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FACTORS AFFECTING THE NUTRIENT ADEQUACY OF  
THE DIETS OF JACKSON COUNTY FARM WOMEN

by

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## INTRODUCTION

The farm belt has for the past 5 to 6 years been experiencing one of the worst economic downturns since the depression of the 1930's. In the 1970's the farmers benefited from the increasing inflation rates which raised land values. Farmers borrowed heavily, and were often encouraged to do so, from government and private lenders on the basis of these inflated land values. In the early 1980's when land values crashed, farmers began to bear a great financial burden. This was especially aggravated when, after a dramatic rise in agricultural exports in the late 1970's, overseas sales fell off sharply in the '80's.

The ramifications of the farm crisis have been felt in the everyday life of the farm family. Suicides within the farming community have been prevalent, divorce rates have increased, drug and alcohol abuse are also on the rise. Crisis hotlines run by social or mental health agencies have been issuing advice and guidance for the stressed farmers and their families.

In order to cope with the financial debt either the husband, wife or both may have obtained employment off the farm. An off-farm job adds more time constraints to a woman who is already busy raising a family, running the family home, as well as working on the farm. But off-farm income is often vital to pay back the farm debt or to keep the farm business alive.

Hill (1981) presented a challenge to sociologists to direct future research into the areas of farm women and farm families, farm work, farm management, off-farm work and farm organization. She asked that the sociological ramifications of farm women's lives be examined. Research, however, should not be limited to sociology. An examination of these aspects with respect to farm women's health and nutritional well-being is also appropriate.

An obvious question for a nutritionist to ask is "How well is the farm woman now able to provide nourishing food for herself and her family?" A traditional view of the farm woman is an image of her tending a vegetable garden and being able to preserve the produce. But as she now maybe working off-farm is she still able to preserve that homegrown produce?

A statewide survey is planned to determine factors affecting the nutritional adequacy of the diets of Kansas farm women. As a preliminary study, this present survey was designed to explore possible factors or trends that may affect the quality of diets of Jackson County farm women. Specific factors investigated were:

- 1) the amount of time that the farm woman is involved in off-farm employment
- 2) the amount of home food production and preservation undertaken
- 3) the farm woman's education, both informal and formal.

## REVIEW OF LITERATURE

### Background: Jackson County

Jackson County, is situated 1 hour north of Topeka, Kansas. The total land area of Jackson County is 658 square miles and consists of rolling plains dissected by numerous streams. The water supply is mainly from wells and an impoundment reservoir provides water to Holton (the county seat).

Winter conditions prevail December through February. The spring and fall seasons are relatively short and warm temperatures last for about 6 months every year providing a long growing season for crops. Rainfall is heaviest in late spring and early summer and although the total is adequate for any crop, its distribution may cause problems in many years. Prolonged dry periods lasting several weeks are not uncommon during the growing season. Alternatively, a delay in planting and harvesting may occur due to a surplus of rain. Annual rainfall is 35.28 inches and of this total 74% falls in April through September which includes the growing season for most crops. Tornadoes and severe thunderstorms occur occasionally in Jackson County. They are usually local in extent and of short duration so that the risk of damage is small. Crop damage by hail is not as important as that

which occurs in Western Kansas.

Farming and related services are the most important enterprises in the county. In 1986, a total of 1,072 farms comprised an area of 595 square miles (381,000 acres) or 90.4% of the total county area. In 1986, the value of crops harvested was \$15,702,000 which ranked 62nd in the state (Kansas Agriculture Statistics, 1986-87). The main crops grown in the county are wheat, corn, sorghum (milo), soybeans and hay. Approximately 16% of Jackson County is rangeland. Most of the rangeland is in the western part of the county. The value of livestock production was \$18,169,300 (ranked 48th in the state) in 1986 (Kansas Agricultural Statistics, 1986-87). Beef cattle and swine are the main kinds of livestock raised. Dairy cattle, sheep, and poultry are also raised. The major source of livestock feed are native range and tame pasture but the crops and their by-products are extensively used as supplemental feed. Almost all of the rangeland in the county is intermingled with cultivated fields. Rangeland areas are generally too rocky or steep to be cultivated (USDA, 1985).

A total of 4,882 persons, aged 16 years and over, were employed in Jackson County in 1980 (U.S. Census, 1980). Of these, 671 (13.7%) were classified in the farming, forestry, and fishing occupations. Females comprised 39.9% of the total workforce. According to these census data, 107 females (5.5% of the female workforce) were in the farming, forestry

and fishing category, 77 of whom are categorized as farm operators or managers. Other major occupations of the county population include technical, sales and administrative support occupations (26.5% of the total workforce), operators, fabricators and laborers (21.6%), managerial and professional specialty occupations (13.2%) and service occupations (11.6%).

In 1980, the total population of Jackson County was 11,644: 5772 men and 5872 women. In the county seat of Holton, the population was 3,132. Other towns in the county ranged from 125 people (Adrian township) to 1,711 (Douglas township). It is a predominantly white population (94.9%).

#### Rural Kansas Surveys

The health of rural women in Kansas was the focus of a survey by Holcomb (1987). 636 rural women from 10 counties completed a 9-page questionnaire on personal health practices. The survey took place between January 1985 and March 1986. The results of this survey revealed that farm women (35% of the sample population) were more likely than women living in the town to eat breakfast daily, sleep 7-8 hours per night, exercise more often, and avoid alcohol and tobacco. These were considered to be healthy practices. However, the rural women employed away from the farm or home were more likely to sleep 6 hours or less per night, skip breakfast, eat snacks daily, drink alcohol, and smoke cigarettes. Therefore, employed rural women were most likely

to be following an unhealthy lifestyle.

Stress, and the way rural families in Kansas cope with stress, was examined in a survey by Bugaighis et al (1985). Specifically, the researchers focused on stress on families in their middle years of the family life cycle. The population sample was drawn from 3 rural counties in Kansas which were near the state average in individual education and annual family income. The average age of the males and females were 47 and 44 years respectively. Of the male respondents 83% were employed full-time. For the women, 38% were employed full-time, 25% part-time, and 32% reported being full-time homemakers. The major stress identified by the families was that associated with worsening economic change. Loss of income and having to go into debt were frequently cited as distressors. Taking on additional paid employment, reducing services used or relying on informal support systems were common ways of coping with these stresses. In a rank order of frequency (most common to least common), Bugaighis et al (1985) listed 16 specific ways that the families reported making money go further. Taking advantage of sales and specials, using less expensive telephone rates, using retail coupons were the 3 most commonly reported methods. Growing own produce tied with prioritizing bill payments at the seventh and eighth ranks. Home food preservation was not commonly reported as being a method to make money go further.

### National Survey: the Farm Women Survey

In the summer of 1980, a cooperative research study of US farm women was undertaken by the National Opinion Research Center and the United States Department of Agriculture (Rosenfeld, 1985). This was the first national survey of farm women set up to study the nature and determinants of farm women's participation in US agricultural operations. The subjects were 2,509 farm women and 569 farm men who were interviewed over the phone. A standard interview took 30 minutes to complete.

Women reported doing half of the 15 inventoried tasks at least occasionally. Most frequently women reported regularly tending a vegetable garden or raising animals for family consumption, bookkeeping and running farm errands. In the Farm Women Survey, most farms produced some of their own food. Almost all women reported regular responsibility for housework (97%) and child care (74%).

In the Farm Women Survey, 31% of the women were employed off-farm at the time of the survey, and an additional 6.4% had had a job in the last year. Women were more likely than the men surveyed to be employed less than fulltime when working off-farm and they earned less in a year. Women on larger farms were less likely to be employed. If only the woman was employed off-farm then she , on average, contributed half the income. Twenty-five percent of

the women said they had an off-farm job at least partially for money for farm-related expenses, another 33% said it was for money needed for other reasons. Almost 33% of the off-farm employed farm women were in clerical positions, approximately 25% in professional and technical jobs, 16% were service workers. Women with more education were likely to have had off-farm jobs, older women were less likely to have off-farm employment especially after age 65.

According to the Farm Women Survey, 74% of the women and 79% of the men had belonged to at least one farm or community organization in the last 3 years. Specifically, the Farm Women Survey asked questions about participation in Extension activities in the last 2 or 3 years. Forty-two percent of the women, and 43 % of the men participated in at least 1 of the 6 listed activities. Men were not asked if they participated in any activities concerning food or nutrition but 20% of the women reported that they did. Womens' other work responsibilities e.g. having an off-farm job, performing a greater range of farm tasks and having school-age children increased the likelihood of their participating in voluntary organizations and political bodies (Rosenfeld, 1985).

#### Farm Women: On-farm and Off-farm Work

There have been deficiencies in national data collections e.g. Census of Agriculture, Bureau of Labor Statistics data that have made it difficult to assess the

contribution of the farm wife to the family farm. Huffman (1976), discussed these deficiencies: failure to count as being employed the unpaid family workers who work less than 15 hours during the survey week, timing of the surveys given the seasonality of farm work, and thirdly that farm wives with both farm and nonfarm work maybe counted as working only in the nonfarm sector. However, Huffman used the 1964 Census of Agriculture data to empirically analyze the farm wives' productivity. His results showed that farm wives participate in and are productive at farm work. The factor cost share of wife labor is largest on crop farms and decreases as the relative importance of livestock output increases. According to U.S. Department of Labor statistics, (Huffman ,1976), farm wives' off-farm labor force participation was 16% in March 1959 and increased to 26% in March 1971.

Fassinger and Schwarzweller (1982), conducted a mail survey of 124 farm households in the mainly cash crop farming area of mid-Michigan to determine the work patterns of the farm wives. Respondents were asked to indicate which family member(s) performed each of the 28 farm tasks and 28 household tasks listed. Information was also obtained on the scale of farming, nature of operation, farm management practices, household composition, and amount of time spent on farming activities by each household member. Farms were divided into "hobby" (not very dependent upon farm sales for

income although supplementing off-farm wages with home food production), "small" (operate 50-300 acres and are more oriented toward profit), and "larger" farms (operate between 300-1000 acres and are complex business organizations with heavy investments ). Of the 3 categories of farms, the women showed similar rates of off-farm employment (39%). They found that women on larger farms were more likely to spend longer hours in farm work year round than those on small or hobby farms. However, the scale of farm operation was shown to have little effect on the range of a woman's household or farm activities, or with the likelihood of her being employed off-farm. In comparison to other members of their households, the chores which farm women contributed most were paying farm bills, bookkeeping, and planting and tending a vegetable garden. A bias inherent in this survey was that the majority (68%) of the questionnaires were filled out by adult males.

Buttel and Gillespie (1984), conducted a telephone survey of 506 farm households in the state of New York to examine the sexual division of farm household labor. Gross farm income was used as an indicator of farm size. They found that women's off-farm labor market participation was inversely and weakly associated with farm size whereas women's hours of on-farm work was positively, although not significantly, associated with farm size. The relationship between men's and women's on-farm labor inputs was positive

and statistically significant.

Sweet (1972), used data from the 1960 Census of Population and Housing to examine the employment patterns of farm women. The analysis was limited to married women under the age of 60 living with their husbands. Hence, 2,613 cases were used, 22.5 % of whom were employed during the census week. Of the employed women, 70% were employed in nonfarm occupations. Employment rates tended to increase with education and wives of farm residents who were employed in nonfarm occupations had greater than average overall employment and nonfarm employment rates.

A mail survey was conducted by Johnson et al (1980), to examine the off-farm income and dual employment characteristics of 750 Eastern Nebraska farm families. In 1978, an average of 25% of the total family income of this population was attributable to off-farm employment. One-third of the farm wives (average age 47 years) worked off the farm during 1978 and traveled an average of 10 miles (one way) to their off-farm employment. Clerical, teaching and medical-related work were the most frequently reported occupations for these women. The collected data indicated that the smaller the farming operation, the higher the frequency of off-farm employment and magnitude of off-farm income. A higher percentage of farm wives on low income farms worked off the farm than wives on higher income farms. Wives on low income farms were more likely to be employed

full-time. The main reason cited for working off-farm was for income to remain on their farms.

