FOOD DEMAND IN PAKISTAN: ANALYSIS AND PROJECTIONS

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In the Name of

The Most Merciful and Compassionate the Most Gracious and Beneficent Whose Help and Guidance We Always Solicit at Every Step At Every Moment.

In the Name of Allah

The Most Beneficent

The Most Gracious

In the creation of the heavens and the earth, in the alteration of day and night, in the ships that sail and benefit the men, in the rain-------there are signs for those who think, understand and believe.

(AL-QURAN)

DEDICATION

Dedicated to the everlasting memories of my father, Said Rahman, my brothers Umar Hayat (Late), Sikandar Hayat, my mother and my grandmother who encouraged me for the course of the Higher Studies

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THANKS FOR EVERY THING YOU DID FOR ME

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LIST OF ABBREVIATIONS

AIDS	Almost Ideal Demand System
LA/AIDS	Linear Approximation Almost Ideal Demand System
QAIDS	Quadratic Almost Ideal Demand System
LES	Linear Expenditure System
ELES	Extended Linear Expenditure System
OLS	Ordinary Least Square
2SLS	Two Stage Least Square
PPHS	Pakistan Panel Household Survey
HIES	Household Integrated Expenditure survey
RHIES	Rural Household Income and Expenditure Survey
HBS	Household Budget Survey
IFLS	Indonesian Family Life Survey
NHS	National Household Survey
PSLM	Pakistan Social and Living Standard Measurement Survey
IFPRI	International Food Policy Research Institute
NSSO	National Sample Survey Organization
PFIES	Philippine Family Income Expenditure Survey
SPSS	Statistical Package for Social Sciences
PIDE	Pakistan Institute of Development Economics Islamabad
GDP	Gross Domestic Products
ERS	Economic Research Service
ADB	Asian Development Bank

ABSTRACT

This study analyzes the household food demand followed by projecting the future level demand of selected food commodities groups such as foodgrains, pulses, ghee, milk, sugar, meat and vegetables in Pakistan. This study uses Pakistan Panel Household survey (PPHS) for the year 2010 conducted by Pakistan Institute of Development Economics (PIDE).The other sources of data included Economic Research Service (ERS) Macro Economic Data set (2005) and Asian Development Bank (ADB) Key Indicators for Asia and the Pacific (2010). The Linear Approximation Almost Ideal Demand System (LA/AIDS) model is used to estimate the demand elasticities while a simple growth model is used for food demand projections. The empirical results reveal that all estimated income elasticities are positive. All uncompensated and compensated own-price elasticities have correct (negative) sign. On the basis of income elasticities, foodgrains, pulses, ghee, sugar and vegetables are found necessities, while milk and meat are identified as luxuries. Except of meat, other six food commodities groups have inelastic own-price elasticities implies that they are integral items of household diet. Pulses and vegetables, ghee and meat, milk and sugar are identifies as gross compliments on the basis of uncompensated cross-price elasticities. The uncompensated cross-price elasticities of foodgrains indicate substitutive relationship with pulses, meat and vegetables, respectively. An increase in the household income will induce substantial expansion in household demand for milk and meat products but consumption of these foods will decline if household size grew ceteris paribus. The food demand projection for the year 2010 to 2030 suggests that keeping prices constant when the population grow by 2 percent per annum then per capita and total household food demand increase for the next two decades. It is concluded that household food demand has been primarily driven by growth in population and income. The estimated expenditure elasticities of food commodities groups calls for food support program. There exists a direct relationship between household size and food demand therefore, various population control measures may improve the standard of living of Pakistani households.The estimated results about food demand projection calls for formulating food policy to ensure food security in Pakistan.

CHAPTER NO 1

INTRODUCTION

1.1.Statement of the Problem

Food demand analysis always remained important issue among the economists. Food demand differs across individuals, households, income, preferences, cultural traditions and local prices (Pinstrup and Watson, 2011). In the analysis of food demand, the food demand is said to be the willingness and ability of a consumer/household to purchase different food commodities such as, cereals, pulses, ghee, milk, sugar, meat and vegetables etc, in order to fulfill his/her daily food needs. The food demand analysis is a primary concern of any developing country, because it related with food security. Adequate nourishment in term of quantity and quality is necessary to sustain healthy life. Undernourishmentleads to poor body growth and health thereby resulting in poor productivity capacity in term of work at individual level which effect GDP at aggregate level. Therefore, the availability and accessibility of food, affordable food prices and consumer adequate purchasing are crucial for ensuring food security.

The main sources of food in Pakistan arecrop based food and animal based food. Crop based food consists of foodgrains, vegetables, fruits, pulses and oil seeds etc. On the other hand, animal based food consists of meat, milk, egg and fish etc. After independencethe policy makers are concentrating on attaining and maintainingself-sufficiency in food production in the country.As a result,in 1960,s Green Revolution in Pakistan increase productivity of agriculture sector and hence reduced the nation's dependency on imported food. However, improvements in productivity could not exceed a certain threshold and productivity growth rates were lower than population growth rates. Because of such a high population growth rate and lower agriculture

growth rate, the country remains a net importer of several essential food items. Fluctuation in the productionof food commodities over time has turned the nation food deficient (Ahmad and Farooq, 2010).

