IMPACT OF SUBSIDIZED FOOD GRAINS ON THE FOOD SECURITY OF RURAL HOUSEHOLDS – AN ECONOMIC ANALYSIS

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in

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Affectionately Dedicated
to My Beloved
Grand Parents,
Channappa Gowda
Sidde Gowda
Shenamma

DEPARTMENT OF AGRICULTURAL ECONOMICS
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CERTIFICATE

This is to certify that the thesis entitled **"Impact of subsidized food grains on the food security of rural households – An economic analysis"** submitted by **Mr. NAGESH, N. S., ID No. PALB 3098**, in partial fulfilment of the requirements for the degree of **MASTER OF SCIENCE (AGRICULTURE) in AGRICULTURAL ECONOMICS** to the University of Agricultural Sciences, GKVK, Bangalore, is a record of bona-fide research work done by him during the period of his study in this University under my guidance and supervision and the thesis has not previously formed the basis for the award of any other degree, diploma, associateship, fellowship or other similar titles.

Bengaluru
January, 2016

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January, 2016 **(Nagesh, N. S.)**

IMPACT OF SUBSIDIZED FOOD GRAINS ON THE FOOD SECURITY OF RURAL HOUSEHOLDS – AN ECONOMIC ANALYSIS

NAGESH, N. S.

THESIS ABSTARCT

The present study was undertaken with an overall objective of assessment of food consumption pattern, calorie and nutrient derivation. In Tumakuru district of Karnataka state, primary data were collected from 120 rural households. The rural households inadequately consumed proteins, milk and milk products. In terms of vegetables, fruits and egg and meat consumption, they were severely inadequate. Among the nutrients intake, the households were inadequate in fats, iron, riboflavin, niacin and carotene intake. The subsidized food items through PDS had greatly helped in attainment of calorie security but had severely lacked in terms of providing balanced diet security. In the presence of food subsidy, share of total expenditure on food was 67.24 per cent among AAY farm households and 59.98 per cent among BPL farm households, which would rise to 75.16 per cent and 65.62 per cent, respectively in the absence of food subsidy. In the presence of food subsidy, proportion of income saved was 30.72 per cent among AAY farm households and 24.19 per cent among BPL farm households, which would decrease to 8.65 per cent and 11.76 per cent, respectively in the absence of food subsidy. In the presence of food subsidy, the vulnerability to food insecurity of AAY farm, AAY non-farm and BPL non-farm households reduced significantly. The optimized food expenditure per consumptive unit per day for major nutrients and all nutrients was Rs. 34.49 and Rs. 36.56 respectively. The food basket of rural households needs to be expanded to ensure nutritional security.

Signature of the student
(Nagesh, N. S.)

Major Advisor
(Dr. B. V. Chinnappa Reddy)

January, 2016.

Department of Agricultural Economics
UAS, GKVK, Bengaluru

ಗ್ರಾಮೀಣ ಕುಟುಂಬಗಳ ಆಹಾರ ಭದ್ರತೆಯ ಮೇಲೆ ಸಬ್ಸಿಡಿ ದರದಲ್ಲಿ ಆಹಾರ ಧಾನ್ಯಗಳ ಪ್ರಭಾವ- ಆರ್ಥಿಕ ವಿಶ್ಲೇಷಣೆ

ನಾಗೇಶ್, ಎನ್.ಎಸ್.

ಪ್ರಬಂಧ ಅಮೂರ್ತ

ಪ್ರಸ್ತುತ ಅಧ್ಯಯನವನ್ನು ಆಹಾರ ಸೇವನೆ ಮಾದರಿ, ಕ್ಯಾಲೋರಿ ಮತ್ತು ಪೌಷ್ಟಿಕಾಂಶ ಪಡೆದುಕೊಂಡಿರುವುದುರ ಪರಿಣಾಮಗಳನ್ನು ಕಂಡುಹಿಡಿಯುವ ಉದ್ದೇಶದಿಂದ ಕೈಗೊಳ್ಳಲಾಗಿದೆ. ಕರ್ನಾಟಕ ರಾಜ್ಯದ ತುಮಕೂರು ಜಿಲ್ಲೆಯಲ್ಲಿ ಪ್ರಾಥಮಿಕ ಮಾಹಿತಿಯನ್ನು 120 ಗ್ರಾಮೀಣ ಕುಟುಂಬಗಳಿಂದ ಸಂಗ್ರಹಿಸಲಾಗಿದೆ. ಗ್ರಾಮೀಣ ಕುಟುಂಬಗಳು ಕಡಿಮೆ ಪ್ರಮಾಣದಲ್ಲಿ ಪ್ರೋಟೀನ್, ಹಾಲು ಮತ್ತು ಹಾಲಿನ ಉತ್ಪನ್ನಗಳನ್ನು ಸೇವಿಸುತ್ತಿದ್ದಾರೆ. ತರಕಾರಿಗಳು, ಹಣ್ಣುಗಳು, ಮೊಟ್ಟೆ ಮತ್ತು ಮಾಂಸ ಸೇವನೆಗೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಅವರು ತೀವ್ರವಾಗಿ ಕಡಿಮೆ ಪ್ರಮಾಣದಲ್ಲಿ ಸೇವಿಸುತ್ತಿದ್ದಾರೆ. ಪೋಷಕಾಂಶಗಳ ಸೇವನೆ ಸಂಬಂದ ಕುಟುಂಬಗಳು ಕೊಬ್ಬು, ಕಬ್ಬಿಣ, ರಿಬೋಫ್ಲಾವಿನ್, ನಿಯಾಸಿನ್ ಮತ್ತು ಕ್ಯಾರೋಟಿನನ್ನು ಕಡಿಮೆ ಪ್ರಮಾಣದಲ್ಲಿ ಸೇವಿಸುತ್ತಿದ್ದಾರೆ. ಸಾರ್ವಜನಿಕ ವಿತರಣಾ ವ್ಯವಸ್ಥೆಯ ಮೂಲಕ ಸಬ್ಸಿಡಿ ದರದಲ್ಲಿ ಆಹಾರವಸ್ತುಗಳನ್ನು ನೀಡುವುದು ಹೆಚ್ಚು ಕ್ಯಾಲೋರಿ ಸಿಗುವಂತೆ ಮಾಡಿದೆ, ಆದರೆ ಸಮತೋಲನ ಆಹಾರ ಒದಗಿಸುವ ವಿಷಯದಲ್ಲಿ ತೀವ್ರವಾದ ಕೊರತೆ ಇದೆ. ಈಗಿನ ಪರಿಸ್ಥಿತಿಯಲ್ಲಿ ಸಬ್ಸಿಡಿ ಇರುವಾಗ ಆಹಾರದ ಒಟ್ಟು ವೆಚ್ಚ ಅಂತ್ಯೋದಯ ಅನ್ನಯೋಜನೆ-ಕೃಷಿಕುಟುಂಬಗಳಲ್ಲಿ ಶೇ. 67.24 ರಷ್ಟು ಪಾಲು, ಮತ್ತು ಬಡತನ ರೇಖೆ ಕೆಳಗಿನ ಕುಟುಂಬಗಳಲ್ಲಿ ಶೇ. 59.98 ರಷ್ಟು ಪಾಲು ಆಗಿರುತ್ತದೆ. ಸಬ್ಸಿಡಿ ಇಲ್ಲದಿರುವಾಗ ಇದು ಕ್ರಮವಾಗಿ ಅಂತ್ಯೋದಯ ಅನ್ನಯೋಜನೆ-ಕೃಷಿಕುಟುಂಬಗಳಲ್ಲಿ, ಶೇ. 75.16 ರಷ್ಟು ಮತ್ತು ಬಡತನ ರೇಖೆಯ ಕೆಳಗಿನ ಕುಟುಂಬಗಳಲ್ಲಿ ಶೇ.65.62 ರಷ್ಟು ಆಗಿರುತ್ತದೆ. ಆಹಾರ ಸಬ್ಸಿಡಿ ಇದ್ದಾಗ, ಉಳಿಸಿದ ಆದಾಯ ಪ್ರಮಾಣವು ಅಂತ್ಯೋದಯ ಅನ್ನಯೋಜನೆ ಕೃಷಿ ಕುಟುಂಬಗಳಲ್ಲಿ ಶೇ. 30.72 ರಷ್ಟು ಮತ್ತು ಬಡತನ ರೇಖೆಯ ಕೆಳಗಿನ ಕುಟುಂಬಗಳಲ್ಲಿ ಶೇ. 24.19 ರಷ್ಟು ಆಗಿರುತ್ತದೆ, ಆದರೆ ಸಬ್ಸಿಡಿ ಅನುಪಸ್ಥಿತಿಯಲ್ಲಿ ಉಳಿಸಿದ ಆದಾಯ ಪ್ರಮಾಣವು ಕ್ರಮವಾಗಿ ಶೇ. 8.65 ರಷ್ಟು ಮತ್ತು ಶೇ. 11.76 ರಷ್ಟು ಕಡಿಮೆ ಆಗಿರುತ್ತದೆ. ಆಹಾರ ಸಬ್ಸಿಡಿ ಇದ್ದಾಗ, ಅಂತ್ಯೋದಯ ಅನ್ನಯೋಜನೆ - ಕೃಷಿ/ಕೃಷಿಯೇತರ, ಬಡತನ ರೇಖೆ ಕೆಳಗಿನ ಕೃಷಿಯೇತರ ಕುಟುಂಬಗಳಲ್ಲಿ ಆಹಾರ ಅಭದ್ರತೆಗೆ ತುತ್ತಾಗುವುದು ಗಮನಾರ್ಹವಾಗಿ ಕಡಿಮೆ ಇರುತ್ತದೆ. ಅತ್ಯುತ್ತಮ ಆಹಾರ ಪಡೆಯಲು ಬಳಕೆಯ ಒಂದು ಘಟಕಕ್ಕೆ, ಒಂದು ದಿನಕ್ಕೆ, ಬಳಸುವ ಪ್ರಮುಖ ಪೋಷಕಾಂಶಗಳಿಗೆ ರೂ. 34.49 ಮತ್ತು ಎಲ್ಲಾ ಪೋಷಕಾಂಶಗಳಿಗೆ ರೂ. 36.56 ವೆಚ್ಚ ಆಗಿರುತ್ತದೆ. ಗ್ರಾಮೀಣ ಕುಟುಂಬಗಳು ಅವರ ಪೋಷಕಾಂಶಗಳ ಭದ್ರತೆಗಾಗಿ ಆಹಾರ ಪದಾರ್ಥಗಳ ಸೇವನೆಯನ್ನು ವಿಸ್ತಾರ ಮಾಡಿಕೊಳ್ಳಬೇಕು.

ನಾಗೇಶ್, ಎನ್.ಎಸ್.
ವಿದ್ಯಾರ್ಥಿಯ ಸಹಿ

ಡಾ. ಬಿ.ವಿ.ಚಿನ್ನಪ್ಪ ರೆಡ್ಡಿ
ಪ್ರಧಾನ ಸಲಹೆಗಾರರು

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ಕೃ. ವಿ. ವಿ., ಗಾ. ಕೃ. ವಿ.ಕೇಂ., ಬೆಂಗಳೂರು.

Public Distribution and Food intake of Rural Households – An Economic Analysis

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INTRODUCTION

At the time of independence, 55 per cent of the Indian population was living below the poverty line. At present 20 per cent of the population still lives below the poverty line. Being a welfare state, it is the responsibility of policy makers and administrators to make food available to deprived sections of the country. In this context, the Government of India and state governments have launched several innovative schemes. Government of Karnataka is one of the pioneers in this regard as it has launched several food security schemes like Anna Bhagya Scheme (from July 2013).

The beneficiaries of the Public Distribution system (PDS) are categorized as Antyodaya Anna Yojana (AAY), Below Poverty Line (BPL) and Above Poverty Line (APL). These beneficiaries are provided with rice, wheat, oil, sugar and kerosene at highly subsidized prices.

The subsidized food grains provided through the PDS has strong implications on crop production, agricultural labor supply, price distortions, fiscal burden for the government, poverty and inequality reductions. This study focuses on the impact of subsidized food grains on the calorie intake and consumption expenditure of rural households including farm and non-farm households.

OBJECTIVE

To assess the consumption pattern of food items and the calorie derivation of rural households.

METHODOLOGY

Study area and sampling: The study was carried out in Gubbi taluk of Tumkur district, Karnataka. A Multi stage sampling procedure was adopted. In the first stage, two hoblis (Nittur and Kadaba) were randomly selected. In the second stage, two panchayats from each hobli were selected considering the respondents available in each category. Two villages from each panchayat were selected randomly. From each village, a sample of 15 respondents comprising of all the six categories (AAY farm, AAY non-farm, BPL farm, BPL non-farm, APL farm and APL non-farm) was selected to make a sample size of 120 households .

Primary data were collected from the sample respondents using a pre-tested schedule by personal interview method for the year 2014-15.

Analytical tools: Averages, Ratios, Regression analysis, the 24 hour recall method

RESULTS

Table 1: Calorie intake and consumption expenditure across various categories

Group	Per capita calorie intake per day (kcal / day)	Food consumption expenditure per month (Rs.)	Calories derived per rupee of expenditure (kcal/Rs.)	Expenditure to meet current calorie requirement (Rs. / day)
Farm (60)	2165.38	816.16	79.59	27.21
AAY (15)	2162.73	667.67	97.18	22.26
BPL (30)	2150.75	782.82	82.42	26.09
APL (15)	2197.27	1031.33	63.92	34.38
Nonfarm (60)	2151.96	819.62	78.77	27.32
AAY (15)	1970.74	677.97	87.20	22.60
BPL (30)	2200.72	816.32	80.88	27.21
APL (15)	2235.66	967.87	69.30	32.26
Total (120)	**2158.67**	**817.89**	**79.18**	**27.26**

The mean calorie intake of the various categories was statistically significant as revealed from 't' test. There existed a very high positive correlation between the household size and the consumption expenditure across all categories. The total consumption expenditure would have increased by 21.08 per cent in the absence of subsidized food items.

Regression analysis of consumption expenditure

$D_1 = 1$ if farm AAY, $D_2 = 1$ if farm BPL, $D_3 = 1$ if farm APL, $D_4 = 1$ if non-farm AAY, $D_5 = 1$ if non-farm BPL, otherwise non-farm APL (Bench mark variable)

Consumption expenditure = $1881.6 + 480.05*\text{Household size} - 1244.77*D_1 - 517.85*D_2 - 260.17*D_3 - 1371.32*D_4 - 660.73*D_5$

Regression coefficient associated with D_3 was not statistically significant, implying that APL farm non-farm households had almost similar consumption expenditure, whereas consumption expenditure of the remaining four groups was varied and lower to that of APL households. Being a farm or non-farm household, had no significant influence on the consumption expenditure, but household size and the type of beneficiary (AAY, BPL and AAY) had significant effects on consumption expenditure.

DISCUSSION

The daily average calorie derivation of the households from PDS (AAY+BPL) was 8,560.70 kcal and without PDS (APL) was 9,394.68 kcal, making a difference of 743.98 kcal. However these results were in contrast to the findings of Dubey and Srivastav (2011) who reported higher daily average calorie derivation for households with access to PDS.

It is inferred that families provided with subsidized food items were not able to derive the calories equivalent to the APL families. It was also observed that APL group had not consumed the recommended dietary allowance, despite their relatively better economic position. Further it was noticed that calorie intake per rupee of expenditure incurred on food items was maximum among AAY farm, followed by AAY non-farm, BPL farm, BPL non-farm, APL non-farm and APL farm implying the effect of subsidised food items distribution.

The proportion of expenditures spent on food items was high on rice (21%), followed by milk, ragi , vegetables and others. This implies that the respondents had to adjust their expenditures in achieving balanced nutrition.

The expenditure incurred by households to meet the current calorie requirements was Rs. 27.27 per day. It was highest for APL and least for AAY households providing strong implications in defining the poverty line.

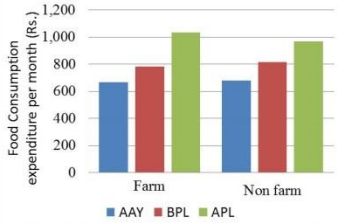

Fig. 1: Per capita expenditure on food consumption across various groups

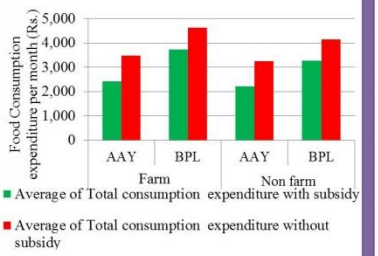

Fig. 2: Total consumption expenditure with and without subsidy

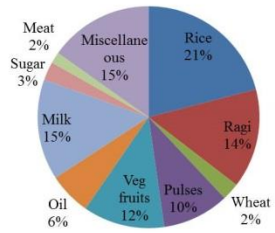

Fig. 3: Proportional expenditure of various food items consumed

SUMMARY

The study revealed that majority of the respondents were not meeting the recommended calorie intake inspite of the availability of subsidized food items. The food consumption expenditure among different groups varied between Rs. 667.67 and Rs. 999.17 per capita per month. The expenditure incurred by households to meet the current calorie requirements was Rs. 27.27 per day. The regression analysis revealed that, the household size and type of beneficiary were the important determinants of consumption expenditure. Thus, there is a need to reorient the scheme of providing subsidized food grains more effectively and efficiently, by giving importance to balanced diet in accordance with their income levels.

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I INTRODUCTION

Food is the most essential basic necessity for the survival of human beings. But, around 800 million to 1 billion people globally suffer from hunger. Around 2 billion people suffer from micronutrient deficiencies according to the Global Hunger Index (2015) report. India has the second-highest estimated number of undernourished people in the world. This is despite the fact that India spends nearly one per cent of its Gross Domestic Product (GDP) on maintaining its food assistance programs like the Public Distribution System (PDS).

Food and Agricultural Organization (FAO) Director General Da Silva (2015) describes the behavior of the rural poor most appropriately in the following paragraph: "Most of the world's poor and hungry belong to rural families who depend on agriculture for their daily meals and their very livelihoods. These family farmers and rural labourers, understandably are focused on survival in the here-and-now. They adopt low-risk, low-return approaches to income-generation, underinvest in the education and health of their children and are often forced to adopt negative coping strategies such as selling off meager assets, putting their children to work, or reducing food intake to cut expenses. They become trapped in survival mode. Poverty and hunger become intergenerational and seemingly inescapable". In this regard, a performance analysis of the food subsidy programme in breaking the vicious cycle faced by the rural poor households is essential.

1.1 Food security

FAO states that, "food security emerges when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". Food security has three important and closely related components, namely: availability of food, access to food and absorption of food. Food security is a multi-dimensional concept and extends beyond the production, availability and demand for food. There has been a definite and significant paradigm shift in the concept of food security from a mere macro level availability and stability to micro level household food insecurity and also from an assessment of energy intake to measures and indicators of malnutrition (Ittyerah, 2013).

Malnutrition reflects an imbalance of both macro and micro-nutrients that may be due to inappropriate intake and/or inefficient biological utilization due to the internal/external environment. Malnutrition therefore is a major threat to social and economic development as it is among the most serious obstacles to attaining and maintaining health of this infancy and early childhood age group.

According to the Global Hunger Index, 2015 India ranks 55 among the 80 nations having the worst hunger situation. It reports that 190 million people in India go hungry daily (Anonymous, 2015a).

Deficiencies in nutrition inflict long-term damage to both individuals and society. Compared with their better-fed peers, nutrition-deficient individuals are more likely to have infectious diseases such as pneumonia and tuberculosis, which lead to a higher

mortality rate. In addition, nutrition-deficient individuals are less productive at work. Low productivity not only gives them low pay that traps them in a vicious circle of under-nutrition, but also brings inefficiency to the society, especially in India where labour is a major input factor for economic production.

1.2 Subsidy

The word 'subsidy' is derived from the Latin word '*subsidium*', which literally implies "coming to assistance from behind". A subsidy means, government pays part of the cost. Subsidies are a kind of incentive which plays an important role in economic development of developing countries. Subsidies bring out desired changes by effecting optimal allocation of resources, stabilizing the price of essential goods & services, redistributing income in favor of poor people thus achieving the twin objective of growth & equity of nation.

Subsidies are used to modify market outcomes, especially to take account of positive externalities, and sometimes to sub serve certain well-defined redistributive objectives. Subsidies are justified in the presence of positive externalities because in these cases consideration of social benefits would require higher level of consumption than what would be obtained on the basis of private benefits only.

1.3 Food Subsidy

In view of the hunger and malnutrition issues prevailing in the country, Government of India has undertaken policies and programmes to provide essential food items (like rice, wheat, edible oil and sugar) at subsidized rates for the poor households. The identification of these households is done by the State governments using some criteria (like income, possession of assets, land, job type and others).

As described by Sharma and Alagh (2013), food subsidy is the sum of consumer subsidy and cost of maintenance of buffer and strategic stocks. The difference between the economic cost of food items and their respective central issue price amounts to consumer subsidy. Economic cost is the sum of minimum support price (MSP), procurement incidentals and distribution costs. In other words, it is the sum of the cost of procurement and cost of Food Corporation of India (FCI) operations involving handling, storage and transportation.

The proportion of expenditure on subsidies was highest towards food subsidies, followed by fertilizer subsidies, petroleum subsidies and interest subsidies. The quantum of food subsidy has increased from Rs. 25,181 crores in 2003-04 to Rs. 89,740 crores in 2013-14. Though there are lots of efforts directed towards containing the subsidy expenditure, very less outcome is evident in this regard. The food subsidy budget is enormous and it warrants a systematic study to assess its contribution to food security. Since most of the rural households are the major beneficiaries of the food subsidy programme, this study focuses only on rural households.

1.4 Food Security Schemes

The major food subsidy programmes initiated by the Government of India are the Public Distribution System (PDS), Mid-Day Meal (MDM) scheme and Integrated Child Development Scheme (ICDS). Under these schemes subsidized food grains and nutritious food are made available for the targeted beneficiaries.

1.4.1 Public Distribution System

PDS is an Indian food security system which provides subsidized food items to the poorer households. The main objective of the PDS is to provide essential consumer goods at cheaper and subsidized prices to the consumers so as to insulate them from the impact of increasing prices of these commodities and maintain the minimum nutritional intake of the population.

In the year 1992, Revamped Public Distribution System (RDPS) was launched mainly to improve the reach of PDS to far flung hilly, remote and inaccessible areas where substantial sections of poor live. The scheme involved development of infrastructure but it was widely criticized for its failure to serve Below Poverty Line (BPL) population, urban bias, negligible coverage in states with high concentration of poor, lack of transportation and accountable arrangements for delivery. Thus from 1997, the Targeted Public Distribution System (TDPS) was started. Under this scheme, a two tier subsidized pricing scheme was introduced for the benefit of the poor who were divided into two categories as Above Poverty Line (APL) and Below Poverty Line (BPL). Thus the BPL households were entitled to receive food grains at highly subsidized prices while the APL households receive food grains at prices closer to open market rates. This classification forms the basis for the present study.

The PDS is in existence from over the past four decades. It is the largest food distribution network in the world. It has a network of more than 5.13 lakh Fair price shops (FPS) that distribute commodities to 18.04 crore families at a cost of more than Rs. 89,740 crores. (Balani, 2013 and Anonymous, 2015b)

Antyodaya Anna Yojana (AAY) was launched on 25 December 2000 to cover the poorest of the poor, by providing 35 kilograms (kg) of rice and wheat per household, at Rs. 3 and Rs. 2 per kg, respectively. Under this scheme, one crore of the poorest among the BPL families were identified and covered under the TPDS.

1.4.2 Mid-day Meal Scheme

This scheme is a school meal feeding programme of the Government of India, initiated from 2004. It was designed to improve the nutritional status of school age children nationwide and also to reduce the school dropout rates. The programme provides free lunch on working days for children in primary and upper primary classes in government schools supported under *Sarva Shiksha Abhiyan*. This programme is one of the largest of the kind in the world serving 12 crore children in over 12.65 lakh schools.

1.4.3 Integrated Child Development Scheme

It is a welfare programme which provides food, preschool education and primary healthcare to children less than 6 years of age and their mothers. These services are provided from Anganwadi centres established mainly in rural areas and staffed with frontline workers. In addition to fighting malnutrition and ill health, the programme is also intended to combat gender inequality by providing girls the same resources as boys.

1.4.4 National Food Security Act

The National Food Security Act, 2013 converts the existing food security programmes of the Government of India into legal entitlements. The objective of the Act is to provide, food and nutritional security by ensuring adequate quantity of quality foods at affordable prices to people, to live a life with dignity. It includes the above three schemes. The Mid-day Meal Scheme and the Integrated Child Development Services Scheme are universal in nature whereas the PDS will reach about two-thirds of the population (75 % in rural areas and 50 % in urban areas).

Under the provisions of the Act, beneficiaries of the PDS are entitled to 5 kg per person per month of cereals at the price Rs. 3 per kg for rice, Rs. 2 per kg for wheat and Re. 1 per kg for coarse grains (millet). The cost of the implementation is estimated to be 1.25 lakh crore, which is approximately 1.5 per cent of GDP.

1.4.5 Anna Bhagya Scheme

The Government of Karnataka has started the Anna Bhagya Scheme from 2013. Under this scheme, 30 kg of food grains per month (rice and wheat) is given to BPL and AAY families across the state at Re. 1 per kg. The government will spend Rs 4,300 crore every year on the scheme. Eighty seven lakh BPL and eleven lakh AAY cardholders are covered under the scheme.

1.5 Issues related to food subsidy

The major contributors for the rise in the food subsidy are the rising economic cost of handling food grains (namely rising minimum support prices, procurement incidental and distribution costs), almost constant Central Issue Price, increasing procurement of food grains and carrying costs of stocks and excesses of buffer stocks. The PDS is fraught with inefficiencies in terms of targeting, leading to excessive leakages (exclusion and inclusion error), diversion of food grains, urban bias, regional disparities and many others. Poor supervision of fair price shops and lack of accountability have spurred middlemen activities.

The Planning Commission has identified that for every Rs. 4 spent on PDS, only Re.1 reaches the poor which meant 75 per cent of the money spent on PDS does not reach the needy. The opportunity cost of food subsidy in terms of investing this amount on other merit subsides or investment opportunities having higher multiplier effects are well known but least implemented. The high transaction costs of availing the benefits and issues of asymmetric information are the other major bottlenecks among these subsidy schemes.

1.6 Focus in our study

Livelihood security forms the major ingredient for the sustainable development of rural households. As reported by Sakamma (2013), outcomes of livelihood security includes food security (availability, accessibility and utilization of food at all the times, at affordable prices), economic security (access to resources), social security (access to and utilization of welfare programmes), educational security (access to quality and affordable school education and educational empowerment through development programmes), health security (access to quality and affordable public health and health empowerment through development programmes) and habitat security (access to shelter, quality shelter, drinking water, electricity, sanitation and other resources). It is evident that provision of subsidized food items would increase the real income of purchasing power constrained poor rural households. This would enable the rural households to use this additional income saved (as a result of provision of subsidized food items) to improve their access to the other components of livelihood security (particularly habitat, health and education security) in addition to food security. This study mainly focuses on the impact of food subsidy in terms of ensuring food security to the rural households (which is the primary and significant part of livelihood security) in particular and also ensuring livelihood security in general.

Empowerment means moving from a position of enforced powerlessness to one of with power. There are three main dimensions of empowerment (Sakamma, 2013), namely: Economic empowerment (in terms of access to resources), Social empowerment (in terms of education, health and free from discrimination) and Political empowerment (equal opportunity in terms of getting elected to any organization, institution and demanding equal rights on par with those of empowered sections). Subsidy is one of the most appealing policy instruments in the present days, having a huge impact on the election outcomes, also. In general, subsidies should be used to empower the powerless households, by providing them with various opportunities and choices and in turn strengthening their capabilities. In this regard, this study tries to analyze the impact of food subsidy in terms of empowering the rural households (through food security, nutrition security, health security, education security and others)

The sustainability of subsidies (in general, the populist schemes) perennially has been a debatable issue. The debts of the Indian government are mounting significantly. In fact post-independence India had positive Balance of Payments only during 2 years. Thus rationalization of subsidy programmes will provide a great relief if done appropriately without compromising on food security in particular and fiscal and environmental sustainability in general. The present study aims to precisely estimate the contribution of subsidized food items given through PDS in ensuring the food and nutritional security to the below poverty line households providing critical insights for further rationalization based on its impact.

India presently faces lots of issues as a result of these subsidies at the World Trade Organization (particularly on public stock holdings widely debated during the Bali Ministerial Conference). This further warrants rationalization of our subsidy regime so as

to meet the legitimate rules of the World Trade Organization and also support our Below Poverty Line households efficiently, equitably and sustainably.

A lot of subsidy schemes have thus come into vogue, particularly in the developing economies, to make available subsidized food grains to the people suffering from hunger and living in poverty. There are various ways in which this subsidy is made available, namely; in kind subsidy, in cash subsidy or as food stamps. These are offered either on conditional or unconditional basis. India is a large democratic country with a largest public food distribution network providing all the essential goods at a subsidized price (incurring a budget cost of around 1.25 lakh crores). But to answer the question raised by Banerjee and Duflo (2014), "India with a billion inhabitants has won on an average, 0.92 medals per Olympics over the course of 22 Olympic Games. It is 10 times lesser when compared with the medal count of Cameroon, Ghana, Ethiopia, Haiti, Kenya and other African countries". One reason may be that Indians are very much obsessed with cricket, so it absorbs much of the talent and not the athletics. Other possibility can be the persistence of malnutrition issues among Indians. It is the latter case that raises a lot of issues with respect to our food subsidy programme in general and PDS in particular. In this regard, this study tries to answer if the food subsidy programme has really impacted the food and nutrition security of the rural households significantly.

1.6 Objectives

1. To assess the consumption pattern of food items and calorie and nutrient derivation among rural households.
2. To assess the spillover effects of subsidized food items on food security and other socio-economic dimensions of rural households.
3. To optimize the food grain consumption to minimize the cost according to nutrients and budget criteria.
4. To analyze the relationships between calories, nutrition, expenditures and incomes.

1.7 Significant features of this study

There are lots of studies contrasting urban and rural contexts, but this study attempts to contrast between farm and non-farm rural households. This classification provides results of high value for formulating food and agricultural policies and gives considerable attention with regard to behavior of farm and non-farm rural households in respect of food consumption.

The impact of subsidized food grains in improving the energy and nutrient intake, supplementing the food consumption expenditures, augmenting the savings and reducing the vulnerabilities to food insecurity are well assessed and documented in this study. The importance of various other agricultural input subsidies, education subsidies, health subsides in relation to food subsides as per the household preferences are used to provide critical insights for rationalization of the subsidy regime.

The optimization of the food budget provides strong evidence (from micro level) for reorientation of the PDS system, to strengthen the food and nutrient security of the rural households. This reorientation should ensure not only energy (calorie) security but also balanced diet security (as per the Desirable dietary plan of Anonymous (1989)).

The expenditure elasticities help us to analyze the consumer's response/ behavior effectively. Analysis of the cost of calorie derivation in terms of expenditures and income spent, in the presence and absence of food subsidy, helps formulation of appropriate poverty reduction strategies. Also the relationships between the calorie and nutrient intake, expenditures incurred and income earned provides necessary and valuable ingredients for policy making.

1.8 Limitations of the study

The data collected was bound to be associated with some amount of recall bias as the respondents did not maintain any records of the costs, expenses, expenditures and returns on crops and pattern of food consumption. However, consistent efforts were made to minimize them through cross checks at the time of data collection. The degree of discrepancy, if any, would be negligible as the data are presented in averages.

Some inconsistencies were associated in energy and nutrient intake estimation, with respect to 24 hour recall method. Since the fruits, eggs and meat are consumed occasionally, their consumption habits were not captured by 24 hour recall method. Thus, they were deduced with the help of Household monthly consumption method to make the 24 hour recall method values approximately precise and realistic.

Assumption on 'with and without subsidy' comparison

'With subsidy' situation refers to the current situation where AAY households and BPL households received subsidized food items through the fair price shops. For instance, issue of rice @ 1 rupee per kilogram. 'Without subsidy' scenario refers to a hypothetical situation where food subsidies are not given. During this situation, the AAY and BPL households will maintain the same level of consumption (as that in the former case of subsidized food grains) by purchasing the food items from the open market. This study assumes that in the absence of subsidy, the non-food expenditure and consumption pattern of the AAY and BPL households will remain unchanged. In other words, the study employs a partial equilibrium approach in studying the effect of subsidized food items in ensuring food and nutrition security. This assumption will assist greatly to delineate the impact of subsidized food grains on food security and other socio economic variables.

II REVIEW OF LITERATURE

The review of literature helps us identify the gaps in conceptual and methodological issues relevant to the research study. The methodology for collection, analysis and interpretation of the data was designed based on the review of literature. Thus the salient features of the previous studies are summarized and presented briefly under the following headings:

2.1 Food consumption pattern and calorie and nutrient derivation of rural households

2.2 Spillover effects of subsidized food grains

2.3 Optimization of food consumption pattern

2.4 Relationship between calories, nutrition, expenditures and income

2.1 Food Consumption pattern and calorie and nutrient derivation of rural households

The study on consumption pattern is very important as it has significant implications on poverty, hunger, malnutrition, inequality, health and standard of living. Food being the foremost basic need gets the priority in the pattern of expenditure of people, especially for low and middle income groups. The analysis of the spatial changing food consumption pattern would help in designing appropriate policies related to food production and efficient distribution of subsidies to help them meet their energy and nutrient requirements within the given cost and budget constraints.

Usha (1987) analyzed the distribution of food and nutritional adequacy of farmers of Dharwad district. Results indicated that the large farmers had significantly higher intake of all the food groups except cereals. In terms of nutrients, the sample farmers were grossly deficient in ascorbic acid, riboflavin, retinol and thiamine. But, the intake of calorie and calcium by large farmers met the Recommended Dietary Allowances (RDA). Intake of these nutrients was far below the RDA in the case of landless labourers.

Delislea *et al*., (1991) conducted a cross sectional survey of food consumption and nutritional status in 225 rural households involved in Wadi agriculture in three adjacent zones of Central Africa. Average household intake of energy, protein and iron appeared to be adequate except in Nokou, where 41 per cent of the households did not meet 60 per cent of their energy requirements. The Vitamin A intake was extremely low in all three zones. Seventy two per cent of total energy intake was contributed by cereals. Cereal needs for household energy sufficiency were estimated at 210 kg per capita per year.

Mohanty and Sahu (1991) studied the food intake of rural kisans of Sambalpur, Orissa. Mean daily food consumption was assessed in 11 randomly selected families. Energy yielding food like cereals, roots and tubers were mainly consumed by kisans. Food rich in protein like meat, fish and pulses were consumed occasionally and inadequately. Protective foods that are rich in proteins, vitamins and minerals like milk, egg and fruits were seldom consumed.

A food consumption and nutrient intake survey of 120 families belonging to different zones in Gwalior city was conducted by Arora (1992). Results concluded that mean intake of all the food groups was more than the RDA except for cereals (81 %) and green leafy vegetables (45 %). Intake of fruits (banana), milk, sugar and jaggery was found to be high. The mean intake of nutrients was also higher in comparison to recommended levels except for vitamin A and C, which were 86 per cent and 55 per cent of RDA, respectively.

Bouis and Haddad (1992) attributed the difference between availability and intake to meals provided for servants and workers, to common measurement error in calories and total expenditure, and to wastage of calories in preparation, through plate wastage, or to food fed to pets or domestic animals.

While studying the nutrient adequacy of farm and landless labourer families of Devanahalli taluk, Karnataka, Shakuntala (1993) reported that farm and landless labourer families met more than 80 per cent of RDA with reference to calories, protein and ascorbic acid. Calcium intake of the families was equal to the recommended standard. All the households had lower adequacies of fat and iron. The adequacy of β-Carotene was more than 80 per cent of RDA in farming community and 70 per cent of recommended among landless labourers.

Kumar (1996) analyzed the relationship between agricultural productivity and food security in India and explored its implications for policy. Expenditure on cereals dominated food expenditure in India. Rice ranked first followed by wheat and coarse grains. Annual per capita consumption of cereals was 176 kg in the rural areas in 1987-88 and 136 kg in the urban areas, accounting for 73 per cent of the total calorie intake in the rural areas and 62 per cent in urban areas. The cereal consumption declined to 163 kg in rural areas and to 129 kg in the urban areas in 1993-94. The per capita consumption of cereals declined despite rising incomes and declining relative cereal prices. This is largely attributed to the shift in tastes and preferences resulting from the increasing availability of a greater variety of food items other than food grains as well as wide range of non-food goods and services. Increasing urbanization and widening rural – urban disparities had reduced the per capita demand for food grains and rapidly increased the demand for fruits, vegetables and milk.

Anonymous (1997) reported the food and nutrient intake of Indians for the period 1975-1995 and inferred that the average consumption of cereals and millets, though tended to decrease, was more or less equal to RDA. The intake of pulses and legumes remains marginally lower than the recommended level while that of green leafy vegetables, an extensive source of vitamins and minerals was about one third of the RDA. The intake of milk and milk products as well as fats and oils was about half the recommended level.

Durrani (1998) conducted a survey of food and nutrient intake in Aligarh, India. The consumption of cereals was higher in the rural areas than in urban areas. There was a difference of about 162 kcal/CU/day between urban and rural people as consumption of

cereals decreased. Consumption of pulses, milk and green leafy vegetables increased with increase in income. The mean intake of sugar and jaggery was lower in both urban and rural areas as compared to recommended levels. The intake of protein and calcium was higher in upper economic class, whereas vitamin A and iron intake were lower in all the groups.

Musebe and Kumar (2002) reported the deficiencies in food consumption and nutrient intake as compared with the recommended dietary allowance. The study emphasized that although cereals form the main source of energy in Indian diet, a substantial proportion of the population was still consuming less than the dietary requirements, with large relative gaps occurring in vegetables, meat, eggs and fish. The factors identified for improving nutritional status related to improvement in household literacy levels, improved agricultural technology for increasing food production and support for dairy enterprises.

Basavaraj (2007) reported that there was a structural shift from low calorie food sources to high calorie food sources. The monthly consumption expenditure across all classes from 27^{th} to 55^{th} round showed decline in consumption of coarse cereals ragi (6 to 3 per cent) and jowar (13 to 4 per cent) and increase in consumption of pulses (7 to 10 per cent), edible oils (8 to 9 per cent), milk and milk products (16 to 23 per cent) and egg, meat and fish (5 to 11 per cent). Consumption of cereals which constituted 63 per cent of food expenditure in 27^{th} round has declined to 45 per cent in the 55^{th} round. Consumption expenditure on milk and milk products and egg, meat and fish which constituted 21 per cent of the food expenditure in 27^{th} round has increased to 35 per cent in 55^{th} round. There is also a marginal increase in consumption of pulses and edible oils.

