digestibility in the nut and fruit diet as in the other cases cited. The studies with fruitarians have all indicated that nut protein is fairly well assimilated; and that this is true with the average healthy person is well illustrated by an experiment with a university student, who, though entirely unaccustomed to such fare, gradually changed from an ordinary mixed diet to one of fruit and nuts without apparent loss of health or strength. It is somewhat difficult to arrive at a definite conclusion regarding the actual percentage of nut protein digested or assimilated. The experimental data obtained at the Califonia Station show a range of seventy-five to eighty-two percent digestible proteins when nuts and fruit were eaten to-

gether, but the figure for nut protein is doubtless higher. These coefficients were in all probability influenced by the fruit protein which has been found to be less digestible than the nut protein. The digestibility of protein in twenty-eight experiments with mixed diets, to which were added fruit and nuts, averaged ninety percent. As fruits, with the exception of the avacodo and olive, yield only a small amount of fat, the fat which is contained in a fruitarian's diet must be very largely obtained from the nuts. The average coefficients of digestibility for this nutrient in thirty experiments with men on a diet of fruit and nuts were eighty-six percent, and in twenty-eight experiments just referred to it was eighty-five percent. These figures are about ten percent lower than the average coefficient for digestibility of fats in the ordinary mixed diet. The digestibility of the carbohydrates in nuts, so far as the available data show, is about equal to that of the same ingredients in other foods. The almond, hazel nut, cocoanut, peanut, pecan, pignolia, and wal-

nut were the nuts used for these experiments.

Wemmo and Merrill report their experiments with cooked chestnuts. A farm laborer aged fifty-three, working eight hours a day was a subject selected by Wemmo. For two days the man's diet consisted entirely of chestnut products. During the last two days his diet was modified by herring and cheese; seventy-five percent protein, eighty-seven percent fat, ninety-seven percent of carbohydrates, were assimilated.

Merrill selected two men aged twenty-three and thirty-four, respectively, for his experiments. A mixed diet was used. About twenty percent protein, fifty-two percent fat, nearly fifty percent carbohydrates, and not far from forty percent fuel value, was furnished by three hundred grams chestnut flour consumed daily. The average coefficients of digestion obtained for chestnuts in these experiments were, protein, fifty-six percent; fat, sixty-three percent; and total carbohydrates, ninety-eight

percent; while eighty-nine percent of energy was available.

In Dr. Winfield S. Hall's very interesting book, Nutrition and Dietetics he gives the results of his experiments conducted by his chosen subjects for thirty days. He finds where nuts and fruits were used together that the diet was a very satisfactory one for the persons using it. At the same time, he was experimenting with a diet using nuts without the fruits. The latter was not as satisfactory because nuts are too concentrated; they apparently need the balance of water and minerals such as fruits contain.

Whether the doctors are from Dr. Kellogg's school or not, they seem to be adopting his views regarding the effect of meat upon the system by omitting it from their personal diets. Probably, without a doubt, Dr. and Mrs. Kellogg have conducted the experiment of subetituting nuts for meat on more persons than any other two individuals in the world.

Miss Phoenix, the noted physical culture

teacher, like many others of her profession, never loses an opportunity to try to convince her audience of the superiority of nut protein over meat protein. When she began using a diet of nuts and fruit her digestive organs were in such poor condition that the doctors had given up the hope of saving her life. They had told her she could expect to live but a few days. She determined to try a diet of fruit and nuts. When she appeared before her classes two years later, she afforded a good picture of perfect health. She attributed her health to a proper diet, which allowed her to perform her chosen work and to obtain an independent livelihood.

Professor A. L. Winton, of the Connecticut Experiment Station, gives the following encouraging message to diabetics: "Most of the nuts including walnuts, Brazil nuts, almonds, and filberts, since they contain no starch and only small amounts of sugar and dextrine but are rich in protein and oil, are valuable additions to the diet of diabetics. Almond meal is

used in the preparation of various biscuits and bread substitutes. The chestnut is a notable exception among nuts, in that it is rich in starch and poor in fat, the corposition of the shelled nut being much the same as that of wheat flour; it is,therefore, entirely unsuited for the use of diabetics. The peanut, although very rich in oil, contains about eleven percent starch, sugar and dextrine of which about half is starch."(a)

For the purpose of putting to actual test some of the principles here enumerated regarding the advantages of nuts as food, a practical experiment was conducted by the writer during the spring weeks of 1913. The comparisons made were between the cost of subsisting upon ordinary menus as checks and nut menus as tests, and the weight of the subject at the beginning and end of each period. The experiment was conducted for a total period of six weeks, during which time the menus alternated weekly.