Worldwide food price inflation and frequent natural disasters in the country have also a negative impact on Pakistan's food security situation. Both the United Nations Food and Agriculture Organization's (FAO's) Hunger Map and the IFPRI Hunger Index suggest a serious prevalence of undernourishment and hunger in Pakistan (Nazli et al, 2012). Moreover,across the country 48.6 percent of the population is food insecure, out of the total food insecure population 22.4 percent are extremely food insecurein the country. The percentage of the population with acceptable food consumption is around 27 percent(Haller et al, 2008).

Similarly, Political unrest, militancy, natural disasters and energy crises reduced income and employment level of the masses, which further reduced purchasing power or increase poverty in Pakistan. Increase in poverty or decline in purchasing power results in an increase in the percentage spending on food. This means that other essential spending, like on health and education is reduced.The share of household expenditure on food in the country has risen up to 61.6 percent from 55.6 percent in the years 2005-06 in the poorest group. An increase in percentage spending on food is directly related to market prices and income level, this increase in food spending shows increase in poverty and consequently high vulnerability to food insecurity. In terms of expenditure share on food, 28 percent of the population was very poor while 22 percent have poor access to food. This means that 50 percent of the population has inadequate access to food. Because of inadequate access to food many more people dropped down to the poor group(Suleri and Haq, 2009).

Changes in income, population explosion and industrialization in Pakistan are also responsible factors for changing the structure of food demand. This may shake the pattern of food demand both in present and in future.In view of the importance of the food demand analysis and its expected implication for Pakistan, this study provides appropriate answers to the questions: What are the influencing factors of household food demand in Pakistan? What is the future level of food demand in Pakistan?This study will help policy makers in devising appropriate food policy through considering prices and demographic factors. Also, the food demand projections will help in formulating food policy which in turn will ensure food security in the country.

1.2. Objectives of the Study

This study aims:

1. To analyze the household food demand in Pakistan.

2. To project the future level of demand of selected food commodity groups such as, foodgrains, pulses, ghee, milk, sugar, meat and vegetables.

1.3. Hypothesesto be tested

This study is based on the hypotheses that:

1. Household income and household composition have positive while prices of food commodities have negative impact on food demand in Pakistan.

2. There exists increasing trends in food demand in Pakistan and will continue in future.

1.4. Organization ofthe Study

This study is organized as follows:

A brief introduction of the study covering statement of the problem, research questions, objectives and hypotheses is given in first chapter.In second chapter, relevant literature is reviewed. The data and methodology is discussed in third chapter. Results and discussion is given in chapter four. Conclusion and recommendations is given in the last chapter.

CHAPTER NO 2

LITERATURE REVIEW

2.1. Introduction

The review of literature provides base, theoretical and empirical background and efficient knowledge to understand the depth and importance of a research problem. So, review of previous studies is one of the initial steps for understanding, evaluating and solving a research problem. Previous studies related to analyses of food demand and their projections havereviewed in subsequent section in chronological order.

2.2. Review of Previous Studies

2.2.1. Review of Previous Studies With Respect to the Rest of the World

Ahmed and Shams (1994) analyzes food demand for rural Bangladesh. They used the Almost Ideal Demand System (AIDS) model and IEPRI data conducted in 1991-92. They found negative income elasticity for wheat, and higher income elasticities for rice and other food items. On the basis of the given results they called for the government price support program and income generating policies which will leads high level of consumption of various food items.They did not incorporate demographic variables in the model. Moreover, the food demand analysis was limited only for rural areas and did not take into account urban areas.

Huang *et al* (1999) examined trends and projections of demand and supply in China's grains economy, with the help of more comprehensive and structurally sound econometrically estimated models i.e. a demand-side model and the supply-response model. The projections of the study showed that China's grains imports will be raised in future due to increasing demand for meat,

foodgrains and from the reduction of food supply because of low investment in agriculture in the late 1980s. The models used for demand projection in this study based on certain assumptions, any change in these assumptions can change the projections for food demand.

Christiaensen and Boisvert (2000) empirically measured household food vulnerability. The empirical analysis was based on panel data from northern Mali, collected in the 1997-98. They used descriptive statistics and 3-SLS method. The empirical results showed that Female-headed households and households with good harvests appear less vulnerable to drought shocks, due to community cohesion and due to greater dependence on agriculture, respectively. They linked household food vulnerability with poverty but did not link it with food insecurity which is an emerging field of study in developing and poor countries.

Claudio (2000) estimated consumption equivalence scales. The author used Quasi-unit record data on expenditure and income of New-Zealand household for the year 1994-95. The Extended Linear Expenditure System (ELES) and a few alternative versions of rank 3 complete demand systems have used to obtained equivalence scales. The results suggested that there was large difference in the values of scales obtained from different models.

Xiaodong*et al* (2000)analyzes linear and semi-parametric Engel's curves for nuclear households in rural China in order to found the relationship between sexual bias and household consumption. They used Rural Household Income and Expenditure Survey (RHIES) for the year 1995. They found non-discrimination effect between boys and girls in food consumption pattern while found discrimination effect between boys and girls in case of going to school and educational expenditures respectively. However, their analysis based on two models when one model not supported the results then second must support it. For example, for some goods such as cereals,

alcohol and tobacco, medical care, and education the linear model gives a reasonable description of the Engel curve relation. But for other goods such as food, meat, fish and vegetables the linear model fits the data poorly and a semi-parametric model would fit better. The study did not use single model who gives significant results for all the included commodities in the analysis.