Sander (1983), used data from the Farm Women Survey to discuss off-farm income and employment in the US. He stated that " the most important rationale for allocating time to off-farm work is simply that the marginal value of time in an off-farm job exceeds the marginal value of time in other uses". He highlighted the finding that both farm men and women have a relatively high representation in high wage operations. Farm women were primarily professionals through their work in the nursing/health and teaching professions. For farm women, education had a positive effect on allocation of time for off-farm work. Children, farm income, dairy farming, age and on-farm work negatively affected the off-farm work hours. Overall, Sander concluded that an increase in farm men and women's off-farm employment has occurred because of a decrease in low opportunity cost labor in farming and an increase in the economic availability of off-farm work. As a consequence of their increased participation in off-farm work, Sander stated that farm women have improved their economic status in the farm family economy.

Gladwin (1985) discussed the findings of a survey conducted in 1981 to determine the role of the farm woman on North Florida farms. Data was collected from 50 personal interviews where the women were asked open-ended questions

about tasks they perform. It was found that, on average, the North Florida farm woman spent 22 hours per week on farm tasks and 17 hours per week on off-farm work. Year-round, women spent 26 hours per week in housework activities and during the spring-summer season an extra 12 hours per week gardening and processing the garden produce.

#### Time Spent in Household Activities

Using 20 government research studies conducted between 1920-1970, Vanek (1974) evaluated time spent in housework. She found that proportionately fewer women in the 1960's were full-time homemakers compared to women in the 1920's. Employed women spent less time (26 hours per week) in housework than nonemployed women (55 hours per week). This difference still held true even when the variables social class, family composition and marital status were taken into account. Between 1926 and 1968 time spent in food preparation (including dishwashing) had decreased overall from approximately 23 hours to 18 hours.

Weigand (1954), surveyed 250 farm and urban homemakers to examine their use of time in homemaking activities. Personal interviews with these New York state women took place in spring 1952. A record of their use of time on the weekday preceding the interview and on the preceding weekend days was obtained. Nearly half of the farm and urban homemakers were in 2- or 3-member households. The average

age of the homemakers was 43 years and most considered themselves to be in excellent or good health. Both farm and urban homemakers spent about 7 1/2 hours in homemaking activities. Cooking and baking was mentioned by 50% of all the homemakers as the homemaking activity they liked best. The average time spent by all the homemakers for food preparation on a weekday was 1.6 hours ranging from 1.8 hours for farm homemakers to 1.2 hours for employed urban homemakers. Dishwashing time averaged slightly less than 1 hour. Food preservation was negligible due to the season of the year. Meals served by farm homemakers tended to involve more food handling in preparation, employed homemakers prepared meals that required the least food preparation.

Berheide et al (1976) surveyed urban women in Evanston, Illinois. Their objectives were to determine the range of household tasks, who is responsible for those tasks, and to find out how women feel about the household work they do. They used 3 data collection methods: 40-minute telephone interviews (n=309), direct observation of household work (n=43), and a self-administered 24-hour diary (n=158). The mean age of the women was 43 years (range of 21 to 84), 43% were employed full-time and 20% part time. Of the employed women 46% worked at professional (mainly health/teaching professions) or technical level jobs. Fifty percent of all the women had at least finished college. The average daily time spent on household work was 4.5 hours. The employed

women reported less time spent in household tasks the more hours she was employed. However, employed married women did not do a significantly smaller proportion of the household work i.e. the reduction in time spent in household work by the wife was not compensated for by an increase in time spent by the husband or other family members.

A comparison of change in time spent in housework activity was undertaken by Sanik (1981). She compared two time-use surveys in 1967 and 1977 of two-parent, two-child households in Syracuse NY. In 1967, 378 families were interviewed and 105 families were interviewed in 1977. There was no observed change in time spent by the woman in food preparation but shopping time increased while time spent in dishwashing and clothing care decreased. Employment significantly decreased the woman's total household work time: an additional hour of employed work was seen to decrease overall household work time by four minutes. The input to all household activities by the total family remained the same at ten hours per day. Sanik concluded that the wife still makes the largest contribution to household reproduction even when employed.

Stafford (1983), surveyed 362 New York women in 1967-68 to study the effects of the employed wife's work day on her time spent in household work activities. She used a household time allocation model which assumed that employment status and length of employment day were outside

the realm of the family's choices when making daily time-use decisions. The results of Stafford's study showed a decrease in the wife's total household work time accompanying an increase in employment time. The biggest decreases were in housecare followed by decreases in clothing care, after-meal cleanup and food preparation. Stafford speculated that these decreases in physical care are compensated for by the employed wife's increase in time spent buying market goods and services to substitute for formerly homeproduced goods and services.

Hafstrom and Schram (1983), interviewed 227 homemakers in the Champaign-Urbana area of Illinois in 1976-77. They found the number of hours that the wife was employed to be a major constraint on the hours she spent in housework. For a woman spending 40 hours per week in the labor force, a decrease from 2 to 5 hours in housework time would be expected. The results did not show that the wives's education, considered by the researchers to be a facilitator of household activity, had any effect in decreasing the number of housework hours ( their supposed indicator of housework efficiency). Hafstrom and Schram proposed that although education per se had no effect, education in specific areas e.g. home economics, home management expertise, may significantly determine reductions in housework time. Hafstrom and Schram also reported that wives spent more hours on housework the larger the family size,

the greater the number of stories in the family dwelling, the fewer times the family ate out, and if the wife had a chronic illness. However, the wife's labor force participation was found to be the most important determinant of housework time.

Fox and Nickols (1983), examined the impact of the employment of wives on the patterns of time spent in household work. They surveyed 206 2-parent, 2-child southern families using two 24-hour time records and reported socioeconomic data. They found that the wife's time in housework was significantly influenced by her employment hours. In contrast, the husband's, son's, and daughter's household work time was not significantly related to the employment hours of their wife/mother. The diversity of household tasks was greater for wives than husbands. The wives' diversity scores decreased as hours of employment increased. Employed wives divided their work hours almost equally between home and job.

In 1977, Graff (1982), conducted a study of 60 farm women in Ontario, Canada. She hypothesized that the work of farm women is in a process of change similar to the change felt by urban women a century ago. From this study, Graff concluded that the younger generation of farm women are participating to a lesser extent in both farm and household production activities than farm women 40 years before. This younger generation appear to be less active in gardening,

orchard work, canning and preserving.

#### Food Preparation Time

Ortiz et al (1981), studied the effect of homemakers' employment on meal preparation time, meals at home, and meals away from home. Their subjects were 210 2-parent, 2-child families of both rural and urban residence in Wisconsin. Interviewers recorded detailed information on how each family member spent two 24-hour days. Their results showed that the amount of the homemaker's time spent in food preparation was significantly related to her employment. The variables: level of education, rural-urban residence, family income were not found to be related to time spent in food preparation. The homemaker's employment hours had no effect on the number of meals eaten together at home. The homemaker's educational level was shown to influence meals eaten together. The family was more likely to eat together if the homemaker had a college degree. Ortiz et al suggested that the homemaker may have produced meals that offered an incentive for family members to eat together or had acquired skills that enabled them to provide meals at times when family members were together. The last dependent variable Ortiz et al examined was the percent of meals eaten away from home. Families of full-time employed homemakers ate a larger proportion of meals away from home. Families of women who worked only part time did not significantly differ from the nonemployed group. Rural families were found to eat more

meals away from home than urban families. It was suggested by Ortiz et al that rural families avoided travel to home from work. It may also relate to the fact that the rural schools had lunch programs whereas many of the urban schools did not. Ortiz et al recommended that further study about the nature of the meal changes will help evaluate the effect of these changes on nutritional well-being.

Goebel and Hennon (1983), using data from the 11 state urban/rural comparison of families' time use, examined the effect of the mother's employment on time spent on meal preparation, and expenditures for meals away from home. The sample included 2-parent, 2-child families and two 24-hour time records were used. Their results indicated a different pattern for urban and rural mothers in how they spent time in meal preparation and dishwashing. In both the rural and urban samples the time spent in these activities were related to the mother's employment status. Rural nonemployed mothers spent the most time in meal preparation and dishwashing per day ( $x=153.49$  minutes) which is significantly different from both part-time ( $x=127.58$  minutes) and full-time ( $x=120.51$  minutes) employed mothers. There was no significant difference for the expenditures for meals purchased away from home by employment status of the mother. Goebel and Hennon (1983), also found that the number of meals eaten together as a family were related to employment status in the rural sample only. Families of

part-time employed rural mothers were eating meals together less often than the families of either the full-time employed or nonemployed mothers.

The impact of women's time allocation on expenditure for meals away from home and prepared foods was examined by Redman (1980). She used a sample size of 9,392 obtaining data from the diary portions of the 1972-73 Bureau of Labor Statistics and 1973-74 Consumer Expenditure Surveys. Family income was found to have a positive effect on meals consumed away from home, family size a negative effect. Households with older women spent significantly less on meals eaten out than those with younger women. Households in metropolitan areas spent significantly more than average, and those in rural areas significantly less on meals away from home. Family income, employment of wife, family size, children of all ages and age of the women were all positively significant for the use of prepared foods. However the woman's college education had a negative effect on the use of prepared foods. Redman suggested that college-educated maybe more nutrition-conscious and therefore would be more selective of ingredients than is possible with many prepared foods.

#### Effect of Employment on Dietary Quality

Skinner et al (1985), studied the relationship between mothers' employment and the nutritional quality of diets of

their adolescent children. The subjects were juniors and seniors in high school between the ages of 15 and 18. One hundred and twenty-three adolescents had employed mothers (part time workers were included in this category) and 88 had nonemployed mothers. Sociodemographic questionnaires provided data on mothers' employment patterns. Twenty-four hour food records showed no significant differences between the two groups for the total day or intakes at breakfast, the evening meal, or snacks. Iron intakes per 1000 kcal for the total day were higher for adolescents whose mothers were not employed (5.7 mg) than for those with employed mothers (5.2 mg). Intakes for both groups were below the RDA for iron. The snacks consumed by the adolescents of employed mothers were lower in nutrient density for iron and thiamin. There were no significant differences between the groups for the proportion of adolescents who skipped breakfast, in the number of snacks consumed, or in the number of evening meals eaten away from home. Skinner et al concluded that factors other than mothers' employment account for the marginal quality of adolescents' diets obtained from the subjects.

A study undertaken by Aucoin et al (1972), evaluated the food habits of 10, 13 and 15 year old students and examined the influence of age, sex and selected family characteristics upon those habits. The 2-day food intake records were evaluated in terms of Canada's Food Guide. The percentage of students with adequate food scores decreased

with increasing age. The educational background of the parents had a positive effect on the food score of the students. Children of university educated women scored consistently higher at each of the three ages. The employment status of the mother had no significant influence on the students' food scores.

Pearson et al (1985) used data obtained from the Spring quarter of the 1977-78 USDA Nationwide Food Consumption Survey for 1,325 housekeeping households. Their findings suggested that the work-shift (the 24-hour period divided into 3 equal shifts called day, afternoon and night) of one or more of the adults in a household did not affect household food purchasing and food preparation practices, expenditure on convenience and nonconvenience foods, pounds of food used, or the nutritive value of those foods.

#### Home Food Production

Volker et al (1983), in their research on household production of food, studied the influence of a variety of factors on gardening, canning and freezing. They found that households living in open country, those with older heads, and larger households were more likely to have family members engaging in these food production activities. Income was found to be negatively related to household production of food indicating that those who produce their own food may do so because of constraints on income. The variables of household size, number of full-time workers, and total

household income positively contributed to food expenditures. The negative relationship of income to household food production indicated that households that did more gardening, canning, and freezing spent less money on food. A study in 1924 (Vanek, 1974) showed that rural families produced about 70% of their own food, compared with 2% for urban families.