Pavithra (2008) reported that the quantities of cereals and pulses consumed declined during 1993-94 to 2004-05. But, the monthly per capita expenditure on these two food items showed an increase of more than 60 per cent. Thus, the price rise appears to be the root cause for the fall in the quantities of cereals and pulses consumed and the price rise was higher in urban areas than in rural areas. Cereals and pulses being an essential component of food, the price rise needs to be kept under control. Due importance should be accorded to cereal and pulses from the view point of food and nutritional security until the level of per capita income is large enough to permit the purchase of adequate quantities of horticulture and livestock products. The consumption and the share of different food items have changed appreciably. Increase in income, education and easy availability of ready-to-eat foods may bring about enormous changes in the food consumption pattern in the near future.

According to Deaton and Dreze (2009), the average calorie consumption in rural areas was about 10 per cent lower in 2004-05 than in 1983 based on National Sample Survey (NSS) data. The proportionate decline was larger among better-off sections of the population and close to zero for the bottom quartile of the per capita expenditure scale. The decline of per capita consumption is not limited to only calories but also applies to proteins and many other nutrients, except for fat consumption, which has increased steadily during this period. It would be difficult to attribute the decline in calorie

consumption to declining per capita incomes or to changes in relative prices. One possible explanation for this drift is that calorie requirements have declined, due to better health as well as to lower physical activity levels.

The low calorie intake in India seems to be due to the lack of awareness or willingness of consumers to raise energy intake. The second important factor, often ignored by the researchers, is the cultural dimension. Most Indians feel comfortable with less food than that needed to supply the normative level of energy. The lifestyle patterns for many is also such that digesting food containing say 2000 kcal by a person involved in sedentary activity creates problem without some sort of exercise. Profligacy in food intake is also not part of India's tradition. Because of importance of such factors it is felt that dietary transition in India may not follow economic transition witnessed earlier in the developed world and in China more recently (Landy, 2009).

Govil *et al*., (2012) reported a per capita calorie decline by 5.25 per cent in rural areas whereas in urban areas it increased slightly by 0.75 per cent during 1972-2010. Similarly the protein intake showed a declining trend whereas fat intake showed an increasing trend in rural areas. As diets are diversified, the consumers derive the nutrients increasingly from milk, fish, meat, egg and fruits. The per capita availability of food grans has been continuously declining particularly since 1991.

Diets are largely imbalanced as the staple food cereals contributed around 70 per cent of total energy intake. While a declining trend in the consumption of cereals is noted, the pace of decline needs to be accelerated. Cereals should not contribute more than 60 per cent of the total dietary energy intakes as per a desirable dietary pattern. The desirable dietary pattern of nutrients for a country's population is recommended based on the current knowledge of nutritional requirements of different age and sex groups and the country's food and dietary habits. Such recommendations for the desirable dietary pattern are used as the basis for dietary guidelines for individuals and groups and for planning national food and agricultural strategies (Anonymous, 2013).

Chand and Jumrani (2013) reported that, improving only incomes was not a panacea for the undernourishment and malnourishment problems in India. There is a strong need to create awareness about adequate intake of energy and protein and bring attitudinal change to raise energy and protein intake and adopt lifestyle to digest higher energy and protein. The paper clearly brought out that income growth and elimination of poverty is a "necessary" but not a "sufficient" condition for reducing undernourishment and malnourishment in India.

Based on the NSSO reports, Ittyerah (2013) reported the pattern of calorie and protein intake for rural and urban households which showed a dissimilar trend during the period 1983-84 to 2009-10. The per capita calorie intake declined from a level of 2240 kcal per day in 1983-84 to 2147 kcal per day in 2009-10, for the rural population. The per capita protein intake for the rural population declined from 63.5 g to 59 g per day during the same period. Whereas, the per capita calorie intake for the urban population however increased marginally from 2070 kcal per day to 2123 kcal per day and per capita protein intake from 58.1 g per day to 58.8 g per day in the period between 1983-84 and 2009-10.

On the other hand the per capita intake of fat increased steadily over time for both rural and urban population. The decline in calorie intake among the rural population has been attributed by some scholars to the lowering of energy requirement that result from a sedentary lifestyle, increasing mechanization of agricultural activities and the use of mechanized transport. However these arguments fail on the basis of the significant rise in calorie intake reported between 2004-05 and 2009-10 for the rural population.

Singh (2013) reported that bottom 10 per cent of the rural households in India in 2009-10 met 72.7 per cent of their calorie requirement from cereals, while for the top 10 per cent households it was 47.4 per cent, as evident from the 66th round NSSO data. With respect to the calorie intake, the bottom 10 per cent of the rural households consumed only 1619 kcal whereas the top 10 per cent households consumed 2473 kcal. This evidence supported the viewpoint that the poor households consumed fewer calories than the minimum prescribed norms and hence supports the need for the National food security bill.

The per capita consumption of cereals was observed to have declined from a peak of 468 g per capita per day in 1990-1991 to 412 g per capita per day in 2005-2006, indicating a decline of 13 per cent during this period. It threatens the position of self-sufficiency achieved through green revolution. Per capita annual consumption of vegetable oil (14.10 kg) was far below the global average (23.60 kg). Per capita availability of milk increased from 124 g per day in 1950-1951 to 176 g per day in 1990-1991 and finally to 290 g per day in 2011-2012, a figure comparable with the global trend. Per capita availability of eggs increased from five eggs per head per annum at one time to 55 eggs per head per annum in 2011-2012. Meat production from the recognized sector increased from 1.9 million tonnes in 1998-1999 to 4.9 million tonnes in 2010-2011 (Swaminathan and Bhavani, 2013).

Balasubramanian *et al.*, (2014) reported that 67 per cent of the consumers believed that rice under the Anna Bhagya Scheme is not sufficient to meet their needs and 32 per cent reported sufficiency. While the current average daily energy requirement per capita is 2200 kcal, only 1450 kcal of energy is expected to be fulfilled through food grains. Of the 1450 kcal, 120 kcal can be achieved from 35 g of pulse, while the remaining 1330 kcal comes from the consumption of 383 g of cereals.

2.2 Spillover effects of subsidized food grains

Gavan and Chandrasekera (1979) reported that the food expenditure elasticities were 0.90 or more for the lowest decile of the population in 1969-70 and declined to less than 0.49 for the top decile. The value of the ration subsidy for each income group as a percentage of monthly income was valued at the open-market price. For the tenth percentile of the population, the ration subsidy provided the equivalent of 16 percent of money income.

Behrman and Deolalikar (1987) studied a malnourished sample of rural India, particularly for carotene and ascorbic acid, in which case less than half of the Indian standards were met at the sample means. Less than three-quarters of the Indian standards

were met at the sample means for calcium and riboflavin. Only for proteins, iron, and thiamine, the sample averages reported values above Indian standards. The coefficients of variation for these nutrient intakes are relatively large for carotene and riboflavin, both with values greater than 0.90, indicating substantial fluctuations in consumption across households. At the other end of the spectrum, the variations across households are relatively small (below 0.40) for calories, protein, niacin and iron.

Behrman (1993) argued that better nutrition increases the productivity of populations. The returns to nutrition are even higher than the returns to education. For instance, the studies in control of iron deficiency and anemia had shown extremely high benefit-cost ratios. In terms of growth and productivity as well as equity concerns, there were payoffs to better nutrition in poorer areas of the developing world. Behrman concludes that governments had comparative advantage in assuring adequate information about nutrition, its nature and its effects, given the public goods aspect of the information.

Ali and Adams (1996) studied the effect of the Egyptian food subsidy system on income distribution. The food subsidy system provides bread, wheat flour, sugar and oil. Even though these four subsidized foods were basically available to all Egyptians, this study reported that the system is self-targeted to the poor because it subsidizes inferior foods. The results from a new "food characteristic demand system" showed bread and sugar are inferior foods. Egyptian food subsidies thus had a positive impact on income distribution. When the food subsidies were not included in expenditures the Gini coefficient raised by 3.7 per cent in urban areas and by 1.2 per cent in rural areas.

George (1998) reported the coefficient of variation of availability of food grains has remained stable during the last twenty years, in spite of production instability. The equity considerations involved in public distribution are reflected in transfers of income between regions and between income groups. A rough approximation of the distribution of food grains from ration shops among the various income groups may be 65 per cent to households with annual incomes of less than Rs 3,600, 20 per cent to those in the Rs 3,600-4,800 range and 15 per cent to those with incomes of more than Rs 4,800. The reduction in calorie intake that would occur if rationing was discontinued ranged from 46 to 224 calories per person in Kerala and from 178 to 196 calories in Gujarat.

Lipton (1998) defined ultra-poor and poor based on food adequacy standard. Ultra poor were those people who spent 80 per cent or more on food and yet fulfill less than 80 per cent of the average calorie requirements for their age, sex and activity groups and are probably both hungry and undernourished (i.e. at significant risk of harm). These poorest people seem to spend an irreducible minimum of about 20 per cent on non-food. People spending 70 per cent or more of income on food and meeting 80-100 per cent of requirements are unlikely to be undernourished but are sometimes hungry. These are termed as poor by Lipton.

Based on the NSSO data, Rao (1998) reported that from 1972-73 to 1993-94, the share of non-food expenditure as a per cent of total expenditure increased from 18.78 per

cent to 30.41 per cent, 22.03 per cent to 32.14 per cent and 28.49 per cent to 34.94 per cent for very poor, moderately poor and non-poor middle income rural households of Karnataka, respectively. The changes between the 1972-73 to 1993-94 periods was 11.63 per cent, 10.11 per cent and 6.45 per cent for very poor, moderately poor and non-poor middle income rural households, respectively.

Hoddinott *et al.,* (2000) studied the impact of PROGRESA on food consumption. Households receiving PROGRESA benefits in treatment localities obtained 4.3 per cent more calories than the comparable households in control localities. The median calorie acquisition per person per day had risen by 7.8 per cent. The increase in the value of consumption (per person per month) is concentrated amongst fruits, vegetables and animal products. PROGRESA beneficiaries appear to have lower household expenditures per capita on non-food items.

Preliminary work by the Hunger Task Force suggested that on a global basis, approximately 50 per cent of the hungry are in farm households, mainly in higher-risk production environments; 25 per cent are the rural landless, mainly in higher-potential agricultural regions; 22 per cent are urban; and 8 per cent are directly resource-dependent i.e. pastoralists, fishers and forest-based (Behrman *et al*., 2004).

Whether a sudden increase of the price of rice supplied by the Public Distribution System in Andhra Pradesh had a negative impact on child nutrition was studied by Tarozzi (2005). It was reported that longer exposures to high prices were not accompanied by worse nutritional status, as measured by weight-for-age.

Jenson and Miller (2008) classified three zones for explaining the effect of the subsidy on the Giffen behavior. Firstly, in the standard zone, as a result of the subsidy through a decrease in the price of the staple food, the consumers will purchase more of both staple and fancy good. Secondly, in the subsistence zone, for a decrease in the price of the staple food, the consumers will purchase less of staple food so as to maintain the minimum calorie intake and increase the consumption of fancy good. Finally, in the calorie deprived zone, the consumers are constrained to purchase more of staple goods as they already have less income. Initial Staple Calorie Share (ISCS) is based on the data recorded from the pre intervention survey that is, the initial share of calorie intake from consumption of the staple. The consumers in the calorie deprived zone will have a high ISCS, followed by the consumers in the subsistence zone with a medium ISCS and then consumers in the standard zone with a low ISCS.

Acharya (2009) reported considerable improvement in the physical access of households to food mainly due to the following factors. The share of rice in the total staple food continues to be as high as around 45 per cent, expansion of network of public distribution system helped in reaching the cereals to the deficit and geographically difficult regions and expansion of infrastructure like rural roads, market yards and storage facilities. The increase in the retail prices of rice and ragi is lower than the per capita income, leading to continuous improvement in the economic access of consumers to food.

Shukla (2010) reported that 51 per cent of all routine expenditure constituted food expenses at the all India level. Rural households, who were illiterate, studied up to 10^{th} standard and graduate and above spent 43.1 per cent, 35.6 per cent and 23.3 per cent of their income on food expenses, respectively.

Asghar (2011) stated that high food insecurity in urban area may be due to the highly dynamic nature of consumption basket. Over the last couple of decades it was observed that urban population had to spend a reasonably high portion of their budget on children education as school fees, mobiles, high utility bills etc. In the absence of significant increase in income, urban population has to either divert its expenditure from food to other expenditures or replace calorie with cheap sources of food intake.

Many developing countries use food-price subsidies or controls to improve nutrition. However, subsidizing goods on which households spent a high proportion of their budget can create large wealth effects. Consumers may then substitute toward foods with higher non nutritional attributes (such as taste) but lower nutritional content per unit of currency, weakening or perhaps even reversing the subsidy's intended impact. Using experimental evidence from randomized experiments in China, Jensen and Miller (2011) found little evidence that subsidies for poor households improved nutrition. In fact, subsidies had a negative impact for some households. It was found that price subsidy effected calorie intake negatively (in Hunan province). The household food consumption patterns also changed substantially as a result of this subsidy, as seen in Hunan where people cut the consumption of rice (as it exhibits strong Giffen behavior). But this subsidy did not have any significant impact on the labour supply, earnings (wages and salary) and unearned income.

Devi and Balasubramanian (2012) reported that the expenditure for all commodities were positive and significant (namely cereals, pulses, oils, fruits and vegetables, milk, chicken, fish) in the case of participants of National Rural Employment Guarantee Scheme (NREGS), whereas it was significant only for two commodities (namely cereals and oils) in the case of non-participants. This clearly showed that participants were consuming high value commodities like milk, chicken and fish in comparison with non-participants due to their higher levels of income. The participants met more than 85 per cent of the average recommended calories per capita per day than the non-participants (76 %) due to relatively higher purchasing power.

Ponnarasi and Devi (2012) reported that the rural households utilized the public distribution to its fullest extent, notwithstanding the occupational categories. Based on Almost Ideal Demand System (AIDS) model, any increase in the level of income would influence the consumption pattern of rice, vegetables and milk. Fruits were inferior whereas oils, pulses and vegetables were complementary goods, showing a dismal state as these goods are the most important dietary components for all the age groups. Agricultural labour and other worker households were found to be food insecure. A revamped direct food assistance programme by the government along with other safety net programmes for the rural poor can be oriented to address these serious food security issues.

Rao and Sabeb (2012) reported that the annual average per capita consumption expenditure for all sample rural households. It was Rs. 6,020.33 for cultivator households, Rs. 4,223.57 for agricultural households and Rs. 5,469.00 for other rural households. The share of food expenditure in the total expenditure was 63 per cent for cultivators, 86 per cent for agricultural labourers, 61 per cent for other rural households and 65 per cent for all sample rural households.

Kaul (2013) reported that an increase in the subsidy amount was found to increase calories by more than what was implied by its impact on cereal consumption alone. This was an important indicator that households benefitted from the program in terms of overall food intake and not just through the food grains directly provided by the PDS. The elasticities for overall calories and calories from all food groups were positive and significant. Compared to results from studies on pure price subsidies which found zero or negative effects, this study suggested that quotas may be more effective at improving nutrition.

Kaushal and Muchomha (2013) studied the impact of exogenous price subsidy on the nutrition in rural India. The increase in incomes resulting from the food price subsidy changed consumption patterns in favor of the subsidized grains and certain more expensive sources of calorie. It lowered consumption of coarse grains that are cheaper, yet taste-wise, inferior sources of nutrition. This had no effect on calorie, protein and fat intake in poor households. Further, some of the increase in income due to food price subsidy was allocated to expenditures on non-food items. It was found that the decline in the price of wheat and rice changed the consumption pattern, towards increased consumption of wheat and rice and lower consumption of coarse grains, the unsubsidized staple food. Thus the food price subsidies are likely to affect agriculture markets without impacting nutrition.

A comparison of beneficiaries and non-beneficiaries by Kumar and Joshi (2013) clearly revealed that MGNREGA is attaining its aim of providing nutritional security to the weaker sections of rural households. The calorie intake had increased from 2199 kcal/capita/day to 2332 kcal/capita/day and protein intake had increased from 67.6 g/capita/day to 81.4 g/capita/day. About 4.3 per cent households will be lifted above the poverty line. The number of nutrition-deficit households reduced nearly by 8 per cent (from 44.2 per cent to 36.3 per cent) and the number of undernourished (deficit in protein) households had come down by 9 per cent (from 26.9 per cent to 17.7 per cent).

Krishnamurthy *et al.,* (2014) studied the impact of food price subsidies on household nutrition. They conducted a study in the early 2000's in Chhattisgarh state of India, by expanding the availability of subsidized rice. They found that households increased their consumption of pulses, animal-based protein and produce relative to households in districts bordering the state as the availability of subsidized rice expanded. This increase was driven by households eligible for rice subsidies and they did not find evidence that ineligible households changed their diet.

Taking into account the average retail prices and the Central Issue Price of wheat and rice and assuming monthly per capita consumption to be 4 kg for wheat and 3 kg for rice, Bhatla *et al*., (2015) estimated the total benefit to consumer in terms of saving to be Rs. 78 per month per person. This may further rise if wheat and rice are sold at Rs. 3/kg and Rs. 2/kg, respectively. Based on the actual expenditure given in the National Sample Survey (NSS) data, the authors found that the average per capita monthly savings to consumers was Rs. 1.91 in 1993-94 (Rs.1.66 in rural areas) and Rs. 4.97 in 1999-00 (Rs. 4.99 in rural areas). The amount saved by the consumer was also compared with the fiscal cost to the government, which showed that it costs the government Rs.1.90 to effect a saving of Re. 1 for consumer in 1993-94 and this cost fell to Rs. 1.82 in nominal terms in 1999-00.

Based on the nutritional security status, the majority of respondent-households (50 %) were found mildly insecured, 24 per cent were moderately insecured, 17 per cent were secured and 8 per cent were severely insecured. A similar pattern of nutritional security existed in the rural and urban areas of the district. The severely insecured households mostly belonged to lower income groups (Kiresur and Chourad, 2015).

2.3 Optimization of food consumption pattern

Khan (1989) reported that the dietary imbalance in terms of available calories from different food groups exists in the national diet of Pakistan. A desirable dietary pattern can be achieved by reducing consumption of cereals, sugar and edible oils and increasing consumption of pulses and tubers. The use of dietary scoring system developed by FAO in the national food and agricultural planning is highly desirable.

Protein deficiency is rare without calorie deficiency and is cost-effectively cured via extra calories. Micronutrient deficiencies are normally best met by (very low-cost) public action for water or food supplementation. Only calorie deficiency is both caused and cured mainly via levels of private income. Calorie deficiency is a frequent independent cause of under nutrition and hunger (Lipton, 1998).

Several studies have shown the important role played by economic factors in food selection. Darmon *et al*., (2002) reported that incorporation of a cost constraint on the food budget independent of other factors can result in the selection of diets with low micronutrient density. Healthy eating patterns will be compromised when the food selection is constrained by economic factors. This in turn will result in nutrition inadequacy. This is of significant public health interest because it suggested that nutrition education alone may prove ineffective unless it was combined with economic measures aimed at improving the affordability of a healthy diet. But, the cultural factors (like family support, nutrition knowledge or cooking skills) attenuate the deleterious impact of poverty on nutrition and health.

The French Food Bank delivered food aid did not meet the French recommendations for dietary fibre, ascorbic acid, vitamin D, folate, magnesium, docosahexaenoic acid, a-linolenic acid and the percentage of energy from saturated fatty acids. The linear programming analysis showed that these recommendations were

achievable if more of fruits, vegetables, legumes and fish were collected and less of cheese, refined cereals and foods rich in fat, sugar and/or salt. In addition, introduction of new foods (previously not collected), particularly nuts, whole meal bread and rapeseed oil were also recommended. These changes increased the total edible weight (42 %) and economic value (55 %) of the food aid donation. The economic value of the complete model's optimized food donation (4.75 €/2000 kcal) was higher than the estimated value of the 2004 food bank's food aid donation (2.75 €/2000 kcal). This was evident from the fact that nutritious diet is costlier. These changes in the types and amounts of food collected will improve the nutritional quality of food-bank-delivered food aid and improve the diets of deprived French populations (Rambeloson *et al.*, 2007).

Food budgets of the poor are insufficient to meet their balanced diet and energy requirement. Even with efficient purchasing strategies, the food budget may not suffice for a diet that is both nutritious and socially acceptable. Indeed, both in France and in the US, the lowest cost required to achieve a nutritionally adequate diet was higher than the actual spending on food at home by low income households. Although good nutrition can be obtained at a minimum cost, those wishing to remain within the same cultural sphere must be prepared to pay more. Exclusion from mainstream society should not be the price paid for affordable nutrition. Diet optimization programs are mathematical tools that are used to create healthful food plans at an affordable cost. In the US, such programs have been used to set the official estimates of the lowest cost of a nutritious diet. The official United States Department of Agriculture (USDA) food plans are generated by an optimization program that selects a diet which closely resembles the observed consumption patterns of the low income population, while simultaneously meeting cost targets as well as nutrition and other constraints. According to the lowest cost USDA Thrifty Food Plan, cost per week was estimated at $ 32.20 for women and $ 35.80 for men in 2007 (Malliot *et al*., 2010).

Chourad (2012) reported the reasons for non consumption of nutrient rich foods as opined by the respondents. Rice, wheat and ragi were not liked. Cooking was the major problem (longer time of cooking and hence fuel cost) in case of Bengal gram, red gram, pea and cowpea. Fruits, vegetables, groundnut, milk and milk products, processed products, meat and egg were expensive. Edible oil and sugar were not suitable for health, spices were uneasy for digestion and there was unawareness about beverages. Value addition to cereals, use of pressure-cookers for pulses, switching to alternate (cheaper but nutritive) food items, appropriate use of oils, sugars and spices and awareness creation programmes through mass media are the suggested solutions requiring policy interventions.

Over the last decades, Bangladesh has made considerable progress in increasing national level food availability and also individual level energy intake. Nevertheless, the intake of energy and other essential nutrients is still far below the nutrient requirements and recommended dietary allowances. Anonymous, 2013 proposed a total of 400 g of cereals as against the current average current intake which is higher and from largely only rice. It recommended a combination of cereals (wheat and maize) rather than focusing only on rice. For the fulfillment of macro and micro nutrient requirements, 50 g of pulses,

130 g of animal products (fish, meat and eggs), 100 g of leafy vegetables, 200 g of non-leafy vegetables, 100 g of seasonal fruits and 130 ml of milk and milk products was proposed. Thirty key foods were identified and various menu options were proposed to meet the required nutrients. The results from the study helped the individuals to plan healthy diets and meals for their household. It also helped the stakeholders and policy makers for food and agriculture planning as well as health and nutrition programmes.

Darko *et al.,* (2013) used a linear programming diet model to determine the cheapest basket of food items that satisfies the recommended daily nutritional requirement of an average Ghanaian. Based on their analysis, an average Ghanaian could meet his daily nutritional requirements with $ 0.36 per day. A food basket made up of sorghum, yam, cassava, coconut and milk will help in meeting this nutritional requirement. With this optimized food basket an average person in Ghana can save about 40 per cent of his/her food expenditure.

Singh (2013) reported that with the increase in income, people diversified their consumption towards high income elastic livestock and horticultural products. The share of food grains in the total food expenditure in rural areas declined from 47.4 per cent in 1987-88 to 36 per cent in 2009-10, whereas the share of dairy products, eggs, meat, fish and vegetables had increased from 26.7 to 34.1 per cent. Singh (2013) argued that food security should not be limited to the accessibility of food grains but it should be extended to the availability of livestock and horticultural commodities.

Kiresur and Chourad (2015) derived an 'optimal food consumption plan' for the rural and urban households of Koppal district in Karnataka using linear programming. The optimal plan, meeting the RDA of Indian Council of Medical Research (ICMR) and desirable dietary plan of FAO at the lowest possible cost was reported. In terms of quantity, the per capita per day consumption of all food items was much higher (2750 g) in optimal food consumption plan than in the existing food consumption pattern (865 g). The per capita per day consumption expenditure on all the food items together was slightly higher (Rs. 45.18) in the optimal plan than in the existing pattern (Rs. 28.19). At a cost of Rs. 45.18 per day per capita, the optimal plan ensures the dietary requirements in terms of energy (2425 kcal), protein (80.18 g), fats (61.46 g), carbohydrates (366.08 g), minerals (15.04 g) and fibres (26.59 g) as against the existing pattern providing energy (1601 kcal), protein (40.09 g), fats (36.41 g), carbohydrates (273.18 g), minerals (6.82 g) and fibres (6.31 g). The optimal food consumption plan for sample-respondents included jowar, green gram, groundnut, palm oil, sugar, milk, brinjal, methi, pomegranate, potato and dry chilli. The quantity suggested by the plan was highest in the case of milk (415 g), followed by jowar (278 g), brinjal (180 g) and potato (125 g) among others.

The above studies showed the essence of optimizing the diet of the poor households. Deriving the least cost combination of food items fulfilling the balanced diet (Recommended dietary allowance) requirements provides valuable insights for reorientation of the food distribution system.

2.4 Relationships between calories, nutrition, expenditures and income

Behrman and Deolalikar (1987) reported that food expenditures increased substantially, more or less proportionately to income, but the marginal increments in food expenditures will not be devoted primarily to obtaining more nutrients. Perhaps with more education about the relation between nutrients and other food characteristics or with development of food varieties in which the nutritional benefits are more highly associated with the food attributes that consumer's value highly, leads to stronger associations between nutrient intakes and increases in income.

Behrman *et al*., (1997) used the panel data on farm households from rural Pakistan to estimate the calorie response to different components of income taking into account the sequential nature of agricultural production, labour and capital market imperfections, heterogeneity and productivity effects of calories. These estimates indicated that the income-calorie relationship depends importantly on production stage, the form of income, the liquidity of assets and the extent to which income is anticipated. The planting-stage-wage-calorie elasticity was 0.61 but income increases in the food abundant harvest stage had only small effects on calorie consumption confined to households with below average wealth.

The poor in low income countries spent 70-85 per cent of income on food. They obtain almost all income through labour, hired out or combined with small amounts of owned or rented assets, usually low-quality land. Lipton (1998) reported that Engel's law does not hold for the poorest of the low income countries as increasingly evident from the village studies as well as large sample surveys. Their perceived need for food was so urgent that as income per person rose, they roughly maintained the proportion spent on food. Such behavior was not observed among moderately-poor persons or in middle-income regions. The moderately poor households reached the average calorie requirement for their age, sex and activity levels merely by purchasing somewhat cheaper calories whereas the ultra-poor households met it by "trading down". For ultra-poor, the felt needs for extra calories was dominant whereas for moderately-poor the other felt needs were overriding.

Based on the NSSO data, Rao (1998) reported that from 1972-73 to 1993-94, the share of expenditure on cereals as a per cent of food expenditure reduced from 70.37 per cent to 42.57 per cent, 64.99 per cent to 39.85 per cent, 59.83 per cent to 37.96 per cent and 51.21 per cent to 29.41 per cent for very poor, moderately poor, non-poor middle income and rich rural households of Karnataka, respectively. The changes for the same period were -27.80 per cent, -25.14 per cent, -21.87 per cent and -21.80 per cent for very poor, moderately poor, non-poor middle income and rich rural households of Karnataka, respectively. The decrease in cereal expenditure was highest in the case of poor households and lowest in the case of rich households. As the expenditure on cereals decreased over time, the expenditure on other foods like pulses and oil seeds had significantly increased. The expenditure elasticities for cereals were 0.98, 0.63, 0.44 and 0.22 for very poor, moderately poor, non-poor middle income and rich rural households of Karnataka, respectively. Expenditure elasticities for total food expenditure was highest for very poor households (1.11), followed by moderately poor, non-poor middle income

and rich rural households of Karnataka, while a reverse pattern was witnessed for non-food expenditure elasticities.

Orewa and Iyanbe (2000) conducted an empirical study to identify the socio-economic and household characteristics that had major impact on the level of food calorie intakes of rural and low-income urban households in Nigeria. The result of the analysis revealed a significant positive relationship between daily per capita calorie intake and household size, age, education level, sex and salary income earners. A negative significant relationship was observed between daily per capita calorie intake and dependency ratio and non-engagement in farming. The study recommended that government should launch a major programme to educate the inhabitants on how to improve their daily diets and also encourage them to take up occupations or businesses that guarantee a steady and reliable monthly income all year round. It also recommends the participation of urban households in farming.

The economic analysis showed that meats, fresh fruits and vegetables had high income elasticities whereas staples have low income elasticities (Darmon *et al*., 2002).

According to MacDonald *et al.,* (2002), improving nutrition tries to address, not only the issues of under nutrition but also other issues concerning development like decreasing the fertility rate by improving the nutrition of the women, improving the work capacity of the employers and employees, reducing the mortality rates of children, improving the immunity and preventing non communicable diseases and other benefits. Improving the nutrition not only improves the health of the individuals but also the overall development of the economy. It helps in poverty reduction, as the improved nutrition will improve the work capacity, which will help them to earn sufficient income so as to move out of poverty. It also addresses the issues of income inequality as nutrition can improve the work capacity of the downtrodden (when subsidy is well targeted) which can reduce the gaps between the rich and poor.

Sinha (2005) examined the effect of income and certain household characteristics on the per capita calorie consumption in rural India. The distribution for calorie consumption was affected differently at different levels depending on the household characteristics and the nutritional status of the household. In deciding upon the food choice, the households also took into account other attributes of foods which might be non-nutritive in nature such as aroma, tastes, quality etc. The results suggested that while providing food subsidy, the nature of the food subsidized was important. Subsidy on certain commodities might actually reduce the nutritional level of the households. Also, in designing the subsidy the policy maker has to take into account the actual "healthiness of the households". A subsidy on a less nutritious food might not be effective in improving the nutrition of the under nourished households whereas it might provide over nutrition for the over nourished households

According to Gandhi and Zohu (2010), the elasticities were quite low for cereals, around 0.17 for rural and nearly zero for urban (for quantity), and around 0.2 to 0.3 (for value). For livestock products, however, the elasticities are much higher as a whole, that

is, 1.67 for rural and 1.04 for urban for value. This indicated that a one per cent increase in income will translate to greater than a one per cent increase in demand/expenditure for livestock products.

Asghar (2011) reported that urban households of Pakistan on average spent Rs.13.18 per 1000 calories, while the lowest decile spent Rs.12.48 per 1000 calories and the best-off spent Rs. 14.35 per 1000 calories. This difference was not large when the richest were compared with the poorest. Reason behind was that both groups of consumers got almost 50 per cent calories from staples which were the cheapest source of energy. Only difference was in the kind of cereals consumed between the two income groups. Less expenditure per 1000 calories by the lowest deciles implied that poor masses got their calorie share from cheaper sources of energy. That is, they were nutritionally insecure even though food secure. Difference between the lowest deciles and upper income deciles for rural area was not very different as far as food expenditure was concerned. In rural population, poorest households spent 54.5 per cent of their total expenditure on food while the richest people spent 43.1 per cent of their budget on food. Expenditure per 1000 calories between the two deciles was Rs.10.21 and Rs.12.02 respectively.

This squeeze in food budget was mentioned by Sen (2005) while discussing the question on why it is that people around the current poverty line are purchasing many fewer calories than the 2400 (rural) and 2100 (urban) recommended allowances. The rising cost of meeting the minimum food budget was reported as the major cause.

Geetha (2011) studied the consumption pattern of rural and urban households in Coimbatore city. The consumption expenditure showed significant difference not only between the groups (rural versus urban) but also within the group. Low expenditure elasticity for cereals and high expenditure elasticity for other food items signified a shifting food consumption pattern in both rural and urban areas as income increases. Education, income, occupation and location significantly determined the consumption expenditure of the households. Hence, according to Geetha (2011) for improving and influencing the consumption pattern of the households, the planning strategy for development should be focused on judicious mix of beneficiary oriented programmes, human resource development and infrastructural development.

Chourad (2012) reported the factors influencing the food consumption expenditures. The monthly income and number of consumption units exerted positive and significant influence on food consumption expenditure in rural, urban and overall. With every rupee rise in the monthly income, monthly expenditure on food increased by about Rs. 0.09 in rural areas. It was observed that for one unit increase in the consumption unit, the monthly food consumption expenditure increased by Rs. 222.59 in rural areas. However, average age of the household and family type dummy had negative and significant influence. In rural areas, the food habit dummy also affected the food expenditure negatively. A shift from vegetarian to non-vegetarian food habit resulted in reduction of food expenditure by Rs. 694.07 in rural areas.

Rao and Sabeb (2012) reported that the expenditure elasticity for rice was 0.25 for cultivators, 0.85 for agricultural labours, 0.27 for other rural households and 0.56 for the combined group. The expenditure elasticity for pulses was greater than one for all categories of sample households except cultivators which implied that it was very costly for majority of rural households. With regard to the milk and milk products, the expenditure elasticity was less than one for cultivator households and greater than one for agricultural labourers, other villagers and combined group. In the case of Edible oils, the expenditure elasticity was unitary for all the occupational groups. The expenditure elasticity for eggs and fish was less than one. For agricultural labourers, the value of the expenditure elasticity for chicken was unitary whereas the expenditure elasticity for mutton was less than one. It was greater than one for cultivators and other rural households. The items (Clothing, Education, Health, Milk & Milk Products, Edible oil, Mutton, Pulses) of consumption for different categories of rural households seemed to be costly particularly where the expenditure elasticities are greater than one. Therefore, the policy makers should consider these results in framing the rural development programmes and planning strategies.

Ojeyele *et al.*, (2014) studied the pattern of calorie consumption and the factors determining the intake of calorie per capita per day of farming households in Nigeria. The daily calorie intake was skewed towards starchy foods as the calorie proportion of meats, fish, fruits and vegetables were very low, with wide variations even among farm households. Total crop production, household size, dependency ratio, total farm income, the age and education level of household head significantly determined the per capita calorie intake daily. The study therefore recommended that the policy interventions should include measures that support farmers increase their level of education particularly on nutrition education and enlighten themselves about family planning. Also, factors that lead to increasing production and productivity should be pursued.

The poverty line was calculated at Rs. 816 a month in rural areas and Rs. 1,000 a month in urban areas, as per the Tendulkar methodology (2011-12). On daily basis, these poverty line figures were at Rs. 27 per day in rural areas and Rs. 33 in urban areas. At these levels getting two square meals a day may be difficult. After a massive public outcry erupted over the abnormally low poverty lines, the Rangarajan committee was tasked with revisiting the Tendulkar formula for estimation of poverty and identification of the poor. Rangarajan committee estimated that those spending more than Rs. 972 a month in rural areas and Rs. 1,407 a month in urban areas in 2011-12 do not fall under the definition of poverty. That is, those spending over Rs. 32 a day in rural areas and Rs. 47 in towns and cities should not be considered poor. Thus the revision of poverty line resulted in an increase in the below poverty line population, which was estimated at 363 million in 2011-12, compared to the 270 million estimate based on the Tendulkar formula, that is, an increase of almost 35 per cent (Singh, 2014).

III METHODOLOGY

To achieve the objectives set for the study, designing a sound research methodology with appropriate tools and techniques is an essential prerequisite. A thorough understanding of the study area with regard to its climate, demographic features and cropping pattern is important as these features will have a significant bearing on the socio-economic status and performance of the households. As a result, this chapter includes description of the study area, location, population, soil, topography, rainfall and land utilization pattern. This chapter also includes the sampling technique adopted, nature and sources of data used and the analytical tools and techniques adopted to meet the objectives of the research study. The details are presented under the following headings.

3.1 Description of the study area

3.2 Sources of data and sampling framework

3.3 Analytical tools and techniques

3.4 Definition of concepts and terms.

3.1 Description of the study area

The Tumakuru district is bound by Chitradurga and Ananthpur (Andhra Pradesh) districts in the North, Mandya district in the South, Bangalore and Kolar districts in the East and Hassan district in the West. It is situated between 12^0 45 and 14^0 20' North latitude and 76^0 20' and 77^0 31' East longitude. The geographical area of the Tumakuru district is 10.64 lakh hectares, consisting of 10 taluks, 2574 villages.

3.1.1 Population and literacy rate

The population of the district was 26,78,980 (2011 Census) and 77.6 per cent of this population is rural. The district had a density of 244 persons per sq. km. Tumakuru ranked 15^{th} (0.63) in terms of performance of districts in Human Development Index in 2001, on par with the state (0.65). Over 75.17 per cent of the total population and 71.66 per cent of the rural population were literate.

3.1.2 Climate, rainfall and soil type

The maximum temperature in the district was 34 degree Celsius while the minimum temperature was 12 degree Celsius. Tumakuru district receives an average annual rainfall of 593 mm with 32 rainy days. Wells and tanks formed a major source of irrigation in the district. The net irrigated area was 10,535 hectares under tanks and 1,039 hectares under wells. The district comprises of red loamy, red sandy, mixed red and black soil.

3.1.3 Production and cropping pattern

In Tumakuru district, kharif is the main cropping season. Ragi and groundnut are the major crops which occupy about 70 per cent of the cultivable area followed by paddy, maize and red gram. The total normal kharif area under agricultural crops is 4.80 lakh hectares. Around 0.10 lakh hectares is covered during rabi and 0.15 lakh hectares during

summer season. The production is over and above the requirements of the district with regard to cereals but it falls short of meeting the requirement of pulses and oil seeds.

3.1.4 Distribution of Fair price shops and ration cards

The Tumakuru district has 1,086 ration shops, out of which 861 (79.28 %) were in rural areas and 225 (20.72 %) were in urban areas. As on March 2014, Tumakuru district had 49,452 ration cards out of which 45,853 were in rural and 3,599 were in urban areas. On an average each ration shop in rural area served 53 rural BPL and AAY card holders.

3.1.5 Gubbi taluk

Gubbi is a taluk located at the center of Tumakuru district. The total Geographical area of Gubbi taluk is 1,22,057 hectares with a total population of 2,62,518. It has a literate population of 58.34 per cent. It is classified under the Eastern dry zone and has a population corresponding to the district average. Gubbi taluk was selected based on the average number of ration shops, BPL and AAY card holders served in the taluk which almost matched with the district averages. Hence Gubbi taluk formed the most representative taluk in the Tumakuru district, to study the impact of subsidized food grains.

The Gubbi taluk received an average annual rainfall of 617.8 mm with 34 rainy days. The taluk contains red soil predominantly. Ragi, paddy, groundnut and red gram were the major field crops and coconut and areacanut are the major plantation crops grown in the taluk.

The Gubbi taluk has 107 ration shops comprising 98 ration shops in rural areas and 9 ration shops in urban areas. As on March 2014, Gubbi taluk had 4,386 BPL and AAY card holders, comprising 4,275 rural and 111 urban card holders. On an average, each ration shop in rural area served 43.62 rural BPL and AAY card holders. The quantity and rate of food grains being distributed in the Karnataka state under Anna Bhagya Scheme is presented in Table 3.1.

3.2 Sources of data and Sampling framework

The required data were collected from both primary and secondary sources. The primary data were collected by personal interview method, from the rural households comprising Antyodaya (AAY) households, Below Poverty Line (BPL) households and Above Poverty Line (APL) households using a pre tested structured schedule (Appendix). Based on the proportion of households having AAY, BPL and APL cards, the sample size for each type ration card was decided. That is, 30 households each from AAY and APL category and 60 households from BPL category were interviewed in such a way that each category comprises equal number of farm and non-farm households. The classification of farm and non-farm households was based on the share of annual net income from agriculture and allied activities to the total annual income. Households having more than 50 per cent of their total income from crop production and livestock maintenance were categorized as farm households.