James *et al* (2003) examined consumer responsiveness to changes in food prices and income. They obtained the data of 114 countries from the 1996 International comparison project (ICP) for nine broad categories of consumer goods and eight sub categories of food commodities. They used a two stage cross country demand model. The results of the study showed that low income countries were more responsive to change in income and food prices and therefore make larger adjustments to their food consumption pattern when income and prices change. However, this study presents information on consumer responsiveness to changes in food prices and income but the study ignore a number of other demographic and non-demographic factors in the developing and the developed countries which are also responsible for change in consumer responsiveness.

Mitra and Ray (2003) exaimend the behavioral and walfare impacts of private and public transfers on household expanditure pattren. They used household level unit record data of South Africa and non unitry econometric model. They found that pensions transfers and other income have different effect on budget shares of household consumption on various items and in particular transfer and non transfer income were not spent in the same way. The study employed OLS estimation for the expenditure shares equations that treats income and transfers as exogenous. But OLS estimation leads to the problem of miss-specification which is likely to yield misleading results.

Goyal and Singh (2004) addressed various issues namely, the present food supply and future trends, shift in food consumption pattern over years and food demand projection forthe next three decades in the background of food security. The data were collected from different published sources such as National Sample Survey (NSS) Organization, Economic Survey of India, Agricultural Statistics at a Glance and Agriculture in Brief etc, for the period 1960-61 to 1998-99. They used double logarithmic function and conclude that, the foodgrains production has increased at the rate of 2.68 percent per annum during 1960-1999 which was mainly because of productivity growth (2.44%). However, the expenditure on food items showed a declining trend during this period. The food basket was found to be diversified both in rural and urban areas. The study include various food items in order to address various issues regarding food demand analysis and projections but the study only project the demand for cereals and did not project the demand of other food items which occupy a major share in household food demand.

Horioka (2004) measured the extent to which the stagnation of household consumption is responsible for the decade-long recession in Japan during the 1990s and early 2000s and the reasons for the stagnation of household consumption during this period. He used simple statistical methods and found that, the stagnation of private investment not the household consumption was the major cause of the decade-long recession, because the household consumption was not relatively stagnant during this decade. However, the study focused entirely on the demand side of the economy and ignores the supply side of the economy. But the decade-long recession was may be due to both demand-side factors and supply-side factors.

Paul and Beverly (2005) analyses demand for food in South Africa for the year 1970 to 2002. He used a general dynamic log-linear demand equation and a dynamic version of the almost ideal demand system (AIDS). The results showed that food, tobacco and alcohol were price elastic in

the long-run. The short-run elasticity estimates of various consumer items were smaller than the long-run elasticity estimates. The study analyses food demand at an aggregate level and with aggregated categories of food and could not capture consumer adjustment of their choice of food and non-food expenditures, due to changes in prices and incomes.

Huang (2006) developed a testing procedure for the structural change in a complete food demand system for United States of America (U.S). The food demand system was consisting of two demand system, Ordinary Demand System and Inverse Demand System. The sample observations data from the year 1954-78 and 1979-2003 were taken for founding out the structural changes. The testing results indicated a significant structural change in an ordinary demand system but not in an inverse demand system because consumers shifted their food demand relationships between the two periods. Although both the demand systems are theoretically consistent within the framework of classical demand theory but they did not provide the same testing results of structural change based on their statistical model estimates.

Ndeffo*et al* (2007) investigated the integration of the relative cost of children to adults and of economies of scale in the background of the evaluation of household welfare in Cameroon. The results of the estimated equivalence scales indicated that female-headed household was poorer than male headed-households. The scales also indicate that poverty was more prevent in rural areas, in households whose head are illiterate and in household whose heads work in the informal sector. The results further indicate that poverty in Cameroon was increased between the years 1996 and 2001.

Regorsek and Erjavec (2007) analyzes food consumption patterns of Slovenia. Food commodities were divided into seven commodity groups. Cross-sectional household data from

Household Budget Survey for the year 2001 was used. They applied the linearly approximated Almost Ideal Demand System (LA/AIDS). The results indicated that the consumption pattern of Slovenian household changed however, some unique food habits persist. The data set which was used in the study did not identify food quality. Similarly the study did not take household characteristics in the model.

Smith (2007) analyzes the relationship between house prices and household expenditure. He takes Household Economic Survey (HIES) data from period 1972 to 2006. The graphical method was adopted to find out the relationship between house price and household consumption. The result showed positive correlation across consumption of different age groups of household and house price and across consumption of both owners and renters respectively. However, the graphical method is an essay and simple way for explaining the relationship between house price and household expenditure but a sounder and empirically estimated model may gave better results and understanding in this regard.

Cherchye*et al* (2008) presents a nonparametric revealed preference characterization of the general model of collectively rational (i.e. Pareto efficient) household consumption behavior, which accounts for (positive or negative) externalities and public consumption in the household. They used non-convex individual preferences approach. With the help of this approach they derive a necessary and sufficient condition for collective rationality. The results of the study provide a collective version of the Afriat Theorem for unitary rational behavior. They also obtained Generalized Axioms of Reveled Preferences (GARP) as a general model and also a special case (i.e. the case with all private consumption and no externalities, and the case with all Public consumption) for non-convex preferences.