Many items which were not possible to tabu-

(a) Connecticut State Station Report, 1906, p. 153.

late played an important part but in so far as possible they were recorded. Thus, the fluctuating price of some articles from week to week was computed. The food estimated as consumed by the subject was determined by actual weight for a number of days, after which it was averaged. The responsibilities, and causes for worry, the work performed and various other things were factors which could not be kept from influencing the physical condition and weight of the subject, for the time being, but were noted in so far as possible.

The subject had been subsisting upon a mixed diet containing nuts and meat for some time and was in excellent physical condition at the beginning of the experiments as a fairly steady increase in weight for several months previous had proven. During the period of experiments her weight increased quite regularly while subsisting on the menus containing nuts and, almost strangely, fell off during the weeks while on diets containing meat. It was further

observed that she was able to do the same day's work with less fatigue while subsisting upon the nut menus than while upon the meat menus. The total cost of the food consumed during the three weeks meat protein was used in the menus was eight dollars and thirty cents, as compared with seven dollars and thirty five cents, during the weeks when nut protein entered into the menus. Thus, in three weeks time it cost ninety-five cents less to use pecans at thirty cents per pound, as a substitute, than it did to use beefsteak, at twenty-five cents per pound, and occasionally, pork and lamb, at about eighteen cents per pound. This was a saving of practically thirty-two cents a week, and for a year would have been sixteen dollars and sixty-four cents.

As the experiment was made upon a subject who naturally was a moderate eater, it may be conservatively estimated, that for a laboring man, the saving would have been fully a quarter greater,or about twenty dollars. With several in the family

proportionate savings would go a long way toward paying taxes, buying clothing or educating children.

The following tables show in detail the results of the experiments:

(Note: With but a very few exceptions, the figures showing the chemical constituents and calories of the foods used were taken from the revised edition of Office of Experiment Stations, U.S.Department of Agriculture, Bulletin No. 28, by W. O. Atwater, Ph.D., and A. P. Bryant, M.S., which was issued April 14,1906. Such analysis of foods used,as did not appear in that document were obtained from the Chief of the Vegetable Physiological Laboratory,of the Bureau of Chemistry, U.S.Department of Agriculture, from unpublished data.

The tables go into detail for periods of but two weeks, during the former of which, a nut menu was used, and during the latter of which, a meat menu was substituted as a check. However, the tables go far enough to illustrate the method by which the records were kept,and upon what foods the comparisons were made. Following the detailed tables, a general summary is given, which shows the total results for each week. The results for the weeks during which the nut menus were used, are grouped separately from those during which the meat menus were used. A comparison of the weekly averages shows a slight advantage in favor of the nut menus in matters of calories, cost,and weight of the subject,while in weight of protein, fat and carbohydrates, the advantages are slightly in favor of meat.)

DIETARY--NUT MENU.

	Protein.	Fats.	Water.	Carbo-hydrates.	Calories.	Cost.
April 1, 1913.						
Breakfast:						
Cocoa	.021	.006	.454	.033	133,128	.050
½ grapefruit	.004	.001	.437	.058	120,000	.035
2 oz. Ralston	.014	.002		.096	210,750	.013
Sugar				.062	116,250	.002
1 oz. bran bread & butter	.009	.022	.042	.081	539,643	.020
1 oz. milk						
4 oz. escalloped potatoes	.009	.054	.294	.046	361,580	.037
Luncheon						
1 oz, bread & butter	.009	.022	.042	.081	539,643	.020
1 oz cake With sour cream	.007	.005	.026	.052	133,508	.008
Jelly						
Dinner:						
Nut loaf	.017	.080	.029	.029	416,950	.050
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Baked potato	.007	.003	.182	.058	120,000	.005
One cookie	.008	.019	.023	.072	251,883	.019
Lettuce salad	.001		.101		9,275	.003
French dressing		.125	.200		510,000	.025
April 2, 1913.						
Breakfast:						
Cocoa	.021	.006	.454	.033	133,128	.050
½ grapefruit	.004	.001	.437	.058	120,000	.035
Ralston	.014	.002			210,750	.013
1 oz. Milk						
Sugar				.062	116,250	.002
One cookie	.008	.019	.023	.072	251,883	.019