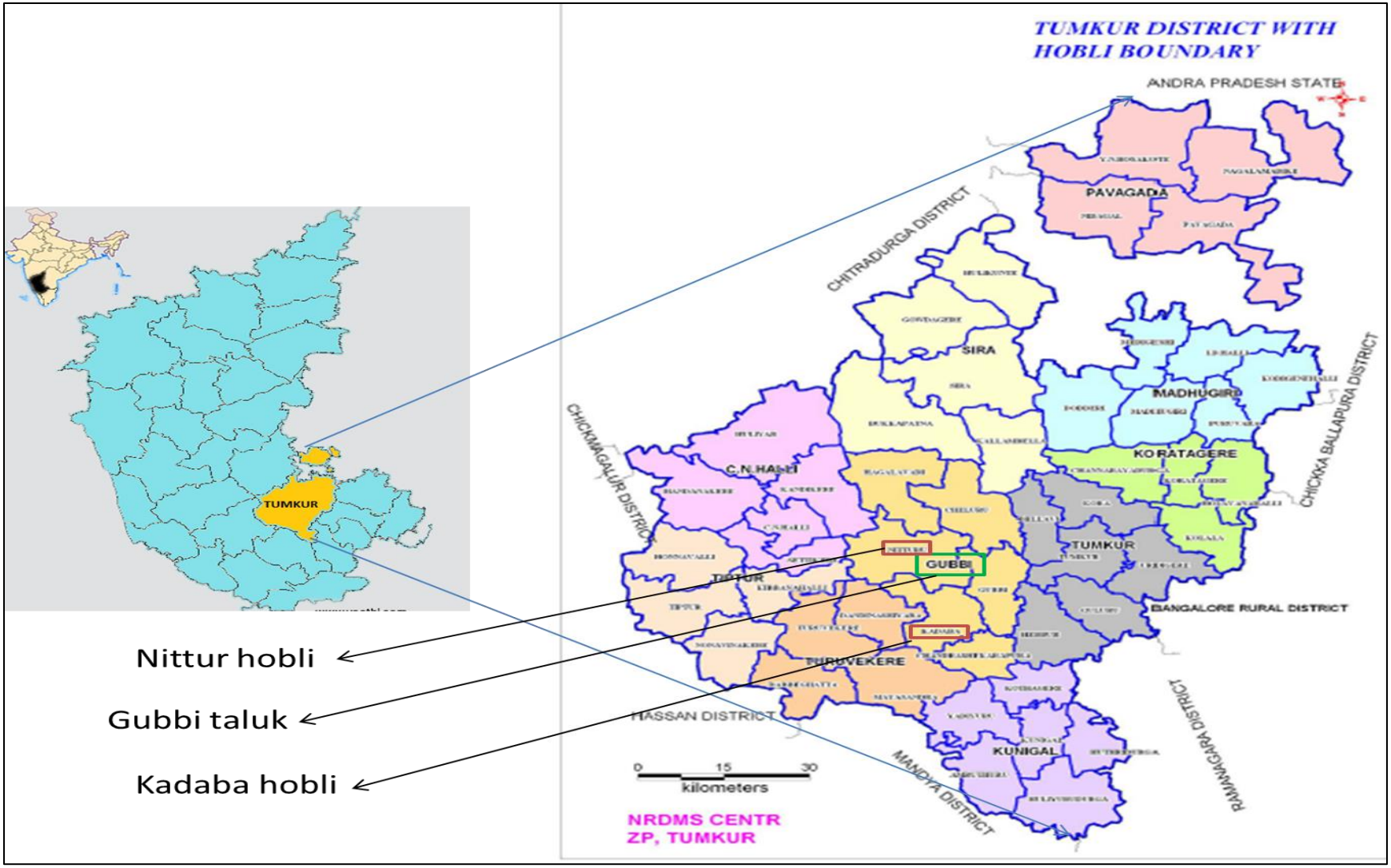

Fig. 1: Map showing the study area

Table 3.1: Scale of issue of subsidized food grains

Category of ration cards	Rice				Wheat				Sugar	
	Scale of issue (kg)			Rate (Rs./kg)	Scale of issue (kg)			Rate (Rs./kg)	Scale of issue (kg)	Rate (Rs./ kg)
AAY households	29			1	6			1		
		North Karnataka Districts	South Karnataka Districts			North Karnataka Districts	South Karnataka Districts			
BPL households	Single Person	6	8	1	Single Person	4	2	1	1	13.5
	Two Persons	14	16		Two Persons	6	4			
	Three and above person families	20	24		Three and above person families	10	6			

Source: Anonymous (2015c)

Secondary data on the study area and the scale of issue of subsidized food grains were collected from 'Tumakuru district at a glance 2013-14' (Anonymous, 2014) and 'Economic survey of Karnataka 2014-15' (Anonymous, 2015c), respectively. The data on nutritive value of Indian foods (Table 3.2) and the derivative of consumptive units (CU) prescribed by the National Institute of Nutrition, Hyderabad under Indian Council of Medical Research (ICMR) were used (Gopalan *et al.*, 2007). The values for the Recommended Dietary Allowances (RDA) for energy, protein, fat, calcium and other nutrients for Indians were taken from 'Nutritive requirements and recommended dietary allowances for Indians – A report of the expert group' (Anonymous, 2010). The RDA values for cereals, pulses and other food groups, based on the balanced diet requirements for Indians were taken from 'Dietary guidelines for Indians – A manual' (Anonymous, 2011). The desirable contribution to energy from each food item category was based on FAO's desirable dietary plan (Anonymous, 1989).

A Multi stage sampling procedure was adopted. In the first stage, two hoblis (Nittur and Kadaba) were randomly selected. In the second stage, two panchayats from each hobli were selected considering the proportion of respondents available in each category. Nittur and Tyagatur panchayats from Nittur hobli and Kadaba and Belavatta panchayats from Kadaba hobli were selected making a total of four panchayats. In the third stage, two villages were selected randomly from each panchayat. Nittur village and Hesarahalli from Nittur panchayat, Tyagatur village and Kodinagenahalli from Tyagatur panchayat, Kadaba village and Adagondanahalli from Kadaba panchayat and lastly Belavatta village and Pura village from Belavatta panchayat were selected randomly making a total sample of 8 villages. At the last stage, fifteen households were chosen randomly from each village. The sampling framework is represented in Figure 2.

A sample of 15 respondents comprising all the six categories (AAY farm, AAY non-farm, BPL farm, BPL non-farm, APL farm and APL non-farm) proportionately was selected from each village. Thus, total number of sample respondents interviewed for analyzing the impact of subsidized food grains was 120 rural households. The distribution of respondents across each category is presented in Table 3.3.

3.3 Analytical tools and techniques used

The data collected from the rural households were tabulated and analyzed using the following tools and techniques:

3.3.1 Measures of central tendency and dispersion

These measures were used to analyse the food consumption pattern and nutritional status of rural households in comparison to recommended dietary allowances. Averages and percentages were used for assessment and comparisons, particularly with respect to presence and absence of food subsidy.

3.3.2 Nutrient adequacy ratio

The 24 hour recall method was used to calculate the calorie and nutrient intake of the rural households, by adjusting for fruits, egg and meat intake from household monthly

Table 3.2: Nutritive value of Indian food items per 100 g of consumption

Food items	Energy (kcal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)	Carotene (µg)
Rice	345.00	6.80	0.50	10.00	0.70	0.06	0.06	1.90	0.00	0.00
Ragi	328.00	7.30	1.30	344.00	3.90	0.42	0.19	1.10	0.00	42.00
Wheat	341.00	12.10	1.70	48.00	4.90	0.49	0.17	4.30	0.00	29.00
Tur dal	335.00	22.30	1.70	73.00	2.70	0.45	0.19	2.90	0.00	132.00
Grams	372.00	20.80	5.60	56.00	5.30	0.48	0.18	2.40	1.00	129.00
Onion	59.00	1.80	0.10	40.00	1.20	0.08	0.02	0.50	2.00	15.00
Tomato	20.00	0.90	0.20	48.00	0.64	0.12	0.06	0.40	27.00	351.00
Potato	97.00	1.60	0.10	10.00	0.48	0.10	0.01	0.20	17.00	24.00
Beans	158.00	7.40	1.00	5.00	2.60	0.34	0.19	0.00	27.00	34.00
Green leafy vegetables	45.00	4.00	0.05	397.00	3.49	0.03	0.30	1.20	99.00	5520.00
Other vegetables	24.00	1.40	0.30	18.00	0.38	0.04	0.11	0.90	12.00	74.00
Fruits	116.00	1.20	0.30	17.00	0.36	0.05	0.08	0.05	7.00	78.00
Oil	900.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	750.00
Groundnut	561.00	25.30	40.10	90.00	2.50	0.90	0.13	19.90	0.00	37.00
Coconut	444.00	4.50	41.60	10.00	1.70	0.05	0.10	0.80	0.10	0.00
Sugar	398.00	0.10	0.00	12.00	0.16	0.00	0.00	0.00	0.00	0.00
Milk	67.00	3.20	4.10	120.00	0.20	0.05	0.19	0.10	2.00	53.00
Egg	173.00	13.30	13.30	60.00	2.10	0.10	0.40	0.10	0.00	420.00
Meat	109.00	25.90	0.60	25.00	0.00	0.00	0.14	0.00	0.00	0.00

Source: Gopalan *et al.,* (2007)

Table 3.3: Sampling distribution of the rural households across various categories (number)

Village	Farm Households			Farm Total	Non-farm Households			Non-farm Total	Grand Total
	AAY	BPL	APL		AAY	BPL	APL		
Aadagondanahalli	2	4	2	8	2	3	2	7	15
Belavatta	1	4	3	8	3	4	0	7	15
Hesarahalli	1	5	2	8	1	5	1	7	15
Kadaba	2	5	1	8	1	4	2	7	15
Kodinagenahalli	3	7	0	10	1	1	3	5	15
Nittur	0	2	2	4	5	5	1	11	15
Pura	4	1	4	9	2	1	3	6	15
Tyagatur	2	2	1	5	0	7	3	10	15
Grand Total	15	30	15	60	15	30	15	60	120

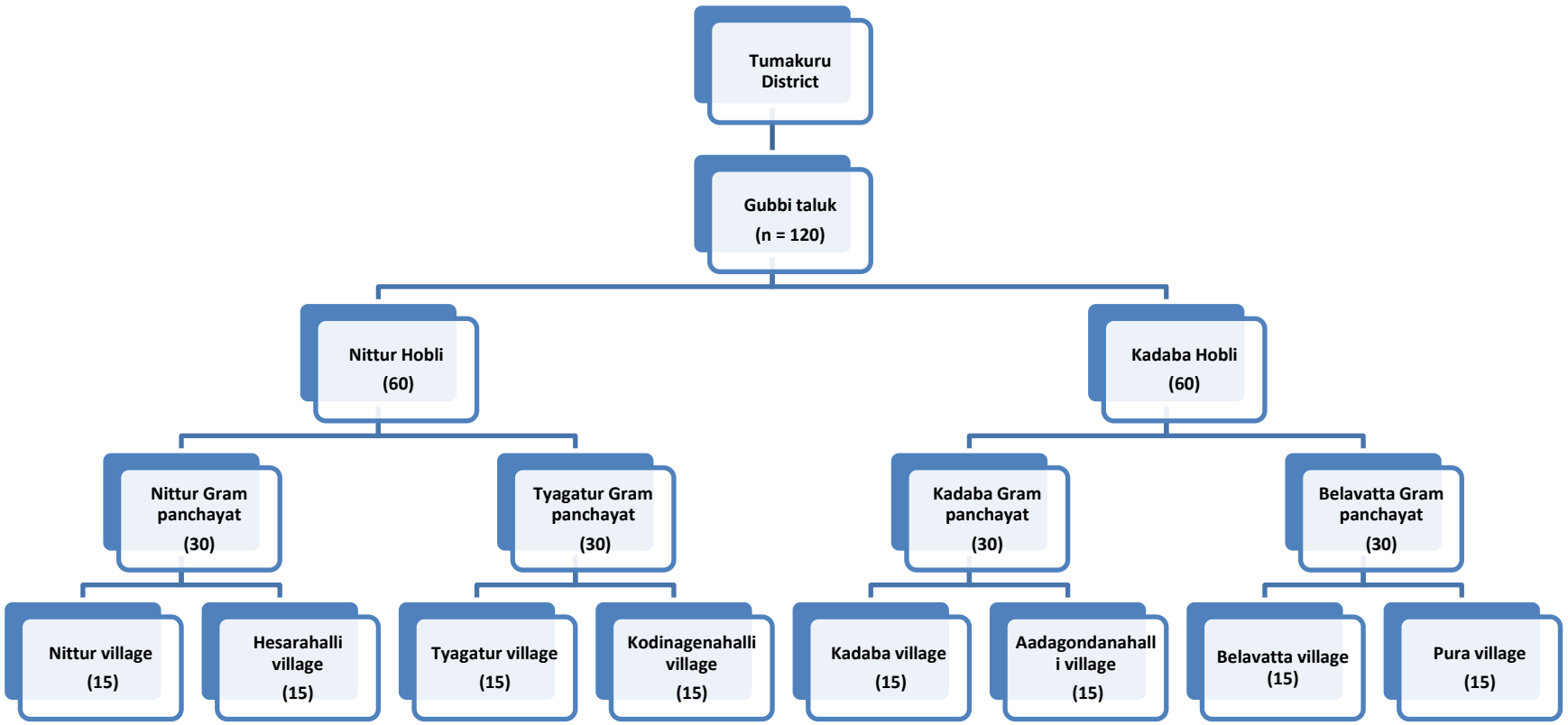

Fig. 2: Multi stage sampling framework

consumption. Thus, all the calorie and nutrient intake values are based on Adjusted 24 hour recall method and not on 24 hour recall method. Sets of pre-standard vessels were used to obtain the estimates of foods consumed by the households. To determine the size of the ragi balls and roti/chapathi, different sizes of balls and cardboard discs were standardized and used, respectively. Different sizes of spoons and ladles were used to record the amounts of oil and other ingredients consumed. Subsequently the amount of energy and individual nutrients like protein, fat, iron, calcium, riboflavin, thiamine, niacin, vitamin C and carotene consumed were calculated using the standardized food composition tables (Gopalan *et al.*, 2007 and Sakamma, 2013).

To determine the deviation of actual energy intake from the recommended dietary allowance (RDA) of ICMR, per cent of nutrient adequacy was calculated as follows:

Per cent of nutrient adequacy = (Intake of each nutrient / RDA) * 100

3.3.3 Inequality analysis

The Gini coefficient is a measure of inequality in any distribution. It is defined mathematically based on the Lorenz curve. It is the ratio of the area between the Lorenz curve of the distribution and the uniform distribution line to the area under the uniform distribution line. The uniform distribution line is a diagonal line which divides the graph into two equal halves at 45 degrees. The Gini coefficient value ranges from zero to one. One indicates perfect equality in the distribution and zero indicates perfect inequality in the distribution. Gini coefficient was used in the study to assess the consumption expenditure and income inequality on per household and per capita basis across various rural household categories.

Gini coefficient was calculated using the formula,

$$G = 1 + \frac{1}{n} - \frac{1}{n^2 y}[Y_1 + 2Y_2 + 3Y_3 + ... + nYn\ ]$$

Where,

G =	Gini coefficient
Y =	Mean income
$Y_{1.....}Y_n$ =	Monthly consumption expenditures / net income per household arranged in the descending order.
n =	Size of population.

3.3.4 Vulnerability to food security

If the food budget share is high, the household is much vulnerable to food insecurity. Asghar (2011) reported the following guidelines to assess the vulnerability to food insecurity of the households based on their share of food expenditure out of the total consumption expenditure.

More than 75 per cent	:	very high (very vulnerable to food insecurity)
65 to 75 per cent	:	high
50 to 65 per cent	:	medium
Less than 50 per cent	:	low

3.3.5 Nutritional security status

Kiresur and Chourad (2015) analyzed the nutritional security status of households in terms of security ratio. The security ratio refers to the ratio of actual energy intake to recommended energy intake as per ICMR. The following categories were defined based on the value of the ratio:

Secured households	: > 1
Moderately insecured households	: 0.8 - 0.99
Mildly insecured households	: 0.5 - 0.79
Severely insecured households	: < 0.5

3.3.6 Functional forms for computing expenditure elasticities

The following functional relationships were used to compute the expenditure elasticities of demand for different food items (Gujarathi, *et al.*, 2009 and Chourad, 2012).

Function		**Functional form**	**Elasticity coefficient**
Linear Model	:	$Y_i = a_0 + a_1 * X_i + u_i$	$a_1 (X_i/Y_i)$
Double-Log Model	:	$Ln\ Y_i = Ln\ a_0 + a_1 * Ln\ X_i + u_i$	a_1
Semi-Log Model	:	$Ln\ Y_i = a_0 + a_1 * X_i + u_i$	$a_1 X_i$
Inverse function	:	$Y_i = a_0 + a_1 * (1/X_i) + u_i$	$a_1/ (X_i * Y_i)$
Log-inverse function	:	$Ln\ Y_i = a_0 + a_1 (1/X_i) + u_i$	a_1/ X_i
Log-log-inverse function	:	$Ln\ Y_i = a_0 + a_1\ Ln\ X_i + a_2 (1/X_i) + u_i$	$[a_1 - (a_2/X_i)]$

Where,

Y_i = Monthly per capita expenditure on a specific food item in rupees.
X_i = Monthly per capita total consumption expenditure in rupees.
a_0, a_1 and a_2 = Regression coefficients
u_i = Random disturbance term

The monthly per capita total consumption expenditure has been used as proxy for income. The expenditure elasticities for each commodity were derived from the derivatives of each equation with respect to total expenditure as follows:

$$EE = (dY/dX) * (X / Y)$$

The expenditure elasticities (EE) are evaluated at the sample mean values for X and Y. Each food commodity group was fitted with all the six functions. Each food

commodity group was assigned to a functional form which yielded the highest adjusted R^2 value with a significant regression coefficient (Chourad, 2012).

3.3.7 Linear programming technique

Linear Programming model was used to develop optimal food plan for rural households of Gubbi taluk in Tumakuru district of Karnataka State. The objective was to minimize the per capita per day food consumption expenditure subject to the constraints of energy and nutrient requirements based on the Recommended Dietary Allowances (as recommended by ICMR) and the Desirable Dietary Plan (as recommended by FAO).

In line with the United States Department of Agriculture (Anonymous, 2007), food items consumed by at least twenty five per cent of the sample households were included in this analysis. Using ICMR's RDA for energy, protein, fat, calcium and other nutrients along with FAO's specification of desirable percentage of energy to be derived from each food group, a set of 11 and 17 constraints were formulated for optimization based on major and all nutrients respectively. The resultant optimized least cost combination of food items per person per day is essential to meet both the ICMR's RDA and FAO's desirable dietary plan.

The Linear Programming Model for estimating minimum per consumptive unit (per capita for Household consumption method values) per day food expenditure meeting recommended dietary based on major nutrients and all nutrients for rural households (Chourad, 2012) in Gubbi taluk of Tumakuru district is as follows:

$$\text{Min } Z = P_j X_j$$

Subject to: $\Sigma\ a_{ij} X_j \geq b_i$ (b_i = 2227.2 for energy, 60 for protein, 30 for fat and 600 for calcium) for major nutrients

$\Sigma\ a_{ij} X_j \geq b_i$ (b_i = 2227.2 for energy, 60 for protein, 30 for fat, 600 for calcium,17 for iron, 1.2 for thiamine, 1.4 for riboflavin, 16 for niacin, 40 for vitamin C, 4800 for carotene) for all nutrients.

$\Sigma\ d_{nk} X_k = 928.00$ (k = 1, 2…m, where m = no. of cereals)

$\Sigma\ d_{nk} X_k = 116.00$ (k = m+1…n, where n-m = no. of pulses)

$\Sigma\ d_{nk} X_k = 232.00$ (k = n+1…p, where p-n = no. of vegetables and fruits)

$\Sigma\ d_{nk} X_k = 301.60$ (k = p+1…q, where q-p = no. of oils and fats)

$\Sigma\ d_{nk} X_k = 464.00$ (k = q+1…r, where r-q = no. of animal products)

$\Sigma\ d_{nk} X_k = 85.60$ (k = r+1…s, where s-r = no. of sugars & jaggery)

$X_j \geq 0$

Where,

Z = Per capita (CU for 24 hour recall method values) per day food expenditure (Rs)

X_j = Decision variable, namely, average per capita (CU for 24 hour recall method values) per day consumption demand of food items (j = 1…n)

P_j = Average market price per unit of food item consumed (j = 1…n)

a_{ij} = the i^{th} nutrient content of j^{th} food item

b_i = RDA of i^{th} nutrient

i = Corresponds to nutrients

j = Corresponds to food items

d_{nk} = the energy content of k^{th} food item

k = 1, 2…m, m+1…n, n+1…p, p+1…q, q+1…r, r+1…s indicating number of food items in each food group, viz., cereals, pulses,…..

3.3.8 Multiple regression analysis

To determine the factors determining the food consumption expenditure pattern of rural households, a multiple linear regression analysis was carried out, with total monthly household food expenditure as the dependent variable. The form of the function used is as follows:

$$Y_i = a_0 + a_1 X_{1i} + a_2 D_1 + a_3 D_2 + a_4 D_3 + a_5 X_{2i} + a_6 X_{3i} + a_7 D_4 + a_8 D_5 + u_i$$

Where,

Y_i = Monthly household food expenditure (Rs.)

X_{1i} = Monthly household income (Rs.)

D_1 = Type of Household (1 = non-farm household, otherwise farm household)

D_2 = Type of Ration card (1 = APL household, otherwise $D_2 = 0$)

D_3 = Type of Ration card (1 = BPL household, otherwise AAY household)

X_{2i} = Households size (No.)

X_{3i} = Land holding (acres)

D_4 = Type of family Dummy (1 = nuclear family, otherwise joint family)

D_5 = Food habit Dummy (1 = non-vegetarian household, otherwise vegetarian household)

a_i (i = 0…8) = Regression coefficients

u_i = Random disturbance term

The same multiple regression equation was used to study the influence of factors affecting calorie and nutrient intake, but land holding and type of family dummy were dropped from the regression equation.

3.4 Definition of concepts and terms used in the study

3.4.1 Household

A group of persons, normally living together and taking food from a common kitchen, constitutes a household. The word "normally" means that temporary visitors are excluded.

3.4.2 Household consumption expenditure

The expenditure incurred by a household on domestic consumption during the reference period is the household's consumption expenditure. Household consumption expenditure is the total of the monetary values of consumption of various groups of items, namely (i) Food items and (ii) Non-food items like gas bills, fees, travel and entertainment expenses, clothing and other durable goods.

3.4.3 Farm sector households

A household deriving more than 50 per cent of its total annual net income from either agriculture only or agriculture and livestock.

3.4.4 Non-farm sector households

It is a household deriving less than 50 per cent of its total annual net income from either agriculture only or agriculture and livestock production. This category broadly includes labourers (employed in agriculture and other sectors), employees and businessmen.

3.4.5 Below Poverty line (BPL) Households

Households identified by the state government based on the 13 guidelines notified by it. They are given ration card which entitles them to subsidized food grains distributed through fair price shops (Table 3.1).

3.4.6 Antyodaya Anna Yojana (AAY) Households

Households categorised as poorest of the poor under the programme of the Government of India from 2000. These households receive a higher scale of subsidised food items in comparison to the BPL Households.

3.4.7 Above Poverty line (APL) Households

Household’s not fulfilling the 13 guidelines notified by the state government. They are given ration cards which entitles them to only subsidized kerosene distributed through fair price shops.

3.4.8 Household size

It is the total number of persons constituting the household.

3.4.9 Consumptive Unit (CU)

The energy consumption of an average male doing a sedentary work is taken as one Consumptive Unit and the other coefficients are worked out on the basis of calorie requirements relative to that of an adult sedentary man. One unit of the CU corresponds to energy requirement of 2320 kcal/day.

3.4.10 Monthly per capita expenditure (MPCE)

Household's total expenditure over a period of 30 days, divided by its household size.

3.4.10 Expenditure elasticity

It implies the percentage change in consumption of a commodity as a result of one per cent change in total income/expenditure.

3.4.12 Groups of food consumption items

Different items of consumption are (1) cereals (2) pulses (3) vegetables (4) fruits (5) oils and fats (6) sugar and jaggery (7) milk and milk products and (8) egg and meat.

3.4.13 Balanced diet

A diet consisting of the proper quantities and proportions of food needed to maintain good health and growth. Diet that contain proper proportions of carbohydrates, fats, proteins, vitamins, minerals and water necessary to maintain good health are termed balanced diet.

3.4.14 The 24 hour recall method

This method calculates the energy and nutrient intake based on the consumption of the food items on the previous normal day. Data on the raw ingredients of cooked food were collected using standardized utensils and food models. Based on this energy and nutrient intake per CU per day was computed.

3.4.15 Adjusted 24 hour recall method

Since the 24 hour recall method values were based on previous (normal) day consumption, food items like fruits, egg and meat which are generally consumed occasionally in a month were left out. So for these commodities, values were obtained from Household consumption method and added to the 24 hour recall method values to make it more realistic and amenable for further comparisons. All the calorie and nutrient intake values used for analysis were based on Adjusted 24 hour recall method.

3.4.16 Household consumption method

This method calculates the energy and nutrient consumption based on the household monthly consumption. Thus calorie and nutrient availability per person per day were computed.

IV RESULTS

The empirical results of the study are presented in this chapter under the following headings in accordance with the objectives:

4.1 Food consumption pattern, calorie and nutrient derivation of the rural households

4.2 Spillover effects of subsidized food grains

4.3 Optimized food consumption plan for the rural households

4.4 Relationship between calories, nutrients, expenditures and income

4.1 Food consumption pattern, calorie and nutrient derivation of the rural households

The 2011 Manual of Dietary Guidelines for Indians by the National Institute for Nutrition has prescribed the recommended dietary allowance (RDA) for an adult sedentary worker (equivalent to one consumptive unit (CU)). Based on these values, adequacy of the diet was computed for each food item, energy and nutrient intake. The adequacy in the food consumption per CU helps us analyze the gaps between the actual and recommended food consumption requirements.

4.1.1 Food consumption and diet adequacy of rural households

Food consumption and adequacy of diet across type of household and type of ration card is presented in Table 4.1. AAY farm households had a mean cereal intake of 494.9 g which was significantly lower than that of the non-farm AAY households (561.9 g). The same holds in the case of BPL households but there exists little difference. Whereas in the case of APL households, farm households had higher cereal intake in comparison with that of non-farm households. All the households were adequate in cereal consumption. In fact the cereal consumption was 26.6 per cent (APL non-farm household) to 49.80 per cent (BPL non-farm household) higher than the recommended level.

The pulses consumption was highest among APL farm households (47.5 g) followed by APL non-farm (43.8 g), BPL non-farm (42.8 g), AAY non-farm (40.2 g), BPL farm (39.0 g) and AAY farm (34.9 g) households. Only APL farm households were adequate in pulses consumption as they consumed 5.5 per cent higher than the recommended levels. The adequacy of the pulses was least among the AAY farm households with a deficiency of 22.4 per cent from the recommended levels followed by BPL farm (13.3 %), AAY non-farm (10.7 %) and BPL non-farm (4.8 %) households. Both the AAY non-farm households and BPL non-farm households had higher adequacy in pulse consumption in comparison to their respective farm households. On the contrary, APL farm households had higher pulses adequacy in comparison to APL Non-farm households.

Consumption of fruits was highest among APL non-farm households (27.0 g) and the least was in BPL farm households (9.1 g). Vegetables consumption was highest among APL farm households (180.6 g) and the lowest was in case of BPL farm

Table 4.1: Food consumption and adequacy of diet across type of household and type of ration card

Food groups (unit / CU / day)	RDA	Farm households (n=60)						Non-farm households (n=60)					
		AAY (n=15)		BPL (n=30)		APL (n=15)		AAY (n=15)		BPL (n=30)		APL (n=15)	
		Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)
Cereals (g)	375	494.9	132.0	502.4	134.0	511.9	136.5	561.9	149.8	522.1	139.2	474.7	126.6
Pulses (g)	45	34.9	77.6	39.0	86.7	47.5	105.5	40.2	89.3	42.8	95.2	43.8	97.3
Vegetables (g)	500	137.1	27.4	131.1	26.2	180.6	36.1	154.6	30.9	160.4	32.1	159.0	31.8
Fruits (g)	100	11.2	11.2	9.1	9.1	26.7	26.7	10.9	10.9	12.3	12.3	27.0	27.0
Oils and fats (ml)	25	24.6	98.5	28.0	111.8	32.5	130.0	28.3	113.1	30.8	123.2	26.6	106.5
Milk and milk products (ml)	300	163.7	54.6	170.1	56.7	212.6	70.9	177.1	59.0	195.7	65.2	181.8	60.6
Sugar and jaggery (g)	20	23.9	119.3	30.6	153.2	28.7	143.5	29.6	147.9	33.6	167.8	30.7	153.6
Egg and meat (g)	50	33.3	66.6	17.4	34.9	15.2	30.4	20.6	41.2	17.1	34.2	13.2	26.4

Note: RDA values are based on balanced diet recommendations and household monthly consumption values are divided by the consumptive units for comparison with RDA values.

households (131.1 g). Fruits and vegetables consumption was inadequate among all the sample households across all categories in comparison with RDA. These were the only major food groups where the inadequacy was more than 60 per cent.

All the household categories were adequate in consumption of sugar and jaggery and oils and fats. In the case of sugar and jaggery, the consumption was 19.3 per cent (AAY farm households) to 67.8 per cent (BPL non-farm households) higher than the recommended levels. Whereas in the case of oils and fats, the consumption was 1.5 per cent (AAY farm households) lower to 30 per cent (APL farm households) higher than the recommended levels.

Milk consumption was highest among the APL farm households (212.6 ml) followed by BPL non-farm (195.7 ml), APL non-farm (181.8 ml), AAY non-farm (177.1 ml), BPL farm (170.1 ml) and AAY farm (163.7 ml) households. All households were inadequate in the milk consumption, with an inadequacy ranging from 29.1 per cent (APL farm household) to 45.4 per cent (AAY farm household) lower than the RDA. Whereas in the case of egg and meat consumption, AAY farm household's (33.30 g) had the highest consumption followed by AAY non-farm, BPL farm, BPL non-farm, APL farm and APL non-farm households. The farm AAY, BPL and APL households had higher egg and meat consumption in comparison to their respective non-farm households. All households were highly inadequate in egg and meat consumption.

Details of food consumption and adequacy of diet across types of ration card are presented in Table 4.2. AAY households had a mean cereal intake of 528.41 grams followed by BPL households (512.22 g) and APL households (493.27 g). Thus AAY households consumed highest quantity of cereals in comparison to BPL and APL households. The cereal adequacy was highest among the AAY households (40.91 % higher than RDA) followed by BPL households (36.59 %) and APL households (31.54 %). Only APL households had adequacy in pulses consumption with AAY households and BPL households having inadequate consumption by 16.57 per cent and 9.06 per cent respectively. All the households were inadequate in the consumption of fruits and vegetables by more than 65 per cent. AAY households consumed the least amount of fruits and vegetables in comparison to BPL and APL households.

All the households had adequate consumption of oils and fats with 5.77 per cent (AAY households) to 18.25 per cent (APL households) higher than the recommended levels. In respect of consumption of sugar and jaggery, all the households were adequate with 33.61 per cent (AAY households) to 60.48 per cent (BPL households) higher than the recommended levels of intake.

All the households were inadequate in milk consumption ranging from 34.27 per cent (APL households) to 43.2 per cent (AAY households) lower than the recommended level. In egg and meat consumption, all the households had inadequate consumption ranging from 46.11 per cent (AAY) to 71.58 per cent (APL households).

Table 4.2: Food consumption and adequacy of diet across type of ration card

Food groups (unit / CU / day)	RDA	AAY households (n=30)		BPL households (n=60)		APL households (n=30)	
		Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)
Cereals (g)	375	528.41	140.91	512.22	136.59	493.27	131.54
Pulses (g)	45	37.55	83.43	40.92	90.94	45.63	101.39
Vegetables (g)	500	145.84	29.17	145.74	29.15	169.79	33.96
Fruits (g)	100	2.20	2.20	5.91	5.91	14.29	14.29
Oils and fats (ml)	25	26.44	105.77	29.38	117.50	29.56	118.25
Milk and milk products (ml)	300	170.39	56.80	182.91	60.97	197.20	65.73
Sugar and jaggery (g)	20	26.72	133.61	32.10	160.48	29.71	148.53
Egg and meat (g)	50	26.95	53.89	17.27	34.54	14.21	28.42

Note: RDA values are based on balanced diet recommendations and household monthly consumption values are divided by the consumptive units for comparison with RDA values.

Results of analysis pertaining to food consumption and adequacy of diet across type of households are presented in Table 4.3. There was no significant difference in the consumption pattern between farm and non-farm households. Both the farm and non-farm households had more than adequate consumption of cereals, oils and fats, sugar and jaggery. However they were least adequate in the consumption of fruits, vegetables, egg and meat, milk and pulses. Overall, the consumption pattern was highest for cereals (511.53 g), followed by milk (183.35 ml), vegetables (151.78 g), pulses (41.25 g), sugar and jaggery (30.16 g), oils and fats (28.69 g), egg and meat (18.92 g) and fruits (15.45 g).

4.1.2 Energy and nutrients intake and diet adequacy of rural households

Energy and nutrient intake across type of household and type of ration card are presented in Table 4.4. The mean energy intake of AAY non-farm households (2029.4 kcal) was the least among all categories. The highest energy intake was among APL non-farm (2279.4 kcal), followed by BPL non-farm, APL farm, AAY farm and BPL farm households. All the households were nearly adequate in terms of energy intake, except AAY non-farm household, where the adequacy was 87.50 per cent only.

The protein intake was highest among AAY farm households (60.8 g) and lowest among AAY non-farm households (51.5 g). BPL farm and non-farm households had 52.8 g and 55.8 g of protein consumption, respectively. APL farm and non-farm households had same levels of protein consumption (57.0 g). All the households across all the categories had higher levels of adequacy in the case of calcium and thiamine, whereas inadequacies were reported in intake of fats, iron, riboflavin, niacin and carotene.

All the AAY, BPL and APL farm households had higher intake of calcium in comparison with their respective non-farm categories. The calcium adequacy was highest in the case of AAY farm households and least in the case of AAY non-farm households. AAY farm, APL non-farm and APL farm households were adequate in the consumption of vitamin C whereas BPL farm, BPL non-farm and AAY non-farm households had inadequate intake. The adequacy of carotene intake was highest among AAY farm, followed by APL farm, APL non-farm, AAY non-farm, BPL farm and BPL non-farm households. All the households were inadequate in carotene intake which ranged from 37.6 per cent (AAY farm) to 81.8 per cent (BPL non-farm) of the RDA levels.

Energy and nutrient intake across type of ration card is presented in Table 4.5. The energy intake was maximum among APL households (2259.67 kcal) followed by BPL and AAY households. There was a significant difference in the calorie intake of AAY and APL households. The energy adequacy level ranged from 91.78 per cent (AAY) to 97.40 per cent (APL). The protein consumption was almost similar among AAY, BPL and APL households with highest protein intake among APL households (57 g) and lowest among BPL households (54.32 %). Fat intake was highest among AAY households (19.39 g) and lowest among BPL households (15.67 g), though all the households remained inadequate. Calcium intake was also highest among the AAY households (1096.77 g) and lowest among APL (1069.68 g). All the households had adequate consumption of calcium and thiamine but inadequate consumption of iron,

Table 4.3: Food consumption and adequacy of diet across type of household

Food groups (unit / CU / day)	RDA	Farm households (n=60)		Non-farm households (n=60)		Total (n=120)	
		Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)
Cereals (g)	375	502.88	134.10	520.18	138.72	511.53	136.41
Pulses (g)	45	40.11	89.12	42.40	94.23	41.25	91.68
Vegetables (g)	500	144.96	28.99	158.60	31.72	151.78	30.36
Fruits (g)	100	14.95	14.95	15.97	15.97	15.45	15.45
Oils and fats (ml)	25	28.26	113.04	29.12	116.47	28.69	114.75
Milk and milk products (ml)	300	179.15	59.72	187.55	62.52	183.35	61.12
Sugar and jaggery (g)	20	28.46	142.28	31.85	159.27	30.16	150.78
Egg and meat (g)	50	20.83	41.67	17.01	34.02	18.92	37.85

Note: RDA values are based on balanced diet recommendations and household monthly consumption values are divided by the consumptive units for comparison with RDA values.

Table 4.4: Energy and nutrients intake and adequacy across type of household and type of ration card

Nutrients (units / CU / day)	RDA	Farm households (n=60)						Non-farm households (n=60)					
		AAY (n=15)		BPL (n=30)		APL (n=15)		AAY (n=15)		BPL (n=30)		APL (n=15)	
		Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)
Energy (kcal)	2320	2229.3	96.1	2189.4	94.4	2240.0	96.5	2029.4	87.5	2241.8	96.6	2279.4	98.2
Proteins (g)	60	60.8	101.3	52.8	88.0	57.0	95.0	51.5	85.9	55.8	93.0	57.0	95.0
Fats (g)	25	18.1	72.4	13.9	55.6	16.1	64.2	20.7	82.7	17.4	69.7	15.4	61.8
Calcium (mg)	600	1294.4	215.7	1102.6	183.8	1137.8	189.6	899.1	149.9	1058.5	176.4	1001.6	166.9
Iron (mg)	17	16.5	97.0	14.3	83.9	15.9	93.4	13.5	79.4	14.5	85.3	15.2	89.6
Thiamin (mg)	1.2	1.6	134.0	1.5	126.3	1.6	135.8	1.4	115.5	1.5	128.8	1.6	132.7
Riboflavin (mg)	1.4	1.3	92.6	1.1	79.8	1.2	86.9	0.9	66.7	1.1	80.1	1.1	81.6
Niacin (mg)	16	10.8	67.4	10.0	62.3	11.7	73.1	10.7	66.8	10.8	67.2	12.8	79.9
Vitamin C (mg)	40	62.6	156.4	27.6	69.1	43.9	109.7	36.4	91.0	28.0	69.9	50.6	126.6
Carotene (µg)	4800	2994.3	62.4	886.4	18.5	1912.2	39.8	1273.4	26.5	873.5	18.2	1836.2	38.3

Table 4.5: Energy and nutrients intake and adequacy across type of ration card

Nutrients (units / CU / day)	RDA	AAY households (n=30)		BPL households (n=60)		APL households (n=30)	
		Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)
Energy (kcal)	2320.0	2129.38	91.78	2215.60	95.50	2259.67	97.40
Proteins (g)	60.0	56.17	93.61	54.32	90.53	57.00	95.00
Fats (g)	25.0	19.39	77.56	15.67	62.66	15.75	63.00
Calcium (mg)	600.0	1096.77	182.79	1080.56	180.09	1069.68	178.28
Iron (mg)	17.0	15.00	88.21	14.39	84.62	15.56	91.54
Thiamin (mg)	1.2	1.50	124.77	1.53	127.55	1.61	134.26
Riboflavin (mg)	1.4	1.11	79.63	1.12	79.97	1.18	84.25
Niacin (mg)	16.0	10.74	67.13	10.36	64.77	12.25	76.54
Vitamin C (mg)	40.0	49.48	123.69	27.80	69.51	47.25	118.14
Carotene (µg)	4800.0	2133.85	44.46	879.96	18.33	1874.24	39.05

riboflavin, niacin and carotene. Intake of vitamin C and carotene was highest in the case of AAY households and lowest among BPL households.