Jeffrey (2008) introduced aggregatable system of Gorman Engel curves for U.S. food consumption with Box-Cox transformations on prices and incomenest functional form. The model nests rank up to rank three. The model was estimated bynonlinear three-stage least squares with annual time series data on 21 foods, 17 nutrients, age, race, demographics, and the distribution of income from the years 1919-1941 and 1947-2000.The results suggested that this empirical model was a rational and logical econometric framework for studying the aggregate consumer effects of changes in farm and food policies in the United States.

Mittal (2008) presented the supply, demand trends and projections of various food items for India, for the year 2011, 2016 and 2021. AIDS model and simple growth model for Demand Projection were used in the study. The projections were based on change in yield levels, changes in price, growth of population and income growth. The data for this study was taken from various rounds survey of National Sample Survey (NSS), for the years 1983, 1987-88, 1993-94, 1999-2002 and 2004-05. The results showed that the total demand of food was increase due to growth in population and per capita income. On the supply side, growth of food production was very slow. The study analyses the supply, demand trends and its projections of crop-based food items only and did not analyses animal-based food items.

Sekhar (2008) projected demand and supply of rice, wheat and coarse cereals in India for the year 2011-2012. He applies available FCDS demand system over SWF data for the year 2008 and concluded that wheat production appears to meet the consumption requirement in 2011-2012 but for rice and coarse cereals the position was bleak. It is also needs to be noted that the study included only the household consumption estimate and ignore the estimates for export demand and demand for stocks.

Barigozzi*et al* (2009) analyzes the statistical properties of household consumption expenditure budget share distributions for a large sample of Italian households for the period 1989-2004. They found that household budget share distributions were fairly stable over time for each particular category, but greatly heterogeneous across different commodity categories. The study focusing only on unconditional budget share distributions and ignore household budget share distributions conditional to household income or total expenditures, age, cohort of household's head and other relevant household commodity-specific variables. These variables may link to the budget shares with the help of Engel curve model. Moreover the study employed univariat approach for k-dimensional budget share distribution which is not fully incorporate the across-budget share correlation structure. There is need to employed the multvariat approach for k-dimensional household distribution because this approach fully incorporate the across-budget share correlation structure.

Khim*et al* (2009) provided an empirical assessment of the effect of fertility on household consumption with respect to the equalance scale. They defined equalance scale as the effect of a new born child (under age 15 years) on household consumption. They used simple regression and statistical method along with the Indonesian family life survey (IFLS) conducted from the years 1993 and 1997. The finding indicated that a newly born child leads to a reduction of household consumption by 20 % within four year.However, the results of the study did not show anycausal relationship between fertility and household welfare because the study not taken into accounts a structural model. Similarly, poverty is measured as an aggregate variable in a household in this study but it is not clear how fertility is going to affect total household income.

Kumar *et al* (2009) projected Indian foodgrains demand for the years 2011-12, 2016-17 and 2021-22 respectively. Indirect demand including home away demand was also incorporated in

working out this food demand projections. They used household level data taken from National Sample Survey Organization (NSSO) for the year 2004-05. They applied various demand systems such as FCDS, transcendental logarithmic demand system (TLDS), normalized quadratic demand system (NQDS) and LEDS for calculation of demand elasticities while a simple growth model for food demand projection and concluded that given the recent trends in production, meeting future demand for food grains trough domestic production alone appears to be difficult, but not impossible. The study compared demand parameters from the proposed models and at last the FCDS was selected as it derived the lowest income elasticity. But the FCDS model is a non-econometric model, since a more suitable and sound econometric model such is LEDS exist but the study did not taken into account the expenditure elasticities of such a suitable model.

Samuel (2009) investigated the evaluation of househlod expenditure inequality in cameroon, with the help of Lorenz curve and Gini coefficent. The National Household Survey (NHS) data for the year 1984 and 1996 was used for the purpouse. Total expenditure inequality is decomposed into the witin-groups and between-groups inequality components using Theil,s decomposition techniques. Decomposition were carried out according to the residence area, stratum, age, educational level and the gender of household head. The results showed that gender inequality appears to be insignificant in camerron. However, the study only taken into account inequality and did not linked it with poverty and welfare of the individual and of the society.

Guy *et al* (2010) adopted the methodology described by Human Resource and Skill Development council (HRSDC, 2009) for equivalence scales computation. The equivalence scales in the study were obtained by using the expenditure ratio for the four-person households divided by the expenditure for unattached persons (reference household) and scales were varied

between 1.92 and 2.19 depending on community size. Twenty-five groups of commodities and services were considered and data was obtained from the Bangladesh Bureau of statistic for the year 1974-75. The study found that twenty out of twenty five income parameters are statistically significant at 5 percent degree of significance.

Mittal (2010) estimates the price andincome elasticities of various food commodity groups in India by using data of Household Consumer Expenditure Survey (HCES). A two-stageQuadratic Almost Ideal Demand System (QUAIDS) model was used to estimate parameters and to estimatethe demand elasticities. The results of this study were much closer to the actual numbers. The per capita annual cereals projected demand of this study for the year 2005 was 143.62 kg, while according to the NSSO it was 141.69 kg. In this study the projection of cereal is carried out with the help of two stage QUAIDS model but in this model assumption of linearity in the expenditure function is given away so, the projected results of the model are not reliable.