Green et al (1986), conducted a study of home food production in a rural area of the Ozarks. One thousand, six hundred and ninety-five rural residents were interviewed from 24 towns of less than 500 people. They found almost all of the residents to be doing some form of home production activity. Over 85 % of the subjects gardened and preserved fruits and vegetables, 50% butchered their own beef. Home food production was not limited to any particular income or age group. Urban migrants were less likely to be engaged in home food production than rural migrants or lifelong residents of the area.

Scholl (1982), proposed that farm women, because of their contribution to food production in the form of raising vegetables and livestock for family consumption, should be encouraged to participate in horticulture programs. She considered that farm women need information on selection of planting sites, soil analysis, control of weeds and pests, and use of plant residues.

### National Dietary Surveys

Swan (1983) reviewed 2 major surveys conducted to determine food consumption by individuals in the United States: The Nationwide Food Consumption Survey (NFCS), and the National Health and Nutrition Examination Surveys (NHANES). The NFCS data have been used frequently in nutrition research. This survey gathered information on food consumption in households and on individuals within those households. The 1977-78 sample was a stratified area probability sample of about 15,000 households and 34,000 individuals surveyed in the conterminous states between April 1977 and March 1978. Food use data for households was obtained for a 7-day period. Individuals completed a 24-hour dietary recall and kept food intakes for the following 2 days. Swan (1983), in her review of data obtained from NFCS, concluded that nutrient consumption, especially for women and particularly elderly women, is limited more by low food intakes now than in previous years.

The US Department of Agriculture (USDA) has been conducting a Continuing Survey of Food Intakes by Individuals (CSFII) as a component of the National Nutrition Monitoring System. The CSFII was initiated in 1985 to provide information on the adequacy of diets of selected populations and give early indications of changes in dietary patterns. The data were collected using a 24-hour dietary recall and information on dietary data were collected by

telephone at 2 month intervals (USDA 1986).

Peterkin (1986), compared the data on women's diets from the spring 1977 National Food Consumption Survey (NFCS) and the spring 1985 CSFII. In 1977, 2,338 women between the ages of 19 and 50 years were interviewed, 1,503 women were interviewed in 1985. In both the surveys women's diets did not provide the recommended levels of calcium, iron, magnesium, zinc, vitamin B6, and folacin. The contribution of fat to energy intake decreased from 41% to 37% in 1985. The carbohydrate contribution to energy increased from 41% to 46% between the two surveys.

#### Dietary Surveys of Rural Populations

Jeans et al (1952) assessed the dietary habits of 404 low income pregnant women in a rural area of Iowa. The data collected indicated faulty dietary habits. The authors suggested that these poor habits were at least as important as food costs in determining what was eaten. Bread and potatoes made up a large portion of the energy intake. The high consumption of potatoes was suggested to be important in preventing ascorbic acid and iron deficiencies. The enrichment of bread was thought to have kept the majority of the women from deficiencies in iron, thiamin, and riboflavin.

Low income, rural families from Iowa and North Carolina were the subject of a study conducted by Inano and Pringle

(1975-I). Twenty-four hour recalls were obtained from 668 families who were interviewed quarterly. A "family nutrient standard" for each family was established to evaluate the diets for each of the 7 nutrients and for the entire family intake. A family-composite allowance was then compared with the total nutrient content in the family's food for the recall day. Families were divided into 4 income groups and the percentage of the families with good, fair or poor intakes of the selected 7 nutrients (protein, calcium, iron, vitamin A, ascorbic acid, thiamin, and riboflavin) were calculated for each level. Proportions of families with poor nutrient intakes were higher in North Carolina than in Iowa. Calcium was found to be the most limiting nutrient for the total sample. Vitamin A, ascorbic acid and iron were also limiting. As the income level of the family increased, the percentage of the total family sample with poor diets tended to decrease.

The percentage contribution of 4 nutrients from foods in selected food groups to the total nutrient content of diets was determined by Inano and Pringle (1975-III) using a subsample of their previous study population. Twenty-four hour recalls of 35 rural families from Iowa and 25 rural families from North Carolina were examined. The criteria for selection for this survey was 1) that all members ate all meals at home the day of the interview, and 2) the family diets rated "fair" ( $\geq 2/3$  RDA) or "good" ( $\geq 2/3$  RDA). The diets

were categorized according to 4 food groups i.e. meat, milk, vitamin A-rich fruit/vegetables, and vitamin C-rich fruit/vegetables. The results indicated that the use of the "Basic 4" or "Daily Food Guide" may produce biased information if used exclusively to assess nutritional intake. Foods from the meat group contributed 0-84% of the protein intake of the North Carolina families, and 35-85% of the Iowa families. Foods from the milk group contributed 0-84% and 2-97% of the calcium intake of the North Carolina and Iowa families respectively. Vitamin A intake from the vitamin A-rich fruit/vegetable group ranged from 0-99% for North Carolina families and from 0-88% for the Iowa group. The ascorbic acid intake of the North Carolina group ranged 0-95% from the ascorbic acid-rich fruit/vegetables and for the Iowa families 0-100%.

#### Dietary Surveys of Low Income Households

Allen and Gadson (1984), analyzed the food consumption and nutritional status of low-income households to determine the effectiveness of the Food Stamp Program (FSP). The researchers determined the amount spent on food by respondents in the 1979-80 NFCS belonging to the two categories: FSP participants and those eligible but not participating in the FSP. Nutrient adequacy ratios were determined for vitamin A, ascorbic acid, riboflavin, calcium and iron. These are nutrients that the Ten-State Survey (1968-70) and the NHANES (1971-72) indicated are most

likely to be consumed in inadequate amounts by the low-income population. The results showed that for FSP households and eligible nonparticipating households were about the same except for calcium. Eligible nonparticipating households were more likely than FSP households to fall below 100% of the RDA's except for vitamin C.

The 1977-78 NFCS data were used by Rizek and Peterkin (1980) to determine the food costs and practices of working women households. Data from 6,565 housekeeping household were utilized. "Housekeeping households" being households with at least one person having ten or more meals from home food supplies during the 7 days prior to the interview. Of these households, 2,420 had female heads who were employed 20 or more hours per week outside the home i.e. working-women households. The working-women households had a higher total money value on the average for food used at home and away, than the food used by other households. Working-women households bought more food away from home than other households although eight out of every ten meals came from the home food supply. For the nutrients studied (protein, calcium, iron, magnesium, phosphorus, vitamins A, B6, B12, thiamin and ascorbic acid) the nutrient return per dollar's worth of food was slightly lower in the working-women households. The female head in most survey households usually planned, shopped for, and prepared the food. Fifteen percent of male heads in working women households, compared

with 7% in other households, usually prepared or helped in food preparation.

#### The 24-Hour Dietary Recall

The 24-hour recall is a dietary tool frequently used to assess nutrient intake of groups of individuals. It is limited by the individual's ability to accurately recall all food eaten in the prior 24 hours. Madden et al (1976) designed a study to test the validity of the 24-hour recall among 76 elderly people at a congregate meal site. They compared for one lunch meal, the nutrient values derived from weighed dietary intake to nutrient values derived from a 24-hour recall. With the exception of calories, no significant difference, using the paired t-test, was found between the mean recalled and the mean actual intake of nutrients. However, using regression analysis, results indicated that calories, protein and vitamin A tended to be over-reported for small intakes and under-reported for larger intakes

The study conducted by Gersovitz et al (1978), like that of Madden et al (1976), used data from congregate meal sites where the actual intake of the elderly could be observed. Gersovitz et al (1978), endeavored to determine the validity of the 24-hour dietary recall and the 7-day food record. As in the study by Madden et al (1976), recalled intakes were compared with actual intakes. Results

from the paired-t test for both the 7-day food record and the 24-hour recall suggested that the two methods gave about the same accuracy in the estimates of mean intake. Regression analysis results from the 24 hour recall suggested that there is a tendency to over-report intakes below the mean and under-report intakes above the mean ("flat-slope syndrome").

Guthrie and Crocetti (1985) used data from 21,867 individuals in the 1977-78 NFCS to determine the variability of nutrient intake over a 3-day period. The NFCS data were obtained from a 24-hour dietary recall and 2 days of written food records. Eighty-five percent of the respondents had intakes of a nutrient on any one day that varied by greater than 25% from the overall 3-day average. Guthrie and Crocetti concluded that the 24-hour recalls were of limited value if used alone in assessing nutrient adequacy of an individual. The study showed that the more adequate the mean nutrient intake then the less variability in intake from day to day. The more consistent the meal pattern, the less variability was seen in nutrient intake.

#### Assessment of Nutrient Adequacy of Diets

Johnson et al (1974), described a nutrient adequacy reporting system (NARS) that is frequently used to assess nutrient adequacy of people in the Expanded Food and Nutrition Programs (EFNEP). A computer program was written

to process the data obtained from a completed food record form and to provide nutrient profiles of a diet by calculating, for each subject, mean daily intakes for 12 nutrients and compared them to the appropriate Recommended Dietary Allowance. This nutrient adequacy assessment is similar to the nutrient adequacy ratio (NAR) as described by Guthrie and Scheer (1981). The MAR (mean adequacy ratio ) also was described by the researchers. The nutrient adequacy ratios were calculated as follows:

$$\text{NAR} = \frac{\text{the subject's daily intake of a nutrient}}{\text{RDA of the nutrient}}$$

$$\text{MAR} = \frac{\text{sum of the NARs for X nutrients}}{X}$$

The 12 nutrients selected by Guthrie and Scheer (1981) were protein, calcium, zinc, magnesium, iron, vitamins A, B6, and B12, ascorbic acid, thiamin, riboflavin, and folacin. For the MAR analysis, the NAR values were truncated back to 1.0 to prevent intakes in excess of the RDA for one nutrient compensating mathematically for another nutrient for which it can not nutritionally substitute. The MAR assesses the overall quality of the diet. In Guthrie and Scheer (1981), the cut-off point of 0.66 or 2/3 the RDA to signify nutrient adequacy in the NAR score ; a commonly used marker.

A study conducted by Guthrie and Scheer (1981) to establish validity for food group scores used 24 hour

dietary intakes of 212 university students (29 men and 183 women). The food group score is based on the Basic Four Food Guide. Points are assigned whenever a serving of a food item occurs in the diet. Two points are given for each of 2 items in both the milk and protein food groups, and one point for each of 4 items in both the fruit/vegetable group and cereal/bread group. This scoring system is based on the assumption that diets providing foods from each of the four groups can provide an adequate dietary intake. The study was used to determine the relationship between the food group approach (food group score) and the nutrient approach (NAR, MAR) in assessing nutrient intake. It was found that the food group score and the nutrient adequacy scores had strong associations using a one-way analysis of variance with Scheffe's method of multiple comparisons.

Crocetti and Guthrie (1981), in their preliminary report of the 1977-78 Nationwide Food Consumption Survey used a MAR consisting of the mean of the sum of percentages of the RDA's for 7 selected nutrients. The nutrients used were protein, calcium, iron, vitamin A, thiamin, riboflavin, and ascorbic acid. Instead of using a cut-off point to assess adequacy an "inadequacy score" was developed. For the inadequacy score each of the 7 nutrients is assigned a weight according to the percent of the RDA achieved. The 7 weights are then summed to yield scores. For nutrient intakes greater or equal to 80% RDA a "1" is assigned

(considered desirable), a "2" is assigned for nutrients between 60-79.9% RDA (considered acceptable), and an inadequate intake of less 59.9% RDA would be given a "9". Therefore, for the individual, inadequacy scores ranged from 7, for  $\geq 80\%$  RDA for each of the 7 nutrients, to 63 for intakes of all 7 nutrients less than or equal to 59.9% RDA. Crocetti and Guthrie (1981) concluded that both the MAR and inadequacy score are limited by the fact that all nutrients are assigned equal significance and fail to identify specific nutrients which are inadequate. However, the researchers state that as a single indicator or nutrient adequacy these measures are useful.