Energy and nutrient intake across type of household is presented in Table 4.6. There was no significant difference in the energy and nutrient intake of farm and non-farm households except for carotene. Both the farm and non-farm households were more than adequate in intake of Calcium and thiamine, but inadequate in the intake of other nutrients like protein, fats, iron, riboflavin, niacin and carotene. Intake of vitamin C was adequate among farm households and inadequate among non-farm households. Overall, the mean energy intake of all the rural household categories was 2205.06 kcal. The consumption of proteins, fats, calcium, iron, thiamine, riboflavin, niacin, vitamin C and carotene was 55.45 g, 16.62 g, 1081.89 mg, 14.84 mg, 1.54 mg, 1.13 mg, 10.93 mg, 38.08 mg and 1442.00 µg respectively.

4.1.3 Share of energy derived from different food groups

The share of energy derived from different food items across type of household is presented in Table 4.7. Among the cereals, rice contributed more than half of total energy derived among all categories except APL farm households. Share of energy derived from rice was maximum for AAY non-farm (57.6 %), followed by APL non-farm (55.4 %), BPL non-farm (53.7 %), AAY farm (50.8 %), BPL farm (50.8 %) and APL farm (49.8 %). AAY, BPL and APL non-farm households had higher share of energy derived from rice compared to AAY, BPL and APL farm households. Share of energy derived from ragi was maximum for BPL farm households (46.1%), followed by AAY farm (45.7 %), BPL non-farm (42.5 %), APL farm (40.8 %), AAY non-farm (36.8%) and APL non-farm (35.7%) households. On the contrary, share of energy derived from wheat was maximum in APL farm households (9.4 %), followed by APL non-farm (9.0 %), AAY non-farm (5.7 %) BPL non-farm (3.8 %), AAY farm (3.5 %) and BPL farm (3.1 %) households.

Share of energy derived from cereals was highest among AAY non-farm households (86.4 %), followed by AAY farm (78.7 %), BPL non-farm (78.7 %) BPL farm (78.3 %), APL farm (77.8 %) and APL non-farm (74.1 %). The second highest share of energy was derived from oils and fats, highest among APL non-farm (10.3%), followed by BPL farm (8.9%), APL farm (7.6%), BPL non-farm (7.4%), AAY farm (6%) and AAY non-farm (2.6%). The third highest share of energy was derived from pulses, highest among APL non-farm (4.9%), followed by BPL non-farm (4.8%), APL farm (4.0%), AAY farm (3.8%), BPL farm (3.1%) and AAY non-farm (2.7%). The highest share of energy from cereals was derived by AAY non-farm and AAY farm households, whereas in the case of oils and fats and pulses, the highest share was derived from APL non-farm and APL farm households. The remaining share of energy was derived from vegetables, milk, sugar and jaggery, egg and meat and fruits.

Share of energy derived from different food items across type of household is presented in Table 4.8. The highest energy derived from rice was in AAY households (950.6 kcal) followed by BPL (909.1 kcal) and APL (902.1 kcal) households, whereas in the case of wheat highest energy was derived from APL households (157.4 kcal) followed by AAY (80.3 kcal) and BPL (59.9 kcal) households. In the case of ragi the

Table 4.6: Energy and nutrients intake and adequacy across type of household

Nutrients (units / CU / day)	RDA	Farm households (n=60)		Non-farm households (n=60)		Total (n=120)	
		Mean	Adequacy (%)	Mean	Adequacy (%)	Mean	Adequacy (%)
Energy (kcal)	2320.0	2212.03	95.35	2198.09	94.75	2205.06	95.05
Proteins (g)	60.0	55.86	93.09	55.05	91.74	55.45	92.42
Fats (g)	25.0	15.49	61.97	17.74	70.97	16.62	66.47
Calcium (mg)	600.0	1159.38	193.23	1004.41	167.40	1081.89	180.32
Iron (mg)	17.0	15.23	89.56	14.44	84.93	14.83	87.25
Thiamin (mg)	1.2	1.57	130.60	1.52	126.47	1.54	128.54
Riboflavin (mg)	1.4	1.19	84.77	1.08	77.14	1.13	80.96
Niacin (mg)	16.0	10.61	66.31	11.25	70.29	10.93	68.30
Vitamin C (mg)	40.0	40.43	101.07	35.74	89.35	38.08	95.21
Carotene (µg)	4800.0	1669.83	34.79	1214.17	25.30	1442.00	30.04

Table 4.7: Share of different food items from the total energy intake across type of household and type of ration card

Food items / groups	Farm households (n=60)						Non-farm households (n=60)					
	AAY (n=15)		BPL (n=30)		APL (n=15)		AAY (n=15)		BPL (n=30)		APL (n=15)	
	Energy derived (kcal/ CU/day)	Per cent of total (%)	Energy derived (kcal/ CU/day)	Per cent of total (%)	Energy derived (kcal/ CU/day)	Per cent of total (%)	Energy derived (kcal/ CU/day)	Per cent of total (%)	Energy derived (kcal/ CU/day)	Per cent of total (%)	Energy derived (kcal/ CU/day)	Per cent of total (%)
Share of energy derived from cereals												
Rice	891.5	50.8	871.2	50.8	868.8	49.8	1009.6	57.6	946.9	53.7	935.5	55.4
Ragi	801.5	45.7	789.7	46.1	710.6	40.8	644.4	36.8	750.1	42.5	602.2	35.7
Wheat	61.1	3.5	53.3	3.1	163.5	9.4	99.4	5.7	66.5	3.8	151.3	9.0
Total cereals	1754.1	100.0	1714.3	100.0	1742.8	100.0	1753.4	100.0	1763.5	100.0	1689.0	100.0
Share of energy derived from all the food items												
Cereals	1754.1	78.7	1714.3	78.3	1742.8	77.8	1753.4	86.4	1763.5	78.7	1689.0	74.1
Pulses	85.3	3.8	67.2	3.1	89.1	4.0	55.5	2.7	108.0	4.8	111.4	4.9
Vegetables	69.1	3.1	59.2	2.7	58.5	2.6	78.5	3.9	60.9	2.7	82.6	3.6
Fruits	8.1	0.4	5.6	0.3	10.3	0.5	16.2	0.8	7.9	0.4	8.9	0.4
Oils and fats	134.1	6.0	194.0	8.9	170.2	7.6	53.6	2.6	165.7	7.4	233.8	10.3
Milk and Milk products	94.6	4.2	86.6	4.0	101.5	4.5	29.5	1.5	78.2	3.5	83.3	3.7
Sugar and jaggery	44.9	2.0	41.8	1.9	49.1	2.2	18.7	0.9	37.4	1.7	54.3	2.4
Egg and meat	39.0	1.8	20.8	1.0	18.4	0.8	24.0	1.2	20.0	0.9	16.0	0.7
Total	2229.3	100.0	2189.4	100.0	2240.0	100.0	2029.4	100.0	2241.8	100.0	2279.4	100.0

Table 4.8: Share of different food items from the total energy intake across type of ration card

Food items / groups	AAY households (n=30)			BPL households (n=60)			APL households (n=30)		
	Energy derived (kcal/CU/day)	Per cent of total (%)	Rank	Energy derived (kcal/CU/day)	Per cent of total (%)	Rank	Energy derived (kcal/CU/day)	Per cent of total (%)	Rank
Share of energy derived from cereals									
Rice	950.6	54.2	1	909.1	52.3	1	902.1	52.6	1
Ragi	722.9	41.2	2	769.9	44.3	2	656.4	38.3	2
Wheat	80.3	4.6	3	59.9	3.4	3	157.4	9.2	3
Total cereals	1753.8	100.0		1738.9	100.0		1715.9	100.0	
Share of energy derived from all the food items									
Cereals	1753.8	82.4	1	1738.9	78.5	1	1715.9	75.9	1
Pulses	70.4	3.3	4	87.6	4	3	100.3	4.4	3
Vegetables	73.8	3.5	3	60	2.7	5	70.6	3.1	5
Fruits	12.1	0.6	7	6.8	0.3	8	9.6	0.4	8
Oils and fats	93.8	4.4	2	179.8	8.1	2	202	8.9	2
Milk and Milk products	62	2.9	5	82.4	3.7	4	92.4	4.1	4
Sugar and jaggery	31.8	1.5	6	39.6	1.8	6	51.7	2.3	6
Egg and meat	31.5	1.5	6	20.4	0.9	7	17.2	0.8	7
Total	2129.4	100,0		2215.6	100.0		2259.7	100.0	

highest energy derived was by BPL households (769.9 kcal), followed by AAY (722.9 kcal) and APL (656.4 kcal) households.

Among the cereals, the share of energy derived from rice was highest for AAY households (54.2 %), followed by APL (52.6 %) and BPL (52.3 %) households. Share of energy derived from ragi was maximum for BPL households (44.3 %), followed by AAY (41.2 %) and APL (38.3 %) households. On the contrary, the energy derived from wheat was highest in case of APL households (9.2 %), followed by AAY (4.6 %) and BPL (3.4 %) households.

Highest and lowest share of energy was derived from cereals (1^{st}) and fruits (8^{th}) respectively among all the household categories. The second highest share of energy was from oils and fats for all the households. The third highest source of energy was from vegetables in the case of AAY household, but from pulses in the case of BPL and APL households.

Share of energy derived from different food items across type of households is presented in Table 4.9. Among the cereals, the farm households derived 50.6 per cent of energy from rice, 44.6 per cent from ragi and 4.8 per cent from wheat whereas, non-farm households derived 55.1 per cent of energy from rice, 39.4 per cent from ragi and 5.5 per cent from wheat.

The first and second highest share of energy was derived from cereals and oils and fats. The third, fourth and fifth highest source of energy was derived from milk, pulses and vegetables respectively in case of farm households and pulses, vegetables and milk respectively in the case of non-farm households. The lowest share of energy was derived from fruits (8^{th}) followed by egg and meat (7^{th}) and sugar and jaggery (6^{th}). Overall, cereals (78.8 %) contributed for the highest share of energy followed by oils and fats (7.4 %), pulses (3.9%), milk (3.6 %), vegetables (3.0 %), sugar and jaggery (1.9 %), egg and meat (1.0 %) and fruits (0.4 %).

4.2 Spillover effects of subsidized food grains

4.2.1 Food expenditure of rural households with and without subsidy

The results of analysis in terms of mean, standard deviation and coefficient of variation of food expenditures with and without subsidy are presented in Table 4.10. The coefficient of variation was highest for expenditures on fruits (151 %) and meat (102 %). The coefficient of variation in the presence and absence of food subsidy varied only in the case of cereals, oils and fats and sugar and jaggery, but the difference was negligible in the latter two food items. The coefficient of variation in cereal expenditure rises from 23 per cent in the absence of food subsidy to 52 per cent in the presence of food subsidy. The overall coefficient of variation of the food expenditure would increase in the presence of food subsidy (30 %) as against the absence of food subsidy (26 %).

The food expenditure with and without subsidy, for the farm household is presented in Table 4.11. In the presence of food subsidy, the expenditure of AAY farm households on cereals was highest (Rs. 420.30), followed by milk and milk products

Table 4.9: Share of different food items from the total energy intake across type of household

Food items / groups	Farm households (n=60)			Non-farm households (n=60)			Total (n=120)		
	Energy derived (kcal /CU/day)	Per cent of total (%)	Rank	Energy derived (kcal /CU/day)	Per cent of total (%)	Rank	Energy derived (kcal /CU/day)	Per cent of total (%)	Rank
Share of energy derived from cereals									
Rice	875.7	50.6	1	959.7	55.1	1	917.7	52.8	1
Ragi	772.9	44.6	2	686.7	39.4	2	729.8	42.0	2
Wheat	82.8	4.8	3	95.9	5.5	3	89.4	5.1	3
Total cereals	1731.4	100.0		1742.4	100.0		1736.9	100.0	
Share of energy derived from all the food items									
Cereals	1731.4	78.3	1	1742.4	79.3	1	1736.9	78.8	1
Pulses	77.2	3.5	4	95.8	4.4	3	86.5	3.9	3
Vegetables	61.5	2.8	5	70.8	3.2	4	66.1	3.0	5
Fruits	7.4	0.3	8	10.2	0.5	8	8.8	0.4	8
Oils and fats	173.1	7.8	2	154.7	7.0	2	163.9	7.4	2
Milk and milk products	92.3	4.2	3	67.3	3.1	5	79.8	3.6	4
Sugar and jaggery	44.4	2.0	6	37.0	1.7	6	40.7	1.9	6
Egg and meat	24.7	1.1	7	20.0	0.9	7	22.4	1.0	7
Total	2212.0	100.0		2198.1	100.0		2205.1	100.0	

Table 4.10: Mean, Standard deviation and Coefficient of variation of food expenditures

Food expenditure (Rs. per capita per month)	With subsidy			Without subsidy		
	Mean	Standard deviation	Coefficient of variation (%)	Mean	Standard deviation	Coefficient of variation (%)
Cereals	230.90	120.28	52.00	423.94	98.56	23.00
Pulses	106.27	40.68	38.00	106.27	40.68	38.00
Vegetables	93.17	33.97	36.00	93.17	33.97	36.00
Fruits	8.62	13.01	151.00	8.62	13.01	151.00
Oils and fats	59.55	23.32	39.00	66.09	25.43	38.00
Milk and milk products	138.09	99.33	72.00	138.09	99.33	72.00
Sugar and jaggery	25.07	10.02	40.00	28.53	10.88	38.00
Egg	5.60	5.02	90.00	5.60	5.02	90.00
Meat	46.18	47.02	102.00	46.18	47.02	102.00
Miscellaneous	134.60	56.88	42.00	134.60	56.88	42.00
Total	848.06	252.23	30.00	1051.10	271.75	26.00

Table 4.11: Food expenditure of rural farm households in comparison with food subsidy

Expenditure on food items	AAY households (n=30)				BPL households (n=60)				APL households (n=30)	
	With subsidy (Rs.)	Share of MCE on food per HH (%)	Without subsidy (Rs.)	Share of MCE on food per HH (%)	With subsidy (Rs.)	Share of MCE on food per HH (%)	Without subsidy (Rs.)	Share of MCE on food per HH (%)	Without subsidy (Rs.)	Share of MCE on food per HH (%)
Average HH size				3.73				4.90		4.13
Cereals	420.30	17.79	1489.62	42.79	1011.10	28.12	1945.40	42.49	1587.20	36.89
Pulses	301.67	12.77	301.67	8.66	492.23	13.69	492.23	10.75	480.50	11.17
Vegetables	296.00	12.53	296.00	8.50	373.00	10.37	373.00	8.15	429.33	9.98
Fruits	10.67	0.45	10.67	0.31	30.67	0.85	30.67	0.67	77.33	1.80
Oils and fats	172.50	7.30	205.47	5.90	260.17	7.24	291.96	6.38	296.33	6.89
Milk and milk products	403.17	17.07	403.17	11.58	541.63	15.06	541.63	11.83	565.00	13.13
Sugar and jaggery	66.40	2.81	83.25	2.39	118.28	3.29	134.99	2.95	105.40	2.45
Egg	28.07	1.19	28.07	0.81	23.68	0.66	23.68	0.52	23.50	0.55
Meat	273.67	11.58	273.67	7.86	207.60	5.77	207.60	4.53	151.67	3.52
Miscellaneous	390.00	16.51	390.00	11.20	537.00	14.94	537.00	11.73	586.67	13.63
Total MCE on food per HH	2362.43	100.00	3481.57	100.00	3595.37	100.00	4578.17	100.00	4302.93	100.00
Total MCE on food per capita	632.79		932.56		733.75		934.32		1041.03	

MCE: Monthly consumption expenditure

(Rs. 403.17), miscellaneous (Rs. 390.00), pulses (Rs.301.67), vegetables (Rs. 296.00), meat (Rs.273.67), oils and fats (Rs. 172.50), sugar and jaggery (Rs. 66.40), egg (Rs. 28.07) and fruits (Rs.10.67). In the absence of food subsidy (assuming they maintain same consumption habits) the expenditure on cereals increases to Rs. 1489.62, oils and fats to Rs. 205.47 and sugar and jaggery to Rs. 83.25.

In the presence of food subsidy, the share of expenditure of AAY farm households was highest for cereals (17.79 %), followed by milk and milk products (17.07 %), miscellaneous (16.51 %), pulses (12.77 %), vegetables (12.53 %), meat (11.58 %), oils and fats (7.30 %), sugar and jaggery (2.81 %), egg (1.19 %) and fruits (0.45 %). In the absence of food subsidy (assuming they maintain same consumption habits) the share of expenditure on cereals will increase to 42.79 per cent, whereas share of the expenditure on all the other food groups will decline correspondingly. The highest decline in the share of food expenditure is for milk and milk products (5.49 %), followed by miscellaneous (5.31 %), pulses (4.11 %), vegetables (4.03 %), meat (3.72 %), oils and fats (1.40 %), sugar and jaggery (0.42 %), egg (0.38 %) and fruits (0.14 %).

In the presence of food subsidy, the expenditure of BPL farm household on cereals was highest at Rs. 1011.10, followed by milk and milk products (Rs. 541.63), miscellaneous (Rs. 537.00), pulses (Rs. 492.23), vegetables (Rs. 373.00), oils and fats (Rs. 260.17), meat (Rs. 207.60), sugar and jaggery (Rs. 118.28), fruits (Rs. 30.67) and egg (Rs. 23.68). In the absence of food subsidy (assuming they maintain same consumption habits) the expenditure on cereals increases to Rs. 1945.40, oils and fats to Rs. 291.96 and sugar and jaggery to Rs. 134.99.

In the presence of food subsidy, the share of expenditure of BPL farm household was highest for cereals (28.12 %), followed by milk and milk products (15.06 %), miscellaneous (14.94 %), pulses (13.69 %), vegetables (10.37 %), oils and fats (7.24 %), meat (5.77 %), sugar and jaggery (3.29 %), fruits (0.85 %) and egg (0.66 %). In the absence of food subsidy (assuming they maintain same consumption habits), the share of expenditure on cereals will increase to 42.49 per cent. Share of expenditure on all the other food groups will decline correspondingly. The highest decline in the share of food expenditure was for milk and milk products (3.23%), followed by miscellaneous (3.21 %), pulses (2.94 %), vegetables (2.22 %), meat (1.24 %), oils and fats (0.86 %), sugar and jaggery (0.34 %), fruits (0.18 %) and egg (0.14 %).

In the presence of food subsidy, the share of expenditure on cereals turned out to be the lowest in case of AAY (17.79 %) and BPL (28.12 %) households in comparison to APL households (36.89 %). But in the absence of subsidy for AAY and BPL households, the share of expenditure on cereals was higher in the case of AAY (42.79 %) and BPL (42.49 %) households in comparison to APL households (36.89 %).

The food expenditure for the non-farm households with and without subsidy is presented in Table 4.12. In the presence of food subsidy, the expenditure of AAY non-farm households on cereals was highest (Rs. 470.07), followed by milk and milk products (Rs. 438.00), miscellaneous (Rs. 416.67), pulses (Rs. 332.33), vegetables (Rs. 293.33),

Table 4.12: Food expenditure of rural non-farm rural households in comparison with food subsidy

Expenditure on food items	AAY households (n=30)				BPL households (n=60)				APL households (n=30)	
	With subsidy (Rs.)	Share of MCE on food per HH (%)	Without subsidy (Rs.)	Share of MCE on food per HH (%)	With subsidy (Rs.)	Share of MCE on food per HH (%)	Without subsidy (Rs.)	Share of MCE on food per HH (%)	Without subsidy (Rs.)	Share of MCE on food per HH (%)
Average HH size				3.53				4.27		4.33
Cereals	470.07	19.30	1539.38	43.28	952.43	28.01	1838.85	42.43	1709.43	39.11
Pulses	332.33	13.65	332.33	9.34	418.67	12.31	418.67	9.66	472.93	10.82
Vegetables	293.33	12.05	293.33	8.25	370.33	10.89	370.33	8.55	404.00	9.24
Fruits	10.67	0.44	10.67	0.30	32.67	0.96	32.67	0.75	56.00	1.28
Oil and fats	176.00	7.23	211.33	5.94	241.50	7.10	270.94	6.25	239.67	5.48
Milk and milk products	438.00	17.99	438.00	12.32	572.58	16.84	572.58	13.21	571.00	13.06
Sugar and jaggery	73.77	3.03	90.34	2.54	101.30	2.98	118.15	2.73	119.93	2.74
Egg	16.80	0.69	16.80	0.47	23.12	0.68	23.12	0.53	23.57	0.54
Meat	207.60	8.52	207.60	5.84	185.00	5.44	185.00	4.27	125.27	2.87
Miscellaneous	416.67	17.11	416.67	11.72	503.33	14.80	503.33	11.61	648.67	14.84
Total MCE on food per HH	2435.23	100.00	3556.45	100.00	3400.93	100.00	4333.64	100.00	4370.47	100.00
Total MCE on food per capita	689.22		1006.54		797.09		1015.70		1008.57	

MCE: Monthly consumption expenditure

meat (Rs. 207.60), oils and fats (Rs. 176.00), sugar and jaggery (Rs. 73.77), egg (Rs. 16.80) and fruits (Rs. 10.67). In the absence of food subsidy (assuming they maintain same consumption habits) the expenditure on cereals increases to Rs. 1539.38, oils and fats to Rs. 211.33 and sugar and jaggery to Rs. 90.34.

In the presence of food subsidy, the share of food expenditure of AAY non-farm households was highest for cereals (19.30 %), followed by milk and milk products (17.99 %), miscellaneous (17.11 %), pulses (13.65 %), vegetables (12.05 %), meat (8.52 %), oils and fats (7.23 %), sugar and jaggery (3.03 %), egg (0.69 %) and fruits (0.44 %). In the absence of food subsidy (assuming they maintain same consumption habits) the share of expenditure on cereals would increase to 43.28 per cent. Share of expenditure on all the other food groups would decline correspondingly. The highest decline in the share of food expenditure was for milk and milk products (5.69 %), followed by miscellaneous (5.39 %), pulses (4.31 %), vegetables (3.80 %), meat (2.68 %), oils and fats (1.29 %), sugar and jaggery (0.49 %), egg (0.22 %) and fruits (0.14 %).

In the presence of food subsidy, the food expenditure of BPL non-farm households was highest on cereals (Rs. 953.43), followed by milk and milk products (Rs. 572.58), miscellaneous (Rs. 503.33), pulses (Rs. 418.67), vegetables (Rs. 370.33), oils and fats (Rs. 241.50), meat (Rs. 185.00), sugar and jaggery (Rs. 101.30), fruits (Rs. 32.67) and egg (Rs. 23.12). In the absence of food subsidy (assuming they maintain same consumption habits) the expenditure on cereals increases to Rs. 1838.85, oils and fats to Rs. 270.94 and sugar and jaggery to Rs. 118.15.

In the presence of food subsidy, the share of food expenditure of BPL non-farm households was highest for cereals (28.01 %), followed by milk and milk products (16.84 %), miscellaneous (14.80 %), pulses (12.31 %), vegetables (10.89 %), oils and fats (7.10 %), meat (5.44 %), sugar and jaggery (2.98 %), fruits (0.96 %) and egg (0.68 %). In the absence of food subsidy (assuming they maintain same consumption habits) the share of expenditure on cereals will increase to 42.43 per cent. Share of expenditure on all the other food groups will decline correspondingly. The highest decline in the share of food expenditure was for milk and milk products (3.63 %), followed by miscellaneous (3.19 %), pulses (2.65 %), vegetables (2.34 %), meat (1.17 %), oils and fats (0.85 %), sugar and jaggery (0.25 %), fruits (0.21 %) and egg (0.15 %).

In the presence of food subsidy, the share of food expenditure on cereals was lower in case of AAY (19.30 %) and BPL (28.01 %) households in comparison to APL households (39.11 %). But in the absence of subsidy for AAY and BPL households, the share of expenditure on cereals became higher in the case of AAY (43.28 %) and BPL (42.43 %) households in comparison with APL households (39.11 %).

4.2.2 Consumption and household budget of rural households

Details of the non-food expenditures of sample households are presented in Table 4.13. Mobile phone expenses were highest among APL non-farm households (Rs. 227.67) and were least among AAY farm households (Rs. 98.33). Education expenses were highest among APL farm households (Rs. 2003.58) and health expenses among

Table 4.13: Non-food expenditure of rural households across various categories

Items	Farm households (n=60)			Farm (n-=60)	Non-farm households (n=60)			Non-farm (n-=60)	Total (n=120)
	AAY (n=15)	BPL (n=30)	APL (n-15)		AAY (n=15)	BPL (n=15)	APL (n=15)		
Mobile phone charges	98.33	163.33	213.93	161.98	142.31	209.82	227.67	198.93	180.96
Electricity charges	82.08	112.00	206.43	129.20	65.40	144.26	209.00	140.54	134.92
Gas bill	-	352.50	411.33	379.24	-	376.58	415.33	393.68	386.57
Education expenses	226.92	1013.00	2003.58	1050.07	333.08	1210.65	1021.33	925.65	985.85
Health expenses	90.00	182.67	172.86	156.78	125.33	168.39	150.00	152.54	154.70
Travel expenses	178.00	255.17	344.67	258.25	236.67	430.00	416.67	378.33	318.29
Kerosene expenses	128.20	138.59	133.33	133.69	97.33	127.00	150.00	117.43	126.18
Entertainment charges	139.00	283.83	387.33	273.50	150.67	331.83	442.33	314.17	293.83
Others expenses	274.67	453.00	467.20	411.97	277.33	503.83	621.6	476.65	444.31
Total	1150.87	2399.03	3793.73	2435.67	1345.27	2978.67	3319.67	2655.57	2545.62

Note: Averages cannot be linearly aggregated (i. e. vertically added) as the sample size varies across each category.

BPL farm households (Rs. 182.67). But both the education and health expenses were least for AAY farm households. Travel expenses were highest for BPL non-farm households and lowest for AAY farm households. Entertainment and recreation expenses were highest among APL non-farm households (Rs. 442.33) and were least among AAY farm households (Rs. 139.00).

Non-food expenditure was highest among non-farm households (Rs. 2,655.57) in comparison to farm households (Rs. 2,435.67). Overall, non-food expenditures were highest for educational expenses (Rs. 985.85), followed by others (Rs. 444.31), gas bill (Rs. 386.57), travel expenses (Rs. 318.29), entertainment and recreation expenses (Rs. 293.83), mobile phone charges (Rs. 180.96), health expenses (Rs. 154.70), electricity charges (Rs. 154.92) and kerosene (Rs. 126.18).

The empirical values pertaining to the consumption budget are presented in Table 4.14. The food consumption expenditure was highest among APL non-farm households (Rs. 4370.47) and lowest among AAY farm households (Rs. 2,362.43). On the contrary, non-food expenditure was highest among APL farm households (Rs. 3,793.73) and lowest in AAY farm households (Rs. 1,150.87). Correspondingly the total consumption expenditure was highest in APL farm households (Rs. 8,096.67), followed by APL non-farm (Rs. 7,690.13), BPL non-farm (Rs. 6,379.60), BPL farm (Rs. 5,994.40), AAY non-farm (Rs. 3,780.50) and AAY farm (Rs. 3,513.30) households. On the contrary, share of total expenditure spent on food was highest in AAY farm households (67.24 %) followed by AAY non-farm (64.42 %), BPL farm (59.98 %), APL non-farm (56.83 %), BPL non-farm (53.31 %) and APL farm (53.14 %) households.

Further, in the absence of food subsidy, the food consumption expenditure was highest among BPL farm households (Rs. 4,578.17) and lowest among AAY farm housheholds (Rs. 3,481.57). Correspondingly the total consumption expenditure was highest in APL farm households (Rs. 8,096.67), followed by APL non-farm (Rs. 7,690.13), BPL non-farm (Rs. 7,312.31), BPL farm (Rs. 6,977.20), AAY non-farm (Rs. 4,901.72) and AAY farm (Rs. 4,632.44). On the contrary, the share of expenditure on food was highest in AAY farm (75.16 %) followed by AAY non-farm (72.56 %), BPL farm (65.62 %), BPL non-farm (59.27 %), APL non-farm (56.83 %) and APL farm (53.14 %) households.

In the presence of food subsidy, share of total expenditure on food was 67.24 per cent among AAY farm households and 59.98 per cent among BPL farm households, which would raise to 75.16 per cent and 65.62 per cent respectively in the absence of food subsidy. Whereas APL farm households spent nearly half of their total expenditure on food and the remaining half on non-food expenditure. In the presence of food subsidy, share of total expenditure on food was 64.42 per cent among AAY non-farm households and 53.31 per cent among BPL non-farm households, which would rise to 72.56 per cent and 59.27 per cent respectively in the absence of food subsidy. Whereas APL farm households spent 56.83 per cent of their total expenditure on food and the remaining 43.17 per cent on non-food items.

Table 4.14: Consumption budget of rural households across various categories

Components of consumption expenditure	Farm households (n=60)			Farm (n=60)	Non-farm households (n=60)			Non-farm (n-=60)	Total (n-=120)
	AAY (n=15)	BPL (n-30)	APL (n-15)		AAY (n=15)	BPL (n=30)	APL (n=15)		
Consumption expenditure (monthly) with subsidy									
Food consumption expenditure (Rs.)	2362.43	3595.37	4302.93	3464.03	2435.23	3400.93	4370.47	3401.89	3432.96
Non-food consumption expenditure (Rs.)	1150.87	2399.03	3793.73	2435.67	1345.27	2978.67	3319.67	2655.57	2545.62
Total consumption expenditure (Rs.)	3513.30	5994.40	8096.67	5899.69	3780.50	6379.60	7690.13	6057.46	5978.58
Proportion of food consumption expenditure (%)	67.24	59.98	53.14	58.72	64.42	53.31	56.83	56.16	57.42
Proportion of non-food consumption expenditure (%)	32.76	40.02	46.86	41.28	35.58	46.69	43.17	43.84	42.58
Consumption expenditure (monthly) without subsidy									
Food consumption expenditure (Rs.)	3481.57	4578.17	4302.93	4235.21	3556.45	4333.64	4370.47	4148.55	4191.88
Non-food consumption expenditure (Rs.)	1150.87	2399.03	3793.73	2435.67	1345.27	2978.67	3319.67	2655.57	2545.62
Total consumption expenditure (Rs.)	4632.44	6977.20	8096.67	6670.88	4901.72	7312.31	7690.13	6804.12	6737.50
Proportion of food consumption expenditure (%)	75.16	65.62	53.14	63.49	72.56	59.27	56.83	60.97	62.22
Proportion of non-food consumption expenditure (%)	24.84	34.38	46.86	36.51	27.44	40.73	43.17	39.03	37.78

In the absence of food subsidy (assuming that the households maintains same consumption habits), the share of total expenditure on food would increase for all the AAY and BPL households. The rise is highest among AAY non-farm households (8.14 %), followed by AAY farm (7.91 %), BPL non-farm (5.96 %) and BPL farm (5.64 %) households.

In the presence of food subsidy the total food consumption expenditure was higher in farm households (Rs. 3,464.03) in comparison to non-farm households. On the contrary, total consumption expenditure was highest in non-farm households (Rs. 6,057.46) in comparison with farm households (Rs. 5,899.69). The share of expenditure on food was highest among farm households (58.72 %) in comparison to non-farm households (56.16 %).

In the absence of food subsidy, the total food consumption expenditure would be higher in farm households (Rs. 4,235.21) in comparison to non-farm households. On the contrary, total consumption expenditure was highest in non-farm households (Rs. 6,804.12) in comparison to farm households (Rs. 6,670.88). The share of expenditure on food was highest among farm households (63.49 %) in comparison to non-farm households (60.97 %).

In the presence of food subsidy, share of total expenditure on food was 58.72 per cent among farm households, which would rise to 63.49 per cent in the absence of food subsidy. Similarly, for non-farm households, share of total expenditure on food was 56.83 per cent in the presence of food subsidy and it would rise to 60.97 per cent in the absence of food subsidy.

The empirical values pertaining to the household budget are presented in Table 4.15. The average monthly net income was highest among APL non-farm households (Rs. 11,960.00) followed by APL farm (Rs. 10,246.89), BPL non-farm (Rs. 9,044.58), BPL farm (Rs. 7,906.67) AAY non-farm (Rs. 6,742.22) and AAY farm (Rs. 5,071.11) households.

In the presence of food subsidy the monthly savings was highest in APL non-farm households (Rs. 4,269.87), followed by AAY non-farm (Rs. 2,961.72), BPL non-farm (Rs. 2,664.98), APL farm (Rs. 2,152.22), BPL farm (Rs. 1,912.27) and AAY farm (Rs. 1,557.81) households. But in the absence of food subsidy, the monthly savings was highest in APL non-farm households (Rs. 4,269.87), followed by APL farm (Rs. 2,152.22), AAY non-farm (Rs. 1,840.51), BPL non-farm (Rs. 1,732.27), BPL farm (Rs. 929.46) and AAY farm (Rs. 438.67) households.

The share of income spent on food was highest in AAY farm (46.59 %) and least among AAY non-farm at 36.54 per cent, in the presence of food subsidy. In the absence of food subsidy, the share of income spent on food was highest in AAY farm (68.66 %) followed by BPL farm (57.90 %), AAY non-farm (52.75 %), BPL non-farm (47.91 %), APL farm (41.98 %) and APL non-farm (36.54 %) households. The above pattern

Table 4.15: Household budget of rural households across various categories

Components	Farm households (n=60)			Farm (n-=60)	Non-farm households (n=60)			Non-farm (n-=60)	Total (n-=120)
	AAY (n=15)	BPL (n=30)	APL (n=15)		AAY (n=15)	BPL (n=30)	APL (n=15)		
Household budget (monthly) with subsidy									
Food consumption expenditure (Rs.)	2362.43	3595.37	4302.93	3464.03	2435.23	3400.93	4370.47	3401.89	3432.96
Non-food consumption expenditure (Rs.)	1150.87	2399.03	3793.73	2435.67	1345.27	2978.67	3319.67	2655.57	2545.62
Total consumption expenditure (Rs.)	3513.30	5994.40	8096.67	5899.69	3780.50	6379.60	7690.13	6057.46	5978.58
Average monthly income (Rs.)	5071.11	7906.67	10248.89	7783.33	6742.22	9044.58	11960.00	9197.85	8490.59
Total savings (Rs.)	1557.81	1912.27	2152.22	1883.64	2961.72	2664.98	4269.87	3140.39	2512.02
Proportion of food consumption expenditure (%)	46.59	45.47	41.98	44.51	36.12	37.60	36.54	36.99	40.43
Proportion non-food consumption expenditure (%)	22.69	30.34	37.02	31.29	19.95	32.93	27.76	28.87	29.98
Proportion of savings (%)	30.72	24.19	21.00	24.20	43.93	29.46	35.70	34.14	29.59
Household budget (monthly) without subsidy									
Food consumption expenditure (Rs.)	3481.57	4578.17	4302.93	4235.21	3556.45	4333.64	4370.47	4148.55	4191.88
Non-food consumption expenditure (Rs.)	1150.87	2399.03	3793.73	2435.67	1345.27	2978.67	3319.67	2655.57	2545.62
Total consumption expenditure (Rs.)	4632.44	6977.20	8096.67	6670.88	4901.72	7312.31	7690.13	6804.12	6737.50
Average monthly income (Rs.)	5071.11	7906.67	10248.89	7783.33	6742.22	9044.58	11960.00	9197.85	8490.59
Total savings (Rs.)	438.67	929.46	2152.22	1112.45	1840.51	1732.27	4269.87	2393.73	1753.09
Proportion of food consumption expenditure (%)	68.66	57.90	41.98	54.41	52.75	47.91	36.54	45.10	49.37
Proportion non-food consumption expenditure (%)	22.69	30.34	37.02	31.29	19.95	32.93	27.76	28.87	29.98
Proportion of savings (%)	8.65	11.76	21.00	14.29	27.30	19.15	35.70	26.02	20.65

remains almost similar for the share of income spent on food also, but with considerable changes.

The share of income spent on non-food ranged from 19.95 % (AAY non-farm) to 37.02 % (APL farm). The proportion of income saved was highest among AAY non-farm households (43.93 %) and lowest among APL farm households (21.00 %) in the presence of subsidy. On the contrary, in the absence of food subsidy, proportion of income saved was highest in APL non-farm households (35.70 %) and lowest among AAY farm households (8.65 %).

In the presence of food subsidy, proportion of income saved was 30.72 per cent among AAY farm households and 24.19 per cent among BPL farm households, which would decrease to 8.65 per cent and 11.76 per cent respectively in the absence of food subsidy. The APL farm households saved 21 per cent of their income. In the presence of food subsidy, proportion of income saved was 43.93 per cent among AAY non-farm households and 29.46 per cent among BPL non-farm households, which would decrease to 27.30 per cent and 19.15 per cent respectively in the absence of food subsidy. APL farm households could save 35.70 per cent of their income.

The total savings was higher among non-farm households in comparison to farm households, both in the presence and absence of food subsidy. In the presence of food subsidy, proportion of income saved was 24.20 per cent among farm households, which would decrease to 14.29 per cent in the absence of food subsidy. Among non-farm households, proportion of income saved was 34.14 per cent in the presence of food subsidy and it would decrease to 26.02 per cent in the absence of food subsidy.

In the absence of food subsidy, the share of income spent on food will increase by 9.9 per cent for farm households and 8.11 per cent for non-farm households. Correspondingly the share of income saved would decrease by the 9.9 per cent for farm households and 8.11 per cent for non-farm households.

4.2.3 Impact of food subsidy on food security

The outcome of analysis on inequality in the food consumption expenditure and monthly income is presented in Table 4.16. In the presence of food subsidy, inequality in food consumption expenditure per household and per capita was higher as against the absence of food subsidy for both the farm and non-farm households.

Inequality in food consumption expenditure per household was slightly higher for non-farm households (0.179) in comparison to farm households (0.176), whereas inequality in monthly income per household was higher for farm households (0.283) than non-farm households (0.221). The same results hold for inequality in food consumption expenditure on per capita basis. Inequality in food consumption expenditure per capita was higher for non-farm households (0.161) in comparison to farm households (0.148), whereas inequality in monthly income per capita was higher for farm households (0.328) than non-farm households (0.281).

Table 4.16: Inequality in food consumption expenditures and incomes

Category of rural household	Food consumption expenditure per household per month		Monthly income per household	Food consumption expenditure per capita per month		Monthly income per capita
	With subsidy	Without subsidy		With subsidy	Without subsidy	
Farm households (n=60)	0.176	0.119	0.283	0.148	0.110	0.328
Non-farm households (n=60)	0.179	0.125	0.221	0.161	0.136	0.281
AAY households (n=30)	0.116	0.079	0.190	0.123	0.137	0.341
BPL households (n=60)	0.155	0.127	0.264	0.131	0.128	0.312
APL households (n=30)	0.091	0.091	0.160	0.099	0.099	0.208
Overall (n=120)	0.178	0.122	0.257	0.156	0.126	0.311

Inequality in food consumption expenditure and monthly income per household were lowest in the APL households in comparison to AAY and BPL households. But, on per capita basis inequality in food consumption expenditure (with subsidy) and monthly income were highest among the APL households in comparison to AAY and BPL households.