Ulubasoglu*et al* (2010) estimates disaggregate food demand elasticities for Australia using data of National Household Expenditure Surveys (NHES) for the year 1998-99 and 2003-04. The LA/AIDS model was used for estimating food demand system for fifteen food categories. The results showed that bread and fresh vegetables were both own-price and expenditure inelastic, while beef and veal, mutton and lamb, poultry, pork, rice, margarine and preserved vegetables were both own-price and expenditure elastic. Own-price elasticity estimates for rice, bread, milk and fresh vegetables of Australia were close to the Canadian, US and Japanese elasticities. However, the long-run elasticity estimates provide more meaningful results than short-run elasticity estimates. But the study used cross-sectional data and estimates only short-run demand elasticities while did not use available time-series data regarding household consumption for Australia which provided long-run demand elasticities.

Bansil (2011) developed a model for projecting foodgrains demand. The model was based on two major parameters first food balance sheet analysis of the past years and second incremental demand model for the future. The model used the NSSO data for the year 1993-94, 1999-2000 and 2004-05 of direct and indirect human consumption. Based on actual production and consumption of foodgrains the model gave unrealistic picture about the future foodgrains demand. These unrealistic demand projections were likely to send wrong signals to the development strategists and planning.

Kumar *et al* (2011) estimates demand elasticities for food items in India, using non-econometric Food Characteristic Demand System (FCDS) model along with econometric QUAIDS model. They used national sample survey (NSS) data from the years 1983, 1987-88, 1993-94, 1999 and 2004-05. The results showed that the computed expenditureelasticities vary across various income groups and were lowest for cereals products and highest for horticultural and livestock products. However, FCDS model gave meaningful results but it is non-econometric in nature. In analysis of food demand the proposed model must be econometric in nature because it gives significant results.

Cagayan and Aster (2012) analyzes the demographic and non demographic determinants of household consumption expenditures in both urban and rural areas of turkey by using the cross sectional data of household budget survey (HHBS) for the year 2009. They used quantile regression and concluded positive relationship between household income and household consumption for both the rural and urban areas. Considering the demographic side, the consumption expenditures of males were lower than the consumption expenditures of females and an increase in the household age raises the household consumption expenditures. Although, the quantaile regression has advantage over OLS but not over standard model of household

consumption such that LES, AIDS, QAIDS etc. Therefore, the results were being more consistent if they used standard model of household consumption instead of quantaile regression.

Govindasamy*et al* (2012) highlighted increased purchases of locally grown ethnic greens and herbs due to consumer interest in reducing food miles. To document ethnic consumer behavior and their demand for greens and herbs, a telephone survey was conducted in 16 East Coast states and Washington D.C. during May through October, 2010. A logit model was used to forecast the influence of demographic and other factors on increased purchase of locally grown ethnic greens and herbs. The results of the study indicated that 34 percent of ethnic consumers have increased purchases of locally grown ethnic greens and herbs due to food miles reason. The results were being clearer if they used probit model along with logit model.

Li *et al* (2012) examined consumer demand for organic fluid milk and conventional milk by using a nationwide weekly retail scanner data set. The organic and conventional milk were further decomposed into products with different fat contents. The analysis was carried out with the help of an Almost Ideal Demand System (AIDS). The demand for organic milk was found to be price elastic. Moreover, the organic and conventional milks were substitutes. Butthe substitution pattern was asymmetric and there was greater movement toward organic milk than back toward conventional milk for the same relative change in price.However, consumer income and demographic variables have significant impact over consumer milk demand but the study did not focus on these important variables.

Maria and Derrel (2012) analyzes separabilityamong preferences of the major food groups in Mexico by using household data for the year 2008 and a two-step censored model. These results implied a major food security issue that, Mexico has already lost its self-sufficiency in white

corn because its domestic consumption was higher than its domestic production. If corn becomes a luxury good in Mexico, low income families will not be able to afford their main source of calories and it will be a sensitive food insecure situation for the country.The AIDS model satisfies the adding-up, homogeneity, and symmetry restrictions automatically. But in this studyhomogeneity and symmetry restrictions did not hold for the demand system of cereals which create serious theoretical problems.

Mekonnen*et al* (2012) estimates Quadratic AIDS model to analyze the U.S. fruit consumption using annual per capita consumption data of USDA Economic Research Service covering the period from 1980 to 2007. The results showed that Fruit juices were expenditure elastic while fresh fruits and other processed fruits were expenditure inelastic. The study used small sample size because of which Hicksian price elasticities were found as statistically insignificant. Moreover, the study used cross-sectional data and did not use the available time series data.

Vardegs and Brain (2012) examined food preference change in urban China using province-level annual expenditure surveys data of urban Chinese households conducted by the China National Bureau of Statistics (CNBS). They used dynamic GQAIDS model and concluded structural changes in urban Chinese food preferences. The data set used in the study missing the data of some years. Consequently, these data deficiency do not allow accounting for potential endogeneity in total expenditures.

Tian and Xiaohua (2012) introduced a direct approach for the estimation of demand for nutrition in China. For estimation of income elasticity of nutrient, they used two approaches, indirect approach which convert food elasticity to nutrient elasticity and direct approach which convert food consumption to nutrient intake and then regress nutrient intake directly on income. The

results showed that income elasticites of most nutrients were small, poor peoples have higher nutrient elasticity than rich ones and most nutrient elasticities were non-significant for rich people. The study used indirect approach which converts food elasticity to nutrient elasticity but the estimation in indirect approach is biased. Moreover, the study concludes that income will not result in substantial improvements in nutrient intakes, this result contradict with economic theory.