Krebs-Smith et al (1987), in their study of the effects of variety in food choices on dietary quality, also used the MAR as an indicator of nutrient adequacy. For this study the MAR was defined as a truncated index of the percent of RDA's for 11 nutrients: protein, calcium, iron, magnesium, phosphorus, vitamins A, B6, B12, thiamin, riboflavin and ascorbic acid. Krebs-Smith et al, outlined the limitations of the MAR. Firstly, there are more nutrients required by the body to maintain good health than those represented by the MAR score. For example, zinc and folacin, which are considered to be lacking in many diets, were not included in the MAR because of the lack of food composition data for these nutrients. Secondly, they stated that the measure does not take into account the necessity for the nutrients to be

present in the diet in balanced amounts.

### Summary

Worsening economic changes were identified by rural Kansas families as the major stress affecting their lives. Taking on additional paid employment was one way these families reported coping with this stress. Employed women in Kansas were found more likely to be following unhealthy lifestyle practices.

Studies have shown that women contribute to daily farming operations. Many farm women are employed off-farm especially those on low income farms. The number of hours spent in household work has been shown to be less for employed women than for non-employed women. Studies of the time women spend preparing food have indicated there is a decrease in food preparation time with women's employment.

Employment status of the mother was found to have no effect on the nutrient adequacy of her children's diets. However, no study had specifically looked at the effect of employment on the woman's own diets.

Home food production was found to be affected by residence (open country), age of the household head, size of household and income. Most farm families were found to be participating in some type of food production activity.

Nutrient consumption, especially for women, according

to the results of a national dietary survey, is limited by low food intake more than in previous years. Calcium, iron, magnesium, zinc, vitamin B6, and folacin were not well provided for in women's diets. A 1975 survey of rural families in Iowa and North Carolina found calcium to be the most limiting nutrient. More recent dietary surveys of rural populations have not been undertaken.

The impact of the time-consuming nature of the farm woman's lifestyle on the nutrient adequacy of her diet has not been determined by previous research. This preliminary survey was designed to bridge a gap in the knowledge of farming communities.

## PROCEDURES

This survey was conducted in conjunction with a study designed to test the validity and reliability of a food frequency questionnaire. Results of the 24-hour dietary recall were used for both studies.

### Instrument Development and Pretest

A questionnaire was developed to obtain demographic information and to measure family food production, food preservation and task allocation (Appendix 1). Education level and off-farm employment were determined by questions added to the food frequency questionnaire of the co-study (Appendix 2). Both questionnaires were pretested with 12 members of the Kansas Farm Wives Association. Modifications were made and Dr. Jan Flora, a rural sociologist familiar with this population, reviewed the final questionnaire.

### Data Collection: November 1986

Jackson County was chosen for this survey primarily because we had the support of the County Home Economist, Margaret Hund. Ms Hund advised us of potential participants who would have been inappropriate to recruit for the survey. Reasons for not including eligible families were a history of refusal to cooperate in previous surveys, recent family bereavement and family illness. Participants were able to

contact Ms Hund if they had queries about the survey's validity or any general inquiry.

Farm families who owned between 100-500 acres were asked to participate in our survey. Farm ownership was determined from the 1983 Jackson County plat map. Names were then compared with the Jackson County Rural Directory to obtain phone numbers and addresses. A letter, cosigned by Dr. Meredith Smith and Ms Margaret Hund, was sent to 147 families considered eligible to participate. This letter explained what the survey would involve for the participant. Within 2 weeks after the letter was sent each family was telephoned and asked to participate in the study. To contact as many people as possible, telephone calls were made at a variety of times on weekdays, week nights and on the weekend. If the homemaker agreed to participate then an appointment was made for a home interview. Two questionnaires (farm/food production questionnaire and food frequency questionnaire) were sent to the participants with instructions to complete before the home interview.

#### Interviews

Interviews were scheduled for the first 3 weeks of November 1986 on Thursdays and Saturdays between 8:30 am and 5:00p.m. Seven interviewers ( 5 nutrition graduate students and 2 senior nutrition students) were trained in recording the anthropometric data, conducting 24-hour dietary recall

interviews, and were familiarized with the objectives of the survey. Forty-two women were interviewed. The average length of the interview was 45 minutes. At each interview session, questionnaires were checked for clarity and completeness.

#### Physical Measurements

Height and weight were the only anthropometric data collected. Bathroom scales, calibrated at each interview with a 5 pound laboratory weight, were used to measure the weight of each woman. The woman's height was measured with a plastic measuring tape and flat board. Her bare or stockinged feet were together with heels and back against a wall.

As an indicator of body fatness, a body mass index (BMI) was calculated from the measured weight and height :

$$\text{BMI} = \frac{\text{weight in kilograms}}{(\text{height in metres})^2}$$

#### 24-hour Dietary Recall

A 24-hour dietary recall was recorded on a standard recall form (Appendix 3). A food model kit was used as an aid for determining portion sizes. This kit contained a dinner plate, bowl, drinking cup with 4 oz. and 5 oz. markings, various-sized serving spoons, measuring spoons, bags of beans and rice depicting 1/4 cup, 1/3 cup, 1/2 cup portion sizes, and cardboard shapes representing pie, cake, and

pizza portions.

#### Data Collection: March 1987

Additional farm/food production questions were added to the Food Frequency questionnaire which was readministered in March 1987 (Appendix 4). Questions were designed to determine how much land was being operated, away-from-home meal consumption, changes in farming activities and in off-farm employment hours since the November collection. This questionnaire was mailed to the 42 farm families in March 1987. Of these, 35 people returned the completed questionnaire.

#### Variables

##### Farm Size

In the November questionnaire, respondents were asked to state the number of acres in crop production and the number of acres in livestock production on their farm. Unfortunately, these questions proved to be confusing especially for those farms that grew crops such as hay and silage for livestock feed. In the spring questionnaire the farm size questions were reworded to obtain the total number of acres of land currently being operated, acres of land rented to another farmer, and acres of land rented from a landowner.

##### Farm Food Production

A list of 38 fruits and vegetables, modified from a

list provided by the Kansas Cooperative Extension Service, was included in the farm/food production questionnaire. Subjects were asked to check the list if they grew and/or preserved the homegrown produce for home consumption. Subjects were asked to approximate amounts of fruit and vegetables preserved throughout the year. As quantities were stated in a variety of measures, all quantities were converted into pints. Conversion factors were obtained from 3 sources: American Home Economics Association (1980), Ball Corporation (1981), and Hertzberg et al (1979).

Quantities for animal foods were converted into pounds. Conversion factors were obtained from Dr. David Schaefer, Department of Animal Sciences and Industry, Kansas State University (Table 1). Most subjects reported the number of animals preserved. However, if the amount was already reported in pounds, and it was stated that the locker plant was responsible for the butchering, then this weight was assumed to be a carcass weight. Locker plants charge on carcass weight not final weight. As carcass weight would be recorded on the service docket it was assumed that this would be the figure the subject would quote. Additional calculations were then made to determine the final weight after trimming.

Table 1

Conversion factors : animal foods.

Animal	liveweight <sup>a</sup>	carcass weight <sup>b</sup>	final weight <sup>c</sup>
Sheep	110-120	50%	75%
beef	1050	62%	70%
pig	230	63%	70%
chickens	4	75%	+++

<sup>a</sup> liveweight in pounds

<sup>b</sup> percent of live weight after removal of bones

<sup>c</sup> percent of carcass weight after removal of fat, organs etc.

Three new variables were generated from the questions on food production and preservation. The types of fruit and vegetable harvested from the home garden were summed to give the total number of different types of fruits and vegetables grown for home consumption. The types of fruits and vegetables preserved and the total quantity of these foods preserved were each totaled to provide information on food preservation. These home food production and preservation variables were then correlated against variables based on education, work off-farm and dietary quality.

#### Farming Activities

In the November questionnaire respondents were asked to state who participated in 10 common farming activities. Again, this question led to some confusion and in the spring questionnaire it was reworded and the activities were divided into 2 main categories : 'Commercial farming

activities' and 'Production and processing at least partly for home use'. Respondents were also asked to estimate the approximate number of hours spent doing farm work by the woman, man, and children.

#### Education

Questions were asked to determine total years of school, years of home economics and agricultural education, and number of years of involvement in 4H and extension activities.

#### Work Off-Farm

For both the woman and the man, total number of hours spent working off-farm were generated from the reported number of hours worked part time and number of days worked full-time each week.

#### Measure of Isolation

As a measure of isolation, subjects were asked to state how far they lived from the closest town where they purchased food and from the nearest town of a population of 10,000 or more.

#### Dietary Quality

The 24-hour dietary recalls were coded and analyzed using a nutrient database compiled from several sources: USDA Data Tape of Handbook 8, Fast Food Data from Ross Laboratories, and Home and Garden Bulletin 72. This database

was updated in January 1986. Daily intakes were determined for protein, vitamin A, ascorbic acid, thiamin, riboflavin, niacin, calcium, iron and energy. These values were compared with the appropriate Recommended Dietary Allowances (RDA) for the corresponding age group and activity level to generate the nutrient adequacy ratios (NAR's).

$$\text{NAR} = \frac{\text{the subject's daily intake of each nutrient}}{\text{RDA of the nutrient}}$$

A mean adequacy ratio, for each subject was calculated as a measure of dietary quality. This was an average of the 8 nutrients each truncated back to 100% of the RDA. Values were truncated to 1.0 to avoid a nutrient in excess of the RDA compensating for a nutrient present in the diet in inadequate levels. An additional MAR value (MAR\_E) was calculated using the 8 nutrients plus energy.

$$\text{MAR} = \frac{\text{sum of truncated NAR's for 8 nutrients}}{8}$$

$$\text{MAR}_E = \frac{\text{sum of truncated NAR's for 8 nutrients and energy}}{9}$$

For some analyzes , the two MAR values were used to categorize the dietary quality into inadequate (<80 of the RDA) and adequate (>80 of the RDA). As the RDA is set 2 standard deviations above the mean to accommodate the needs of most individuals in a particular age and sex group, then an average intake of 77% of the RDA should meet the needs of the group. For the purposes of this study, this value was

rounded up to 80%.

#### Data Analysis

Data were analyzed, in the Department of Foods and Nutrition, on a personal computer using a Statistical Package for the Social Sciences (SPSS/PC) program. Descriptive analysis (frequencies, means, and standard deviations) was completed on most variables. Inferential analysis of selected variables and the dietary quality and food production variables was completed using Pearson's moment product correlation, oneway analysis of variance and multiple regression.

## RESULTS AND DISCUSSION

It was anticipated that between 50 and 100 women would participate in the survey but in the November data collection only 42 women were interviewed. Two women did not fill out the farm/food production questionnaire, 24-hour recalls were not completed for 2 other individuals, and the spring data collection yielded only 35 returned questionnaires. The final sample included a total of 31 women who completed all 3 questionnaires plus the 24-hour recall.

### Descriptive Findings

#### Age

The average age of the women interviewed was 54 years with a range of 30 to 80 years. Over 66% of the sample were older than 50 years of age (Table 2).

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Table 2

Age distribution of surveyed women

Years	Frequency	Percent
≤ 40	5	11.9
41 - 49	9	21.4
50 - 59	15	35.7
≥ 60	13	31.0
	-----	-----
	N = 42	100.0

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No data were available for the age distribution of Jackson County farm women. The average age of farm operators in Kansas in 1982 was 50.9 years (U.S. Bureau of Census, 1982). As men usually marry women younger than themselves it can be assumed that the average age of farm women in Kansas would not be greater than 50.9 years. Johnson et al (1980) reported the average age of farm wives surveyed in eastern Nebraska to be 47 years which was 2 years younger than the average age of the farm operators. Therefore, the average age of the women in this study probably was higher than the average age of the population.