NUT MENU.(Continued)

	Protein.	Fats.	Water.	Carbo-hydrates.	Calories.	Cost.
Luncheon:						
One soft boiled egg	.017	.015	.091		95,625	.020
4 oz. bread	.018	.044	.084	.162	1,071,886	.040
Peanut butter	.018	.029	.001	.011	176,565	.005
A. Nut croquettes	.013	.018	.219	.047	421,500	.047
Creamed potatoes	.009	.054	.294	.046	361,580	.037
4 oz. ruta-baga	.003	.....	.222	.021	47,500	.....
Dinner:						
Bran bread & butter	.009	.022	.042	.081	539,643	.020
One cookie	.008	.019	.023	.072	251,883	.019
4 oz peach sauce	.002	.....	.221	.027	55,000	.030
April 3, 1913.						
Breakfast:						
Cocoa	.021	.006	.454	.033	133,128	.080
½ grapefruit	.004	.001	.437	.058	120,000	.035
Ralston	.014	.002	.....	.....	210,750	.013
Sugar	.....	.....	.....	.062	116,250	.002
Milk	.....	.....	.....	.....	.....	.....
Luncheon:						
One soft boiled egg	.017	.015	.091	.....	95,625	.020
Bread & butter	.009	.022	.042	.081	539,643	.020
One cookie	.008	.019	.023	.072	251,883	.019
Dinner:						
Nut loaf	.017	.080	.029	.029	416,950	.050
Escalloped potatoes	.009	.054	.029	.046	361,580	.037
Spinach with egg	.006	.017	.082	.025	404,705	.071
Bran bread & butter	.009	.022	.042	.081	539,643	.020
One cookie	.008	.019	.023	.072	251,883	.019
Peach sauce	.002	.....	.221	.027	55,000	.030

A The last three items should have been included in menu for dinner.

NUT MENU.(Continued)

	Protein.	Fats.	Water.	Carbo-hydrates.	Calories.	Cost.
April 4, 1913.						
Breakfast:						
Nut loaf	.017	.080	.029	.029	416,950	.050
Brown potatoes	.005	.009	.087	.035	189,000	.015
Spinach with egg	.006	.017	.082	.025	404,705	.071
Whole wheat bread & butter	.012	.001	.048	.062	139,250	.006
Rhubarb sauce	.001	.002	.207	.133	255,470	.036
Luncheon:						
Soft boiled egg	.017	.015	.090	.....	95,625	.020
Bran bread & butter	.009	.022	.042	.081	539,643	.020
One cookie	.008	.019	.023	.072	251,883	.019
Dinner:						
Nut croquettes	.013	.018	.219	.047	421,500	.047
Creamed potatoes	.009	.054	.029	.046	361,580	.037
Apple butter	.....	.002	.155	.093	182,500	.002
Bran bread & butter	.009	.022	.042	.081	539,643	.020
One cookie	.008	.019	.023	.072	251,883	.019
April 5, 1913.						
Breakfast:						
Cocoa	.021	.006	.454	.033	133,128	.050
½ grapefruit	.004	.001	.437	.058	120,000	.035
Ralston	.014	.002	.....	.....	210,750	.013
Sugar	.....	.....	.....	.062	116,250	.002
Milk	.....	.....	.....	.....	.....	.....
One cookie	.008	.019	.023	.072	251,883	.019
Luncheon:						
Total	.034	.056	.156	.153	887,151	.059
Dinner:						
Nut loaf	.017	.080	.029	.029	416,950	.....
Brown potatoes	.005	.009	.087	.035	189,000	.....

NUT MENU. (Continued)

	Protein.	Fats.	Water.	Carbo-hydrates.	Calories.	Cost.
Dinner: (Continued)						
Spinach	.006	.017	.082	.025	404,705	.....
Whole wheat bread & butter	.009	.022	.042	.081	539,643	.....
Total cost at restaurant						.400
April 6, 1913.						
Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Dinner:						
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Mint jelly	.....	.....	.....	.....	.....	.....
Lettuce and nut salad	.010	.196	.203	.016	1,056,125	.060
Ruta baga	.003	.....	.222	.021	47,500	.....
Escalloped potatoes	.009	.054	.294	.046	361,580	.037
Snow pudding & custard	.019	.015	.281	.115	321,120	.340
Supper:						
Peanut butter	.018	.029	.001	.011	176,565	.005
Two slices white bread	.023	.004	.047	.108	306,250	.006
One cookie	.008	.019	.123	.072	251,883	.019
Custard	.009	.015	.137	.043	167,884	.019
April 7, 1913.						
Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Luncheon:						
Snow pudding	.010	.....	.144	.072	153,236	.015
One cookie	.008	.019	.023	.072	251,883	.019
Escalloped potatoes	.009	.054	.294	.046	361,580	.037