The assessment of vulnerability to food insecurity is presented in Table 4.17. In the absence of food subsidy the farm AAY households experienced 'very high' vulnerability to food insecurity as they spent more than 75 per cent of their total expenditure on food. But due to the presence of food subsidy the share of total expenditure on food had decreased to 67.24 per cent indicative of only 'high' vulnerability. A similar kind of shift is witnessed in case of AAY non-farm and BPL farm households from 'high' levels of vulnerability to food insecurity to 'medium' levels of vulnerability to food insecurity. There was no such shift in the vulnerability levels experienced by BPL non-farm households as they were at medium level, both during the presence and absence of food subsidy. The farm and non-farm households also did not show any shift in the vulnerability levels to food insecurity.

The food security status with respect to rice consumption from various sources is presented in Table 4.18. All the AAY and BPL households purchased rice at subsidized prices from the fair price shops. The subsidized food grains obtained through public distribution system meets the household food requirements partly. Thus the rural households fulfill the remaining consumption requirements either by use of owned rice grown in their farms or purchase from open market or both. In this regard 50.00 per cent of BPL farm households consumed rice cultivated from their own farm while 43.33 per cent of the BPL non-farm households purchased rice from open market. None of the AAY households consumed rice cultivated from their own farm, but 6.67 per cent of AAY farm households and 13.33 per cent of non-farm households purchased rice from open market. APL households were not entitled to subsidized food grains. Thus 80 per cent of the APL farm households and 20 per cent of the non-farm households used rice cultivated in their own farms. Correspondingly, 20 per cent of the APL farm households and 80 per cent of the non-farm households purchased rice from the open market.

The food security status in ragi consumption from various sources is presented in Table 4.19. Ragi was not provided through the fair price shops. Thus all the households had to purchase it from the open market or use ragi cultivated on their own farms. As a result, 73.33 per cent of BPL farm households and 73.33 per cent of AAY farm households consumed ragi cultivated in their own farms. On the contrary, 63.33 per cent of the BPL non-farm households and 66.67 per cent of the AAY non-farm households purchased ragi from the open market. Ragi cultivated in their own farms was used by 60 per cent of the APL farm households and 26.67 per cent of the non-farm households. On the contrary, 40 per cent of the APL farm households and 73.33 per cent of the non-farm households purchased ragi from the open market.

Table 4.17: Assessment of vulnerability to food insecurity

Type of rural households	Type of ration card	Without subsidy		With subsidy	
		Proportion of food consumption expenditure (%)	Vulnerability to food insecurity	Proportion of food consumption expenditure (%)	Vulnerability to food insecurity
Farm households	AAY (n=15)	75.16	Very high	67.24	High
	BPL (n=30)	65.62	High	59.98	Medium
	APL (n=15)	53.14	Medium	53.14	Medium
Total farm households (n=60)		63.49	Medium	58.72	Medium
Non-farm households	AAY (n=15)	72.56	High	64.42	Medium
	BPL (n=30)	59.27	Medium	53.31	Medium
	APL (n=15)	56.83	Medium	56.83	Medium
Total non-farm households (n=60)		60.97	Medium	56.16	Medium
Overall (n=120)		62.22	Medium	57.42	Medium

Table 4.18: Consumption and purchase pattern of rice

Category of rural households	Proportion of households consuming farm grown owned rice (%)	Proportion of households purchasing rice from PDS (%)	Proportion of households purchasing rice from open market (%)
AAY households (n=30)		100.00	10.00
Farm households (n=15)		100.00	6.67
Non-farm households (n=15)		100.00	13.33
BPL households (n=60)	31.67	100.00	35.00
Farm households (n=30)	50.00	100.00	26.67
Non-farm households (n=30)	13.33	100.00	43.33
APL households (n=30)	50.00		50.00
Farm households (n=15)	80.00		20.00
Non-farm households (n=15)	20.00		80.00
Overall (n=120)	28.33	75.00	32.50

Table 4.19: Consumption and purchase pattern of ragi

Category of rural households	Proportion of households consuming farm grown owned ragi (%)	Proportion of households purchasing ragi from open market (%)	Proportion of households consuming ragi (%)
AAY households (n=30)	50.00	46.67	96.67
Farm households (n=15)	73.33	26.67	100.00
Non-farm households (n=15)	26.67	66.67	93.33
BPL households (n=60)	51.67	43.33	95.00
Farm households (n=30)	73.33	23.33	96.67
Non-farm households (n=30)	30.00	63.33	93.33
APL households (n=30)	43.33	56.67	100.00
Farm households (n=15)	60.00	40.00	100.00
Non-farm households (n=15)	26.67	73.33	100.00
Overall (n=120)	49.17	47.50	96.67

The details of nutritional security status of rural households are presented in Table 4.20. Among the farm households, one household was 'secured', 22 households were 'moderately' insecured and 37 households were 'mildly' insecured. Among the non-farm households, four households were 'secured', 19 households were 'moderately' insecured and 37 households were 'mildly' insecured. On the whole five households were 'secured', 41 households were 'moderately' insecured and 74 households were 'mildly' insecured. However there were no households which were 'severely' insecured. In terms of percentages, 4.17 per cent of households were 'secured', 34.17 per cent of households were 'moderately' insecured and 61.67 households were 'mildly' insecured.

The preferences of rural households towards various kinds of subsidies are presented in Table 4.21. Among the various subsidy schemes, 81.67 per cent of the farm households preferred fertilizer subsidy, followed by seeds subsidy (53.33 %), subsidy on other agricultural items (36.67 %), education subsidy (31.67 %), health subsidy (30.00 %), food subsidy (28.33 %) and electricity subsidy (16.67 %). Among various subsidy schemes, 55 per cent of the non-farm households preferred food subsidy, followed by education subsidy (41.67 %), health subsidy (33.33 %), kerosene subsidy (26.67 %), gas subsidy (23.33 %), fertilizer subsidy (21.67 %) and electricity subsidy (20 %). Thirty two households preferred unconditional cash whereas eighty eight households rejected it.

4.3 Optimized food consumption plan for the rural households

4.3.1 Existing food consumption pattern

The existing food consumption pattern of all the rural households based on 24 hour recall method is presented in Table 4.22. The consumption of an adult sedentary man (equivalent to one CU) was highest from rice (266.00 g), followed by ragi (222.50 g), milk and milk products (119.11 ml), other vegetables (58.15 g), wheat (26.21 g), green leafy vegetables (19.03 g), tur dal (17.40 g), meat (16.23 g), onion (15.58 g), tomato (14.52 g), potato (13.70 g), coconut (13.48 g), beans (11.53 g), oils and fats (10.53 g) and sugar and jaggery (10.22 g).

Highest quantum of energy was derived from rice (917.70 kcal), ragi (729.80 kcal), oils and fats (94.77 kcal), wheat (89.38 kcal), milk and milk products (79.80 kcal), coconut (59.85 kcal), tur dal (58.29 kcal), sugar and jaggery (40.68 kcal), grams (27.71 kcal), beans (18.22 kcal), meat (17.69 kcal), other vegetables (13.96 kcal) and potato (13.29 kcal). The highest amount of protein was obtained from rice, ragi, meat, tur dal, milk and wheat, fats from oils, coconut, milk, ragi and rice and calcium from ragi, milk, green leafy vegetables and rice. Main sources of vitamin C were green leafy vegetables, other vegetables, tomato and beans.

Per capita expenditure was highest on ragi (Rs. 8.73), followed by rice (Rs. 8.17), milk and milk products (Rs. 4.82), miscellaneous (Rs. 3.96) and other vegetables (Rs. 2.53). The food expenditure per consumptive unit per day was Rs. 33.93 under the existing food consumption pattern based on 24 hour recall method.

Table 4.20: Nutritional security status of rural households

Nutritional Security Status	Farm households (n=60)			Farm (n=60)	Non-farm households (n=60)			Non-farm (n=60)	Total (n=120)
	AAY	BPL	APL		AAY	BPL	APL		
Number of households (number)									
Secured (> 1.00)	0	1	0	1	0	3	1	4	5
Moderately insecured (0.80 - 0.99)	4	12	6	22	1	9	9	19	41
Mildly insecured (0.50 - 0.79)	11	17	9	37	14	18	5	37	74
Severely insecured (< 0.50)	0	0	0	0	0	0	0	0	0
Total number of households	15	30	15	60	15	30	15	60	120
Proportion of households (per cent)									
Secured (> 1.00)	0.00	3.33	0.00	1.67	0.00	10.00	6.67	6.67	4.17
Moderately insecured (0.80 - 0.99)	26.67	40.00	40.00	36.67	6.67	30.00	60.00	31.67	34.17
Mildly insecured (0.50 - 0.79)	73.33	56.67	60.00	61.67	93.33	60.00	33.33	61.67	61.67
Severely insecured (< 0.50)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 4.21: Subsidy preferences (based on micro level evidence) across type of households and type of ration card

Type of subsidy	Farm households (n=60)						Non-farm households (n=60)					
	AAY (n=15)		BPL (n=30)		APL (n=15)		AAY (n=15)		BPL (n=30)		APL (n=15)	
	Per cent of HH's responded	Rank	Per cent of HH's responded	Rank	Per cent of HH's responded	Rank	Per cent of HH's responded	Rank	Per cent of HH's responded	Rank	Per cent of HH's responded	Rank
Education subsidy	13.33	7	40.00	4	33.33	3	20.00	3	33.33	2	80.00	1
Electricity subsidy	20.00	5	16.67	7	13.33	7	6.67	7	23.33	5	26.67	5
Fertilizer subsidy	80.00	1	76.67	1	93.33	1	6.67	8	16.67	7	46.67	3
Seeds subsidy	13.33	8	70.00	2	60.00	2	6.67	9	3.33	9	26.67	6
Health subsidy	20.00	6	33.33	5	33.33	4	20.00	4	30.00	3	53.33	2
Food subsidy	73.33	2	20.00	6	0.00	10	80.00	1	63.33	1	13.33	9
Pension and other allowances	0.00	9	0.00	11	6.67	8	13.33	5	0.00	11	0.00	
Diesel and petrol subsidy	0.00	10	13.33	8	6.67	9	6.67	10	3.33	10	13.33	7
Kerosene subsidy	33.33	3	6.67	10	0.00	11	66.67	2	20.00	6	0.00	
Gas subsidy	0.00	11	10.00	9	26.67	6	13.33	6	26.67	4	26.67	4
Subsidy on other Agricultural items	26.67	4	43.33	3	33.33	5	0.00	11	13.33	8	13.33	8

Table 4.22: Existing food consumption pattern based on adjusted 24 hour recall method

Sl. No.	Food items	Daily intake of food per CU		Nutrient contribution									
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)	Carotene (µg)
1	Rice	266.00	8.17	917.70	18.09	1.33	26.60	1.86	0.16	0.16	5.05	0.00	0.00
2	Ragi	222.50	8.73	729.80	16.24	2.89	765.40	8.68	0.93	0.42	2.45	0.00	93.45
3	Wheat	26.21	0.86	89.38	3.17	0.45	12.58	1.28	0.13	0.04	1.13	0.00	7.60
4	Tur dal	17.40	0.21	58.29	3.88	0.30	12.70	0.47	0.08	0.03	0.50	0.00	22.97
5	Grams	7.45	0.09	27.71	1.55	0.42	4.17	0.39	0.04	0.01	0.18	0.07	9.61
6	Green leafy vegetables	19.03	0.76	8.56	0.76	0.01	75.56	0.66	0.01	0.06	0.23	18.84	1050.57
7	Onion	15.58	0.78	9.19	0.28	0.02	6.23	0.19	0.01	0.00	0.08	0.31	2.34
8	Tomato	14.52	0.73	2.90	0.13	0.03	6.97	0.09	0.02	0.01	0.06	3.92	50.97
9	Potato	13.70	0.62	13.29	0.22	0.01	1.37	0.07	0.01	0.00	0.03	2.33	3.29
10	Beans	11.53	0.48	18.22	0.85	0.12	0.58	0.30	0.04	0.02	0.00	3.11	3.92
11	Other vegetables	58.15	2.53	13.96	0.81	0.17	10.47	0.22	0.02	0.06	0.52	6.98	43.03
12	Fruits	7.61	0.19	8.82	0.09	0.02	1.29	0.03	0.00	0.01	0.00	0.53	5.93
13	Oil	10.53	0.14	94.77	0.00	10.53	0.00	0.00	0.00	0.00	0.00	0.00	78.98
14	Milk	119.11	4.82	79.80	3.81	4.88	142.93	0.24	0.06	0.23	0.12	2.38	63.13
15	Sugar	10.22	0.33	40.68	0.01	0.00	1.23	0.02	0.00	0.00	0.00	0.00	0.00
16	Groundnut	1.66	0.03	9.31	0.42	0.67	1.49	0.04	0.01	0.00	0.33	0.00	0.61
17	Coconut	13.48	0.30	59.85	0.61	5.61	1.35	0.23	0.01	0.01	0.11	0.01	0.00
18	Egg	2.71	0.03	4.69	0.36	0.36	1.63	0.06	0.00	0.01	0.00	0.00	11.39
19	Meat	16.23	0.18	17.69	4.20	0.10	4.06	0.00	0.00	0.02	0.00	0.00	0.00
A.	Sub total		29.97	2204.62	55.49	27.91	1076.61	14.83	1.54	1.11	10.79	38.50	1447.78
20	Miscellaneous		3.96										
B.	Total Existing cost		33.93										

The existing food consumption pattern of all the rural households based on household consumption method is presented in Table 4.23. The quantity consumed by per person was highest from rice (260.20 g), followed by ragi (200.10 g), milk and milk products (173.10 ml), other vegetables, wheat, onion and meat.

Highest quantum of energy was derived from rice (897.69 kcal), ragi (656.33 kcal), oils and fats (238.5 kcal), wheat (140.49 kcal), milk and milk products (115.98 kcal) and sugar and jaggery (112.24 kcal). The highest amounts of proteins were obtained from rice, ragi, wheat, milk and milk products, meat, tur dal and grams, fats from oils and fats, milk and milk products, ragi and rice and calcium from ragi, milk and milk products, rice, wheat, tomato and tur dal. Main sources of vitamin C were from other vegetables, tomato and milk and milk products.

Per capita expenditure was highest on rice (Rs. 8.47), followed by ragi (Rs. 4.43), milk and milk products (Rs. 4.27), miscellaneous (Rs. 3.96) and meat (Rs. 2.66). The food expenditure per person per day was Rs. 34.86 under the existing food consumption pattern based on household monthly consumption method.

4.3.2 Optimal food consumption plan based on 24 hour recall method

The optimal food consumption plan for major nutrients, based on 24 hour recall method is presented in Table 4.24. Optimal food consumption plan for the sample respondents included ragi, grams, beans, oils and fats, milk and milk products and sugar. As per the optimal plan, highest consumption was in the case of milk and milk products (692.54 ml), followed by ragi (282.93 g), beans (146.84 g), sugar and jaggery (46.63 g), oils and fats (33.51 g) and grams (31.18 g).

Highest quantum of energy could be derived from ragi (928 kcal), followed by milk and milk products (464 kcal), oils and fats (301.6 kcal), beans (232 kcal), sugar and jaggery (185.6 kcal) and grams (116 kcal). The highest amount of protein was obtained from milk and milk products and ragi, fats from oils and fats and milk and calcium from ragi and milk and milk products.

Per capita expenditure was highest on milk and milk products (Rs. 17.1), ragi (Rs. 7.21), beans (Rs. 3.52), grams (Rs. 2.69), oils and fats (Rs. 2.52) and sugar and jaggery (Rs. 1.44). The optimized food expenditure per consumptive unit per day was Rs. 34.49 (exclusive of miscellaneous expenditure).

The optimal food consumption plan for all nutrients, based on 24 hour recall method is presented in Table 4.25. Optimal food consumption plan for the sample respondents included ragi, green leafy vegetables, grams, beans, oils and fats, milk and milk products, sugar and jaggery and groundnut. As per the optimal plan, highest consumption was in the case of milk and milk products (692.54 ml), followed by, ragi (282.93 g), beans (125.12 g), green leafy vegetables (76.23 g), groundnut (52.93 g), sugar and jaggery (46.63 g), grams (31.18 g) and oils and fats (0.52 g)

Table 4.23: Existing food consumption pattern based on household monthly consumption

Sl. No.	Food items	Daily intake of food per CU		Nutrient contribution									
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)	Carotene (µg)
1	Rice	260.20	8.47	897.69	17.69	1.30	26.02	1.82	0.16	0.16	4.94	0.00	0.00
2	Ragi	200.10	4.43	656.33	14.61	2.60	688.34	7.80	0.84	0.38	2.20	0.00	84.04
3	Wheat	41.20	1.26	140.49	4.99	0.70	19.78	2.02	0.20	0.07	1.77	0.00	11.95
4	Tur dal	18.90	1.54	63.32	4.21	0.32	13.80	0.51	0.09	0.04	0.55	0.00	24.95
5	Grams	20.10	1.73	74.77	4.18	1.13	11.26	1.07	0.10	0.04	0.48	0.20	25.93
6	Onion	40.50	0.81	23.90	0.73	0.04	16.20	0.49	0.03	0.01	0.20	0.81	6.08
7	Tomato	28.80	0.58	5.76	0.26	0.06	13.82	0.18	0.03	0.02	0.12	7.78	101.09
8	Other vegetables	70.30	1.41	16.87	0.98	0.21	12.65	0.27	0.03	0.08	0.63	8.44	52.02
9	Fruits	14.70	0.59	17.05	0.18	0.04	2.50	0.05	0.01	0.01	0.01	1.03	11.47
10	Oil	26.50	2.00	238.50	0.00	26.50	0.00	0.00	0.00	0.00	0.00	0.00	198.75
11	Milk	173.10	4.27	115.98	5.54	7.10	207.72	0.35	0.09	0.33	0.17	3.46	91.74
12	Sugar	28.20	0.87	112.24	0.03	0.00	3.38	0.04	0.00	0.00	0.00	0.00	0.00
13	Egg	4.20	0.28	7.27	0.56	0.56	2.52	0.09	0.00	0.02	0.00	0.00	17.64
14	Meat	29.30	2.66	31.94	7.59	0.18	7.33	0.00	0.00	0.04	0.00	0.00	0.00
A.	Sub total		30.90										
15	Miscellaneous		3.96										
B.	Total existing cost		34.86										

Table 4.24: Optimal food consumption plan based on adjusted 24 hour recall method (for major nutrients)

Sl. No.	Food items	Daily intake of food per consumptive unit		Nutrient contribution			
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)
1	Rice	0.00	0.00	0.00	0.00	0.00	0.00
2	Ragi	282.93	7.21	928.00	20.65	3.68	973.27
3	Wheat	0.00	0.00	0.00	0.00	0.00	0.00
4	Tur dal	0.00	0.00	0.00	0.00	0.00	0.00
5	Grams	31.18	2.69	116.00	6.49	1.75	17.46
6	Green leafy vegetables	0.00	0.00	0.00	0.00	0.00	0.00
7	Onion	0.00	0.00	0.00	0.00	0.00	0.00
8	Tomato	0.00	0.00	0.00	0.00	0.00	0.00
9	Potato	0.00	0.00	0.00	0.00	0.00	0.00
10	Beans	146.84	3.52	232.00	10.87	1.47	7.34
11	Other vegetables	0.00	0.00	0.00	0.00	0.00	0.00
12	Fruits	0.00	0.00	0.00	0.00	0.00	0.00
13	Oil	33.51	2.52	301.60	0.00	33.51	0.00
14	Milk	692.54	17.10	464.00	22.16	28.39	831.04
15	Sugar	46.63	1.44	185.60	0.05	0.00	5.60
16	Groundnut	0.00	0.00	0.00	0.00	0.00	0.00
17	Coconut	0.00	0.00	0.00	0.00	0.00	0.00
18	Egg	0.00	0.00	0.00	0.00	0.00	0.00
19	Meat	0.00	0.00	0.00	0.00	0.00	0.00
A.	Optimized cost		34.49	2227.20	60.21	68.80	1834.71
20	Miscellaneous		3.96	92.80			
B.	Total optimized cost		38.45	2320.00	60.21	68.80	1834.71

Table 4.25: Optimal food consumption plan based on adjusted 24 hour recall method (for all nutrients)

Sl. No.	Food items	Daily intake of food per CU		Nutrient contribution									
		Quantity (g)	Expenditure (Rs.)	Energy (kal)	Proteins (g)	Fats (g)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)	Carotene (µg)
1	Rice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Ragi	282.93	7.21	928.00	20.65	3.68	973.27	11.03	1.19	0.54	3.11	0.00	118.83
3	Wheat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Tur dal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Grams	31.18	2.69	116.00	6.49	1.75	17.46	1.65	0.15	0.06	0.75	0.31	40.23
6	Green leafy vegetables	76.23	1.91	34.30	3.05	0.04	302.63	2.66	0.02	0.23	0.91	75.47	4207.87
7	Onion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Tomato	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Potato	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Beans	125.12	3.00	197.70	9.26	1.25	6.26	3.25	0.43	0.24	0.00	33.78	42.54
11	Other vegetables	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	Fruits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	Oil	0.52	0.04	4.69	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	3.91
14	Milk	692.54	17.10	464.00	22.16	28.39	831.04	1.39	0.35	1.32	0.69	13.85	367.04
15	Sugar	46.63	1.44	185.60	0.05	0.00	5.60	0.07	0.00	0.00	0.00	0.00	0.00
16	Groundnut	52.93	3.18	296.91	13.39	21.22	47.63	1.32	0.48	0.07	10.53	0.00	19.58
17	Coconut	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	Egg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	Meat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A.	Optimized cost		36.56	2227.20	75.05	56.85	2183.89	21.38	2.61	2.44	16.00	123.41	4800.00
20	Miscellaneous		3.96	92.80									
B.	Total optimized cost		40.52	2320.00	75.05	56.85	2183.89	21.38	2.61	2.44	16.00	123.41	4800.00

Highest quantum of energy was derived from ragi (928 kcal), followed by milk and milk products (464 kcal), groundnut (296.91 kcal), beans (197.7 kcal), sugar and jaggery (185.6 kcal) and grams (116 kcal). The highest amounts of proteins were obtained from milk and milk products, ragi, groundnut and beans, fats from milk and milk products, groundnut, ragi and grams and calcium from ragi, milk and milk products, green leafy vegetables and groundnut. The main sources of vitamin C were green leafy vegetables, beans and milk and that of carotene were from green leafy vegetables, milk and milk products, ragi, beans and grams. The optimal plan excludes completely rice from the food basket.

Per capita expenditure was highest on milk and milk products (Rs. 17.10), ragi (Rs. 7.21), groundnut (Rs. 3.18), beans (Rs. 3.00), grams (Rs. 2.69), green leafy vegetables (Rs. 1.91) and sugar and jaggery (Rs. 1.44). The optimized food expenditure per consumptive unit per day was Rs. 36.56 (exclusive of miscellaneous expenditure).

4.3.3 Optimal food consumption plan based on household consumption method

The optimal food consumption plan for major nutrients, based on Household consumption method is presented in Table 4.26. Optimal food consumption plan for the sample respondents included ragi, wheat, tur dal, onion, oils and fats, milk and milk products and sugar. As per the optimal plan, highest consumption was in the case of milk and milk products (692.54 ml), followed by onion (393.22 g), ragi (229.02 g), wheat (51.85 g), sugar and jaggery (46.63 g), tur dal (34.63 g) and oils and fats (33.51 g).

Highest quantum of energy was derived from ragi (751.19 kcal), followed by milk and milk products (464 kcal), oils and fats (301.6 kcal), onion (232 kcal), sugar and jaggery (185.6 kcal), wheat (176.81 kcal) and tur dal (116 kcal). The major sources of proteins were milk and milk products, ragi and tur dal, fats from oils and fats and milk and calcium from milk and milk products, ragi and onion.

Highest share of per capita expenditure was on milk and milk products (Rs. 17.1), onion (Rs. 7.86), ragi (Rs. 5.07), tur dal (Rs. 2.82), oils and fats (Rs. 2.52), wheat (Rs. 1.59) and sugar and jaggery (Rs. 1.44). The optimized food expenditure per consumptive unit per day was Rs. 38.40 (exclusive of miscellaneous expenditure).

The optimal food consumption plan for all nutrients, based on household consumption method is presented in Table 4.27. Optimal food consumption plan for the sample respondents included ragi, wheat, grams, onion, tomato, oils and fats, milk and milk products and sugar. As per the optimal plan, highest consumption was in the case of Tomato (1154.98 g), milk and milk products (692.54 ml), wheat (216.02 g), ragi (58.35 g), sugar and jaggery (46.63 g), oils and fats (33.51 g), gram (31.18 g) and onion (1.70 g).

Highest quantum of energy was derived from wheat (736.63 kcal), milk and milk products (464 kcal), oils and fats (301.6 kcal), tomato (231 kcal), ragi (191.37 kcal), sugar and jaggery (185.6 kcal) and grams (116 kcal). The highest amounts of proteins were obtained from wheat and milk and milk products, fats from oils and fats and milk and milk products, and calcium from milk and milk products, tomato, ragi and wheat.

Table 4.26: Optimal food consumption plan based on household monthly consumption (for major nutrients)

Sl. No.	Food Items	Daily intake of food per CU		Nutrient contribution			
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)
1	Rice	0.00	0.00	0.00	0.00	0.00	0.00
2	Ragi	229.02	5.07	751.19	16.72	2.98	787.84
3	Wheat	51.85	1.59	176.81	6.27	0.88	24.89
4	Tur dal	34.63	2.82	116.00	7.72	0.59	25.28
5	Gram	0.00	0.00	0.00	0.00	0.00	0.00
6	Onion	393.22	7.86	232.00	7.08	0.39	157.29
7	Tomato	0.00	0.00	0.00	0.00	0.00	0.00
8	Other veg	0.00	0.00	0.00	0.00	0.00	0.00
9	Fruits	0.00	0.00	0.00	0.00	0.00	0.00
10	Oils	33.51	2.52	301.60	0.00	33.51	0.00
11	Milk and milk products	692.54	17.10	464.00	22.16	28.39	831.04
12	Sugar and jaggery	46.63	1.44	185.60	0.05	0.00	5.60
13	Egg	0.00	0.00	0.00	0.00	0.00	0.00
14	Meat	0.00	0.00	0.00	0.00	0.00	0.00
A.	Optimized cost		38.40	2227.20	60.00	66.75	1831.93
15	Miscellaneous		3.96	92.80			
B.	Total optimized cost		42.36	2320.00	60.00	66.75	1831.93

Table 4.27: Optimal food consumption plan based on household monthly consumption (for all nutrients)

Sl. No.	Food Items	Daily intake of food per CU		Nutrient contribution									
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)	Carotene (µg)
1	Rice	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Ragi	58.35	1.29	191.37	4.26	0.76	200.71	2.28	0.25	0.11	0.64	0.00	24.51
3	Wheat	216.02	6.62	736.63	26.14	3.67	103.69	10.58	1.06	0.37	9.29	0.00	62.65
4	Tur dal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Gram	31.18	2.69	116.00	6.49	1.75	17.46	1.65	0.15	0.06	0.75	0.31	40.23
6	Onion	1.70	0.03	1.00	0.03	0.00	0.68	0.02	0.00	0.00	0.01	0.03	0.26
7	Tomato	1154.98	23.10	231.00	10.39	2.31	554.39	7.39	1.39	0.69	4.62	311.85	4053.99
8	other veg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Fruits	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	Oils	33.51	2.52	301.60	0.00	33.51	0.00	0.00	0.00	0.00	0.00	0.00	251.33
11	Milk and milk products	692.54	17.10	464.00	22.16	28.39	831.04	1.39	0.35	1.32	0.69	13.85	367.04
12	Sugar and jaggery	46.63	1.44	185.60	0.05	0.00	5.60	0.07	0.00	0.00	0.00	0.00	0.00
13	Egg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	Meat	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A	Optimized cost		54.79	2227.20	69.52	70.39	1713.57	23.38	3.19	2.54	16.00	326.04	4800.00
15	Miscellaneous		3.96	92.80									
B	Total optimized cost		58.75	2320.00	69.52	70.39	1713.57	23.38	3.19	2.54	16.00	326.04	4800.00

The main sources of vitamin C were tomato and milk and that of carotene were from tomato, milk and milk products, oils and fats and wheat.

Per capita expenditure was highest on tomato (Rs. 23.1), milk and milk products (Rs. 17.1), wheat (Rs. 6.62), grams (Rs. 2.69) and oils and fats (Rs. 2.52). The optimized food expenditure per consumptive unit per day was Rs. 54.79 (exclusive of miscellaneous expenditure).

4.3.4 Existing versus optimal food consumption plan based on 24 hour recall method

Details of existing versus optimal food consumption plan for major nutrients, based on 24 hour recall method are presented in Table 4.28. Optimal food consumption plan for the sample respondents prescribes consumption of lesser amounts of cereals, pulses, vegetables, fruits, oils and fats and higher amounts of sugars and jaggery and animal products. Per day per CU consumption of all the food items was higher (1.233 kg) in the optimal plan compared to the existing pattern (1.133 kg). The cereal consumption which was 576.72 g in the existing pattern has been reduced to 282.93 g in the optimal plan.

The per CU daily expenditure on cereals decreased from Rs. 17.75 to 7.21 whereas it increased from Rs. 5.04 to Rs. 17.10 for animal products. The cost incurred was higher for the optimal plan (Rs. 34.49) in comparison to the existing pattern (Rs. 29.97). Including the miscellaneous expenditure, the total optimized food consumption expenditure would increase to Rs. 38.45 and this is the least cost at which the RDA's for all the major nutrients and is in line with the FAO's desirable dietary plan.

The existing versus optimal food consumption plan for all the nutrients, based on 24 hour recall method is presented in Table 4.29. Optimal food consumption plan for the sample respondents prescribes consumption of lesser amounts of cereals, pulses, vegetables, fruits, oils and fats and higher amounts of sugars and jaggery and animal products. Per day per CU consumption of all the food items was higher (1.308 kg) in the optimal plan compared to the existing pattern (853.62 kg). The cereal consumption which was higher in the existing pattern has been reduced to 282.93 g in the optimal plan.

The per CU daily expenditure on cereals decreased whereas it increased for animal products. The cost incurred was higher for the optimal plan (Rs. 36.56) in comparison to the existing pattern (Rs. 29.97). Including the miscellaneous expenditure, the total optimized food consumption expenditure would increase to Rs. 40.52 and this is the least cost at which the RDA's for all the nutrients are met and is in line with the FAO's desirable dietary plan.

4.3.5 Existing versus optimal food consumption plan based on Household monthly consumption

The existing versus optimal food consumption plan for major nutrients, based on household consumption method is presented in Table 4.30. Optimal food consumption plan for the sample respondents prescribed consumption of lesser amounts of cereals and pulses and higher amounts of vegetables and fruits, oils and fats, sugars and jaggery and

Table 4.28: Existing versus optimal food consumption plan (for major nutrients based on adjusted 24 hour recall method)

Food items	Plan of consumption	Daily intake of food per CU		Nutrient contribution			
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)
Cereals	Existing	514.71	17.75	1736.88	37.50	4.67	804.58
	Optimal	282.93	7.21	928.00	20.65	3.68	973.27
Pulses	Existing	24.85	0.30	86.00	5.43	0.71	16.87
	Optimal	31.18	2.69	116.00	6.49	1.75	17.46
Vegetables and fruits	Existing	140.12	6.09	74.95	3.15	0.38	102.47
	Optimal	146.84	3.52	232.00	10.87	1.47	7.34
Oils and Fats	Existing	25.67	0.47	163.93	1.03	16.80	2.84
	Optimal	33.51	2.52	301.60	0.00	33.51	0.00
Sugar and jaggery	Existing	10.22	0.33	40.68	0.01	0.00	1.23
	Optimal	46.63	1.44	185.60	0.05	0.00	5.60
Animal products	Existing	138.05	5.04	102.19	8.38	5.34	148.62
	Optimal	692.54	17.10	464.00	22.16	28.39	831.04
Existing quantity/ cost		853.62	29.97	2204.62	55.49	27.91	1076.61
Optimal quantity/ cost		1233.63	34.49	2227.20	60.21	68.80	1834.71
Miscellaneous			3.96	92.80			
Total existing cost			33.93	2297.42	55.49	27.91	1076.61
Total optimal cost			38.45	2320.00	60.21	68.80	1834.71

Table 4.29: Existing versus optimal food consumption plan (for all nutrients based on adjusted 24 hour recall method)

Food items	Consumption	Daily intake of food per CU		Nutrient contribution									
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)	Carotene (µg)
Cereals	Existing	514.71	17.75	1736.88	37.50	4.67	804.58	11.82	1.22	0.63	8.63	0.00	101.05
	Optimal	282.93	7.21	928.00	20.65	3.68	973.27	11.03	1.19	0.54	3.11	0.00	118.83
Pulses	Existing	24.85	0.30	86.00	5.43	0.71	16.87	0.86	0.11	0.05	0.68	0.07	32.58
	Optimal	31.18	2.69	116.00	6.49	1.75	17.46	1.65	0.15	0.06	0.75	0.31	40.23
Vegetables and fruits	Existing	140.12	6.09	74.95	3.15	0.38	102.47	1.56	0.12	0.16	0.92	36.03	1160.04
	Optimal	201.35	4.91	232.00	12.31	1.29	308.89	5.91	0.45	0.47	0.91	109.25	4250.41
Oils and Fats	Existing	25.67	0.47	163.93	1.03	16.80	2.84	0.27	0.02	0.02	0.44	0.01	79.59
	Optimal	53.45	3.21	301.60	13.39	21.74	47.63	1.32	0.48	0.07	10.53	0.00	23.49
Sugar and jaggery	Existing	10.22	0.33	40.68	0.01	0.00	1.23	0.02	0.00	0.00	0.00	0.00	0.00
	Optimal	46.63	1.44	185.60	0.05	0.00	5.60	0.07	0.00	0.00	0.00	0.00	0.00
Animal products	Existing	138.05	5.04	102.19	8.38	5.34	148.62	0.30	0.06	0.26	0.12	2.38	74.52
	Optimal	692.54	17.1	464.00	22.16	28.39	831.04	1.39	0.35	1.32	0.69	13.85	367.04
Existing quantity/ cost		853.62	29.97	2204.62	55.49	27.91	1076.61	14.82	1.53	1.11	10.79	38.49	1447.78
Optimal quantity/ cost		1308.08	36.56	2227.20	75.05	56.85	2183.89	21.38	2.61	2.44	16.00	123.41	4800.00
Miscellaneous			3.96	92.80									
Total existing cost			33.93	2297.42	55.49	27.91	1076.61	14.82	1.53	1.11	10.79	38.49	1447.78
Total optimal cost			40.52	2320.00	75.05	56.85	2183.89	21.38	2.61	2.44	16.00	123.41	4800.00

Table 4.30: Existing versus optimal food consumption plan (for major nutrients based on Household consumption method)

Food items	Plan of consumption	Daily intake of food per CU		Nutrient contribution			
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)
Cereals	Existing	501.50	14.16	1694.51	37.29	4.60	734.14
	Optimal	280.87	6.65	928.00	22.99	3.85	812.72
Pulses	Existing	39.00	3.27	138.09	8.40	1.45	25.05
	Optimal	34.62	2.82	116.00	7.72	0.58	25.27
Vegetables and fruits	Existing	139.60	3.39	46.53	1.97	0.31	42.68
	Optimal	393.22	7.86	232.00	7.07	0.39	157.28
Oils and Fats	Existing	26.50	2.00	238.50	0.00	26.50	0.00
	Optimal	33.511	2.52	301.60	0.00	33.51	0.00
Sugar and jaggery	Existing	28.20	0.87	112.24	0.03	0.00	3.38
	Optimal	46.63	1.43	185.60	0.04	0.00	5.59
Animal products	Existing	206.60	7.21	155.18	13.69	7.83	217.57
	Optimal	692.53	17.09	464.00	22.16	28.39	831.04
Existing quantity/ cost		941.40	30.90	2385.04	61.37	40.69	1022.82
Optimal quantity/ cost		1481.40	38.40	2227.20	60.00	66.75	1831.93
Miscellaneous			92.80	92.80			
Total existing cost			34.86				
Total optimal cost			42.36	2320.00	60.00	66.75	1831.93

Note: The existing calorie (2385.04 kcal) is the availability and not the actual intake

animal products. Per day per person consumption of all the food items was higher (1.481 kg) in the optimal plan compared to the existing pattern (0.941 kg). The cereal consumption which was 501.5 g in the existing pattern has been reduced to 280.87 g in the optimal plan.

The daily food expenditure per person on cereals decreased from Rs. 14.16 to Rs. 6.65 whereas it increased from Rs. 7.21 to Rs. 17.09 and Rs. 3.39 to Rs. 7.86 for animal products and vegetables and fruits respectively. The cost incurred was higher for the optimal plan (Rs. 38.40) in comparison to the existing pattern (Rs. 30.90). Including the miscellaneous expenditure, the total optimized daily food consumption expenditure per person would increase to Rs. 42.36.

The existing versus optimal food consumption plan for all the nutrients, based on household consumption method is presented in Table 4.31. Optimal food consumption plan for the sample respondents prescribed consumption of lesser amounts of cereals and pulses and higher amounts of vegetables and fruits, oils and fats, sugars and jaggery and animal products. Per day per person consumption of all the food items was higher (1.308 kg) in the optimal plan compared to the existing plan (1.133 kg). The cereal consumption which was higher in the existing plan had been reduced to 282.93 g in the optimal plan.

The daily food expenditure per person on cereals decreased whereas it increased for animal products, vegetables and fruits. The increase in the per capita daily food expenditure was highest for vegetable and fruits from Rs. 3.39 to Rs. 23.13 and they form a major source in meeting the requirements of vitamin C and carotene. The cost incurred was significantly higher for the optimal plan (Rs. 54.79) in comparison to the existing pattern (Rs. 30.90). Including the miscellaneous expenditure, the total optimized food consumption expenditure would increase to Rs. 58.75.

4.4 Relationship between calories, nutrients, expenditures and income

4.4.1 Determinants of consumption expenditures

A multiple linear regression function was used to determine the factors influencing the food consumption expenditure. Food expenditure and total expenditure per household was considered as the dependent variable. The independent variables like household monthly income, the type of household dummy, type of ration card dummy, household size, land holding, type of family dummy and food habit dummy were expected to influence the consumption expenditures. The empirical estimates from the regression analysis are presented in Table 4.32.