#### Perceived Levels of Health and Activity

A health condition affecting farm or food production activities was reported by 14.3% of the women although less than 5% perceived their general state of health to be poor. For most women (81%) their activity level was moderate, consisting of mainly light work with occasional heavy work (Table 3).

#### Vitamin or Mineral Supplements

Approximately 67% of the women reported consuming vitamin or mineral pills on either a regular or irregular basis (Table 3). Peterkin (1986), reported that in the 1985 Continuing Survey of Food Intake of Individuals, 58% of the women took a vitamin and/or mineral supplement every day,

almost every day, or every so often. Therefore, the percentage of women in this study who consumed vitamin or mineral pills was higher than the 1985 national average.

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 Table 3

General health characteristics of the surveyed women

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	Frequency (N = 42)	Percent
<b>General state of health:</b>		
poor health	1	2.4
good health	25	59.5
excellent	16	38.1
<b>Health condition affecting farm/food production activities:</b>		
no	36	85.7
yes	6	14.3
<b>Activity level of usual day:</b>		
not very active	4	9.5
occasional heavy physical and light work most of the day	34	81.0
heavy physical work most of the day	4	9.5
<b>Consumption of vitamin or mineral pills:</b>		
not consumed	14	33.3
consumed regularly	12	28.6
consumed irregularly	16	38.1
<b>Body Mass Index<sup>a</sup>:</b>		
normal weight	25	67.6
20 % overweight	12	32.4

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<sup>a</sup> N = 37

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#### Body Mass Index

A BMI of 26.9 was used as an indicator of obesity (Burton and Foster, 1985). At this level, a woman is

considered to be 20% overweight. Over half of the women (67.6%), were of normal weight according to the BMI calculations. The remaining women (32.4%) were at least 20% overweight.

#### Children

Eleven families (28.2%) had a child/children under 18 years of age eating one or more meals at home. Of these , 3 families had a child/children under 5 years of age. There were no pregnant or lactating women among the subjects.

#### Education

##### Formal education

Ninety percent of the women had completed at least 12 years of school, 9.6% had not finished high school and 40.4% had attended college for at least 1 year. Most of the women had attended home economics classes in high school (90.5%) and over 16% had continued with home economics education in college (Table 4). Agricultural education in either high school or college was not common for these women; only 9.5% attended agricultural education classes in high school.

Table 4

Years of home economics education.

Number of years	Frequency	Percent
Completed at high school		
0	4	9.5
1	6	14.3
2	9	21.4
3	6	14.3
4	17	40.5
N = 42		100.0
Completed at college		
0	35	83.3
1	3	7.1
2	1	2.4
3	1	2.4
4	1	2.4
6	1	2.4
N = 42		100.0

Informal education

Of the 42 women originally interviewed, 59.5% had been involved in 4-H activities, and 42.9% had participated in extension activities at some stage in their life. In the Farm Women Survey (Rosenfeld, 1985), 42% of the women had participated in at least one extension activity in the past 2 or 3 years.

Employment

Almost half (47.6%) of the women reported working off-farm for the six months prior to the November data collection. Some women (28.6%) had been working off-farm for

over 10 years although 14.3% had started work in the past 5 years (Table 5). Full-time employment i.e. 40 hours per week was undertaken by 22% of the women (Table 6). Of the men, 24% were working off-farm (Table 6). At least one spouse worked off-farm in 38.5% of the family households and both spouses worked off-farm in 17.9% of the family households.

In 1971, the off-farm labor participation rate of farm wives was 26% (Huffman, 1976). In the 1980 Farm Women Survey, 37% of the women and 47% of the men were employed off-farm at least at the time of the survey or in the preceding year (Rosenfeld, 1985). Among mid-Michigan farm women, the average rate of off-farm employment was 39% (Fassinger and Schwarzweller, 1982). In Eastern Nebraska, 33% of the farm women and 30% of the farm operators surveyed were employed off-farm (Johnson et al, 1980).

The off-farm employment rate of the Jackson County farm women interviewed was higher than the off-farm employment rates of the women in the national, the mid-Michigan and Eastern Nebraska farm surveys. This may indicate that the farm crisis, which was not a factor in the earlier studies, has affected the women's employment rate in this area. Without the 14% of the women who had started work in the past 5 years, the off-farm employment rate was similar to the earlier studies. However, the off-farm employment rate for men was lower than that reported in these surveys.

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 Table 5

Number of years woman has worked off-farm.

Years	Frequency	Percent
Has not worked off-farm	22	52.4
Less than 5 years	6	14.7
Between 5 and 10 years	2	4.8
Between 10 and 15 years	4	9.5
Between 15 and 20 years	5	11.9
More than 20 years	3	7.1
	-----	-----
	N = 42	100.0

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 Table 6

Number of hours woman and man each spent working off-farm each week.

Number of hours	Frequency	Percent
Woman		
0	22	53.7
6	1	2.4
10	1	2.4
12	1	2.4
22	1	2.4
25	1	2.4
32	3	7.3
36	2	4.9
40	9	22.1
	-----	-----
	N = 41	100.0
Man		
0	32	76.2
6	1	2.4
16	1	2.4
40	8	19.0
	-----	-----
	N = 42	100.0

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### Farm Size

The operating size of the family farms ranged from less than 100 acres to over 1000 acres (Table 7). Most of the farmers (54.3%) were renting land from another landowner while less than a third (31.4%) were renting land out to another farmer. Hay, milo, soybean, wheat, and corn were grown on most of the farms. Hay, milo and in some instances corn were grown not as commercial crops but for livestock feeding. Beef was raised on 75% of the farms.

Table 7

Acres of land operated by surveyed families

Acres	Frequency	Percent
Less than 100 acres	8	22.9
Between 100 and 499 acres	9	25.7
Between 500 and 999 acres	9	25.7
More than or equal to 1000 acres	9	25.7
	N = 35	100.0

### Farming Activities

This survey showed that these women were involved in a variety of farming activities often working with their husband and/or children. Their most common commercial farming activities were milking, care and feeding of livestock and bookkeeping activities. These activities, plus tending a vegetable garden were reported most frequently by women in the Farm Women Survey (Rosenfeld, 1985) and in the

mid-Michigan survey (Fassinger and Schwarzweller, 1982)

Over 75% of the women in the present study gardened and almost all of the women did some type of food preservation (Table 8).

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Table 8  
Woman's involvement in farming activities.  
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Task	Frequency (N = 35)	Percent
<b>Commercial farming activities:</b>		
land preparation	5	14.3
planting	2	5.8
harvesting, picking	6	17.2
milking, care and feeding of livestock	15	42.9
bookkeeping	24	68.6
maintenance of farm equipment	2	5.7
<b>Production and processing at least partly for home use:</b>		
gardening	27	77.0
pruning, cultivation and picking of fruit	22	62.9
canning and other food preservation	33	94.3

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#### Home Food Production and Preservation

Growing fruits and vegetables for home consumption was reported by 90% of the surveyed women (Table 9). Green beans, corn, irish potatoes, lettuce, tomatoes, green peppers, onions and radishes were each grown by more than 50% of the farm families. Tomatoes were the most popular, as 75% of the families grew this vegetable for home consumption. Eighty percent of the women preserved fruits and vegetables from their garden (Table 9). Freezing and

canning were the preservation methods used by all of the women. Green beans, corn, and tomatoes were the only vegetables that were preserved by more than 50% of the surveyed women.

Most families (82.5%) raised livestock for home consumption and 72.5% also preserved the meat for home consumption. Beef was raised by 75% of the families and preserved by 65%. Hunting for game, birds or fishing were reported by 27.5% of the subjects; 20% received these foods as gifts. Game, birds or fish were preserved by 30% of the subjects. Wild berries, mushrooms, greens, nuts and fruits were unimportant sources of food for these farm families.

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 Table 9

Fruits and vegetables grown and preserved for home consumption<sup>a</sup>.

Number Grown	Frequency	Percent
none grown	4	10.3
1 - 5	7	18.0
6 - 10	10	25.6
11 - 15	10	25.6
16 - 20	6	15.4
greater than 20	2	5.1
	-----	-----
	N = 39	100.0
<b>Number preserved</b>		
none preserved	8	20.5
1 - 5	18	46.1
6 - 10	12	30.8
greater than 10	1	2.6
	-----	-----
	N = 39	100.0

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<sup>a</sup> Subjects were given a list of 38 fruits and vegetables to check if they grew or preserved for home consumption.  
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### Dietary Quality

The mean adequacy ratio (MAR) for this sample was  $81.3 \pm 16.8$ . This indicates that these women generally were consuming nutritionally adequate diets (Table 10). Sixty-two percent of the women consumed a diet with a MAR  $\geq 80\%$  of the RDA.

The average energy intake of this sample was well below 80% of the RDA. Therefore, the mean adequacy ratio for the 8 nutrients plus energy (MAR\_E) was below the adequate level of  $\geq 80\%$ . The energy intake of the women was inversely correlated with body mass index ( $r = -.3472$ ,  $p = .018$ ). This is consistent with previous research (Romieu et al, 1988). The mean intakes of calcium and iron, while above the adequate level, were relatively low. All other nutrients were at least 100% of the RDA.

Information from the National Food Consumption Survey (NFCS) and the National Health and Nutrition Examination Survey (NHANES) indicated that nutrient consumption was limited by low food intakes particularly for women and especially elderly women (Swan, 1983). Adult females in the NFCS had a larger percentage of marginal caloric intake ie  $\leq 59.9\%$  of the recommended energy intake (Crocetti and Guthrie, 1982). A mean energy adequacy ratio of 82 was reported for women, aged 1-50 years, in the 1985 Continuing Survey of Food Intake by Individuals (CSFII) (Peterkin, 1986).

Women's intakes were reported in the CSFII to be below the RDA for both calcium and iron (NAR = 78 and 61 respectively) although their intakes of nutrients were significantly higher than those reported in the NFCS (Peterkin, 1986). Calcium and iron intakes for women were also low in both NHANES I and II (Swan, 1983). Calcium was found to be the most limiting nutrient for low income, rural families in Iowa and North Carolina. Iron, vitamin A and ascorbic acid were also limiting when compared to the 1968 RDA's (Inano and Pringle, 1975-I)

On average, the women surveyed were consuming nutritionally adequate diets. Energy, calcium and iron intakes were below the RDA for the women interviewed. However, national surveys have shown that women are at risk of obtaining less than the RDA for these nutrients.

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 Table 10

Energy, nutrient and mean adequacy ratios (N =39)<sup>a</sup>

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	Mean	Standard deviation
energy	62.7	20.4
protein	140.4	56.0
vitamin A	121.4	129.0
ascorbic acid	162.4	110.3
thiamin	109.2	47.0
riboflavin	119.2	61.6
niacin	128.9	57.8
calcium	82.3	50.5
iron	89.3	60.8
MAR <sup>b</sup>	81.3	17.3
MAR_E <sup>c</sup>	79.1	16.8

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<sup>a</sup> Energy and nutrients expressed as percentages of the 1980 RDA (Food and Nutrition Board: Recommended Dietary Allowances. 9th rev.ed., National Academy of Sciences, Washington, D.C., 1980)

<sup>b</sup> Mean adequacy ratio (MAR) is the average of the 8 nutrient adequacy ratios. Nutrient intakes greater than 100% of the RDA were truncated to 100.

<sup>c</sup> Mean adequacy ratio with energy (MAR\_E) is the average of the 8 nutrient plus energy adequacy ratios.