NUT MENU. (Continued)

	Protein.	Fat.	Water.	Carbo-hydrates.	Calories.	Cost.
Dinner:						
Bran bread	.009	.022	.042	.081	539,643	.020
Baked potatoes	.007	.003	.182	.058	120,000	.005
Lettuce and nut salad	.010	.071	.003	.016	346,125	.035
French dressing	.....	.125	.200	.....	510,900	.025
Snow pudding with custard	.019	.015	.281	.115	321,120	.340
One cookie	.008	.019	.023	.072	251,883	.019
Total for week	.936	2.104	13.182	5.377	25,452,100	2.551

MEAT MENU.

April 8, 1913.

Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Luncheon:						
Sturgeon	.080	.024	.127	.....	297,500	.....
New beets	.006	.....	.222	.019	46,250	.....
Rolls & butter	.020	.019	.074	.135	362,500	.....
Total cost at restaurant	.....	.....	.....	.....	.....	.350
Dinner:						
4 oz. lamb chops	.046	.067	.100	.....	367,500	.....
Mashed potato	.007	.008	.188	.045	126,250	.005
Rolls & butter	.020	.019	.074	.135	362,500	.030
Green peas	.017	.009	.185	.037	247,750	.050
Cake	.007	.005	.026	.052	133,500	.008
Two cups coffee	.....	.....	.500	.....	.....	.....

April 9, 1913.

Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Luncheon:						
2 oz beef loaf	.030	.072	.100	.008	377,850	.635
Bran bread & butter	.009	.022	.042	.081	539,642	.020

MEAT MENU. (Continued)

	Protein.	Fats.	Water.	Carbo-hydrates.	Calories.	Cost.
Supper:						
4 oz. beef loaf	.059	.145	.189	.017	755,700	.070
4 oz boiled potatoes	.006	.....	.189	.052	88,000	.002
White sauce	.008	.063	.221	.012	306,570	.036
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Creamed asparagus	.005	.008	.224	.005	55,000	.060
Rhubarb sauce	.001	.002	.207	.133	255,470	.030
Sponge cake	.008	.013	.019	.082	244,750	.020
April 10, 1913.						
Luncheon:						
One soft boiled egg	.017	.015	.091	.....	95,625	.020
Fried potatoes	.007	.008	.188	.045	126,250	.005
2 oz. sponge cake	.008	.013	.019	.082	224,750	.020
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Supper:						
Beef loaf	.059	.145	.189	.017	755,700	.070
Mashed potatoes	.007	.008	.188	.045	126,250	.030
Brown bread & butter	.009	.022	.042	.081	539,643	.020
Rhubarb sauce	.001	.002	.207	.133	255,470	.036
2 oz. sponge cake	.008	.013	.019	.082	224,750	.020
April 11, 1913.						
Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Luncheon:						
Total	.034	.056	.156	.153	887,151	.079
Dinner:						
Beef loaf	.059	.145	.189	.017	755,700	.070
Boiled potatoes	.006	.....	.189	.052	88,000	.002
White sauce	.008	.063	.221	.012	306,570	.036

MEAT MENU. (Continued)

	Protein.	Fats.	Water.	Carbo-hydrates.	Calories.	Cost.
Dinner: (Continued)						
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Spinach with egg	.006	.017	.082	.025	404,705	.071
Butter				.065	101,150	.030
Apple butter		.002	.155	.093	182,500	.020
Sponge cake	.008	.013	.019	.082	224,750	.020
April 12, 1913.						
Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Luncheon:						
Total	.034	.056	.156	.153	887,151	.079
Dinner:						
Beef loaf	.059	.145	.189	.017	755,700	.070
Escalloped potatoes	.009	.054	.294	.046	361,580	.037
Spinach	.006	.017	.082	.025	404,705	.071
White bread & butter	.009	.022	.042	.081	539,643	.020
Rhubarb sauce	.001	.002	.207	.133	255,470	.036
Sponge cake	.008	.013	.019	.082	224,750	.020
April 13, 1913.						
Breakfast:						
Total	.047	.026	.914	.225	504,011	.104
Luncheon:						
Total	.034	.056	.156	.153	887,151	.079
Dinner:						
4 oz. pork loin	.052	.048	.154		300,000	.066
Mashed potatoes	.007	.008	.188	.045	126,250	.005
Gravy	.008	.063	.221	.012	306,570	.036
2 oz. celery	.001	.001	.059	.002	4,370	.025
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Rhubarb sauce	.001	.002	.207	.133	255,470	.036