The type of ration card, household size and type of food habit, significantly determined the monthly food consumption expenditure both in the presence and absence of food subsidy. Variables, monthly income and the type of ration card were significant determinants of monthly non-food consumption expenditure. Thus monthly income, type of ration card, household's size and the type of food habit significantly determined the total consumption expenditure of rural households. Type of household was not significant in determining the expenditure of rural households. The food expenditure will increase by

Table 4.31: Existing versus optimal food consumption plan (for all nutrients based on household monthly consumption)

Food items	Plan of consumption	Daily intake of food per CU		Nutrient contribution									
		Quantity (g)	Expenditure (Rs.)	Energy (kcal)	Proteins (g)	Fats (g)	Calcium (mg)	Iron (mg)	Thiamine (mg)	Riboflavin (mg)	Niacin (mg)	Vitamin C (mg)	Carotene (µg)
Cereals	Existing	501.50	14.16	1694.51	37.29	4.60	734.14	11.64	1.20	0.61	8.92	0.00	95.99
	Optimal	274.37	7.91	928.00	30.40	4.43	304.40	12.86	1.30	0.48	9.93	0.00	87.15
Pulses	Existing	39.00	3.27	138.09	8.40	1.45	25.05	1.58	0.18	0.07	1.03	0.20	50.88
	Optimal	31.18	2.69	116.00	6.49	1.75	17.46	1.65	0.15	0.06	0.75	0.31	40.23
Vegetables and fruits	Existing	139.60	3.39	46.53	1.97	0.31	42.68	0.94	0.10	0.10	0.95	17.02	159.19
	Optimal	1156.68	23.13	232.00	10.43	2.31	555.07	7.41	1.39	0.69	4.63	311.88	4054.25
Oils and Fats	Existing	26.50	2.00	238.50	0.00	26.50	0.00	0.00	0.00	0.00	0.00	0.00	198.75
	Optimal	33.51	2.52	301.60	0.00	33.51	0.00	0.00	0.00	0.00	0.00	0.00	251.33
Sugar and jaggery	Existing	28.20	0.87	112.24	0.03	0.00	3.38	0.04	0.00	0.00	0.00	0.00	0.00
	Optimal	46.63	1.44	185.60	0.05	0.00	5.60	0.07	0.00	0.00	0.00	0.00	0.00
Animal products	Existing	206.60	7.21	155.18	13.69	7.83	217.57	0.43	0.09	0.39	0.18	3.46	109.38
	Optimal	692.54	17.10	464.00	22.16	28.39	831.04	1.39	0.35	1.32	0.69	13.85	367.04
Existing quantity/ cost		941.40	30.90	2385.04	61.37	40.69	1022.82	14.64	1.57	1.17	11.07	20.69	614.19
Optimal quantity/ cost		2234.91	54.79	2227.20	69.52	70.39	1713.57	23.38	3.19	2.54	16.00	326.04	4800.00
Miscellaneous			3.96	92.80									
Total existing cost			34.86										
Total optimal cost			58.75	2320.00	69.52	70.39	1713.57	23.38	3.19	2.54	16.00	326.04	4800.00

Note: The existing calorie (2385.04 kcal) is the availability and not the actual intake

Table 4.32: Determinants of consumption expenditures

Dependent variable / Independent variable	Monthly food consumption expenditure (With subsidy)		Monthly food consumption expenditure (Without subsidy)		Monthly non-food consumption expenditure		Monthly total consumption expenditure (With subsidy)		Monthly total consumption expenditure (Without subsidy)	
	b_i	t	b_i	t	b_i	t	b_i	t	b_i	t
Intercept	178.20	0.59	1113.40***	3.72	144.28	0.20	322.48	0.39	1257.68	1.51
Monthly income (Rs.)	0.02*	1.72	0.02	1.89	0.09***	3.07	0.12***	3.31	0.12***	3.35
Type of household (D_1)	125.17	0.96	96.21	0.75	154.14	0.49	279.31	0.78	250.35	0.70
Type of ration card (D_2)	1662.37***	11.12	527.47***	3.55	1798.87***	4.98	3461.24***	8.39	2326.34***	5.61
Type of ration card (D_3)	689.07***	5.98	509.77***	4.45	1114.77***	4.01	1803.85***	5.68	1624.54***	5.09
Household size (no.)	463.93***	11.66	493.86***	12.48	115.26	1.20	579.19***	5.27	609.12***	5.52
Total land holding (acres)	15.62	0.37	12.64	0.30	3.74	0.04	19.36	0.17	16.38	0.14
Type of family (D_4)	40.54	0.24	111.27	0.66	-78.37	-0.19	-37.83	-0.08	32.89	0.07
Type of food habit (D_5)	385.39***	4.44	403.92***	4.67	158.94	0.76	544.33***	2.27	562.86***	2.34
R Square	0.80		0.80		0.44		0.71		0.64	
Adjusted R Square	0.78		0.79		0.40		0.69		0.62	

Note: ***, ** and * indicates 1 per cent, 5 per cent and 10 per cent level of significance, respectively

463.93 rupees in the presence of food subsidy and by 493.86 rupees in the absence of food subsidy for increase in every one additional household member.

4.4.2 Factors influencing calorie and nutrients intake

Results of the multiple linear regression analysis to analyze the factors influencing calorie and nutrient intake among rural households are presented in Table 4.33. Daily calorie intake and nutrient intake per CU was considered as the dependent variable. The independent variables household monthly income, the type of household dummy, type of ration card dummy, household size and food habit dummy were expected to influence the per capita calorie and nutrient intake.

Calorie intake per day per CU was significantly influenced by variables type of ration card and household size. The household size was negatively associated with the per capita calorie intake. For every additional household member daily calorie intake decreases by 56.98 kcal per CU. The BPL households, the household size and the food habit dummy had a significant influence on the protein intake per day per CU. A non-vegetarian person will have 8.66 g of additional protein intake per day per CU over the vegetarian person. Only the household size affected the fats intake per day per CU significantly.

The APL household, household size and food habit dummy were significantly influencing the calcium intake per day per CU. As the household size increases by one unit, the calcium intake per day per CU decreases by 49.49 mg. A non-vegetarian person will have 120.58 g of additional calcium intake per day per CU over the vegetarian person. The type of ration card (BPL) and the household size had significant influence in determining the intake of vitamin C and carotene per day per CU.

4.4.3 Expenditure elasticities of food consumption

The expenditure elasticities for the rural households are presented in Table 4.34. The linear function was the best fit for the vegetables, fruits, oils and fats, milk and milk products, sugar and jaggery, egg and miscellaneous items. The inverse model was a best fit for cereals and pulses whereas for meat, log inverse model was a best fit. The expenditure elasticity for fruits and milk and milk products were greater than one significantly. The expenditure elasticity for cereals was negative and significant.

4.4.4 Relationship between monthly income and food expenditures

As the monthly income per household increases, the share of income spent on food decreases (Figure 3). The logarithmic and power function provided a good fit with a high R square value of around 64 per cent. As the monthly income per household increases, the share of expenditure on food to total expenditure decreases (Figure 4). On the whole for every 100 rupees of monthly income available, share of food expenditure to total expenditure was 66 per cent.

Table 4.33: Factors influencing calorie and nutrients intake

Dependent variable / Independent variable	Calorie intake (kcal/CU/day)		Proteins (g/CU/day)		Fats (g/CU/day)		Calcium (mg/CU/day)		Vitamin C (mg/CU/day)		Carotene (µg/CU/day)	
	b_i	t	b_i	t	b_i	t	b_i	t	b_i	t	b_i	t
Intercept	2265.61***	21.92	58.07***	18.61	32.63***	19.12	1331.35***	13.20	70.40***	6.07	3303.29***	4.78
Household monthly income (Rs.)	0.01	0.81	0.00	-0.64	0.00	0.41	-0.01*	-1.64	0.00	-0.57	-0.05	-0.85
Type of household (D_1)	-34.96	-0.63	-0.37	-0.22	0.91	1.00	-140.10***	-2.61	-5.10	-0.82	-439.21	-1.19
Type of ration card (D_2)	153.49*	1.71	6.06**	2.23	-2.22	-1.50	114.73	1.31	5.77	0.57	236.45	0.39
Type of ration card (D_3)	139.33*	1.93	2.66	1.22	-0.76	-0.64	94.51	1.34	-13.83*	-1.71	-827.29	-1.71
Household size (no.)	-56.98***	-3.11	-2.04***	-3.69	-3.60***	-11.89	-49.49***	-2.77	-5.38***	-2.62	-247.11*	-2.02
Type of food habit (D_5)	64.06	1.14	8.66***	5.08	-1.25	-1.34	120.58***	2.19	5.57	0.88	290.04	0.77
R Square	0.11		0.25		0.60		0.17		0.15		0.13	
Adjusted R Square	0.06		0.21		0.58		0.13		0.11		0.09	

Note: ***, ** and * indicates 1 per cent, 5 per cent and 10 per cent level of significance, respectively

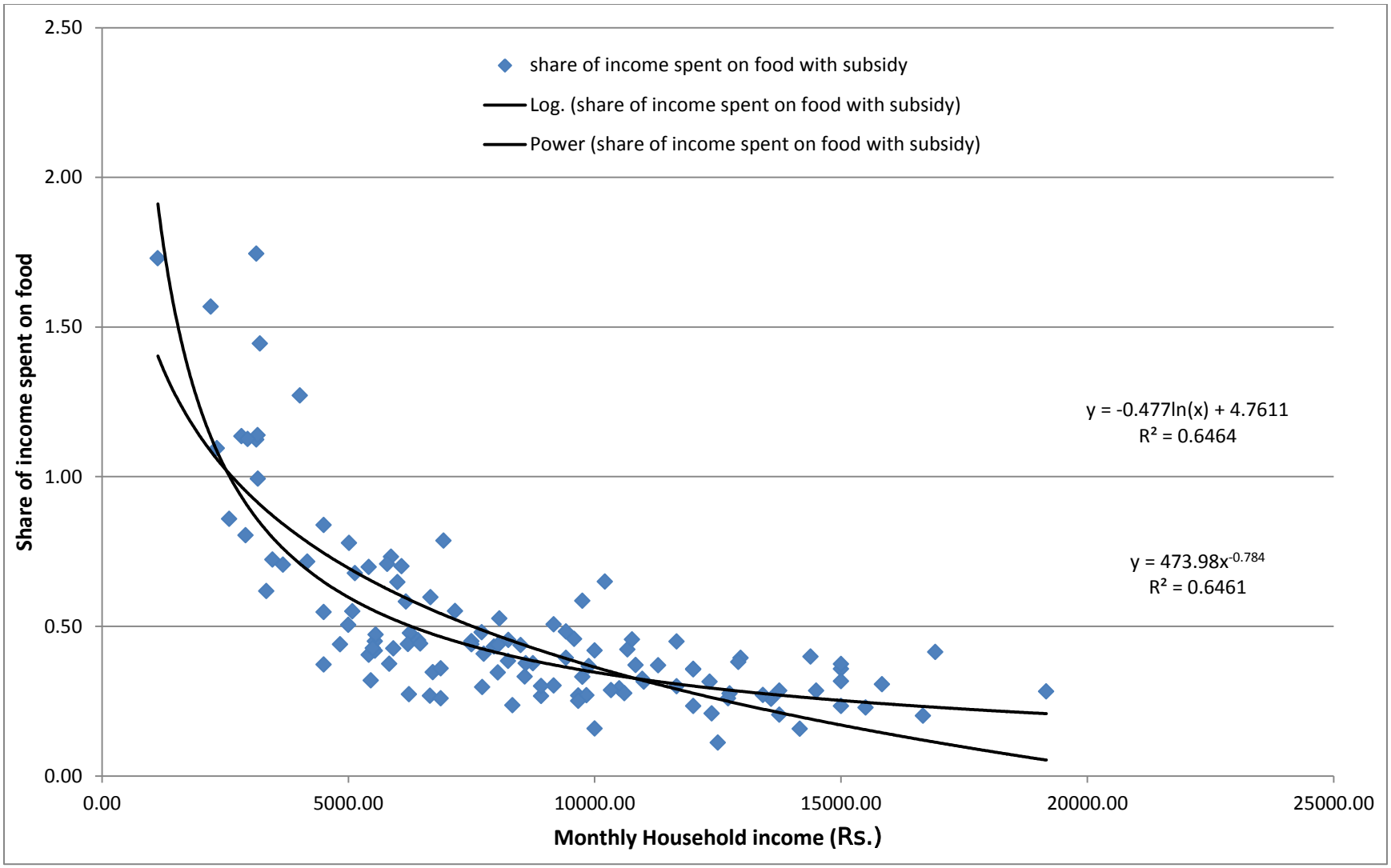

Fig. 3: Share of income spent on food (with subsidy) versus monthly income

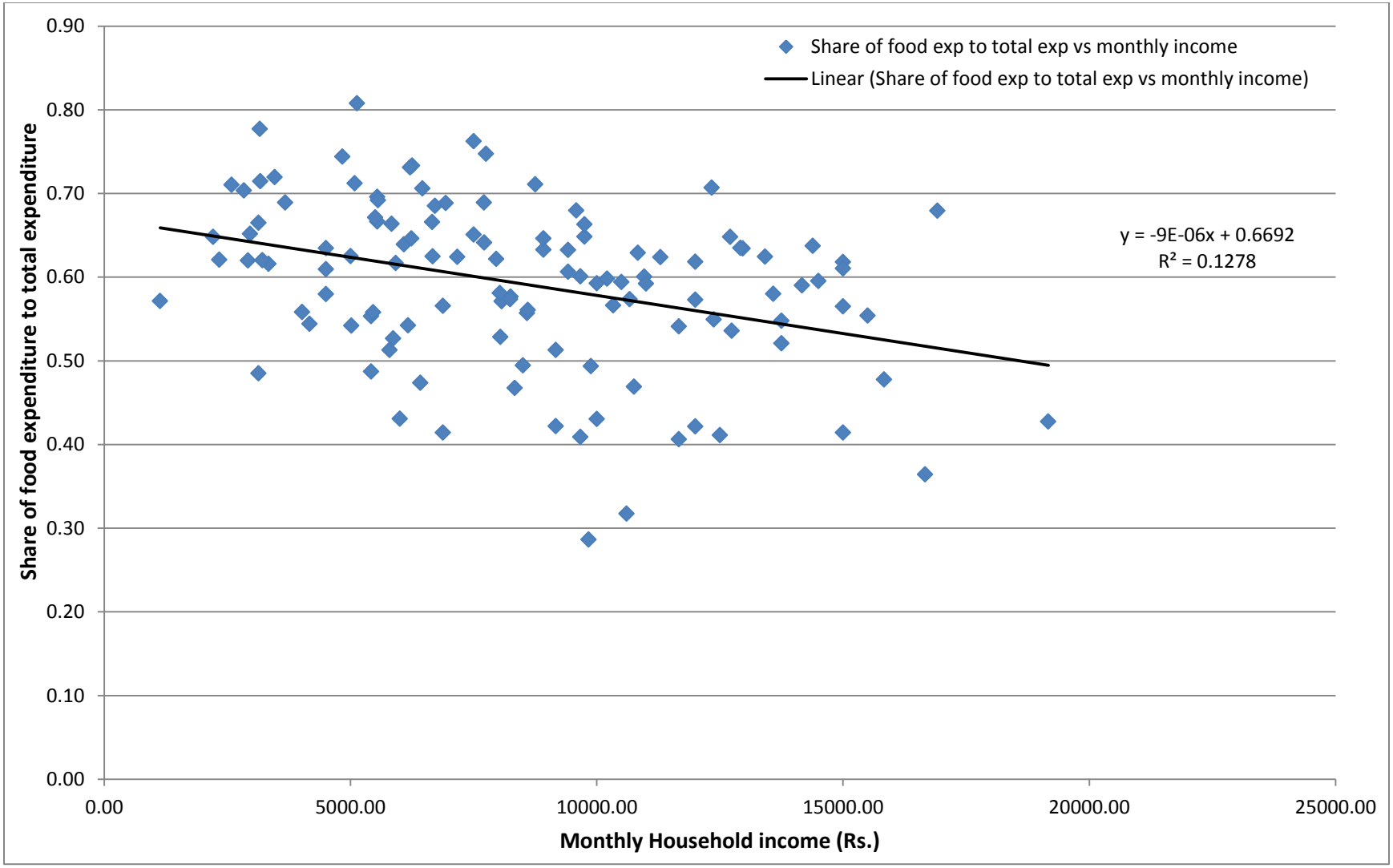

Fig. 4: Share of food expenditure to total expenditure versus monthly income (Households)

Table 4.34: Expenditure elasticities

Engel function fitted	Food expenditure	Expenditure elasticity
Linear	Vegetables	0.759
	Fruits	1.923
	Oils and fats	0.787
	Milk and milk products	1.559
	Sugar and jaggery	0.734
	Egg	0.656
	Miscellaneous	0.963
Double-log	-	-
Semi-log	-	-
Inverse	Cereals	-1.095
	Pulses	-0.809
Log inverse	Meat	-0.638
Log-log inverse	-	-

4.4.5 Relationship between household monthly income and energy and nutrient intake per consumptive unit

The effect of monthly household income on the calorie and nutrients intake per consumptive unit was analyzed. With the 24 hour recall method values for calorie and nutrients intake, the calcium, vitamin C and carotene exhibited a decreasing response with increase in household's monthly income. The calorie and fats intake per CU showed a very slightly increasing and decreasing response respectively, whereas the response for proteins intake almost remained constant. To make the 24 hour recall method values for calorie and nutrients intake more realistic, they were adjusted for consumption of fruits, eggs and meat using the data from the household monthly consumption. The adjusted 24 hour recall method values were thus obtained, with some significant changes in their responses. There were reversals in the responses for fats, calcium and carotene. For instance, the decreasing response for calcium, vitamin C and carotene in the former case changed to an increasing response. The slightly increasing response for calories increased further and slightly decreasing response for fats decreased further, significantly. The response for protein intake remained unchanged. The effect of monthly household income on the calorie and nutrients intake per consumptive unit based on the adjusted 24 hour recall method is shown from Figure 5 to 10.

4.4.6 Cost of calories in terms of expenditure and income

The cost of meeting the calorie requirements across various categories of rural households is presented in Table 4.35. The calorie derived per rupee of food expenditure was highest among AAY farm households (106.73 kcal), followed by BPL farm (91.92 kcal), AAY non-farm (88.00 kcal), BPL non-farm (84.26 kcal), APL non-farm (67.89 kcal) and APL farm (65.21 kcal) households. Correspondingly, the cost incurred per 1000 calories was lowest among AAY farm households (Rs. 9.37), followed by BPL farm ((Rs. 10.88), AAY non-farm ((Rs. 11.36), BPL non-farm ((Rs. 11.87), APL non-farm ((Rs. 14.73) and APL farm ((Rs. 15.34) households.

In the absence of food subsidies, the calorie derived per rupee of expenditure would decrease by 34.31 kcal and 19.73 kcal for AAY farm and BPL farm households, respectively. The calorie derived per rupee of expenditure would decrease by 27.74 kcal and 18.14 kcal for AAY non-farm and BPL non-farm households respectively, in the absence of food subsidies. The decrease in the calorie intake due to the absence of food subsidy was highest among AAY farm households followed by AAY non-farm, BPL farm and BPL non-farm households.

Due to the food subsidy AAY farm, BPL farm, AAY non-farm and BPL non-farm households are able to save Rs. 4.44, Rs. 2.97, Rs. 5.23 and Rs. 3.25 per 1000 calories respectively. The highest amount of savings was among AAY non-farm households, followed by AAY farm, BPL non-farm and BPL farm.

Calorie derived per rupee of income was highest for AAY farm households (49.72 kcal), followed by BPL farm (41.8 kcal), AAY non-farm (31.78 kcal), BPL non-farm (31.68 kcal), APL farm (27.38 kcal) and APL non-farm (24.81 kcal) households. Correspondingly, the income spent per 1000 calories was lowest among AAY farm households (Rs. 20.11), followed by BPL farm (23.93), AAY non-farm (31.46), BPL non-farm (31.56), APL farm (36.53) and APL non-farm (40.31) households.

The cost of meeting the calorie requirements across type of households is presented in Table 4.36. The calorie derived per rupee of food expenditure was highest among farm households (86.15 kcal) and lowest among non-farm households (79.67 kcal). Correspondingly, the cost incurred per 1000 calories is lowest among farm households (Rs. 11.61) in comparison to non-farm households (12.55).

In the absence of food subsidies, the additional calories derived per rupee of expenditure would decrease by 15.69 kcal and 14.34 kcal for farm and non-farm households respectively. Due to the food subsidy farm and non-farm households are able to save Rs. 2.58 and Rs. 2.75 per 1000 calories respectively.

Calorie derived per rupee of income was highest for farm households (38.34 kcal) and lowest among non-farm households (29.47 kcal). Correspondingly, the income spent per 1000 calories is lowest for farm households (Rs. 26.08) in comparison to non-farm households (Rs. 33.94).