Meng*et al* (2013) applied quantile regression to identify determinants of entire distribution of food expenditure and quantify their effects among the Gana's urban household subgroups. The study used survey data collected in the year 2011 in Gana's three big cities i.e. Accra, Tamale and Takoradi. Results of the study indicated that household income and education have positive effect on the weekly food expenditure at any quantile. Regarding age composition, elders consume foods with low fat and sugar, while households with a large number of children tend to purchase high nutrition foods with attractive taste and package. Gana is a developing country where a large portion of population lives in rural areas but the study identified the determinants of food expenditure for urban household only and ignore the rural household.

Shengfei (2013) analyzes the decision to eat and buy cookies, by urban households in Uganda, using Logit choice model and double-hurdle model. The household survey data for the year 2011 was used for the analyses. The results indicated that the decision to eat cookies were positively affected by increase in monthly household income, household education level, and the stability of employment, but negatively affected by the location in the Capital city (relative to the other five areas) and the household's age. Since price have significant impact on household decision to eat and buy cookies but the study did not showed the price effect on household decision.

2.2.2. Review of Previous Studies With Respect to Pakistan

Khan (1975) projected the demand for important food items in Pakistan and then analyzed the significance of these demand for future agriculture development of Pakistan. The study used the data of Household Integrated Economic Survey (HIES)for the year 1963-64 and second and third five year plans, respectively. The Engel's curve was used for food demand as well as a linear per capita consumption model was used for demand projections. The results pointed out that other than population and per capita income there were many other factors which influenced food demand such as repaid industrialization, urbanization, change in preferences regarding the choice and advances in nutritional diets.The model used in this study for demand projection consists of two independent variables namely, per capita income growth and population growth. The model did nottake expenditure elasticity as independent variable which have a significant role in demand projection, thus the projection model was miss-specified.

Rehana(1982) examined household consumption pattern of Pakistan by using the HIES data for the year 1971-72 with pooled data for the years 1968-69 and 1971-72. She specified linear and log linear relationship between expenditure on various commodities, household size and income. Five commodity groups and seven food items were taken for aggregate and disaggregate analysis, respectively. The results of the study put ambiguity verification for Engel's law in the case of clothing, housing, fuel and lighting. She was also calculated the demand growth rates of various commodity groups for urban and rural areas separately, as well as for Pakistan as a whole but she could not taken into consideration the differences in consumption growth rates, population growth rate and also the consumer's responsiveness to change in these and other factors.These factors have significant impact on demand growth rates of various commodity groups.

Malik*et al* (1988) analyzes the regional and intertemporal differences in consumption behavior in Pakistan, using Household IntegratedEconomic Survey (HIES) for the years 1979 and 1984-85. They used log linear model and concluded that,the elasticity estimates of vegetable ghee decline over time. They also computed inter-temporal differences in the expenditure pattern within rural and urban sectors in each province, and found that the rural functions were different in the case of wheat, vegetable ghee and sugar in the Punjab, gur in Sind and wheat, and gur in NWFP. In all other cases there was evidence of inter-temporal similarity.Their results were notconsistent with reality it was because they used non-arrange HIES data for their disaggregated analysis.

Burney andAkhtar (1990) examined the pattren of housholds expenditures on fuel consumption in Pakisan using Household Integrated Economic Survey (HIES) data for the year 1984-85. They applied Extended Linear Expenditure system with the help of this system they estimated price and income elasticities. The results of the study showed thatall fuels were own-price and income inelastic, implied thatthey were necessites for both rural and urban households. Beside income and price there are many other factors such as houshold demoghrapic and socio-economic factors which have significant impact on household fuel consumption butthey did not include these factors in their analysis.

Burney and Khan (1991) examined the household consumption patterns for twelve broad consumercommodity groups, separately for the urban and rural sectors of Pakistan. They used linear Engel equation and Household Integrated Economic Survey Survey (HIES) data for the year 1984-85. The results conformed the Engel,s law. In case of rural households the expenditure share of transport and comunnication was rised while the expenditure share of clothing and footwear and fuel and lighting decline with rised in the income level. In order to meetthe

futuredemand of various commditiety groups their emphises liad on demand projection butthey did not projectthe demand of this commodity grouops.

Rashid and Haroon (1992) attempts the study of regional differences in consumption behavior by using HIES data for the year 1986-88. They used Extended Linear Expenditure System (ELES) and found, insignificant variation in the marginal budget shares and subsistence expenditure among all provinces except for transport in rural Balochistan and food and rent in urban Punjab. Although, the ELES is easy to use but assumes additive preferences, severely restricting substitution possibilities and it also rules out inferior goods. Another major weakness of the model is that marginal budget shares obtained from estimation are constant with income changes.

Malik and Sarwar (1993) analyzes the expenditure patterns in relation to with and without remittances incomes for Pakistan for four provinces and across rural and urban region. They used the data of HIES for the year 1987-88 and divided total households into three different groups non migrated households, domestic migrated households and international migrated households, respectively. They used the simple linear Engel's curve approach for estimations. The result of their analysis showedlower marginal propensities to consume for households receiving international remittances than household receiving domestic remittances. Their results are against an economic school of thoughts who believe that a considerable portion of the remittances (both international and domestic) raised current consumption, raised investment in real estate such as residential houses and acquiring consumer durables.