MEAT MENU. (Continued)

	Protein.	Fats.	Water.	Carbo-hydrates.	Calories.	Cost.
Dinner: (Continued)						
Sponge cake	.008	.013	.019	.082	224,750	.020
Spinach	.006	.017	.082	.025	404,705	.071
Bran bread & butter	.009	.022	.042	.081	539,643	.020
One cookie	.005	.075	.014	.052	171,633	.006
April 14, 1913.						
Breakfast:						
Total	.047	.026	.914	.225	504,811	.104
Luncheon:						
4 oz. scramble eggs	.034	.030	.182	.....	191,250	.040
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Rhubarb sauce	.001	.002	.207	.133	255,470	.030
One cookie	.005	.015	.014	.052	171,673	.006
Dinner:						
Mashed potato	.007	.008	.188	.045	126,250	.005
Roast pork	.052	.048	.154	.....	300,000	.060
Gravy	.008	.063	.221	.012	306,570	.036
Asparagus	.005	.008	.224	.005	55,000	.060
Bran bread & butter	.009	.022	.042	.081	539,643	.020
Chocolate cream	.062	.006	.157	.093	276,176	.026
2 oz. thin cream	..008	.005	.110	.006	40,620	.010
Layer cake and fig filling	.014	.017	.039	.166	406,992	.012
Total for week	1.318	2.001	13.990	10.464	23,524,069	2.895

COMPARATIVE TABLES SHOWING THE TOTAL WEIGHTS, AND COST OF FOOD ELEMENTS, DURING THE TEST AND CHECK PERIODS.

NUT MENUS.

Period.	Protein.	Fat.	Water.	Carbo-hydrates.	Calories.	Cost.	Gain or Loss (a)
April 1 to 7 inclusive.	.939	2.104	13.182	5.337	25,452.100	2.55	+½ lb.
" 15 to 21 "	.883	2.448	16.083	4.321	23,202.705	2.26	+1 lb.
" 29 to May 5 "	1.332	2.568	16.115	5.184	24,822.220	2.54	+2 lbs.
TOTAL	3.154	1.120	45.380	14.882	73,547.025	7.35	+1½ lbs.
Average per week	1.051	2.273	15.126	4.960	24,515.341	2.45	

MEAT MENUS.

April 8 to 14 inclusive	1.318	2.001	13.990	10.464	23,524.069	2.90	even.
" 22 to 28 "	1.059	2.458	15.253	5.821	25,034.875	2.87	-2 lbs.
May 6 to 12 "	.965	2.643	14.664	4.250	21,982.435	2.53	-1½ lbs.
TOTAL	3.342	7.102	43.807	20.535	70,541.379	8.30	-3½ lbs.
Average per week	1.447	2.334	14.602	6.845	23,513.793	2.77	
	1.051	2.273	15.126	4.960	24,515.341	2.45	
Comparisons of averages with nuts.	+.396	+.061	-.524	+1.785	-1,001.548	+.32	

(a) In weight of subject.

MENUS USED DURING THE LAST FOUR WEEKS OF THE EXPERIMENT.

NUT MENU.

April 15.

Breakfast.
Cocoa; ½ grapefruit; cereal with milk and sugar; buttered toast; soft cooked egg.

Luncheon.
Buttered toast; cocoa; white cake;

Dinner.
Nut loaf; potato balls; creamed cabbage; rhubarb.

April 16.

Breakfast. (a)

Luncheon.
Potato salad; rolls; butter; jelly; white cake; coffee.

Dinner.
Pecan salad; creamed potatoes; corn; rhubarb; white cake.

April 17.

Breakfast.

Luncheon. (b)

Dinner.
Nut croquettes; creamed potatoes; bran bread; butter; baked bananas; cake.

April 18.

Breakfast.

Luncheon.
Baked potato; bran bread; butter.

Dinner.
Nut salad; mashed potatoes; cream sauce; cabbage; bran bread; butter; cherry sauce.

April 19.

Breakfast.