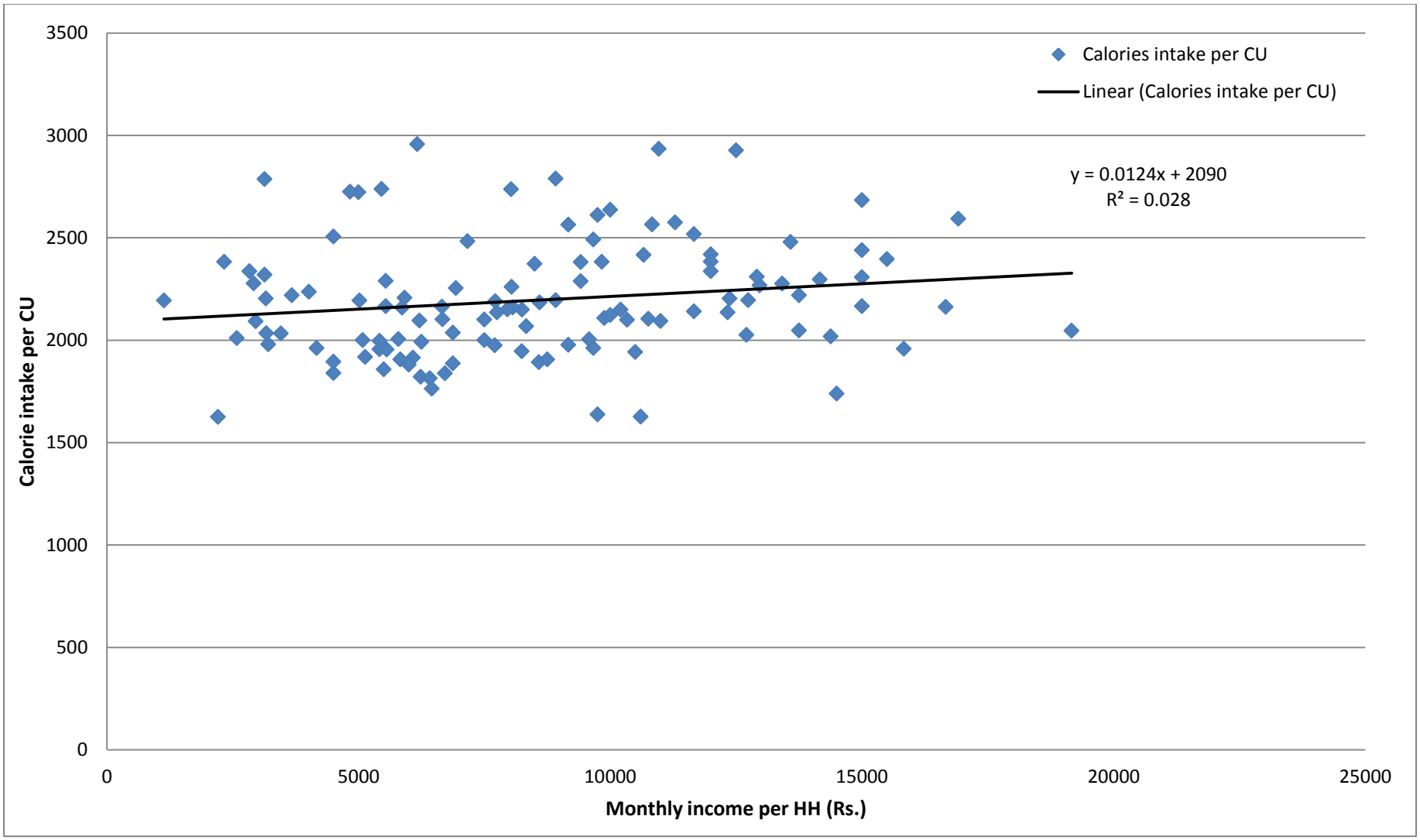

Fig. 5: Calorie intake per CU versus monthly income per household

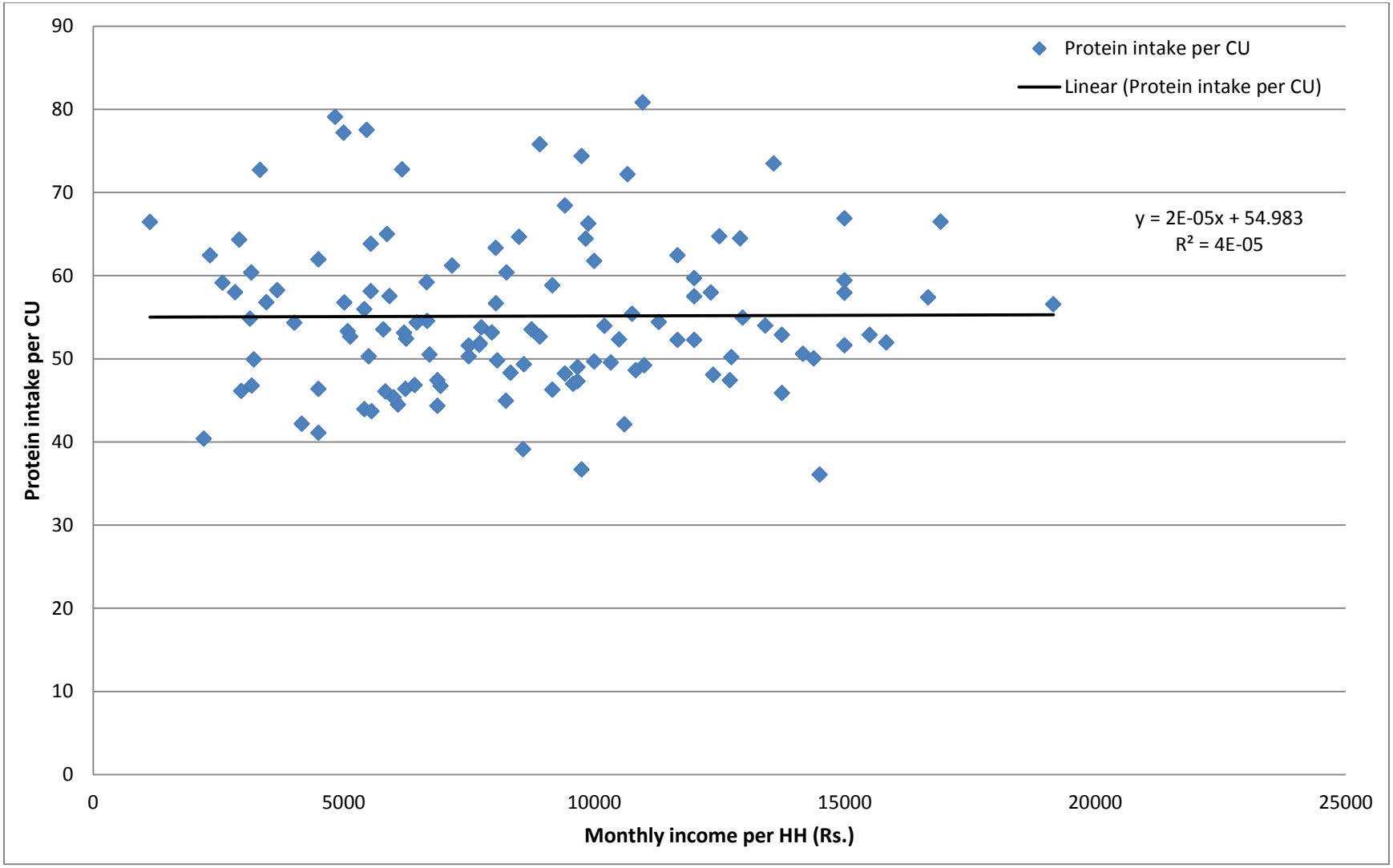

Fig. 6: Protein intake per CU versus monthly household income

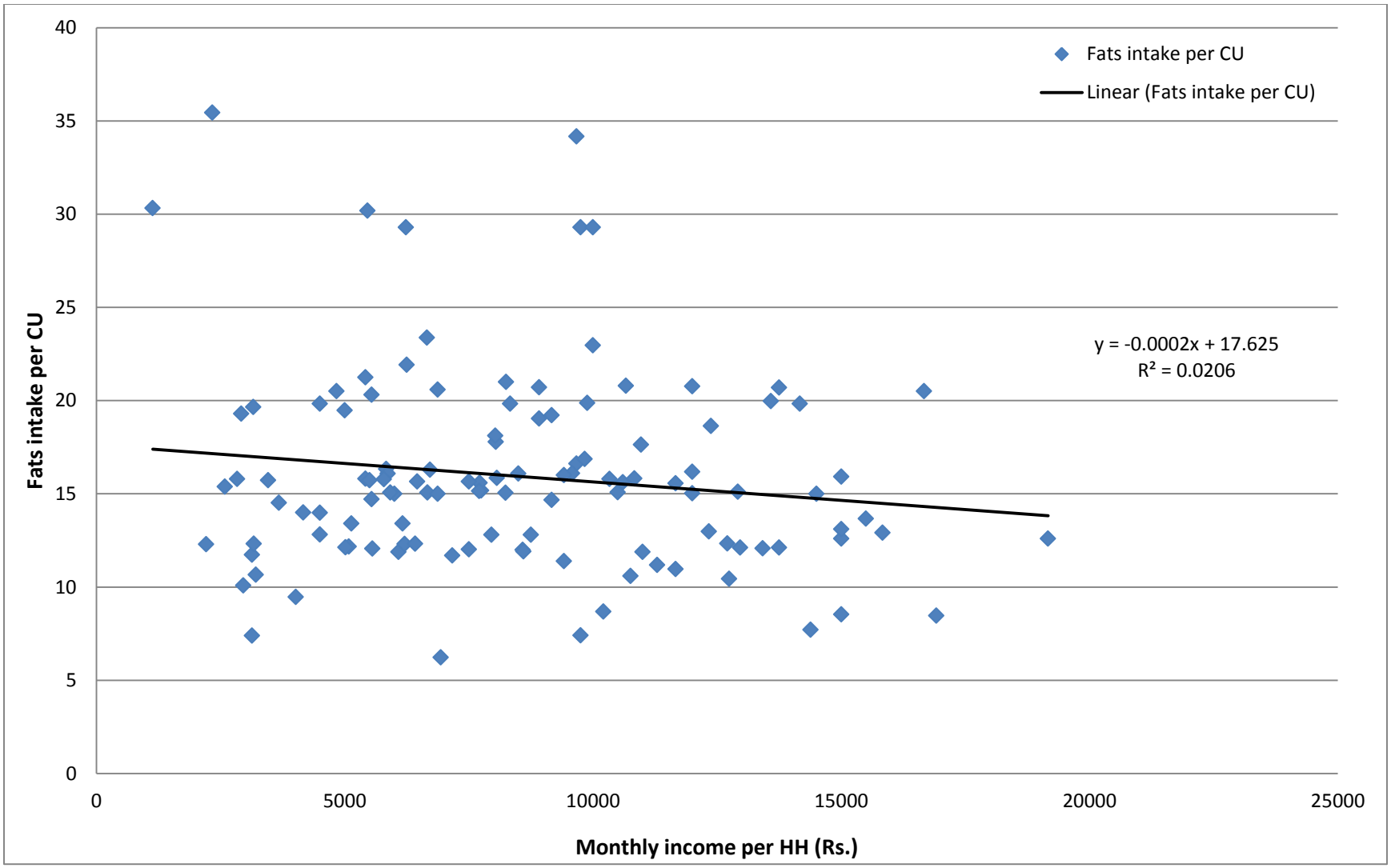

Fig. 7: Fats intake per CU versus monthly household income

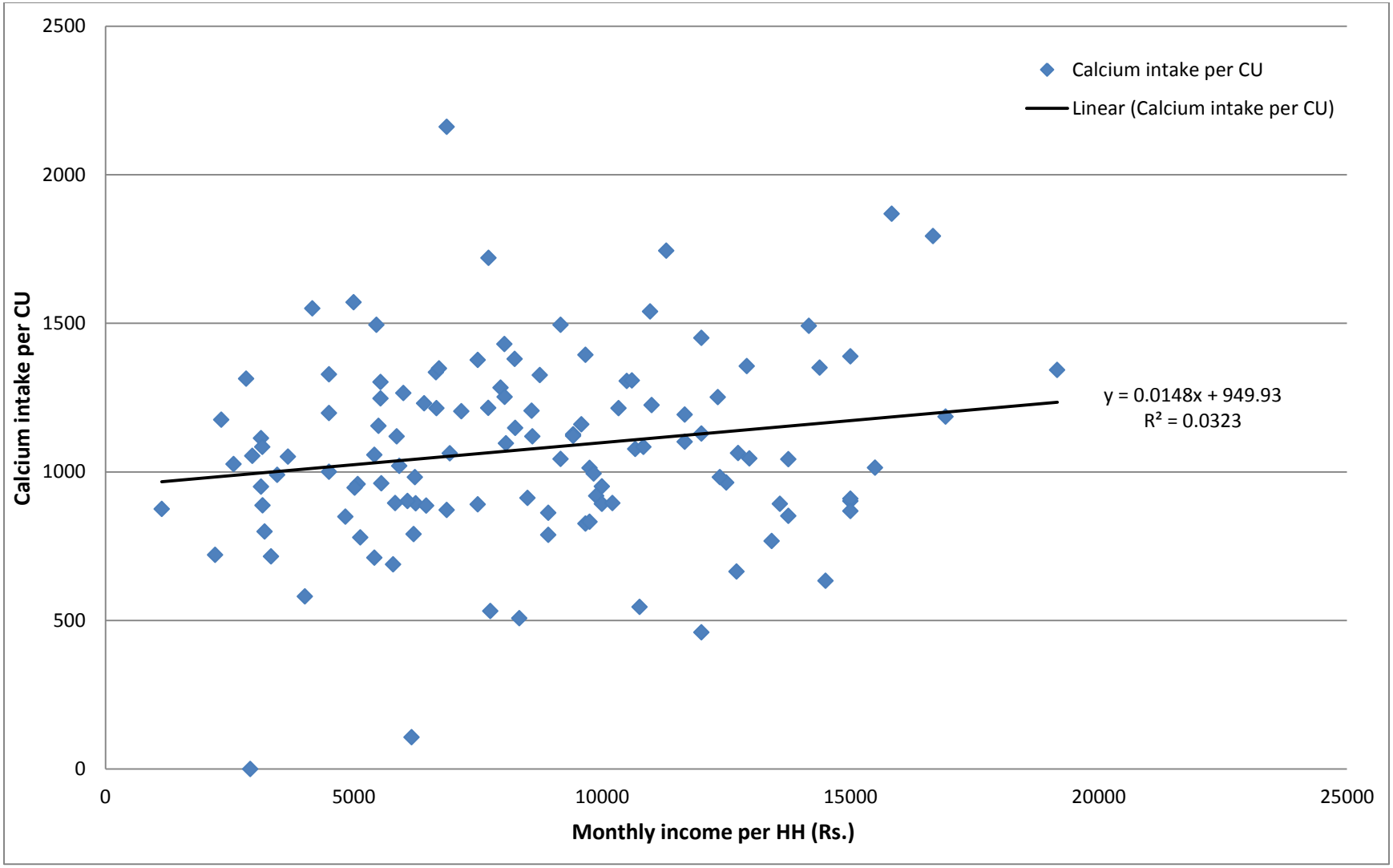

Fig. 8: Calcium intake per CU versus monthly household income

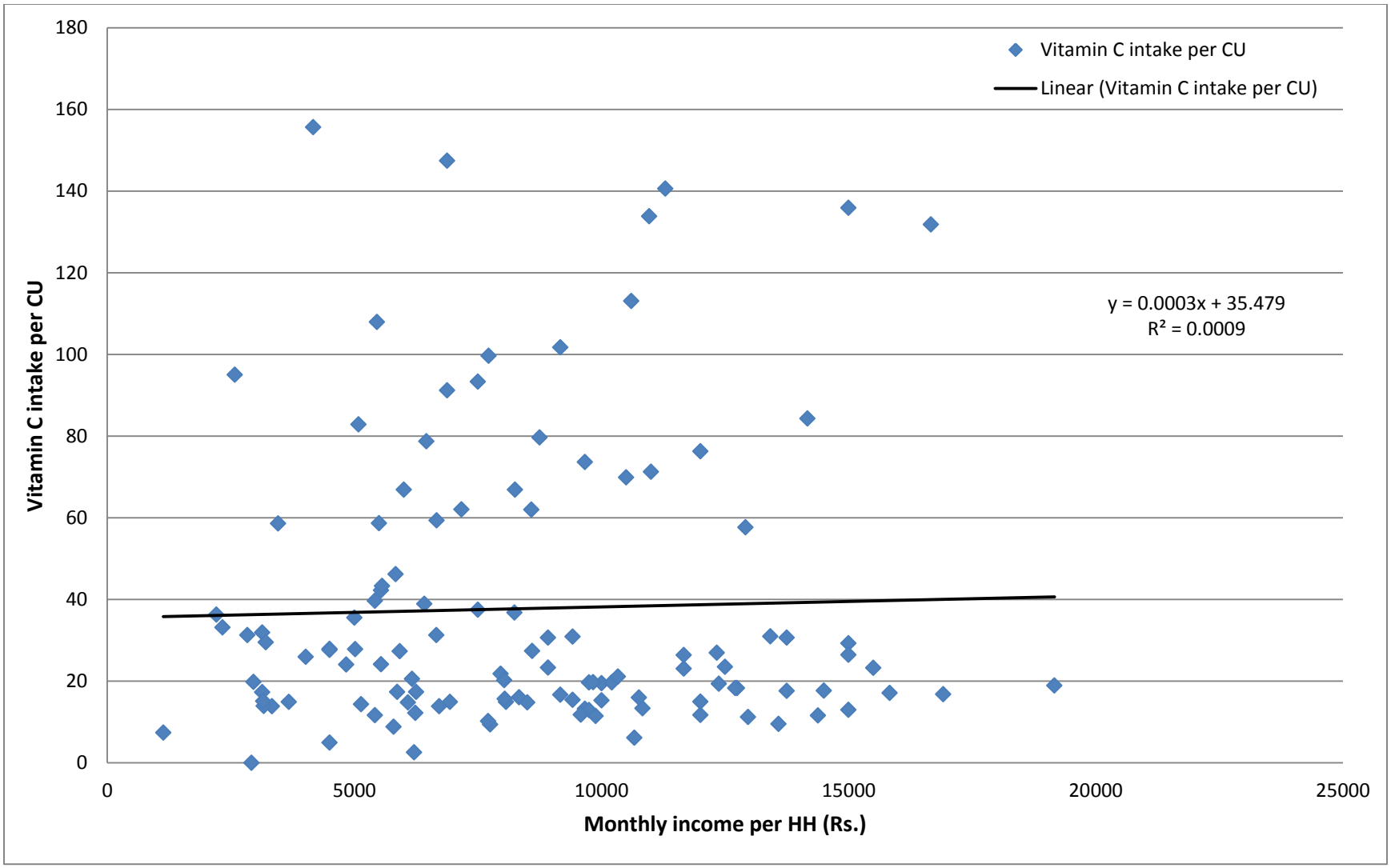

Fig. 9: Vitamin C intake per CU versus monthly household income

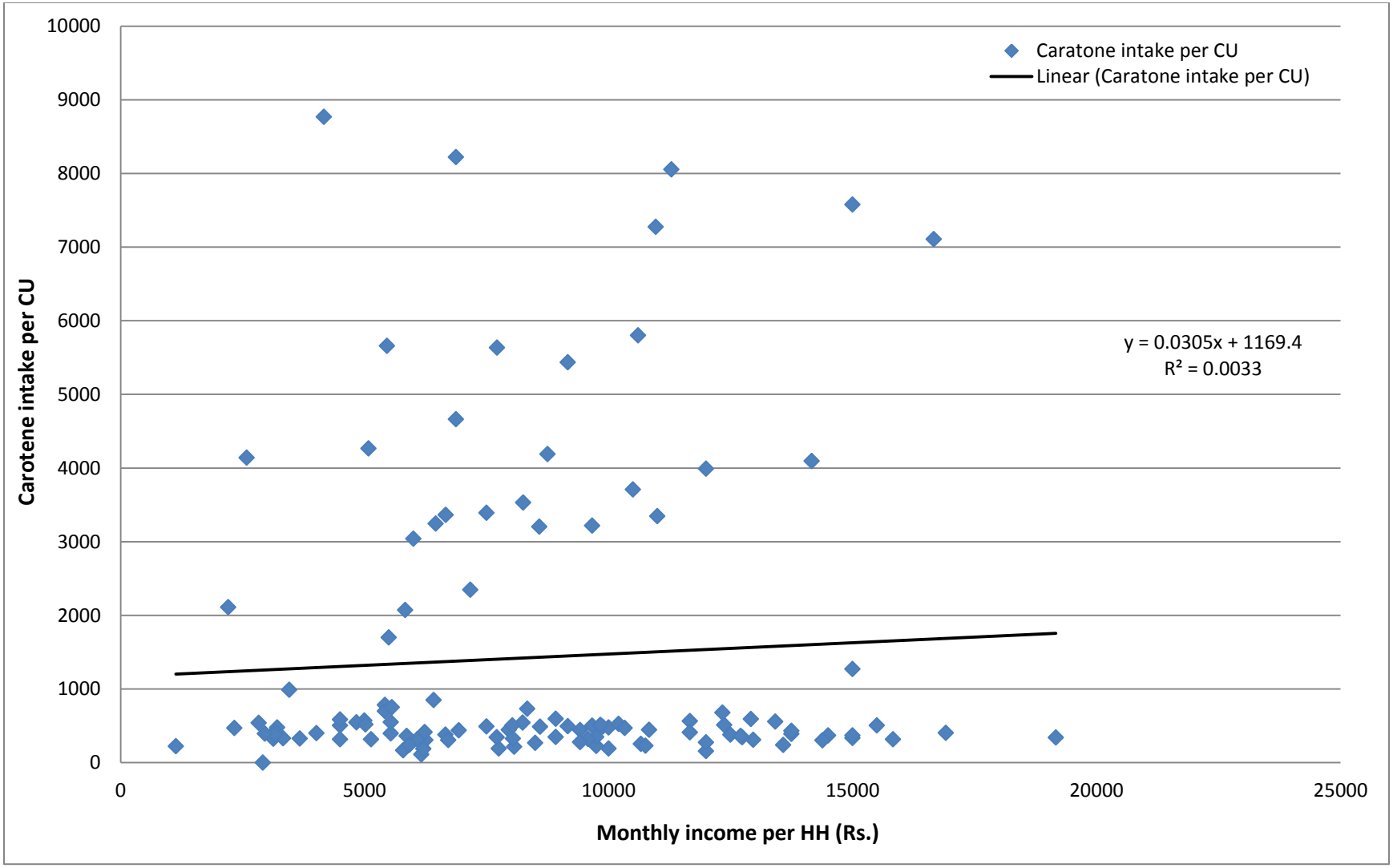

Fig. 10: Carotene intake per CU versus monthly household income

Table 4.35: Cost of calories in terms of expenditure and income

Type of Households	Farm households (n-60)			Non-farm households (n=60)		
	AAY	BPL	APL	AAY	BPL	APL
Daily calorie intake per household (kcal)	8404.88	11015.86	9353.09	7143.10	9552.43	9890.05
Food expenditure with subsidy						
Monthly food expenditure per household (Rs.)	2362.43	3595.37	4302.93	2435.23	3400.93	4370.47
Daily food expenditure per household (Rs.)	78.75	119.85	143.43	81.17	113.36	145.68
Calories derived per rupee of food expenditure (kcal/Rs.)	106.73	91.92	65.21	88.00	84.26	67.89
Expenditure incurred per 1000 kcal (Rs./1000 kcal)	9.37	10.88	15.34	11.36	11.87	14.73
Food expenditure without subsidy						
Monthly food expenditure per household (Rs.)	3481.57	4578.17	4302.93	3556.45	4333.64	4370.47
Daily food expenditure per household (Rs.)	116.05	152.61	143.43	118.55	144.45	145.68
Calories derived per rupee of food expenditure (kcal/Rs.)	72.42	72.19	65.21	60.25	66.13	67.89
Expenditure incurred per 1000 kcal (Rs./1000 kcal)	13.81	13.85	15.34	16.60	15.12	14.73
Effect of subsidy						
Additional calories obtained per rupee of food expenditure (kcal/Rs.)	34.31	19.73	0.00	27.74	18.14	0.00
Savings in expenditure incurred per 1000 kcal (Rs./1000 kcal)	4.44	2.97	0.00	5.23	3.25	0.00
Monthly income						
Monthly income per household (Rs.)	5071.11	7906.67	10248.89	6742.22	9044.58	11960.00
Daily income per household (Rs.)	169.04	263.56	341.63	224.74	301.49	398.67
Calorie derived per rupee of income (kcal/ Rs.)	49.72	41.80	27.38	31.78	31.68	24.81
Income spent per 1000 kcal (Rs./1000 kcal)	20.11	23.93	36.53	31.46	31.56	40.31

Table 4.36: Cost of calories in terms of expenditure and income across type of household

Type of households	Farm households (n=60)	Non-farm households (n=60)	Total (n=120)
Daily calorie intake per household (kcal)	9947.42	9034.50	9490.96
Food expenditure with subsidy			
Monthly food expenditure per household (Rs.)	3464.03	3401.89	3432.96
Daily food expenditure per household (Rs.)	115.47	113.40	114.43
Calorie derived per rupee of food expenditure (kcal/Rs.)	86.15	79.67	82.94
Expenditure incurred per 1000 kcal (Rs./1000 kcal)	11.61	12.55	12.06
Food expenditure without subsidy			
Monthly food expenditure per household (Rs.)	4235.21	4148.55	4191.88
Daily food expenditure per household (Rs.)	141.17	138.29	139.73
Calorie derived per rupee of food expenditure (kcal/ Rs.)	70.46	65.33	67.92
Expenditure incurred per 1000 kcal (Rs./1000 kcal)	14.19	15.31	14.72
Effect of subsidy			
Additional calories obtained per rupee of food expenditure (kcal)	15.69	14.34	15.02
Savings in expenditure incurred per 1000 kcal (Rs./1000 kcal)	2.58	2.75	2.67
Monthly income			
Monthly income per household (Rs.)	7783.33	9197.85	8490.59
Daily income per household (Rs.)	259.44	306.59	283.02
Calorie derived per rupee of income (kcal/Rs.)	38.34	29.47	33.53
Income spent per 1000 kcal (Rs./1000 kcal)	26.08	33.94	29.82

V DISCUSSION

India is a country with highest number of hungry and malnourished people and this seriously impedes the economic development of the country. Therefore to make people nourished and healthy, both central and state governments have launched a slew of programmes under which the poor people are provided with food grains at subsidized prices. In this backdrop, the present study attempts to analyze the impact of subsidized food grains on food consumption pattern, calories intake, nutrients intake and spillover effects of subsidized food items. The results of the study are discussed in this chapter under the following heads:

5.1 Food consumption pattern, calorie and nutrient derivation of the rural households

5.2 Spillover effects of subsidized food grains

5.3 Optimized food consumption plan for the rural households

5.4 Relationship between calories, nutrients, expenditures and income

5.1 Food consumption pattern, calorie and nutrient derivation of the rural households

Food being the foremost basic need gets utmost priority in the expenditure decisions of the households, particularly among the low and middle income groups. The analysis of the spatial changes in food consumption pattern would help in designing appropriate policies related to food production and efficient distribution of subsidies to help them meet their energy and nutrient requirements. Meeting the energy requirements is not an ultimate goal in itself unless it is obtained in a balanced way as per the FAO's desirable dietary plan. In this regard the existing food consumption pattern, the energy and nutrient intake are discussed in this section as follows:

5.1.1 Food consumption and diet adequacy of rural households

Food subsidy programmes enabled the poor households to have access to food in adequate quantity and meet dietary requirements. The results on the existing food consumption pattern (Table 4.1) revealed that AAY farm households had significantly lower mean cereal intake than non-farm AAY households. The same hold true in the case of BPL households but it was statistically insignificant. In the case of APL households, farm households had higher cereal intake in comparison to that of non-farm households. That is, AAY and BPL farm households had lower cereal intake in comparison to their counterpart among non-farm households whereas this was not the case with APL households.

The results pertaining to APL households were in line with the a priori expectation that farm households are more adequate in cereal intake than non-farm households. This case supports the theory that low income households (AAY and BPL) have high marketed surplus (often due to distress sales) in comparison to high income households (APL). The APL households had surplus resources because of which they were able to save as much produce as required to meet their household requirements primarily followed by market demand secondarily. This was not the case with AAY and

BPL households as they have limited resources at their disposal (like owned land and owned capital) which makes them sell their produce immediately to meet their immediate cash requirements. But any way all the households were adequate in cereal consumption and this can be attributed for the availability of subsidized food grains amongst low income households. In fact the cereal consumption was 26.6 per cent (APL non-farm households) to 49.8 per cent (BPL non-farm households) higher than the recommended levels. In contrast, Usha (1987) reported that the large farmers had higher calorie intake in comparison to landless labourers.

The consumption of pulses was highest among APL farm households and lowest among AAY farm households. Only APL farm households were adequate in pulses consumption. There was inadequacy in the pulse consumption with a deficiency of 4.8 (BPL non-farm) to 22.4 (AAY farm) per cent below the recommended levels. This inadequacy in the pulse consumption requires immediate attention as our food subsidy schemes are more skewed towards cereals and not pulses. Other factors like higher prices of pulses and longer time for cooking leading to higher fuel cost (Chourad, 2012) are other major constraints in consumption of pulses.

Fruits and vegetables consumption was inadequate among all the sample households across all categories in comparison with RDA. These were the only major food groups where the inadequacy was more than 60 per cent. But, all the household categories were adequate in the consumption of sugar and jaggery and oils and fats. These two groups of food support a priori expectation that, with provision of better incomes (available through subsidies) the households diversify towards costly sources of calories like oils and sugars.

All the households were inadequate in the consumption of milk and milk products, egg and meat. Among the animal products, the AAY households were lowest in the consumption of milk and milk products but highest in the consumption of egg and meat. This is mainly due to the type of food habit prevailing among the sample respondents, where in majority of the AAY and APL households were non vegetarians and vegetarians, respectively. The farm AAY, BPL and APL households had higher egg and meat consumption in comparison to their respective non-farm households.

AAY households had high mean cereal consumption followed by BPL and APL households (Table 4.2). The availability of subsidized cereals (mainly rice and wheat) and reasonable prices in the open market has led to high cereal consumption among AAY households and also among BPL households to some extent. Thus, cereal adequacy was highest among the AAY households (40.91 per cent higher than RDA) followed by BPL households and APL households. In the consumption of pulses, AAY and BPL households were inadequate by 16.57 per cent and 9.06 per cent respectively except APL households which were adequate. All the households were inadequate in the consumption of fruits and vegetables by more than 65.00 per cent. This inadequacy was due to the expensiveness of fruits and vegetables as reported by Chourad (2012). AAY households consumed least amount of fruits and vegetables in comparison to BPL and APL households. In general the adequacy of vegetable consumption was higher than fruit

consumption. Day to day necessities of vegetables in food preparation and its consequent consumption was one of the main reasons, along with the considerable share of respondents following vegetarian food habits.

All the households were adequate in consumption of oils and fats and sugar and jaggery, though AAY households had inadequate consumption in comparison to APL households. With the increase in real income due to the availability of food subsidy, people tend to consume high value foods which provide costly calories and reduce consumption of foods which provide calorie and other micronutrients at a cheaper rate. All the households were consuming milk lower than the RDA level, ranging from 34.27 per cent (APL households) to 43.2 per cent (AAY households). One of the reasons for this tendency was the lesser quantum of milk retained for household requirements, as most of it is sold to earn cash to meet the household expenses on a daily basis. In respect of egg and meat, all the households had inadequate consumption ranging from 46.11 per cent (AAY) to 71.58 per cent (APL households). The inadequacy in egg and meat consumption among AAY households can be explained by the constrained purchasing power faced by them even though they had access to food subsidy and also egg and meat products were expensive. As sixty per cent of the APL households were non vegetarians, the APL households were inadequate on the whole in egg and meat consumption.

A priori it was expected that farm households have higher consumption of food in comparison to non-farm households. But no significant difference was found in the food consumption pattern between the farm and non-farm households (Table 4.3). Food is a basic necessity and its consumption requirements do not vary much. Thus with the provision of subsidy for AAY and BPL households, there is smoothening of the consumption patterns. Both the farm and non-farm households were more than adequate in consumption of cereals, oils and fats, sugar and jaggery. However they were least adequate in the consumption of fruits, vegetables, egg and meat, milk and pulses. Overall, the consumption was highest for cereals, followed by milk and milk products, vegetables, pulses, sugar and jaggery, oils and fats, egg and meat and fruits.

5.1.2 Energy and nutrients intake and diet adequacy of rural households

With the access to subsidized food, the energy and nutrient intake of rural households are expected to meet RDA norms. The results of the study provided a diverse picture of the intake of energy and nutrients. The mean energy intake of AAY non-farm households (2029.4 kcal) was the least among all categories. The highest energy intake was noticed among APL non-farm (2279.4 kcal) households. On an average, the households were not able to meet the recommended calorie requirements (Table 4.4). But all the household categories were nearly adequate in calorie intake, ranging from 87.5 per cent (AAY non-farm households) to 98.2 per cent (APL non-farm households).

Share of calories derived from the food subsidy (through public distribution system) was 51.5 per cent and 35 per cent among AAY and BPL households, respectively. So this clearly explains the reason behind all the AAY and BPL households having calorie intake and adequacy on par with that of APL households. Thus, the major factor contributing for the smoothening of the energy intake was the availability of

subsidized food grains among the AAY and BPL households, which contributed to a considerable share of calories. These results are in line with Delislea *et al*., 1991 for intake of energy but not for protein and iron as the household categories were inadequate for the latter.

The protein intake was highest and adequate among AAY farm households whereas all other household categories were nearly adequate ranging from 85.9 per cent (AAY non-farm) to 95 per cent (APL farm and non-farm households). Most of the AAY farm households were non vegetarians and this has contributed for their protein adequacy. On the contrary most of the APL households were vegetarians. All the households across all the categories had higher levels of adequacy in the case of calcium and thiamine, whereas inadequacies were reported in intake of fats, iron, riboflavin, niacin and carotene.

All the AAY, BPL and APL farm households had higher intake of calcium in comparison with their respective non-farm categories. The calcium adequacy rate was highest in the case of AAY farm households and least in the case of AAY non-farm households. Farm households usually consume calcium rich sources like ragi, green leafy vegetables and milk and milk products and hence are calcium adequate. Further, ragi is a staple diet in the study area and is also cultivated widely. Milk is calcium rich, obtained from the livestock owned by majority of the rural farm households. These factors facilitated easy availability, accessibility and consumption of calcium rich diets.

AAY farm, APL non-farm and APL farm households had adequate consumption of vitamin C whereas BPL farm, BPL non-farm and AAY non-farm households were inadequate. Awareness on the importance of vitamin C has to be created among the households. Consumption of vitamin C rich foods like green leafy vegetables, beans, tomato, potato and other vegetables requires sufficient support and encouragement. High inflation among some vegetables (onion and tomato at times) needs to be contained to make it more affordable for the rural poor.

All the households were inadequate in carotene intake which ranged from 37.6 per cent (AAY farm) to 81.8 per cent (BPL non-farm) lower than the RDA. In contrast, Shakuntala (1993) reported carotene adequacy of more than 80 per cent and 70 per cent of RDA among farming community and landless labourers, respectively. Green leafy vegetables, oils and fats, eggs and tomato were the rich sources of carotene. Though these food items are expensive, they are essential to achieve carotene adequacy.

The energy intake was highest among APL households followed by BPL and AAY households (Table 4.5). There was a significant difference in the calorie intake of AAY and APL households. The protein consumption was almost similar among AAY, BPL and APL households with highest protein intake among APL households and lowest among BPL households. Fat intake was highest among AAY households and lowest among BPL households, though all the households remained inadequate. Calcium intake was also highest among the AAY households and lowest among APL households. All the households were adequate in consumption of calcium and thiamine but inadequate in

consumption of iron, riboflavin, niacin and carotene. Intake of vitamin C and carotene was highest in the case of AAY households and lowest among BPL households. These results were in line with Usha (1987) except for thiamine. Arora (1992) also reported adequacy in all the nutrients except for vitamin C and carotene.

There was no significant difference in the energy and nutrients intake of farm and non-farm households except for carotene (Table 4.6). Both the farm and non-farm households were more than adequate in intake of calcium and thiamine, but inadequate in the intake of other nutrients like protein, fats, iron, riboflavin, niacin and carotene. Intake of vitamin C was adequate among farm households and inadequate among non-farm households and this is attributed to higher consumption of vegetables particularly green leafy vegetables by the former.

Overall, the mean energy intake of all the rural household categories was 2205.06 kcal. None of the household categories was suffering from hunger as all the household categories had energy intake significantly more than 1800 kcal.

5.1.3 Share of energy derived from different food groups

FAO recommends the desirable dietary plan for energy intake, viz., 40 per cent of the energy has to be derived from cereals, 5 per cent from pulses, 10 per cent from vegetables, fruits, roots and tubers, 20 per cent from animal products, 13 per cent from nuts, oil seeds, fats and oils, 8 per cent from sugars and jaggery and 4 per cent from others like spices, beverages (Anonymous, 1989; Khan, 1989 and Chourad, 2012).

Among the cereals, rice contributed more than half of total energy derived among all categories except APL farm households. The food subsidy scheme provided 24 kgs of rice to BPL households and 29 kgs of rice to AAY households. This resulted in higher rice consumption among the AAY farm, AAY non-farm, BPL farm and BPL non-farm households.

Share of energy derived from ragi was maximum for BPL farm households, followed by AAY farm, BPL non-farm, APL farm, AAY non-farm and APL non-farm households. This pattern of energy derived from ragi, clearly showed that consumption of ragi will decrease as the income increases. On the contrary, share of energy derived from wheat was maximum for APL farm households, followed by APL non-farm, AAY non-farm, BPL non-farm, AAY farm and BPL farm households. Wheat is a non-traditional food whose consumption increases with the increase in income or with increased awareness of its nutritional value and this has resulted in the above pattern. However, availability of wheat through food subsidy scheme has encouraged its usage among the low income households like AAY and BPL households.

Share of energy derived from cereals was highest among AAY non-farm households (86.4 %), followed by AAY farm, BPL non-farm, BPL farm, APL farm and APL non-farm (74.1 %) even though FAO recommends that only 40 per cent of the energy should be derived from cereals. These results are in line with Anonymous (2013) which reported that diets in Bangladesh are largely imbalanced as the staple food cereals

contributed around 70 per cent of total energy intake. Also, Asghar (2011) reported that cereals contributed to 50 to 60 per cent of total calories consumed, as they are the cheapest source of calories in developing countries. The subsidized food items provided through public distribution system has primarily focused on ensuring rice, wheat, oils and sugars, at the cost of other food commodities which are also essential to maintain a balanced diet. This warrants a reorientation of the public distribution system through diversification of the food basket.

The second highest share of energy was derived from oils and fats (as they are the richest sources of calories (900 kcal / 100 g of oil)), highest among APL non-farm and least among AAY non-farm households. In fact, Deaton and Dreze (2009) reported a decline in per capita consumption of calories, proteins and other nutrients, except for fat consumption during 1983 and 2004, supporting the above results. The third highest share of energy was derived from pulses, highest among APL non-farm and lowest among AAY non-farm households.

The highest share of energy from cereals was derived by AAY non-farm and AAY farm households, whereas in the case of oils and fats and pulses, the highest share was derived from APL non-farm and APL farm households. The remaining share of energy was derived from vegetables, milk, sugar and jaggery, egg and meat and fruits.

The highest magnitude of energy derived from rice was in AAY households followed by BPL and APL households, whereas in the case of wheat highest energy was derived by APL households followed by AAY and BPL households (Table 4.8). In the case of ragi, the highest energy derived was by BPL households, followed by AAY and APL households. These patterns in the consumption of rice, ragi and wheat (under Southern Indian conditions) across type of ration card will help us infer about the kind of good. That is, wheat is a superior commodity and ragi is an inferior commodity. In comparison between rice and wheat, rice is an inferior commodity.

Highest and lowest share of energy was derived from cereals (1^{st}) and fruits (8^{th}), respectively among all the household categories. The second highest share of energy was derived from oils and fats among all the households. The third highest source of energy was from vegetables in the case of AAY households, but from pulses in the case of BPL and APL households. This indicates the superior purchasing power among BPL and APL households in comparison to AAY households.

Among the cereals, the farm households derived 50.6 per cent of energy from rice, 44.6 per cent from ragi and 4.8 per cent from wheat. Whereas, non-farm households derived 55.1 per cent of energy from rice, 39.4 per cent from ragi and 5.5 per cent from wheat (Table 4.9). That is, the non-farm households derived higher share of energy from rice and wheat and lower share from ragi in comparison to farm households. These results are in line with a priori expectations. Overall, cereals (78.8 %) contributed the highest share of energy followed by oils and fats, pulses, milk, vegetables, sugar and jaggery, egg and meat and fruits.

5.2 Spillover effects of subsidized food grains

The subsidized food enables a considerable saving in food expenditure of the poor households. Savings, thus obtained would be spent on other priority needs. A comparison of expenditure on food, with and without subsidy was made in the study and the results are discussed as below.

5.2.1 Food expenditure of rural households with and without subsidy

The variation in the food expenditure across different households was analyzed by computing coefficient of variation (CV). CV indicates the percentage deviation from the mean expenditure on food and this facilitates comparison across different households.

The CV was highest and more than hundred, for expenditures on fruits (151 %) and meat (102 %) whereas it was more than hundred for pulses, vegetables and milk in Behrman and Deolalikar (1987) study in rural south India. The CV in the presence and absence of food subsidy varied only in the case of cereals, oils and fats and sugar and jaggery, but the difference was negligible in the latter two food items (Table 4.10). The CV in cereal expenditure rises from 23 per cent in the absence of food subsidy to 52 per cent in the presence of food subsidy. The overall CV for the food expenditure would increase in the presence of food subsidy (30 %) as against the absence of food subsidy (26 %). Thus, the higher CV in the presence of food subsidy implied substantial fluctuations in the per capita food consumption expenditures across households.

In the presence of food subsidy (Table 4.11), the share of expenditure on cereals was 17.79 per cent and 28.12 per cent among AAY farm and BPL farm households respectively. This would increase to 42.79 per cent and 42.49 per cent in the absence of food subsidy (assuming they maintain same consumption habits). Correspondingly the share of the expenditure on all the other food groups would decline. The highest decline in the share of food expenditure was for milk and milk products, followed by miscellaneous, pulses, vegetables, meat, oils and fats, sugar and jaggery, egg and fruits.

In the presence of food subsidy (Table 4.12), the share of expenditure on cereals was 19.30 per cent and 28.01 per cent among AAY non-farm and BPL non-farm households respectively. This would increase to 43.28 per cent and 42.43 per cent in the absence of food subsidy (assuming they maintain same consumption habits). Correspondingly the share of the expenditure on all the other food groups would decline. The highest decline in the share of food expenditure was for milk and milk products, followed by miscellaneous, pulses, vegetables, meat, oils and fats, sugar and jaggery, egg and fruits.

These results showed the effect of food subsidy in increasing the consumption expenditure of other food groups, which would have decreased substantially in the absence of food subsidy. In the presence of food subsidy, the share of expenditure on cereals was lowest in the case of AAY and BPL households in comparison with APL households. But in the absence of food subsidy, the share of expenditure on cereals became higher in case of AAY and BPL households in comparison with APL households.

This shows the vulnerabilities of AAY and BPL households in the absence of food subsidy.

5.2.2 Consumption and household budget of rural households

Food and non-food expenditures constituted the Consumption budgets of the rural households. Inclusion of the income into the consumption budget resulted in the household budget. The changes in the consumption and household budgets in the presence and absence of food subsidy are captured to assess the spillover effect of subsidized food grains.

Education expenses, entertainment and recreation expenses and mobile phone expenses were highest among the APL households in comparison with AAY households (Table 4.13). Non-food expenditure was higher among the non-farm households in comparison to farm households as the former has higher monthly incomes in comparison to the latter. Overall, non-food expenditures were highest for educational expenses, followed by gas bill, travel expenses, entertainment and recreation expenses, mobile phone charges, health expenses, electricity charges and kerosene.

The food consumption expenditure was highest among APL non-farm households (Rs. 4370.47) and lowest among AAY farm households (Table 4.14). On the contrary, non-food expenditure was highest among APL farm households and lowest in AAY farm households. Correspondingly the total consumption expenditure was highest in APL farm households, followed by APL non-farm, BPL non-farm, BPL farm, AAY non-farm and AAY farm households. On the contrary, share of expenditure spent on food was highest in AAY farm households (67.24 %) and lowest among APL farm (53.14 %) households.

The share of non-food expenditure to total expenditure was highest among APL farm households (46.86 %) and lowest among AAY farm households (32.76 %). These results are in line with Rao (1998) who reported 30.41 per cent, 32.14 per cent and 34.94 per cent for very poor, moderately poor and non-poor middle income rural households, respectively.

In the absence of food subsidy (assuming that the households maintain same consumption habits), the share of total expenditure on food would increase for all the AAY and BPL households. The rise would be highest among AAY non-farm households (8.14 %), followed by AAY farm (7.91 %), BPL non-farm (5.96 %) and BPL farm (5.64 %) households. Correspondingly total expenditures also changes. This clearly indicated that food consumption expenditure would reduce significantly in the presence of food subsidy. The savings in terms of food consumption expenditure can be used to purchase other nutritive food items and prioritize non-food expenditures like education and health.

In both the scenarios of presence and absence of food subsidy, the total food consumption expenditure was marginally higher in farm households in comparison with non-farm households. On the contrary, total consumption expenditure was marginally higher among non-farm households in comparison to farm households. Thus, the share of expenditure on food which was 58.72 per cent (farm households) and 56.16 per cent

(non-farm households) in the presence of food subsidy, increased to 63.49 per cent and 60.97 per cent in the absence of food subsidy, respectively. The reason for higher share of food expenditure among farm households in comparison to non-farm households can be explained with respect to the differential income levels among them. This is based on the fact that with higher incomes people tend to spend more on non-food expenditures as against food expenditures.

The average monthly income per household was highest among APL non-farm households (Rs. 11960.00) and lowest among AAY farm (Rs. 5071.11) households. The APL non-farm households were mainly involved in businesses and salaried employment whereas AAY non-farm households were mainly involved in agricultural labour works. Farm households were mainly involved in agriculture and livestock rearing.

In the presence of food subsidy the monthly savings was highest in APL non-farm households (Rs. 4269.87), followed by AAY non-farm, BPL non-farm, APL farm, BPL farm and AAY farm households (Table 4.15). As witnessed from the above pattern, the non-farm households had higher savings in comparison to farm households. The assured source of income among non-farm households in comparison to farm households was the main reason for this pattern. Almost similar trend prevailed even in the absence of food subsidy. Taking into account the average retail prices and the CIP of wheat and rice, Bhatla *et al.,* (2015) estimated Rs. 78 per month per person as the total benefit to consumer in terms of savings assuming monthly per capita consumption to be 4 kg for wheat and 3 kg for rice. The difference in the estimated savings is attributed to the consideration of price in the study. Kundu and Srivastava (2007) have also maintained that PDS has enabled the savings and ensured food security to the poor households.

Both in the presence and absence of food subsidy, the share of income spent on food was higher among the low income households like AAY farm and BPL farm in comparison to their respective non-farm households. The values of the share of income spent on food are comparable with Shukla (2010) appropriately.

In the presence of food subsidy, APL households had higher savings in absolute terms whereas AAY households had highest savings as a proportion of total income. But in the absence of food subsidy APL households had highest savings in absolute terms and also as a proportion of total income.

In the presence of food subsidy, the share of income spent on non-food ranged from 19.95 per cent (AAY non-farm) to 37.02 per cent (APL farm) and it was assumed to be constant in the absence of food subsidy to facilitate the study of food subsidy's impact effectively.

In the presence of food subsidy, non-farm households had higher savings both in absolute terms and as a proportion of total income. In the absence of food subsidy, the share of income spent on food will increase and correspondingly the share of income saved will decrease by 9.9 per cent for farm households and 8.11 per cent for non-farm households.

5.2.3 Impact of food subsidy on food security

The food subsidy is likely to create a considerable savings on food expenditure which in turn could enable these households to fulfill other important and essential needs. Further, saving could also achieve a fair degree of equality in income distribution and consumption expenditure across different households. Gini coefficients were estimated to assess the inequality. The difference in Gini coefficient of food consumption expenditure per households for farm and non-farm households was negligible in comparison to per capita basis, both in the presence and absence of food subsidy (Table 4.16). This implied more inequality in food consumption expenditures among individuals than households. The decrease in inequality in the absence of food subsidy is in contrast with Ali and Adams (1996) who report a 1.2 per cent rise in the Gini coefficient.

Monthly income per capita was higher for farm households in comparison to non-farm households, whereas food consumption expenditure per capita was higher among non-farm households in comparison to farm households. The same pattern existed on per household basis but with a marginal difference. Non-farm households have to purchase all the food items from the open market and thus are exposed to the price volatility, which influences their consumption expenditures significantly in comparison to farm households who had better access to their own farm produce which smoothened their consumption expenditures. Thus, the non-farm households had higher inequality in food consumption expenditures per capita. In the case of monthly income per capita, farm households experienced huge variations due to weather, diseases, pests, un-remunerative prices and other factors in comparison to non-farm households who had assured supply of income except for agricultural laborers to some extent. Thus, the non-farm households had lower level inequality in monthly income per capita.

Overall, there was no major difference in the food consumption expenditure inequality per household and per capita both in the presence and absence of food subsidy. But there was a considerable difference in the Gini Coefficients between food consumption expenditures and monthly incomes.

In the absence of food subsidy the farm AAY households experienced ‘very high’ degree of vulnerability to food insecurity as they would spend more than 75 per cent of their total expenditure on food. But due to the presence of food subsidy, the share of total expenditure on food has decreased to 67.24 per cent indicative of only ‘high’ degree of vulnerability (Table 4.17). A similar kind of shift was witnessed in the case of AAY non-farm and BPL farm households from ‘high’ levels of vulnerability to food insecurity to ‘medium’ levels of vulnerability to food insecurity. This clearly showed the positive impact of food subsidy in relaxing the stress factors related to vulnerability to food insecurity. There were no such shifts in the vulnerability levels experienced by BPL non-farm households as they were at medium level both during the presence and absence of food subsidy. The farm and non-farm households also do not show any shift in the vulnerability levels to food insecurity. These results are in line with Asghar (2011), who also reported majority of households were at medium level of food security. In the absence of food subsidy, only AAY farm households were hungry based on Lipton (1998).

The subsidized food grains obtained through public distribution system meets the household food requirements partly. Thus the rural households fulfilled the remaining consumption requirements either by use of owned rice grown on their farms or purchase from open market or both. Given the limited access to resources like land and water, AAY farm and non-farm households worked more as labourers and thus it was found that none of them consumed owned rice, rather they purchased it from the open market. In this regard the food subsidy has helped them by reducing their complete dependence on the open market substantially. Majority of the BPL farm and APL farm households consumed owned rice whereas BPL non-farm and APL non-farm households consumed rice purchased from the open market (Table 4.18).

As ragi was not distributed through the public distribution system, all the households had to purchase it from the open market or use ragi cultivated on their own farms. As a result, majority of the AAY farm and BPL farm households consumed ragi cultivated in their own farms (Table 4.19). Since AAY households had limited access to land and water, they preferred ragi cultivation primarily to meet the household requirements. On the contrary, majority of the AAY non-farm and BPL non-farm households purchased ragi from the open market.

In general the farm households consumed more of rice and ragi from owned farm produce and thus their consumption was more vulnerable to the vagaries of monsoon, disease and pest attack and price instability. The non-farm households consumed more of rice and ragi from open market and thus their consumption was more vulnerable to the retail inflation, hoardings and price volatility. The vulnerabilities are more severe among non-farm households in comparison with farm households. Anyway the availability of food subsidy has assured the farm and non-farm households to minimal quantities of food grains like rice reducing their vulnerabilities significantly and substantially. Due to a bad crop, farm households may become severely vulnerable than non-farm households as they would have insufficient income to purchase the essential food items from the open market.

In the consumption of owned and purchased rice there was little difference among the farm and non-farm BPL households, as they had access to subsidized rice through public distribution system. But in the case of ragi which was not distributed through subsidized food grains scheme there was large difference among the farm and non-farm households in the consumption of owned and purchased ragi.

None of the households belonged to the ‘severely’ insecured category as a result of the provision of the food subsidy (Table 4.20). Majority of them were ‘mildy’ insecured (61.67 %) followed by ‘moderately’ insecured (34.17 %) and ‘secured’ (4.17 %) households. These findings were in partial conformity with the findings of Kiresur and Chourad (2015). There is no evidence of ‘ultra-poor’ households (Lipton, 1998) among the sample households and this could be attributed to the availability of food subsidy.

Among the various subsidy schemes, most of the farm households preferred fertilizer subsidy, seeds subsidy, education subsidy and health subsidy over food subsidy. But, non-farm households preferred food subsidy primarily, followed by, education subsidy, health subsidy, kerosene subsidy, gas subsidy, fertilizer subsidy and electricity subsidy (Table 4.21). Subsidy on fertilizers, seeds and agricultural inputs are more beneficial to farm households as they promote production activities and augment the beneficiary's income. Subsidies on health and education preferred by non-farm households have long run multiplier effects but they provided first preference to food subsidy as they would otherwise depend heavily on the imperfect open market which is a very costly affair.

5.3 Optimized food consumption plan for the rural households

Diet plans that identify the quantities of different foods to be consumed to provide the human body with required energy and nutrients play an important role in supporting long-term planning for balanced food intake. The food subsidy programmes heavily focused on rice and wheat neglecting other cereals and pulses which resulted in skewed supply affecting the balanced nutrient intake as per the RDA norms. Keeping in view, RDA norms, an attempt was made in the present study to develop normative plans (based on linear programming) so as to ensure balanced diet at the least possible cost.

5.3.1 Existing food consumption pattern

The consumption of an adult sedentary men (equivalent to one CU) and per person was highest from rice, followed by ragi, milk and milk products, other vegetables, wheat, green leafy vegetables, tur dal, meat, onion, tomato, potato, coconut, beans, oils and fats and sugar and jaggery. The availability of rice and wheat, oil and sugar at subsidized prices through the PDS, was one major reason for the above pattern. Most of the households cultivated ragi primarily and also maintained livestock. Thus, ragi and milk and milk products were second and third highest in the existing consumption pattern.

Correspondingly, the highest quantum of energy was derived from rice, ragi, wheat, coconut, oils and fats, miscellaneous, milk and milk products, groundnut, grams, tur dal, beans, sugar and jaggery (Table 4.22). All these food items were rich in calories (more than 398 kcal per 100 g). The highest amount of protein was obtained from rice, ragi, wheat, meat, tur dal and grams, fats from oils and fats, coconut, groundnut and milk and calcium from ragi, green leafy vegetables, milk and milk products. Main sources of vitamin C were green leafy vegetables, beans, other vegetables and tomato. All the households were appropriately deriving nutrients from their nutrient rich food sources but further emphasis (as described in the optimal plan) to optimize the food consumption in terms of meeting the RDA and cost constraints is essential.

Per capita expenditure was highest in the case of rice, followed by ragi, miscellaneous, milk and milk products and wheat. The food consumption expenditure was Rs. 33.93 per consumptive unit per day based on adjusted 24 hour recall method and it was Rs. 34.86 per person per day based on household monthly consumption method. The adjusted 24 day recall method provided precise estimate as it was based on the food

consumption of the previous normal day in comparison to the household consumption data was based on 30 days. The food consumption expenditure for existing pattern based on adjusted 24 hour recall method was comparable with 28.19 rupees as reported by Kiresur and Chourad (2015).

Household consumption method has generally higher values in comparison to the adjusted 24 hour recall method values. The major reason for this discrepancy is because the former considers the availability whereas the latter provides the actual intake values. The reasons for the difference between the two methods are appropriately accounted by Bouis and Haddad (1992).

5.3.2 Optimal food consumption plan based on adjusted 24 hour recall method

Optimal food consumption plan for major nutrients (Table 4.24) included ragi, grams, beans, oils and fats, milk and milk products and sugar and jaggery, while for all the nutrients (Table 4.25) it comprised of green leafy vegetables and groundnut in addition, as these are rich source of micronutrients like carotene and niacin, respectively.

As per the optimal plan, highest consumption was in the case of milk and milk products, followed by ragi and beans in both the cases. Energy was mainly derived from ragi, followed by milk and milk products, oils and fats, beans, sugar and jaggery and grams. The highest amounts of proteins were obtained from milk and milk products and ragi, fats from oils and fats and milk and calcium from ragi and milk and milk products.

In addition to these, the main sources of vitamin C were green leafy vegetables, beans and milk and that of carotene were from green leafy vegetables, milk and milk products, ragi, beans and grams.

The optimized food expenditure per consumptive unit per day was Rs. 34.49 for major nutrients and it increased to Rs. 36.56 for an optimal food expenditure plan inclusive of all the nutrients (exclusive of miscellaneous expenditure). Difference in the optimal consumption plan for major and all nutrients was in the inclusion of green leafy vegetables and groundnut. The optimized cost increased by 2.07 rupees implying that nutritious foods are costlier (Rambeloson *et al*., 2007).

5.3.3 Optimal food consumption plan based on household consumption method

Optimal food consumption plan for major nutrients (Table 4.26) included ragi, wheat, tur dal, onion, oils and fats, milk and milk products and sugar and jaggery, while for all the nutrients (Table 4.27), it comprised of tomato and grams in addition as the latter are the rich source of micronutrients like carotene.