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## Data Analysis: Results

### Pearson Correlations

The Pearson product moment correlation coefficient ( $r$ ) measures the direction and magnitude of the association between 2 normally-distributed variables. An  $r$  value approximating zero indicates no relationship and a value of  $\pm 1$  indicates either a positive or negative linear relationship between the two variables. Many of the variables studied did not fulfill the normal distribution criteria. However, it was decided that the calculation of the Pearson correlation coefficients was still appropriate as detection of trends only was the objective of the analysis.

### Dietary quality

The dietary quality variables (MAR, MAR\_E) were not significantly affected ( $p < .05$ ) by either age, food production, education or off-farm employment. The number of years of participation in 4H activities showed positive correlations with the dietary variables but these were at slightly lower significance levels (MAR  $p = .055$ , and MAR\_E  $p = .053$ ,) (Table 11).

Table 11

Correlation coefficients of selected variables  
and the dietary quality variables (N=37)

Variable	MAR	MAR_E
woman's age	.1997 p=.118	.1519 p=.185
<b>Food Production</b>		
number of different types of fruits and vegetables grown	-.0235 p=.445	-.0450 p=.396
number of different types of fruits and vegetables preserved	.2579 p=.062	.2444 p=.072
quantity of fruits and vegetables preserved	.1850 p=.136	.1701 p=.157
<b>Education</b>		
years of schooling	.0616 p=.359	.1031 p=.272
years of home economics education	-.1779 p=.146	-.1578 p=.175
years of participating in 4H activities	.2670 p=.055	.2707 p=.053
years of participating in Extension activities	.0067 p=.484	.0153 p=.464
<b>Employment off-farm</b>		
number of hours/week worked off-farm (woman)	-.1582 p=.175	-.1263 p=.228
total number of hours/week worked off-farm (man and woman)	-.1256 p=.229	-.1198 p=.175

### Food production

The correlation coefficients for every combination among the food production variables were positive and very significant ( $p < .001$ ). This was an expected outcome which emphasized that these families were growing enough fruits and vegetables to supply immediate requirements as well as a surplus to preserve for later consumption (Table 12).

The number of years of schooling showed a significantly negative association between the variety of produce grown ( $p = .02$ ), variety of produce preserved ( $p = .027$ ) and the quantity of produce preserved ( $p = .007$ ). The number of years of home economics education also showed a negative association with the variety of produce preserved ( $p = .051$ ) and the quantity of produce preserved ( $p = .048$ ). As the number of years of home economics education was positively and strongly associated ( $p < .001$ ) with years of schooling, the negative association of home economics education with the food production variables is more likely to be an association of years of education rather than home economics education per se. The correlation coefficient of the years of schooling and age was also significant ( $p = .006$ ) but was in a negative direction. Age, did not directly correlate, at a significant level with any of the food production variables. There was no significant correlation between the number of acres operated and the quantity of fruits and vegetables preserved.

Table 12

Correlation Coefficients of Selected Variables  
and the Food Production/Preservation Variables (N=39)

Variable	Number of different types of fruits and vegetables grown	Number of different types of fruits and vegetables preserved	Quantity of fruits and vegetables preserved
woman's age	.1826 p=.133	.1911 p=.122	.2445 p=.067
<b>Food production</b>			
number of different types of fruits and vegetables grown	1.000	.8059 p(<.0001	.6841 p(<.0001
number of different types of fruits and vegetables preserved	.8059 p(<.0001	1.000	.8163 p(<.0001
quantity of fruits and vegetables preserved	.6841 p(<.0001	.8163 p(<.0001	1.000
<b>Education</b>			
years of schooling	-.3292 p=.02	-.3119 p=.027	-.3922 p=.007
years of home economics education	-.1949 p=.117	-.2654 p=.051	-.2698 p=.048
years of participating in 4H activities	.2588 p=.056	.3611 p=.012	.2519 p=.061
years of participating in Extension activities	.1946 p=.118	.1815 p=.134	.0297 p=.429
<b>Employment</b>			
number of hours/week worked off-farm (woman)	.2815 p=.041	.1662 p=.156	.2420 p=.068
total number of hours/week worked off-farm (man and woman)	.4050 p=.005	.2584 p=.056	.3151 p=.025

The years of participating in 4H activities was positively associated with the variety of produce preserved ( $p=.012$ ) and to a lesser extent with the variety of produce grown ( $p=.056$ ) and quantity preserved ( $p=.061$ ). In contrast, participation in extension activities was not significantly associated with food production. There was a significant correlation between the years of 4H participation and the number of hours the woman worked off-farm ( $p=.048$ ) and the total number of hours worked off-farm by the man and the woman ( $p=.034$ ).

The associations between off-farm employment and the food production variables were unexpectedly in a positive direction. The strongest associations were between the total number of hours both the man and woman worked off-farm and the variety ( $p=.005$ ) and quantity preserved ( $p=.068$ ).

#### Analysis of Variance

Age, work off-farm, education, 4H and Extension participation variables were converted into interval variables for the analysis of variance determinations (Table 13). These variables were then analyzed against the MAR, MAR\_E and the quantity of food preserved.

Of the 8 variables tested, a difference was found only between the 4H participation and the MAR\_E ( $p<.05$ ). Using Scheffe's method of multiple comparisons, a difference was found between the mean dietary quality of those people who had never participated in 4H (a lower MAR\_E) and those who

Table 13

Categorical Variables for Oneway Analysis of Variance

Variable Name	Categories
Diet	<ol style="list-style-type: none"> <li>1. MAR &lt; 80</li> <li>2. <math>80 \leq \text{MAR} &lt; 90</math></li> <li>3. MAR <math>\geq 90</math></li> </ol>
Old	<ol style="list-style-type: none"> <li>1. Age &lt; 49</li> <li>2. <math>49 \leq \text{age} &lt; 60</math></li> <li>3. Age <math>\geq 60</math></li> </ol>
Work (woman)	<ol style="list-style-type: none"> <li>1. Hours worked off-farm = 0</li> <li>2. Hours worked off-farm &lt; 30</li> <li>3. Hours worked off-farm <math>\geq 30</math></li> </ol>
Work (man and woman)	<ol style="list-style-type: none"> <li>1. Hours worked off-farm = 0</li> <li>2. Hours worked off-farm <math>\leq 40</math></li> <li>3. Hours worked off-farm &gt; 40</li> </ol>
Education 1	<ol style="list-style-type: none"> <li>1. Years of school &lt; 12</li> <li>2. Years of school = 12</li> <li>3. Years of school &gt; 12</li> </ol>
Education 2	<ol style="list-style-type: none"> <li>1. Years of school <math>\leq 12</math></li> <li>2. Years of school &gt; 12</li> </ol>
4H	<ol style="list-style-type: none"> <li>1. Years of 4H = 0</li> <li>2. Years of 4H &lt; 10</li> <li>3. Years of 4H <math>\geq 10</math></li> </ol>
Extension	<ol style="list-style-type: none"> <li>1. Years of Extension = 0</li> <li>2. Years of Extension &gt; 0</li> </ol>
Home Economics	<ol style="list-style-type: none"> <li>1. Years of home economics &lt; 4</li> <li>2. Years of home economics <math>\geq 4</math></li> </ol>

had participated up to 10 years (a higher MAR\_E). No significant difference was found between those people who had participated more than 10 years and the other (participation in 4H) categories.

#### Multiple Regression

A regression model was set up to analyze the effect of the age of the woman, quantity of produce preserved, the number of hours worked off-farm by the woman, the combined number of hours worked off-farm by both the man and the woman, and the number of years of participation in 4H and Extension activities on the MAR and MAR\_E. A stepwise procedure was used to enter the variables into the model at  $p=.05$  but this level of significance was not achieved and none of the variables was entered. This indicated that these variables did not strongly correlate with the quality of the diets.

Two multiple regression models were built to determine whether age, years of schooling, years of 4H participation, number of hours worked off-farm (woman), and number of hours worked off-farm (man and woman) affected the dependent variables of quantity of produce preserved and the variety of produce preserved. A correlation matrix of these variables is shown in Table 14.

Table 14

Correlation matrix of variables entered into the regression equations

Variables	1.	2.	3.	4.	5.	6.	7.
1. age of woman	1.000						
2. years of school	-.3959 p=.006	1.000					
3. # of hours woman works off-farm	-.2256 p=.084	.1338 p=.208	1.000				
4. # of hours woman and man work off-farm	-.2848 p=.039	-.0275 p=.434	.7965 p<.001	1.000			
5. 4H participation	-.1769 p=.141	.1523 p=.177	.2703 p=.048	.2951 p=.034	1.000		
6. quantity of fruits and vegetables preserved	.2445 p=.067	-.3922 p=.007	.2428 p=.068	.3151 p=.025	.2519 p=.061	1.000	
7. variety of fruits and vegetables preserved	.1911 p=.122	-.3119 p=.027	.1662 p=.156	.2584 p=.056	.3611 p=.012	.8163 p<.001	1.000

The variables were entered as described previously in a stepwise fashion. Years of schooling and years of 4H participation each made significant independent contributions to the quantity of fruits and vegetables preserved (Table 15) and the variety preserved (Table 16).

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 Table 15

Multiple regression analysis of selected variables on the quantity of fruits and vegetables preserved

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Variable	Beta	Significant F	r <sup>2</sup>
Years of school	-.3922	.014	.1538
4H participation	.3191	.005	.2533

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Variables not entered into the equation

Age, hours worked off-farm (woman), hours worked off-farm (man and woman)

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Table 16

Multiple regression analysis of variables on the  
variety of fruits and vegetables preserved

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Variable	Beta	Significant F	r <sup>2</sup>
4H participation	.3611	.024	.1304
Years of school	-.3755	.004	.2681

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Variables not entered into the equation

Age, hours worked off-farm (woman), hours worked off-farm  
(man and woman)

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Data Analysis: Discussion

Three statistical methods were used to analyze the data to detect factors affecting the dietary quality variables (MAR, MAR\_E) and the quantity of food preserved.

Dietary Quality

The number of years of 4H participation was the only variable which showed a trend in affecting the quality of the woman's diet. However, this was not a strong trend as the significance level for the correlation coefficient was slightly more than  $p=.05$ . This trend was seen in the analysis of variance but not in the regression model. This trend may be partially explained by the positive correlation

of 4H participation with variety of fruits and vegetables preserved ( $r=.3611$ ,  $p=.012$ ). In turn, variety of fruits and vegetables preserved was positively although weakly correlated with dietary quality ( $r=.2579$ ,  $p=.062$ ).

In this survey, one 24-hour recall was used to assess the nutrient intake of each woman. There are limitations in using the 24-hour recall and these limitations may have produced a high percentage of error that our sample size could not accommodate. It has been reported that a 24-hour recall would yield similar results to the 7-day food record if the sample size is larger than 50 and when a 10% error factor could be tolerated (Young et al, 1952). Variations in nutrient intake have been shown to be higher than 25% on any one day than an overall 3-day average (Guthrie and Crocetti, 1985). The "flat-slope syndrome", whereby small intakes of nutrients maybe over-reported and large nutrient intakes under-reported (Gersovitz et al (1978), Madden et al (1976)), is also a limiting factor in the validity of a 24-hour recall to predict the subject's usual nutrient intake. Other limitations include the ability of the subject to accurately recall food eaten the previous day, and the imprecision of estimating serving portions.

The mean adequacy ratio (MAR), as a measure of dietary adequacy, also has its limitations. Such limitations include under-representation of all nutrients required for maintenance of good health, and the insensitivity of the

ratio to an imbalance of nutrients (Crocetti and Guthrie (1981), Krebs-Smith et al (1987)).

Limitations in the ability of the 24-hour recall to estimate energy and nutrient intakes and the MAR to predict dietary quality adequately, combined with the small sample size may have precluded the detection of possible factors affecting the nutrient adequacy of the diets of the surveyed women.