Luncheon.
Baked potato; scrambled egg; bran bread; butter; radishes; mustard pickle; cherry sauce; cookie; coffee; cocoa.

Dinner.
Cocoa; nut croquettes; escalloped potatoes; corn; pepper relish; rhubarb; sour cream cake.

April 20.

Breakfast.

Luncheon.
White bread; butter; radishes; Spanish cream; sour cream cake.

Dinner.
Pecan salad; creamed potatoes; asparagus; radishes; pickles; Spanish cream; cake.

(a) Staple breakfast menu previously used.
(b) " luncheon " " "

NUT MENU. (Continued)

April 21.

Breakfast.

Luncheon.

Dinner.
Nut loaf; potatoes with well of gravy; beet and cottage cheese salad; radishes; cake.

April 22. (Meat Menu)

Breakfast.

Luncheon.
Salmon steak; hominy; chocolate ice cream.

Dinner.
Bran bread; butter; radishes; Spanish cream; cake.

April 23.

Breakfast.

Luncheon.

Dinner.
Fried ham; boiled potatoes; gravy; rhubarb; sour cream cake; lemonade.

April 24.

Breakfast.

Luncheon. Co.
Salmon loaf; potato salad; white bread; butter; radishes; mustard pickle; snow pudding; custard sauce; sponge cake; tea.

Dinner.
Potato salad; bread; butter; radishes; strawberries; sponge cake; lemonade.

April 25.

Breakfast.

Luncheon.

Dinner.
Pork chops; mashed potatoes; gravy; lettuce with French dressing; snow pudding with custard sauce; sponge cake; lemonade.

April 26.

Breakfast.

Luncheon.

Dinner.
Fried ham; mashed potatoes; gravy; creamed carrots; bread; butter; strawberry short cake; lemonade.

April 27.

Breakfast.

Dinner.
Potatoes with well gravy; radishes; bread; butter; jelly; strawnerry short cake;

Luncheon.
Tea; cake; sandwiches.

April 28.

Breakfast.

Luncheon.

Dinner.
Pork chops; mashed potato in well of gravy; green onions; bran bread; butter; strawberry short cake.

April 29.(Nut Menu.)

Breakfast.

Luncheon.

Dinner.
Pecan salad; creamed potatoes; butter; green onions; strawberry short cake.

April 30.

Breakfast.

Luncheon.

Dinner.
Meat loaf; escalloped potatoes; asparagus; strawberry short cake.

May 1.

Breakfast.

Luncheon.

Dinner.
Nut loaf; escalloped potatoes; biscuits; butter; strawberry short cake; lemonade.

May 2.

Breakfast.

Luncheon.

Dinner.
Nut salad; mashed potatoes; cream sauce; asparagus; doughnut; rhubarb.

May 3.

Breakfast.

Luncheon.

Dinner.
Pecan croquettes; potatoes with well of gravy; asparagus; rhubarb; cookies.

May 4.

Breakfast.

Dinner..
Pecan potato balls; bran bread; butter; radishes; rhubarb; doughnut; lemonade.

Luncheon.
Potato salad; bran bread; butter; mustard pickle; radishes; cookie; strawberries; lemonade.

May 5.

Breakfast.

Luncheon.

Dinner.
Nut salad; cream potatoes; creamed corn; bran bread; butter; strawberries; cookie.

May 6.(Meat Menu)

Breakfast.

Luncheon.

Dinner.
Shad; spinach and egg; rolls; butter; chocolate ice cream.

NUT MENU. (Continued)

May 7.

Breakfast.

Luncheon.

Dinner.
Lamb chops; mashed potatoes; gravy; asparagus; cake; strawberries.

May 8.

Breakfast.

Luncheon.

Dinner.
Lamb chops;mashed potatoes; gravy; asparagus; strawberries; cake.

May 9.

Breakfast.

Luncheon.

Dinner.
Fried ham; mashed potatoes; gravy; creamed cabbage; rhubarb; cake.

May 10.

Breakfast.

Luncheon.

Dinner.
Fried ham; mashed potatoes; gravy; creamed cabbage; radishes; rhubarb; cake.

May 11.

Breakfast.

Dinner.
Cold boiled ham; creamed potatoes; radishes; creamed cabbage; cake; strawberries.

Luncheon.
Bread; butter; cake; straeberries.

May 12.

Breakfast.

Luncheon.

Dinner.
Deviled ham; creamed potatoes; rhubarb; strawberries; cake.