Burki (1997)used annual data of HISE fromthe year 1972 to 1992to estimate and to identify changes inconsumer prefrences for eight food items.He used Genralised Axiom Revealed Prefrence Model (GARP) and first difference LA/AIDS Model. The result of the study did

notsupport the GARP test for change in consumer preferences due to strong change in consumer expenditures, which reduce the power of this test. On the other hand LA/AIDS model do support a shifttowards chicken and away from gram after the year 1982-83 butthe study were not identified the roots of this shift.

Sania and Cliff (1998) analyzes consumption pattern of different commodities for rural areas of Pakistan. They estimated semi-parametric Engel's curves for rural Pakistan by using the Household Integrated Expenditure Survey (HIES) conducted in 1987-88. They found inappropriateSemi-parametric Engel's curves for food, adult and child commodities.

Farooq*et al* (1999) empirically investigated farm household consumptions pattern. They used the concept of almost ideal demand system (AIDS). They took six commodity groups for their analysis and therefore estimated six equations in order to find out the elastisites of each and every commodity group. Moreover they divided the households into three categories children, adolescents, and adults. They used the consumption data collected from 177 farm households of Daska, Gujranwala and Ferozwala Tehsils(1995) and found out that all the own-price elasticities were correct(negative) sign and most of them were significant. On the basis of cross price elasticities Paddy and wheat were found to be gross complements in consumption whereas meat and pulses were identified as gross substitutes. Dairy products and meat were regarded as luxuries.Moreover, significant quantitative dietary impacts were found associated with change in the age composition of farm households. The study rejected the general restrictions of demand theory and the results are based on priori expectations.

Kurosaki (2004) empirically investigated the inabailaty of rural dwellers to deal withnegative income shock. He applied a veriable coefficent regression model on a two periods household

panle data set collected in the NWFP (KPK) Province of Pakistan. The results showed that the abilaity to deal with negative income shocks was lower for households that are aged, landless and do not recive remitances regularly, when their income turn down with a certain size this household reduce their consumptions. On the other hand landed households were faced a high income risk but the size of their marginal response to an income decline was so small. It should be noted thatthis study treats both the sensitivity parameter and size of income shocks as exogenously fixed characteristics of household decision making. But under the context of household dynamics adjustment of their assets including reciprocity net-works, thesetwo parameters become endogenous to household decision making in the long-run. Similarly, this study discussed only the direct effects of cumulative shocks and did notdiscussthe indirect effects of cumulative shocks.

Etzaz and Arshad (2007) analyzed the household budget for Pakistan. They applied Quadratic Spline Engle Equation on HIES (2000-01) data for both rural and urban household separately and foundpositive expenditure elastisitesfor all the 22 commodity groups for both urban and rural households. Urban household considered wheat, housing and health as necessities while rural households considered wheat, housing and tobacco as necessities. The dairy products considered as a luxury food item for poor and middle income rural households while in the case of urban area the dairy was considered luxury for poor household only.The changing slopes and curvatures of Engle curves in this study calls fora uniform tax structure, e.g. General Sales Tax (GST) for the welfare ofhouseholds belonging to different income classes.But they could not design such a uniform tax rate structure in their study.

Haq and Arshid (2009) found income or expenditure Inequality in both rural and urban sector of Pakistan. They apply Gini index and welfare function over Household Integrated Economic

Survey (HIES) data for the year 2005-06. The total food expenditures was decomposed into essential and non essential food expenditures having budget share of 77.37 percent and 22.63 percent respectively. They found inequality in the consumption of dairy products, meat, fruits and readymade food products between rich and poor families.It was also observed that poor spend a greater portion of their incomes on food items.The study emphasis on the role of giving subsidies in order to remove consumption inequality but ignore the importance of taxation to remove consumption inequality.

Yousaf and Khalil (2011) analyzes the households milk demand of Karachi.For the analysis they used Almost Ideal Demand System (AIDS) and the Household Integrated Expenditure Survey (HIES) for the year 2005-06. They used per adult equivalent as explanatory variables.The results showed that all the milk categories were necessity. Moreover the household expenditure and demographic compositions by age were found as the main determinants of household milk consumption.The study includes demographic variables such as adult equivalent age of household in LA/AIDS model but could not explain its effect with the help of household age composition elasticity.

Zahoor *et al* (2011)usedflexible LA/AIDS model for rural and urban households in order to found food demand patterns in Pakistani Punjab. The study used Household Integrated Economic Survey (HIES) data of Pakistan for the year 2004-05. Food commodities were divided into eight commodity groups. Results of the study showed that the demand for all eight food commodity groups was price inelastic suggests that all food items were normal. The highest income elasticity found for milk followed by fruits, other food products, meat, rice, vegetables, wheat and cooking oil. They include socio-economic variables in the model which have

significantimpact on householdfood demand. But they did not show their influence with the help of elasticities.

Bashir *et al* (2012) examined the food security trends and to find out the household level food security and its key determinants in the rural areas of the in Pakistani Punjab. Both secondary and primary data were used. Secondary data were obtained from Food and Agriculture Organization (FAO), World Bank and Government of Pakistan's data sources. Primary data were collected from 1152 households in 12 districts of the Punjab province using questionnaire survey. The analysis was done with the help of binary and multinomial models. It was found that monthly income, livestock assets and education levels of middle, intermediate and graduation had a positive impact on rural household food security. Additionally, household head's age, family size, family structure and orphans adversely affected rural household food security. However, the limitation of the study is that it does not explain the relative importance of these determinants.