#### Home Food Production

Pearson correlation coefficients showed significant associations between the food production variables and the years of schooling, 4H participation, and the combined number of hours both the man and woman spend in off-farm employment. Years of schooling negatively affected the food production variables, whereas the other variables showed positive correlations.

#### Education

##### Formal

The number of years of schooling negatively affected the quantity of food preserved ( $p=.007$ ), and variety of produce grown ( $p=.02$ ) and preserved ( $p=.027$ ). Schooling was the most significant variable entered into the regression equation. However, in the analysis of variance, there was no significant difference between women with less than 12 years, 12 years, or greater than 12 years of education and

the mean quantity of fruits and vegetables preserved. Changing the categories of the education variable to less than or equal to 12 and greater than 12 years made no difference to the outcome of the analysis of variance.

Volker et al (1983), found a negative correlation ( $p < .05$ ) between education and home food production whereas Green and Heffernan (1986) found no correlation between the 2 variables. Both studies were limited as the education of the woman was not determined. In the study by Volker et al the education of the male household head only was determined. Any adult in the household was eligible to be interviewed in the survey by Green and Heffernan, therefore the education status reported was not necessarily that of the woman's. Ortiz et al (1981), found that the education of the homemaker had no effect on time spent in food preparation. Food preparation did not include such food production activities as gardening, canning, or freezing necessarily.

The strong negative correlation between age and education ( $r = -.3959, p = .006$ ) maybe an underlying factor of the negative influence of years of schooling on home food production. Young women, who are more educated, may come from non-farming or non-rural backgrounds. The knowledge, skills, and familiarity with home food production may not yet be present for these women (Volker et al, 1983) and therefore may not receive the priority they do in other

farming families. Further information about the background/upbringing of these women would be necessary in order to validate this hypothesis.

#### Informal

A review of literature did not reveal studies of the effect of 4H participation on home food production. It was surprising that 4H, a youth-oriented program, should appear to affect home food production, whereas Extension participation, an adult-oriented program, had no detectable effect.

To determine why 4H participation would affect the food production variables is beyond the scope of this study. The subjects were asked to state the number of years they had participated in 4H but no differentiation was made between the years participating as a youth and the years participating as an adult through one's children's membership. It also would be necessary to know when the woman last participated in a 4H activity. It is possible that the 4H organization attracts a certain type of person who would be motivated already to produce and preserve food. Such a person may already have the skills and knowledge to perform these activities or may view home food production as an economically necessary option regardless of 4H participation. Alternatively, 4H may have a direct effect on the knowledge, skills and motivation of young people to perform these tasks.

### Off-farm employment

Beginning off-farm employment is seen commonly as a way to meet farm-related expenses and to reduce the financial burden of operating a farm (Bugaighis et al (1985), Johnson et al (1980), Rosenfeld (1985), Sander (1983)). Home food production is also a cost-saving measure that may help families to alleviate a financial burden by decreasing the money spent on food (Volker et al, 1983).

It was expected that the data analysis would detect a trend of less produce grown and preserved the more hours that a woman (and man) worked off-farm. Studies have found that women spent less time in household work when they were employed (Berheide et al (1976), Fox and Nickols (1983), Hafstrom and Schram (1983), Vanek (1974), Weigand (1954)) and specifically less time in food preparation (Ortiz et al (1981), Goebel and Hennon (1983)). However, these studies mainly reviewed only the day-to-day household work hours of the woman. Home food production (gardening, canning and freezing) has a seasonal component to it and therefore the impact of employment may not have been fully examined by these studies. The family farms, with both man and woman working off-farm, may be the farms that bear the largest financial burden. Hence, the opportunity cost of home food production may be greater than the opportunity cost of other activities e.g. rest and relaxation after work.

The results of this survey indicate that for some farm families working off-farm as well as maintaining home food production are economically necessary activities. Home food production is a time-intensive but seasonal activity and therefore, for short durations, both working off-farm and gardening and preserving are feasible for these families. There was a trend ( $r=-.2448, p=.092$ ) for both spouses to be working off-farm if they ran smaller farming operations. Because our sample included only landowners, not renters, it was inappropriate for the size of farming operation to be used as a predictor for economic indebtedness. It is also of note that the number of years of 4H participation positively correlated with the number of hours the woman worked off-farm ( $p=.048$ ) and the 4H participation may be the stronger contributing factor.

The design of this survey may have biased the type of woman interviewed. For a woman to participate in this study she had to be prepared to fill out 2 lengthy questionnaires, participate in an interview for 30-45 minutes, and prepared to complete another questionnaire 4 months later. Our sample, therefore, may not be representative of our population. The combination of the remoteness of the farms and poorly marked roads made it impossible for interviews to be conducted at night. Thereby, the participation of women who worked off-farm during the day was limited. Women who were too busy or not motivated to participate in our

survey may be affected differently by such variables as off-farm work.

A mail or telephone survey would increase the size of the sample with respect to the number of participants and the geographic location. Mail or telephone surveys are not as time-consuming for the participant as a physical interview and therefore even the busier women may be able to participate.

## CONCLUSIONS AND SUMMARY

A dietary survey of 42 Jackson County farm women was conducted in November 1986. A follow-up mail questionnaire was completed by 83% of these women in March 1987. The sample size was smaller than anticipated and only 33 women completed all the questionnaires. Sociodemographic, farm and food production information were obtained. A 24-hour dietary recall was administered to assess nutrient intake.

Farm size ranged from less than 100 to over 1000 acres. Many farmers were renting land from another landowner. Hay, milo, soybean, wheat and corn were most grown commonly and beef was raised on 75% of the farms. The women reported being involved in a variety of farming activities especially milking, care and feeding of livestock and bookkeeping. Gardening and preservation of food for home consumption was undertaken by most of the women. Freezing and canning were the main preservation methods used. The average age (54 years) of the women interviewed was greater than the Kansas average for farm operators (50 years) and therefore our average sample age was older than the population average.

The overall average mean adequacy ratio (MAR) for the group was  $81.3 \pm 17.3$  and therefore only slightly greater than the adequacy cutoff point of 80. Over half the sample (62%) consumed a diet with a MAR of greater than or equal to

80. Energy was the most limiting factor in the women's diets with a mean nutrient adequacy ratio (NAR) of 62 i.e. less than two-thirds of the Recommended Dietary Allowances (RDA). Calcium and iron were also limiting although both NAR's were greater than 80. The other nutrients analyzed were present in amounts greater than 100% of the RDA. Energy, calcium, and iron have been indicated in national dietary surveys to be limiting in women's diets. Many women (67%) took vitamin or mineral supplements on either a regular or irregular basis. The women reported being in good health and 67.6% were of normal body weight. No woman was underweight.

Of the variables studied, participation in 4H activities was the only variable to show a trend of affecting dietary quality. The correlation coefficient was not very significant ( $p=.056$ ) and was not entered into the regression equation. The results of this survey are not definitive that the dietary quality variables were not affected by any of the studied variables. Limitations in the use of the 24-hour dietary recall, the MAR and the small sample size may have precluded the detection of possible factors affecting dietary quality.

An increase in sample size to at least 50 women may increase the validity of the 24-hour recall. However, increasing the sample size may necessitate changing the form of the survey to a mail or telephone survey. Therefore an alternate method of assessing dietary intake would be

required. A food frequency questionnaire, validated for this population would be a viable alternative in this situation.

Ninety percent of the women had completed 12 years of school and 40.4% had gone on to attend at least 1 year of college. Years of school was seen to have a negative effect on variety of produce grown ( $r=-.3292$ ,  $p=.02$ ), preserved ( $r=-.3119$ ,  $p=.027$ ) and the quantity of produce preserved ( $r=-.3922$ ,  $p=.007$ ). Schooling was the most significant variable entered into the regression equation against the dependent variable of quantity of fruits and vegetables preserved. As years of schooling was negatively correlated with age ( $r=-.3959$ ,  $p=.006$ ) it was suggested that the combination of these variables maybe important. Young women, who are more educated, may come from non-farm or non-rural backgrounds. Such women may not have the familiarity with home food production as other farming women.

To further determine why years of schooling may negatively affect the home food production variables, it would be advantageous to find out the background of the woman. For example, whether the woman was brought up in a rural or non-rural area or whether her parents produced and preserved food for home consumption may give more insight to the impact of education.

Years of 4H participation positively correlated with the variety of fruits and vegetables preserved ( $r=.3611$ ,  $p=.012$ ) and to a lesser extent with the variety of fruits

and vegetables grown ( $r=.2588$ ,  $p=.056$ ) and quantity preserved ( $r=.2519$ ,  $p=.061$ ). In contrast, years of Extension participation was shown to have no effect.

The stage in the lifecycle when a woman participated in 4H activities would enable a researcher to ascertain the effect of the 4H programs. Information of participation in Extension activities would still be useful especially if participation in food and/or nutrition programs could be specified.

Almost one-half (47.6%) of the women reported working off-farm for at least the 6 months prior to the November data collection. This rate was higher than off-farm employment rates for women reported in other surveys. Both spouses worked off-farm in 17.9% of the families.

An unexpected positive correlation was detected between the total number of hours both spouses worked off-farm and the variety of produce grown ( $r=.4050$ ,  $p=.005$ ) and the quantity preserved ( $r=.3151$ ,  $p=.025$ ). This trend was not as strong with the number of hours the woman only worked off-farm. It was suggested that farms that have both spouses working off-farm maybe the ones bearing the largest financial burden and therefore in more need of the cost-saving effect of home food production. However, it was not possible for the researchers to determine the level of indebtedness for each farm family in this survey.

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APPENDIX 1

November Farm/Food Production Questionnaire

FAMILY NAME \_\_\_\_\_ DATE: \_\_\_\_\_

General Farm Characteristics

I. Cash Crop Production

1. How many years have you and/or your husband (wife) owned or operated a farm? \_\_\_\_\_
2. Do you consider your farm to be a full time \_\_\_\_\_ or parttime \_\_\_\_\_ business?
3. How many acres of land did you have in crop production during 1986? \_\_\_\_\_
4. Please place a check by the crops you produced during the 1986 growing season:  

<input type="checkbox"/> corn	<input type="checkbox"/> milo
<input type="checkbox"/> silage	<input type="checkbox"/> hay
<input type="checkbox"/> wheat	<input type="checkbox"/> small grains (rye, barley etc)
<input type="checkbox"/> soybeans	<input type="checkbox"/> other, please specify _____
5. What do you consider your main cash crop? \_\_\_\_\_
6. How many acres did you have in livestock production during 1985? \_\_\_\_\_
7. Please place a check by the types of livestock that you now have on the farm.  

<input type="checkbox"/> beef cattle	<input type="checkbox"/> sows and gilts
<input type="checkbox"/> dairy cattle	<input type="checkbox"/> sheep
<input type="checkbox"/> feeder cattle	<input type="checkbox"/> rabbits
<input type="checkbox"/> broilers	<input type="checkbox"/> turkeys
<input type="checkbox"/> laying hens	
8. How many hours did each member of the family spend last week in cash crop production? \_\_\_\_\_ husband \_\_\_\_\_ wife \_\_\_\_\_ children  
\_\_\_\_\_ no cash crop production
9. How many hours did each member of the family spend last week in cash livestock production? \_\_\_\_\_ husband \_\_\_\_\_ wife \_\_\_\_\_ children  
\_\_\_\_\_ no cash live stock production.
10. How many hours did each member of the family spend in producing food (plant or animal) for your family last week?  
\_\_\_\_\_ husband \_\_\_\_\_ wife \_\_\_\_\_ children  
\_\_\_\_\_ no family food production last week.

II. Food Production

1. Do you have a garden plot? \_\_\_\_\_yes \_\_\_\_\_no (If no, go to question 5)
2. How large is your garden plot? \_\_\_\_\_

3. Please tell me about your food production during 1986:  
Check all vegetables that you produced, sold, and/or ate. If preserved, give the approximate amount.