Among the vegetables, onion and tomato contributed towards the share of energy derived (household consumption method) in place of beans (adjusted 24 hour recall method). The amount of tomato prescribed in the optimal plan seemed unrealistic but with the expansion of food basket (particularly including green leafy vegetables) the optimal plan will become realistic.

In addition to these, the main sources of vitamin C were tomato and milk and milk products and carotene were tomato, milk and milk products, oils and fats and wheat.

The optimized food expenditure per consumptive unit per day was Rs. 38.40 for major nutrients and it increased to Rs. 54.79 for an optimal food expenditure plan constrained for all the nutrients (exclusive of miscellaneous expenditure). Difference in the optimal consumption plan for major and all nutrients was in the inclusion of tomato and grams with exclusion of tur dal. The optimized cost increased by 16.39 rupees as the whole of carotene is obtained from its costly source, tomato. This rise was because of the limited options available in the food basket considered for optimization.

5.3.4 Existing versus optimal food consumption plan based on adjusted 24 hour recall method

Optimal food consumption plan for the sample respondents prescribes consumption of lesser amounts of cereals and higher amounts of pulses, vegetables and fruits, oils and fats, sugar and jaggery and animal products for both the major and all the nutrients. Whereas, Khan (1989) reported that the desirable dietary pattern can be achieved by reducing consumption of cereals, sugar and edible oils and increasing consumption of pulses and tubers. Per day per CU consumption of all the food items was higher in the optimal plan compared to the existing pattern for both major and all the nutrients

The cereal consumption which was 514.71 g in the existing pattern has been reduced to 282.93 g in the optimal plan. Thus the highly skewed share of energy obtained only from cereals in the existing pattern (the major reason being the provision of subsidized food grains) has been adjusted and corrected in line with the FAO recommendations (that cereal should contribute for only 40 per cent of the total dietary energy intake). Thus the present optimal plan recommends per CU per day consumption of 282.93 g of cereals only. This value contradicts 400 g of cereals recommended for the optimal plan by Anonymous (2013). The difference is mainly due to the differences in the values of the desirable dietary plan considered. The per CU daily expenditure on cereals decreased whereas it increased for animal products.

The per consumptive unit daily food expenditure incurred for major nutrients (Table 4.28) was higher for the optimal plan (Rs. 34.49) in comparison to the existing pattern (Rs. 29.97), as the nutritious food is generally costlier. The total optimized food consumption expenditure would increase to Rs. 38.45 and it is the least cost at which the RDA for the major nutrients is met along with the FAO recommendations.

Similarly, the per consumptive unit daily food expenditure incurred for all the nutrients (Table 4.29) was higher for the optimal plan (Rs. 36.56) in comparison to the existing pattern (Rs. 29.97). The total optimized food consumption expenditure would increase to Rs. 40.52 and it is the least cost at which the RDA for all the nutrients are met along with the FAO recommendations.

These results were in conformity with Kiresur and Chourad (2015), as they reported an increase from Rs. 28.19 (existing pattern) to Rs. 45.18 (optimal plan). Also the rise in the price is justified as the nutritious food is generally costlier (Rambeloson *et al.*, 2007).

5.3.5 Existing versus optimal food consumption plan based on household consumption method

Optimal food consumption plan for the sample respondents prescribes consumption of lesser amounts of cereals and pulses and higher amounts of vegetables and fruits, oils and fats, sugars and jaggery and animal products for both the major and all the nutrients. Most of the households were inadequate in the consumption of vegetables, fruits and animal products and the optimal plan also prescribes consumption of more such foods. As a result creating awareness on the nutritional importance of vegetables, fruits and animal products will help the households meet their balanced diet requirements effectively at the least cost.

The per day per person consumption of all the food items was higher in the optimal plan compared to the existing pattern for both major nutrients and all the nutrients. The cereal consumption which was 501.5 g in the existing pattern has been reduced to 280.87 g in the optimal plan, in line with the FAO recommendations.

The per capita daily food expenditure for major nutrients (Table 4.30) per person on cereals decreased from Rs. 14.16 (existing pattern) to Rs. 6.65 (optimal plan) while it increased from Rs. 7.21 to Rs. 17.09 and Rs. 3.39 to Rs. 7.86 for animal products and vegetables and fruits, respectively. The cost incurred was higher for the optimal plan (Rs. 38.40) in comparison to the existing pattern (Rs. 30.90). The total optimized daily food consumption expenditure per person would increase to Rs. 42.36 and it is the least cost at which the RDA for all the major nutrients are met along with the FAO recommendations. These results are comparable to Rs. 45.18 per capita per day reported by Kiresur and Chourad (2015).

The increase in the per capita daily food expenditure for all the nutrients (Table 4.31) was highest for vegetable and fruits from Rs. 3.39 (existing pattern) to Rs. 23.13 (optimal plan) and they form a major source in meeting the requirements of vitamin C and carotene. The cost incurred was significantly higher for the optimal plan (Rs. 54.79) in comparison to the existing pattern (Rs. 30.90). The total optimized food consumption expenditure would increase to Rs. 58.75 and it is the least cost at which the RDA for all the nutrients are met along with the FAO recommendations. But by expanding the options available in the food basket, the optimal is expected to come down.

5.4 Relationship between calories, nutrients, expenditures and income

The calories and nutrients intake obtained using the adjusted 24 hour recall method are compared with the expenditures and incomes. The relationships thus derived helps validation of the a priori theories effectively. The results obtained from through the multiple linear regression and scatter plots are discussed as follows.

5.4.1 Factors influencing consumption expenditures

The type of ration card, household size and type of food habit determined the monthly food consumption expenditure, significantly both in the presence and absence of food subsidy (Table 4.32). Monthly income and the type of ration card were significant determinants of monthly non-food consumption expenditure. Thus, monthly income, type of ration card, household's size and the type of food habit significantly determined the total consumption expenditure of rural households. The variable type of household was not significant in determining the expenditure of rural households.

The food expenditure was significantly determined by the type of ration card and not type of household. Based on the type of ration card, the subsidized food grains distributed for the AAY and BPL households influenced their food expenditures significantly. A priori it was expected that farm households should have lower consumption expenditure in comparison to non-farm households as the former will have greater access to the farm produce (for which no explicit costs are incurred). In line with the expectation, non-farm households had their food consumption expenditures 125.17 rupees (in presence of subsidy) and 96.21 rupees (in absence of subsidy) higher than the farm households, but these values were statistically insignificant. Thus being a farm or non-farm household did not influence the food consumption expenditure significantly.

Households having non vegetarian food habits incurred an additional expenditure of 385.39 rupees (in presence of subsidy) and 403.92 rupees (in absence of subsidy) over the expenditure incurred by vegetarian households. These values were significant, implying that the type of food habit influenced the food consumption expenditure significantly. As expected the household size had a positive and significant influence on the food expenditures. The food expenditure will increase by 463.93 rupees in the presence of food subsidy and by 493.86 rupees in the absence of food subsidy for increase in every one additional household member. The land owned and monthly incomes per household were not influencing the monthly food expenditures significantly though they had positive signs as per a priori expectations. But the monthly income significantly determined the non-food expenditures though the magnitude was very less. These results were in contrast to Geetha (2011) and Chourad (2012) as they reported significant influence of income on consumption expenditures.

5.4.2 Factors influencing calorie and nutrients intake

Being a farm or non-farm household did not influence the calorie and nutrients intake significantly except for calcium intake (Table 4.33). The non-farm household had 140.10 mg lesser calcium intake in comparison to farm households. The prevalence of well-established dairy enterprises and ragi cultivation in the study area explains the significance of the type of household in determining the calcium intake.

The type of ration card had significant influence on the intake of calorie. This is in line with a priori expectation as the PDS provides subsidized food grains which are rich in calorie but highly deficient in other nutrients, particularly micronutrients like carotene. This is evident though the type of ration card variable which is not significantly determining the calcium and carotene intake. This result warrants the reorientation and

rationalization of the food subsidy scheme to ensure nutritional security along with calorie security.

The household size has negative and significant relationship with the energy and nutrients intake in line with the a priori expectation. The protein and calcium intake were significantly influenced by the type of food habit prevailing among the households. The non-vegetarian household had 8.66 g and 120.58 mg of higher intake of protein and calcium in comparison to the vegetarian household.

5.4.3 Expenditure elasticities of food consumption expenditures

The expenditure elasticity for fruits (1.923) and milk and milk products (1.559) were greater than one significantly (Table 4.34). This implies that fruits and milk and milk products were luxurious goods as their consumption increases with the increase in total consumption expenditure (which was used as a proxy for monthly incomes). The expenditure elasticity for cereals (-1.095) was negative and significant, as per the a priori expectations. These values are in conformity with Darmon *et al*. (2002) and Gandhi and Zohu (2010).

5.4.4 Relationship between monthly income and food expenditures

As the monthly income per household increases, the share of income spent on food decreases. This provided a clear evidence for Engel's law. The logarithmic and power function provided a good fit with high R square value of around 64 per cent. As the monthly income per household increases, the share of total expenditure on food decreases.

5.4.5 Relationship between household monthly income and energy and nutrient intake per consumptive unit

Household size and type of ration card influenced the per capita calorie intake significantly. Per capita calorie intake was not influenced by household monthly income, significantly. Since the R square is low, it is assumed that the significance of the variables will not change much when other variables are controlled to facilitate further meaningful interpretation. Thus, income policies prove to be ineffective in improving the per capita calorie intake as supported by other studies. In this regard, the in kind food subsidy (through Public distribution system) is better in comparison to direct income payments or income augmentation of the rural households, particularly when the objective is to achieve calorie adequacy or security. But since the calorie security is almost achieved through subsidized food gains, greater emphasis on ensuring balanced diet is essential as evident from the survey results and articles.

Inclusion of fruits, egg and meat had significant impact on calcium, vitamin C and carotene responses plotted against household's monthly income. Also the calorie and fats intake responded significantly.

5.4.6 Cost of calories in terms of expenditure and income

The cost per 1000 calories was lowest for AAY households and highest for APL households (Table 4.35). These results were in conformity with Asghar (2011). The calorie derived per rupee of food expenditure was highest among AAY farm households and lowest among APL farm households. This implied that the calorie derived among APL households was costlier per rupee of expenditure incurred in comparison to AAY and BPL households. The AAY and BPL farm households had higher calorie intake per rupee of expenditure in comparison to their respective non-farm households except for APL households.

The decrease in the calorie intake due to the absence of food subsidy was highest among AAY farm households and it was least among BPL non-farm households. The AAY farm households will be the major sufferers of the removal of food subsidy followed by AAY non-farm, BPL farm and BPL non-farm households. The highest amount of savings due to the food subsidy was among AAY non-farm households. The AAY and BPL non-farm households had higher savings in comparison to their respective farm households. This implied that the non-farm households have highly benefitted due to the food subsidy in comparison to farm households.

Calorie derived per rupee of income was highest for AAY farm households and lowest among APL non-farm households. Correspondingly, the income spent per 1000 calories was lowest among AAY farm households and highest among APL non-farm households. All AAY, BPL and APL farm households had higher calorie intake per rupee of income spent in comparison to their respective non-farm households. On the contrary, a reverse trend was witnessed for the income spent per 1000 kcal.

Farm households had higher calorie derived per rupee of food expenditure in comparison to non-farm households (Table 4.36). This was mainly due to the farm household's access to their own farm produce. On the contrary, non-farm households incurred higher cost per 1000 calories (kcal) in comparison to farm households. Since the non-farm households met their major share of household food requirements from the open market, they incurred higher expenditure in comparison to farm households.

The additional calories derived per rupee of expenditure, in the presence of food subsidies was higher for farm households in comparison to non-farm households. But non-farm households were able to save more in comparison to farm households due to the subsidy.

Farm households derived more calories per rupee of income in comparison to non-farm households. On the contrary, farm households spent lesser income to derive 1000 calories in comparison to non-farm households. These results indicated that farm households obtained cheaper calories while the non-farm households derived calories from expensive sources.

VI SUMMARY

A brief summary of the research along with the salient findings are presented in this chapter. This chapter provides various policy options and alternatives for the policy makers, administrators and researchers. The niche areas for further research are also presented.

6.1 Introduction

Food is the most essential basic necessity for the survival of all human beings. But, around 800 million to 1 billion people suffer from hunger, globally. Around 2 billion people suffer from micronutrient deficiencies according to the Global Hunger Index, 2015 report. India still has the second-highest estimated number of undernourished people in the world. This is despite the fact that India spends nearly one percent of its Gross Domestic Product (GDP) on maintaining its food assistance programmes like the Public Distribution System (PDS).

The Food and Agricultural Organization (FAO) states that food security emerges when all people at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. In view of the hunger and malnutrition issues prevailing in our country, Government has undertaken policies and programmes to provide essential food items at subsidized rates for the poor households.

PDS is an Indian food security system which provides subsidized food items to the poorer households. The main objective of the PDS is to provide essential food items at cheaper and subsidized prices to the consumers so as to insulate them from the impact of increasing prices of these commodities and maintain the minimum nutritional status of the population. This study aims at assessing the impact of subsidized food grains on the food security of rural households

6.2 Objectives

1. To assess the consumption pattern of food items and calorie and nutrient derivation among rural households.
2. To assess the spillover effects of subsidized food items on food security and other socio-economic dimensions of rural households.
3. To optimize the food grain consumption to minimize the cost according to nutrient and budget criteria.
4. To analyze the relationships between calories, nutrition, expenditures and incomes.

6.3 Study area and sampling design

Gubbi taluk of Tumakuru district was selected based on the average number of ration shops, BPL and AAY card holders served in the taluk as it almost matched with the district averages The required data were collected from both primary and secondary sources. The primary data was collected by personal interview method, from the rural

households comprising Antyodaya (AAY) households, Below Poverty Line (BPL) households and Above Poverty Line (APL) households using a pre tested structured schedule. Based on the proportion of households having AAY, BPL and APL cards, the sample size for each type of ration card was decided. The classification of farm and non-farm households was based on the share of annual net income from agriculture and allied activities to the total annual net income. Secondary data on the study area and the scale of issue of subsidized food grains, nutritive value of Indian foods, consumptive units and values for the recommended dietary allowances (RDA) for energy, protein, fat and minerals were collected from various sources.

A Multi stage sampling procedure was adopted. In the first stage, two hoblis (Nittur and Kadaba) were randomly selected. In the second stage, two panchayats from each hobli were selected considering the proportion of respondents available in each category. Nittur and Tyagatur panchayats from Nittur hobli and Kadaba and Belavatta panchayats from Kadaba hobli were selected making a total of four panchayats. In the third stage, two villages were selected randomly from each panchayat. Nittur village and Hesarahalli from Nittur panchayat, Tyagatur village and Kodinagenahalli from Tyagatur panchayat, Kadaba village and Adagondanahalli from Kadaba panchayat and lastly Belavatta village and Pura village from Belavatta panchayat were selected randomly making a total sample of 8 villages. At the last stage fifteen households were chosen randomly from each village.

Samples of 15 respondents comprising all the six categories (AAY farm, AAY non-farm, BPL farm, BPL non-farm, APL farm and APL non-farm) proportionately were selected from each village. Thus, total number of sample respondents interviewed for analyzing the impact of subsidized food grains was 120 rural households.

6.4 Major findings

1. AAY farm households had a mean cereal intake of 494.9 g which was significantly lower than that of the non-farm AAY households (561.9 g). Whereas in the case of APL households, farm households had higher cereal intake in comparison to that of non-farm households. All the households were adequate in cereal consumption. In fact the cereal consumption was 26.60 per cent to 49.80 per cent higher than the recommended level among the selected households.
2. The consumption of pulses was highest among APL farm households and lowest among AAY farm households. Only APL farm households were adequate in pulses consumption. Fruits and vegetables consumption was inadequate among all the sample households across all categories in comparison with RDA. These were the only major food groups where the inadequacy was more than 60 per cent. All the household categories were adequate in consumption of sugar and jaggery and oils and fats, but inadequate in the milk consumption. All household were highly inadequate in the egg and meat consumption.
3. AAY households consumed highest quantity of cereals in comparison to BPL and APL households. Only APL households were adequate in pulses consumption. AAY households consumed least amounts of fruits and vegetables in comparison to BPL

and APL households. All the households were adequate in consumption of oils and fats and sugar and jaggery but inadequate in milk and milk products, egg and meat consumption. There is no significant difference in the consumption pattern between farm and non-farm households.

4. The mean energy intake of AAY non-farm households was the least among all categories. All the households were nearly adequate in terms of energy intake, except AAY non-farm household, where the adequacy was 87.5 per cent. The protein intake was highest among AAY farm households and lowest among AAY non-farm households.

5. All the households across all the categories had higher levels of adequacy in respect of calcium and thiamine intake, whereas inadequacies were reported in intake of fats, iron, riboflavin, niacin and carotene. All the AAY, BPL and APL farm households had higher intake of calcium in comparison with their respective non-farm categories. The calcium adequacy was highest in the case of AAY farm households and least in the case of AAY non-farm households.

6. There was a significant difference in the calorie intake of AAY and APL households. The protein consumption was almost similar among AAY, BPL and APL households with highest protein intake among APL households. Fat and calcium intake was highest among AAY households. All the households were adequate in consumption of calcium and thiamine but inadequate in consumption of iron, riboflavin, niacin and carotene. Intake of vitamin C and carotene was highest in case of AAY households and lowest among BPL households.

7. There was no significant difference in the energy and nutrient intake of farm and non-farm households except for carotene. Both the farm and non-farm households were more than adequate in intake of calcium and thiamine, but inadequate in the intake of other nutrients like protein, fats, iron, riboflavin, niacin and carotene. Intake of vitamin C was adequate among farm households and inadequate among non-farm households.

8. Among the cereals, rice contributed more than half of total energy derived among all categories except APL farm households. Share of energy derived from rice was maximum among AAY non-farm households. AAY, BPL and APL non-farm households had higher share of energy derived from rice compared to AAY, BPL and APL farm households.

9. The highest share of energy from cereals was derived by AAY non-farm and AAY farm households, whereas in the case of oils and fats and pulses, the highest share was derived from APL non-farm and APL farm households. The remaining share of energy was derived from vegetables, milk and milk products, sugar and jaggery, egg and meat and fruits.

10. The highest energy derived from rice was in AAY households whereas in the case of wheat highest energy was derived from APL households. In the case of ragi the highest energy derived was by BPL households. The second highest share of energy was derived from oils and fats. The third highest source of energy was from

vegetables in the case of AAY household, but from pulses in the case of BPL and APL households.

11. Overall, cereals (78.8 %) contributed for the highest share of energy followed by oils and fats (7.4 %), pulses (3.9%), milk and milk products (3.6 %), vegetables (3.0 %), sugar and jaggery (1.9 %), egg and meat (1.0 %) and fruits (0.4 %).

12. The coefficient of variation was highest for expenditures on fruits (151 %) and meat (102 %). The coefficient of variation in cereal expenditure rises from 23 per cent in the absence of food subsidy to 52 per cent in the presence of food subsidy. The overall coefficient of variation of the food expenditure is high in the presence of food subsidy (30 %) as against the absence of food subsidy (26 %).

13. In the presence of food subsidy, the expenditure of AAY farm households on cereals was highest, followed by milk and milk products, miscellaneous, pulses, vegetables, meat, oils and fats, sugar and jaggery, egg and fruits. In the absence of food subsidy (assuming they maintain same consumption habits) the expenditure on cereals increases to Rs. 1489.62, oils and fats to Rs. 205.47 and sugar and jaggery to Rs. 83.25. Similar trends were observed for BPL farm, AAY non-farm and BPL non-farm households.

14. In the presence of food subsidy, the share of expenditure of AAY farm households was highest for cereals (17.79 %), followed by milk and milk products, miscellaneous, pulses and vegetables. In the absence of food subsidy the share of expenditure on cereals would increase to 42.79 per cent, whereas share of the expenditure on all the other food groups would decline correspondingly. The highest decline in the share of food expenditure was for milk and milk products, miscellaneous, pulses and vegetables. Similar trends were observed for BPL farm, AAY non-farm and BPL non-farm households.

15. Non-food expenditure was highest among non-farm households (Rs. 2655.57) in comparison to farm households (Rs. 2435.67). Overall, non-food expenditures were highest for educational expenses (Rs.985.85), followed by others (Rs. 444.31), gas bill (Rs.386.57), travel expenses (Rs.318.29), entertainment and recreation expenses (Rs.293.83), mobile phone charges (Rs.180.96), health expenses (Rs. 154.70), electricity charges (Rs.154.92) and kerosene (Rs.126.18).

16. In the presence of food subsidy, share of total expenditure on food was 67.24 per cent among AAY farm households and 59.98 per cent among BPL farm households, which would rise to 75.16 per cent and 65.62 per cent respectively in the absence of food subsidy. Whereas APL farm households spent nearly half of their total expenditure on food and the remaining half on non-food expenditure. In the presence of food subsidy, share of total expenditure on food was 64.42 per cent among AAY non-farm households and 53.31 per cent among BPL non-farm households, which would rise to 72.56 per cent and 59.27 per cent respectively in the absence of food subsidy. Whereas APL farm households spent 56.83 per cent of their total expenditure on food and the remaining 43.17 per cent on non-food items.

17. In the absence of food subsidy, the rise in food expenditure was highest among AAY non-farm households (8.14 %), followed by AAY farm (7.91 %), BPL non-farm (5.96 %) and BPL farm (5.64 %) households.

18. In the presence of food subsidy the total food consumption expenditure was higher in farm households than in non-farm households. On the contrary, total consumption expenditure was highest in non-farm households in comparison to farm households. The same pattern prevailed in the absence of food subsidy

19. The average monthly income was highest among APL non-farm households (Rs. 11960.00) and lowest for AAY farm (Rs. 5071.11) households. In the presence of food subsidy the monthly savings was highest in APL non-farm households (Rs. 4269.87) and lowest for AAY farm (Rs. 1557.81) households.

20. The share of income spent on food was highest among AAY farm households (46.59 %) and lowest among AAY non-farm households (36.54 %) in the presence of food subsidy. In the absence of food subsidy, the share of income spent on food was highest in AAY farm households (68.66 %) and lowest among APL non-farm households (36.54 %).

21. The share of income spent on non-food ranged from 19.95 per cent (AAY non-farm) to 37.02 per cent (APL farm). Based on this, proportion of income saved was highest in AAY non-farm households (43.93 %) and lowest among APL farm households (21.00 %) in the presence of subsidy. On the contrary, in the absence of food subsidy, proportion of income saved was highest in APL non-farm households (35.70 %) and lowest among AAY farm households (8.65 %).

22. In the presence of food subsidy, proportion of income saved was 30.72 per cent among AAY farm households and 24.19 per cent among BPL farm households, which would decrease to 8.65 per cent and 11.76 per cent, respectively in the absence of food subsidy. Similar pattern was witnessed in case of non-farm households

23. The total savings was higher in non-farm households in comparison to farm households, both in the presence and absence of food subsidy. In the presence of food subsidy, proportion of income saved was 24.20 per cent among farm households, which would decrease to 14.29 per cent in the absence of food subsidy.

24. In the absence of food subsidy, the share of income spent on food would increase by 9.9 per cent for farm households and 8.11 per cent for non-farm households. Correspondingly the share of income saved will decrease by the 9.9 per cent for farm households and 8.11 per cent for non-farm households.

25. In the presence of food subsidy, inequality in food consumption expenditure per household and per capita was higher as against the absence of food subsidy for both the farm and non-farm households.

26. Inequality in food consumption expenditure per capita was higher for non-farm households (0.161) than farm households (0.148), whereas inequality in monthly income per capita was higher for farm households (0.328) in comparison to non-farm households (0.281).

27. In the absence of food subsidy the farm AAY households experienced 'very high' vulnerability to food. But due to the presence of food subsidy the share of total expenditure on food had decreased to 67.24 per cent indicative of only 'high' vulnerability. A similar kind of shift was witnessed in case of AAY non-farm and BPL farm households from 'high' levels to 'medium' levels of vulnerability to food insecurity.

28. Fifty per cent of BPL farm households consumed rice cultivated from their own farm while 43.33 per cent of the BPL non-farm households purchased rice from open market. None of the AAY households consumed rice cultivated from their own farm, but 6.67 per cent of AAY farm households and 13.33 per cent of non-farm households purchased rice from open market.

29. As a result, 73.33 per cent of BPL farm households and 73.33 per cent of AAY farm households consumed ragi cultivated on their own farms. On the contrary, 63.33 per cent of the BPL non-farm households and 66.67 per cent of the AAY non-farm households purchased ragi from the open market.

30. In terms of percentages, 4.17 per cent of households were secured, 34.17 per cent of households were moderately insecured and 61.67 households were mildly insecured. There were no households which were severely insecured.

31. Among the various subsidy schemes, majority of the farm households preferred fertilizer subsidy, followed by seeds subsidy, subsidy on other agricultural items, education subsidy, health subsidy, food subsidy and electricity subsidy. Whereas non-farm households preferred food subsidy, followed by education subsidy, health subsidy, kerosene subsidy, gas subsidy, fertilizer subsidy and electricity subsidy.

32. The food expenditure per consumptive unit per day was Rs. 33.93 under the existing food consumption pattern based on adjusted 24 hour recall method.

33. The food expenditure per person per day was Rs. 34.86 under the existing food consumption pattern based on household monthly consumption method.

34. Optimal food consumption plan for major nutrients, based on adjusted 24 hour recall method included ragi, grams, beans, oils and fats, milk and milk products and sugar. The optimized food expenditure per consumptive unit per day was Rs. 34.49 (excluding miscellaneous expenditure).

35. Optimal food consumption plan for all nutrients, based on adjusted 24 hour recall method included ragi, green leafy vegetables, grams, beans, oils and fats, milk and milk products, sugar and jaggery and groundnut. The optimized food expenditure per consumptive unit per day was Rs. 36.56 (excluding miscellaneous expenditure).

36. Optimal food consumption plan for major nutrients, based on household consumption method included ragi, wheat, tur dal, onion, oils and fats, milk and milk products and sugar. The optimized food expenditure per consumptive unit per day was Rs. 38.40 (excluding miscellaneous expenditure).

37. Optimal food consumption plan for all nutrients, based on Household consumption method included ragi, wheat, grams, onion, tomato, oils and fats, milk and milk

products and sugar. The optimized food expenditure per consumptive unit per day was Rs. 54.79 (excluding miscellaneous expenditure).

38. The cost incurred was higher for the optimal plan (Rs. 34.49) in comparison to the existing pattern (Rs. 29.97), for major nutrients, based on adjusted 24 hour recall method. The cost incurred was higher for the optimal plan (Rs. 36.56) in comparison to the existing pattern (Rs. 29.97) for all the nutrients, based on adjusted 24 hour recall method.

39. . The cost incurred was higher for the optimal plan (Rs. 38.40) in comparison to the existing pattern (Rs. 30.90), for major nutrients, based on household consumption method. The cost incurred was significantly higher for the optimal plan (Rs. 54.79) in comparison to the existing pattern (Rs. 30.90), for all the nutrients, based on household consumption method

40. The type of ration card, household size and type of food habit, significantly determined the monthly food consumption expenditure both in the presence and absence of food subsidy. Monthly income and the type of ration card were significant determinants of monthly non-food consumption expenditure. Thus monthly income, type of ration card, household size and the type of food habit significantly determined the total consumption expenditure of rural households.

41. Calorie intake per day per CU was significantly influenced by type of ration card and household size. The BPL households, the household size and type of food habit had a significant influence on the protein intake per day per CU. Only the household size affected the fats intake per day per CU significantly. Type of household, household size and type of food habit had significant influence on the calcium intake per day per CU. The type of ration card (BPL) and the household size had significant influence in determining the intake of vitamin C and carotene per day per CU.

42. The expenditure elasticity for fruits and milk and milk products were greater than one significantly. The expenditure elasticity for cereals was negative and significant

43. As the monthly income per household increases, the share of income spent on food decreases, exponentially. As the monthly income per household increases, the share of expenditure on food to total expenditure decreases.

6.5 Policy implication / Recommendations

1. The rural households were inadequate in the consumption of proteins and milk and milk products. In terms of vegetables, fruits and egg and meat consumption, they were severely inadequate. This has also correspondingly reflected in the nutrients intake as the households were inadequate in fats, iron, riboflavin, niacin and carotene intake. Thus educating these households in terms of the nutritive value of these food groups is strongly recommended. Increase in subsidies may not be a solution for this as most of these nutrients are not significantly responsive to incomes (i.e. increase in the real income due to subsidies).

2. The greatest contribution of food subsidy is evident in terms of savings due to significant reductions in food expenditures. It has greatly smoothened the food

expenditures of the rural households. These saving needs to be mopped up through formal sources like Jan Dhan to make it more productive and accountable.

3. Both the farm and non-farm households were exposed to vulnerabilities but non-farm households were relatively more vulnerable during a good crop season. During a bad crop season, farm households were most vulnerable as they face dual loss. Firstly, due to loss of crop and secondly, no incomes to buy the food from the open market whereas the non-farm households would have at least some reliable sources of incomes. Thus provisioning equal amount of food subsidy through crop insurance schemes and other risk mitigating mechanism for farm households is more beneficial than food subsidy itself. In addition to food subsidy, managing the retail inflation and price volatilities will help reduce the vulnerabilities of non-farm rural households significantly.
4. Since farmers are basically producers of food, more subsidies on fertilizers and other agricultural inputs will provide greater benefits to them in comparison to food subsidy. Thus, the policies favouring the former will initiate the production activity significantly in comparison to the latter. Also, the government policies should favour more towards education and health subsidies as they have enormous multiplier effects along with long term benefits.
5. The subsidized food items through PDS has greatly helped in attainment of calorie security but has severely lacked in terms of providing balanced diet security (as majority of the total calorie share is still being obtained from staple cereals like rice and ragi). This warrants a strong need for reorientation of the existing PDS system.
6. Though there were no 'severely' insecured households as a result of food subsidy, but, majority of the households still remain 'mildly' insecured. This warrants other innovative ways of tackling the food security problem rather than just relying on food subsidies.
7. Exclusion of rice from the optimal plan is due to its relatively higher cost in comparison to ragi. The former is also deficient in nutrients like calcium. The optimal plan prescribed in the study provides only insights to reorient the PDS system in terms of ensuring balanced diet security (based on FAO's desirable dietary plan).
8. The optimized food consumption plan has important implications for deriving the poverty line by incorporating the minimum non-food expenditures.
9. With the availability of food subsidy, the households diversify towards costlier sources of calorie and needs to be contained, particularly in cases where the increase in the real incomes were completely diverted towards non-food expenditures and unnecessary luxuries.
10. It is recommended to continue this food subsidy programme as it has helped in achieving the food security (in terms of calories) among the poor rural households but proper reorientation and rationalization will benefit more genuine rural households to a larger extent particularly in meeting the nutrient adequacy.

6.6 Future line of research

1. A more representative sample should be studied to obtain more reliable results.
2. An enlarged food basket will provide more consistent results.
3. More standardized methodologies for assessing the impact of food subsidy needs to be designed.
4. Periodical studies have to be taken up consistently.
5. The analysis of the linkages between food subsidy and agricultural development requires more focused research.
6. Analysis of the other modes of transfer of food subsidy like Conditional in kind transfers.
7. Rationalization of food subsidies.
8. The study can be extended to assess the impact of food subsidy on other components of livelihood security and in turn empowerment of rural households.

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APPENDIX

SCHEDULE

Impact of Subsidized food grains on the food security of rural households – An economic analysis

Nagesh N S, PALB 3098, University of Agricultural Sciences, Bangalore

General information

i. Name of the respondent:
ii. Age:
iii. Village:
iv. District:
v. Occupation:
vi. Family type: Nuclear/ Joint

Type of ration card:

Year availed:

Family information:

Name	Gender	Age	Education	Occupation	Annual income

Socio economic variables

1. Caste

- General
- Other backward caste
- SC/ST

2. Institutional Participation: Are you a member of the following organizations?

Particulars	Name of the organization	Member	Participation		
			Regularly (R)	Occasionally (O)	Never (N)
Village panchayat					
Cooperative society					
Milk cooperatives					
Mahila Mandal					
Zilla panchayat					
Any other (Specify)					

3. Mass media participation

a. Do you listen to radio programmes? Yes / No
If yes, how often you listen

Particulars	Programme	Frequency of listening per week		
		R	O	N
General programmes (including News etc.)				
Agricultural programmes				
Developmental programmes				

b. Do you view to Television programmes? Yes / No
If yes, how often you listen

Particulars	Programme	Frequency of listening per week		
		R	O	N
General programmes (including News etc.)				
Agricultural programmes				
Developmental programmes				

c. Do you subscribe to any newspaper? Yes / No

Do you read newspaper? Yes / No

If yes how often do you read?

1. On Agriculture Regular / Occasional/ Never
2. Other News Regular / Occasional / Never
3. Do you subscribe to any magazines? Yes / No
4. Do you subscribe to any development magazines? Yes / No

sLand holding details:

Type of land	Owned		Leased in		Leased out	
	Area (Acres)	Market value of land (Rs.)	Area (Acres)	Rent paid per season (Rs.)	Area (Acres)	Rent received per season (Rs.)
Dry land						
Irrigated land						
Open well						
Tube well						
Tank						
Canal						
Fallow land						

In parentheses (,) , some major changes in the area 2 and 4 years before respectively

Livestock details including milking animals:

Type of animal	Number(s)	Means of purchase	Investment (Rs.)	Expenditure (Rs.)	Returns (Rs.)	Present value (Rs.)
Cow						
Buffalo						
Bullock						
Poultry						
Sheep/Goat rearing						
Any others (specify)						

In parentheses (,) , some major changes in the number of livestock owned 2 and 4 years before respectively

Part I

Food consumption pattern (The 24 hour diet recall method):

Particulars	Quantity	Ingredients used for preparation	Amount spent for preparation	Approximate quantity consumed		
				Men	Women	Children
Breakfast						
Lunch						
Snacks/ Beverages						
Dinner						

Household consumption and expenditure on food items

Food items	Monthly Consumption (Kg/month)	Source of Purchase from						Monthly expenditure on food (Rs.)
		Farm grown		Fair price shops		Open market		
		Qty	Rs./unit	Qty	Rs./unit	Qty	Rs./unit	
Cereals								
1. Rice 2. Wheat 3. Ragi 4. 5.								
Pulses								
1. Red gram 2. Green gram 3. Black gram 4. 5.								
Vegetables								
1. 2. 3. 4.								
Fruits								
1. 2. 3.								
Edible oil								
1. Loose 2. Refined								
Sugar								
Milk								
Meat								
Eggs								

Household non-food expenditure

Particulars	**Rs./month**	**Frequency /month**	**Frequency/year**
Mobile bill			
Electricity bill			
Gas bill			
Cable bill			
House rent			
Water Bill			
School fees			
Health expenses			
Petrol/Diesel			

Part II

Was the money saved from Anna Bhagya Scheme substantial or not? Yes / No

and if Yes,

How much could you save (from the past two years)	
Per month (Rs.)	
Per year (Rs.)	

Investment of saved money from the past two years because of Anna Bhagya scheme

Invested on	Amount invested
Land development	
House up gradation	
Education improvement	
Health improvement	
Business initiatives	
Other assets 1. Radio 2. Television 3. Mobile phone 4. Gas stove 5. Refrigerator 6.	

Subsidy prioritization among the households

Types of subsidy	Un important	Important	Most important
Education			
Electricity			
Fertilizers			
Seeds			
Health			
Food			
Pension			
Diesel/Petrol			
Others			

Did the food subsidy have significant effect improving?

Particulars	Possible	Not possible
Access to health		
Access to education		
Access to assets		

Cropping details

Season	Area (acres)	Cost of cultivation	Main product yield (quintals)	By product yield (quintals)	Price (Rs./quintal)	Total revenue (Rs.)
Kharif 1. 2. 3.						
Rabi 1. 2.						
Summer 1. 2.						

Investment on Farm structure

Sl. No.	Nos.	Initial investment	Years of purchase	Average life (yrs)	Annual repair (Rs.)	Purchase value	Remarks
Farm equipment							
Sprayer							
Power tiller							
Tractor							
Irrigation pump							
Bore well							
Buildings							
Cattle shed							
Pump house							

Have you benefitted from Poverty alleviation programmes?

Name of the programme	Kind of benefit received	Through which department or institution program is implemented	Year of benefit availed	Total benefit or subsidy received (Rs.)	Transaction cost		
					Time spent for obtaining benefit	Expenditure involved in obtaining the benefit (Rs.)	Rents paid (Rs.)

Access to Health Services

Sl. No.	Name of the member	Age of incidence	Case of incidence	Years of ill health	Expenditure (Rs. /unit)

Do you have Yeshasvini health card?

Are you able to avail the services of ASHA?

Access to Education Services

Medium of instruction in your Children's education: English / Kannada

Access to credit

Do you have a bank account? Yes / No If yes,

Bank name		
From which year		
How much you are able to save monthly		
Distance to the bank		

Availing services of PDS:

Availability of Food grains	
1. Rice	Regular / medium / very irregular
2. Wheat	Regular / medium / very irregular
3. Sugar	Regular / medium / very irregular
4. Edible oil	Regular / medium / very irregular

Quality of food grains	
5. Rice	Low / medium / high
6. Wheat	Low / medium / high
7. Sugar	Low / medium / high
8. Edible oil	Low / medium / high
Distance from the Fair price shop	Near / moderate / far away

Impact of price volatility If High, then in which commodities	
1.	Low / Reasonable / high
2.	Low / Reasonable / high
3.	Low / Reasonable / high

Do you have Aadhar card? Yes / No

If no, reason

If cash equivalent to the amount of food grains is given? Yes / No

Constraints	Reasons	Un important	Important	Most important
	Accessibility to bank			
	Lack of education			
	Risk of wasteful expenditure			
Advantages				
	Spending based on priority			
	Will get interest on all transferred money			
	Will help plug leakages			

Number of visits to FPS per month:

Transaction costs of obtaining benefits from PDS

Particulars	Transaction cost		
	Time spent for obtaining benefit	Expenditure involved in obtaining the benefit (Rs.)	Rents paid (Rs.)
Ration card			
In obtaining the monthly rations			

Are you aware of the following information?

If yes,

Sources of information	Importance of nutrition in Food diets	Information on agricultural programmes	Information on development Programmes
Relatives			
Friends			
Extension workers			
Exhibition / Melas			
Agricultural Universities			
Government departments			
SHG			

Are you able to have balanced diets? Yes / No

Do all members of your household 'get enough food every day'?

If no, then during which calendar months did any member of the household 'not get enough food every day'?

Household income sources

Sources of income for household	Number of days employed in a year	Earnings (Rs.)
Crop production		
Livestock		
Wages		
Non-agricultural activities		
Business		
Salary		
Government payments		
Remittances		
Others		
Total		

Do you want to leave from farm sector? Yes / No

If yes,

Reasons	Un important	Important	Most important
Drudgery			
Insufficient income generation			
Insufficient Government support			
Vagaries of weather			
Un remunerative prices			
For children's better future			
Small size of the holdings			
Instability of income			

Do you have any suggestions for modification in the combination of goods given through PDS?

Do you know about Right to Food Act? Yes / No

If yes, from which source

Are you satisfied with the food subsidy? Yes / No