Food	Produced	Sold	Ate fresh	Amount preserved during 1986
green beans	_____	_____	_____	_____
corn	_____	_____	_____	_____
peas, green	_____	_____	_____	_____
broccoli	_____	_____	_____	_____
potatoes, Irish	_____	_____	_____	_____
potatoes, sweet	_____	_____	_____	_____
carrots	_____	_____	_____	_____
pumpkin	_____	_____	_____	_____
lettuce	_____	_____	_____	_____
(all types)	_____	_____	_____	_____
tomatoes	_____	_____	_____	_____
zucchini	_____	_____	_____	_____
spinach	_____	_____	_____	_____
peppers, green	_____	_____	_____	_____
peppers, hot	_____	_____	_____	_____
peppers, sweet	_____	_____	_____	_____
squash, winter	_____	_____	_____	_____
squash, summer	_____	_____	_____	_____
cabbage	_____	_____	_____	_____
onions	_____	_____	_____	_____
cauliflower	_____	_____	_____	_____
asparagus	_____	_____	_____	_____
beans, lima	_____	_____	_____	_____
beans, wax	_____	_____	_____	_____
(yellow)	_____	_____	_____	_____
okra	_____	_____	_____	_____
watermelon	_____	_____	_____	_____
cantalope	_____	_____	_____	_____
muskmelon	_____	_____	_____	_____
radishes	_____	_____	_____	_____
turnips	_____	_____	_____	_____
eggplant	_____	_____	_____	_____

4. Do you have fruit trees?  yes  no (If no go to question 7)

5. Please tell me about your fruit production during 1986.  
Check all fruits that you produced, sold, and/or ate. If preserved, give the approximate amount.

Fruit	Produced	Sold	Ate fresh	Amount preserved
apples	_____	_____	_____	_____
peaches	_____	_____	_____	_____
apricots	_____	_____	_____	_____
plums	_____	_____	_____	_____
cherries	_____	_____	_____	_____
grapes	_____	_____	_____	_____
strawberries	_____	_____	_____	_____
other berries	_____	_____	_____	_____
rhubarb	_____	_____	_____	_____

6. Do you keep animals for food production and home consumption?  
 \_\_\_yes \_\_\_no (if no, go to question 10)

7. Please tell me about the animal foods you produced for your family's use during 1986:  
 Check all animals you produced, sold, and/or ate. If preserved, give the approximate amount.

Animal	Amount	Sold	Eat fresh	Amount preserved
Chickens	_____	_____	_____	_____
Eggs	_____	_____	_____	_____
Sheep	_____	_____	_____	_____
Pigs	_____	_____	_____	_____
Dairy cow (milk, cheese)	_____	_____	_____	_____
Beef cattle	_____	_____	_____	_____
Other	_____	_____	_____	_____

8. Who butchers the animals for home use?  
 \_\_\_self  
 \_\_\_neighbors  
 \_\_\_locker plant  
 \_\_\_other  
 \_\_\_do not butcher any animals

9. Please tell me about the fish or game you have consumed during the past six months?  
 Check all fish or game you hunted, fished, gathered from road kill and/or received as a gift. If preserved, give the approximate amount.

Game	Hunted	Roadkill	Received as gift	Preserved
venison	_____	_____	_____	_____
game birds	_____	_____	_____	_____
small game (rabbit, etc.)	_____	_____	_____	_____
fish	_____	_____	_____	_____

\_\_\_no hunting or fishing

10. Please tell me about the wild foods such as berries, nuts, mushrooms or greens you have consumed during the past six months?

Food	Gathered	Received as a gift	Preserved
berries	_____	_____	_____
mushrooms	_____	_____	_____
greens	_____	_____	_____
nuts	_____	_____	_____
fruits	_____	_____	_____

\_\_\_none

11. What methods of home preservation do you use?  
 canning \_\_\_\_\_  
 freezing \_\_\_\_\_  
 drying \_\_\_\_\_  
 cold storage \_\_\_\_\_  
 other \_\_\_\_\_

III. Other Activities

1. Please tell us who does each of the following farming activities. Check all that apply.

Task	Husband	Wife	Children	Hired Help	Other	Do Not Do
land preparation	_____	_____	_____	_____	_____	_____
seeding and planting	_____	_____	_____	_____	_____	_____
watering, fertilizing	_____	_____	_____	_____	_____	_____
weeding	_____	_____	_____	_____	_____	_____
harvesting, picking	_____	_____	_____	_____	_____	_____
food preservation and storage	_____	_____	_____	_____	_____	_____
animal feeding	_____	_____	_____	_____	_____	_____
milking	_____	_____	_____	_____	_____	_____
egg gathering	_____	_____	_____	_____	_____	_____
butchering	_____	_____	_____	_____	_____	_____

2. Check any of the following you have received during the last six months.

commodity foods	_____
WIC	_____
Food Stamps	_____
Food from community food banks or pantries	_____

3. Check any of the following changes in food preparation that have occurred in your home during the past year:

_____ fewer dishes per meal
_____ more dishes per meal
_____ less elaborate dishes prepared
_____ more elaborate dishes prepared
_____ more canned or convenience foods (commercial)
_____ fewer canned or convenience foods (commercial)
_____ more commercial frozen foods
_____ fewer commercial frozen foods
_____ more home preserved foods
_____ fewer home preserved foods

4. Why have you made these changes? \_\_\_\_\_

5. Who is primarily responsible for meal preparation?

Family member	week day/weekend morning	week day/weekend mid-day	week day/weekend evening
Husband	_____	_____	_____
Wife	_____	_____	_____
Children	_____	_____	_____
No-one	_____	_____	_____
Other _____	_____	_____	_____

6. Please give the ages and sexes of all people who eat one or more meals here each day.

Age	Sex
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

7. What is the number of miles from your home to the nearest town or city where you make most of your food purchases? \_\_\_\_\_ miles.

8. What is the number of miles from your home to the nearest town or city with a population of 10,000 or more? \_\_\_\_\_ miles

9. In five years, do you and your husband (wife) expect to be: Check all that apply.

- Running the farm as a full time business
- Runing the farm as a part time business
- one working off farm full time
- both working off farm full time
- one or both working off farm part time
- not farming
- retired

To be filled in by interviewer.

INTERVIEWER \_\_\_\_\_

DATE \_\_\_\_\_

H \_\_\_\_\_

W \_\_\_\_\_

THANK YOU FOR YOUR COOPERATION

APPENDIX 2

November: Front Page of Food Frequency Questionnaire



APPENDIX 3

24-Hour Dietary Recall Form



APPENDIX 4

March : Additional Questions Added to Food Frequency  
Questionnaire

FOOD INTAKE QUESTIONNAIRE

We would like you to answer the following questions. These additional questions will help us to analyze the information we obtained during our interview last November. Please answer the questions in the same way as you completed the questionnaire last time. We would like you to return this questionnaire to us in the stamped, self-addressed envelope by April 7th 1987.

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

How many acres of land are you currently operating? \_\_\_\_\_

How many acres of land do you rent out to another farmer? \_\_\_\_\_

How many acres of land do you rent from another landowner? \_\_\_\_\_

Has there been any change in the number of acres you have operated since November? Yes/No

Last week, how many hours were spent doing farmwork (land preparation, planting, watering/fertilizing, milking, care and feeding of livestock, bookkeeping, maintenance of farm equipment) by

- a) yourself \_\_\_\_\_ hours
- b) husband \_\_\_\_\_ hours
- c) children \_\_\_\_\_ hours

What were your major farming activities last week?

Since November, have your hours of off-farm employment

- |   |   |
|---|---|
| WOMAN                                       | MAN   |
| <input type="checkbox"/> increased?         | <input type="checkbox"/> increased?         |
| <input type="checkbox"/> decreased?         | <input type="checkbox"/> decreased?         |
| <input type="checkbox"/> remained the same? | <input type="checkbox"/> remained the same? |

If the number of hours has changed, how many hours per week are you currently working?

How many meals did you consume away from home last week?

- Is this number of meals \_\_\_\_\_ typical  
 \_\_\_\_\_ less than  
 \_\_\_\_\_ more than

the number of meals you normally eat out per week? If this number of meals is not typical, how many meals do you normally eat out per week?

Please tell us who does each of the following farming activities.

Task	Husband	Wife	Children	Hired Help	Other	Do Not Do
<b>COMMERCIAL FARMING ACTIVITIES:</b>						
land preparation	_____	_____	_____	_____	_____	_____
planting	_____	_____	_____	_____	_____	_____
harvesting, picking	_____	_____	_____	_____	_____	_____
milking	_____	_____	_____	_____	_____	_____
care and feeding of livestock	_____	_____	_____	_____	_____	_____
bookkeeping	_____	_____	_____	_____	_____	_____

Task	Husband	Wife	Children	Hired Help	Other	Do Not Do
maintenance of farm equipment	_____	_____	_____	_____	_____	_____
PRODUCTION AND PROCESSING AT LEAST PARTLY FOR HOME USE:						
gardening	_____	_____	_____	_____	_____	_____
pruning, cultivation, and picking of fruit	_____	_____	_____	_____	_____	_____
canning and other food preservation	_____	_____	_____	_____	_____	_____

Has there been any change in your eating habits since November?

Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, a. what are the changes?

b. why did you make these changes?

Has your weight changed more than 10 pounds since November?

Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, increased more than 10 \_\_\_\_\_

increased more than 20 \_\_\_\_\_

decreased more than 10 \_\_\_\_\_

decreased more than 20 \_\_\_\_\_

## II. HOW OFTEN DO YOU EAT OR DRINK THE FOLLOWING FOODS?

Please tell us how often you ate the foods listed below during the past month.

To answer each question:

a) Circle the number that tells how often you ate the food.

b) Circle the letter that tells if you ate the food every day, week, month.

For example: If you drank skim milk for breakfast and before going to bed almost every day, circle 2 (for number of times) and D (for the time period). If you never drink skim milk circle 0.

If you only eat the food when it is in season circle the y.

### 1. MILK OR MILK DRINKS?

(including hot chocolate, milk shakes, chocolate milk drinks)

	Never	Number of times									Per Time Period			
		0	1	2	3	4	5	6	7	8	9	D	W	M
Skim Milk or skim milk drinks (including reconstituted dry milk)	0	1	2	3	4	5	6	7	8	9	D	W	M	Y
low-fat or low-fat milk drinks	0	1	2	3	4	5	6	7	8	9	D	W	M	Y
whole milk or whole milk drinks	0	1	2	3	4	5	6	7	8	9	D	W	M	Y

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FACTORS AFFECTING THE NUTRIENT ADEQUACY OF  
THE DIETS OF JACKSON COUNTY FARM WOMEN

by

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B.HSc., Otago University, New Zealand, 1984

AN ABSTRACT OF A THESIS

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## ABSTRACT

Education, off-farm employment and home food production were the variables studied to determine their possible relationship to the quality of diets of Jackson County farm women. A survey of 42 women was conducted in November 1986 and a mail questionnaire was completed by 83% of these women in March 1987. Dietary quality was determined by a mean adequacy ratio (MAR) calculated from a 24-hour dietary recall. Pearson correlation and multiple regression analysis did not determine an effect of the 3 variables on dietary quality. A one-way analysis of variance indicated a difference ( $p < .05$ ) between the MAR (including energy) of people who had never participated in 4H and those who had participated up to 10 years. Years of 4H participation was positively correlated to the variety of produce preserved ( $p = .012$ ). The total number of hours that both the man and woman worked off-farm was positively correlated to the variety of produce grown ( $p = .005$ ) and the quantity preserved ( $p = .025$ ). Years of schooling negatively correlated to the variety of produce grown ( $p = .02$ ), preserved ( $p = .027$ ) and the quantity preserved ( $p = .007$ ). This survey was conducted as a preliminary study for a statewide farm women survey. Implications for this research are discussed.