Falak*et al* (2012) evaluated the household food demand patters for various income groups in Pakistan. The study used Pakistan Social and Living Standard Measurement Survey (PSLM) data for the year 2007-08 and the linear Engel's curve.They took thirteen commodity groups for evaluating food demand pattern. Thehousehold size and income elasticitieswere estimated to explain the food consumption trends in Pakistan.The study did not estimate the own-price, cross-price and household age composition elasticites which are essential for evaluating the household food demand pattern.

Khalil and Yousaf (2012) analyzes the household consumption patterns of Balochistan. They used the Household Integrated Expenditure Survey (HIES) data of Pakistan for the year 2005-06.

The linear-log model and LA/AIDS modelwere applied for the analysis of household consumption patterns.The results of the study showed thatthehousehold expenditure on food items was increasing at decreasing rate. Except of vegetable ghee, all other food items were considered as necessitiesfor both urban and rural Balochistan.The study includes demographic variables such as adult equivalent age and gender demographic groups of household in LA/AIDS model but could not explain its effect with the help of elasticities.

Khalil *et al*(2012) analyzesconsumption and expenditure patterns of seven food items for Pakistan, usingthe data of HIES for the year 2007-08. TheLinear Approximated version of Almost Ideal Demand System (LA/AIDS) was appliedfor the analysis. The results showed thatMarshallian own-price elasticities were negative for all food items except for Mutton and Fish in rural areas. The estimates of the cross-price elasticitiesshowed both the substitution and complementary relationships. The incomeelasticities were indicating that Fish was luxury food item for rural areas and mutton both for urban and rural areasrespectively.They did not include household demographic variables in the model which have significant impact on household consumption and expenditure pattern.

Nisar*et al*(2012)analyzesthe food consumption pattern of Pakistan at different income levels of the household at national as well as provincial levels. They used Household Integrated Economic Survey (HIES) for the year 1998-99. The analysis was carried out with the help of incomeelasticitiesusingEngel's curve for different food itemsgroups. The results of the study indicated that households in the lower income group spend a higherportion of their incomes on necessities while households in the higher income group spend a larger portion of their incomes on luxuriesAlthough Engel's curve approach is easy to use but it cannot provide complete information aboutthe food consumption pattern. This approach only estimates expenditure and

uncompensated own-price elasticities and unable to measure compensated own, cross-price and household age composition elasticities.

2.3. Summary of the Reviewed Studies

The studies discussed above employed various data setsand models toaddress various issues relating to food demand (and non-food demand) and its projection for different counties and for different regions.The studies dividedtotal household demand into food demand and nonfood demand. The food demandconsists of demand for various food items such as foodgrains, pulses, ghee, milk, sugar, meat, vegetables, fruits etc while nonfood demand consist of education, health, clothing and footwear, housing etc.In these studiesthe analysis of food demand is carried out with the help of income, price and households agecompositionelasticities. The elasticitiesestimateprovideinformation aboutthe nature(suchas luxury, necessary,substitute, compliment, normal, inferior and geffenetc)as well as consumption patternof various food items. On the other hand, the food demand projections discussed in these studies based on growth in population and income ceteris paribus.Moreover, we also discussed several studies regarding food demand analysis in Pakistan.Mostof these studies used Household Integrated Economic Survey (HIES) data sets for various years and different models for the analysis of food demand in Pakistan. Although the results of these studies analyzed food demand and have important policy implications, butnone of these studies provide projections of food demand.

2.4. Contribution of the Present Study

This study used most recent information taken from Pakistan Panel Household Survey (PPHS) 2010 to analyze food demand in Pakistan.Based on these recent information the food demand is also projected for the years 2010 to 2030, which aids to literature.

CHAPTER NO 3

DATA AND METHODOLOGY

3.1. Introduction

Thechapter consists of three sections, first sectiondescribedtheoretical framework, second section deals with data and its sources and last section discussed methodology developed for this study.

3.2.Theoretical Background

3.2.1 Background on Demand Analysis

Demand analysis is a science of consumer/household choice/preferences among various goods and services. The analysis of consumer demand is basically the act of analysis of consumer preferences such that how consumers choose to distribute their income among different goods. Economic theory uses the concept of utility to define the level of satisfaction that comes from the specific distribute of income among various commodities. The basic problem of demand analysis is how to maximize utility subject to a given budget constraint or given level of income. The utility maximization condition is given by:

$$\text{Maximize } u = v(q_1, q_2, \ldots, q_k) \text{ Subjectto } \sum p_k q_k = x \quad \ldots\ldots (3.1)$$

Where u is a utility function, x is total income of consumer and p and q are the prices and quantities of kth commodities, respectively.

Solving the first order condition for utility maximization we get Marsallian or uncompensated demand function:

$$q_i = g_i(x, P) \quad \ldots\ldots\ldots (3.2)$$

Where P is the vector of commodity price. The Marsallian demand function shows that quantity demand of each good is the function of price and income.For a logarithmic utility function bothincome and price elasticities can be calculated by taking the derivative of the Lagrangean function we get,

$$dlogq_i = \eta_i dlogx + \sum \mu_{ij} dlogp_j \ldots\ldots\ldots\ldots\ldots\ldots (3.3)$$

Where$\eta_i$is the income elasticity and $\mu_{ij}$are the uncompensated price elasticities. So that changes inprices and total expenditure do not violate the budget constraint in the demand function the followingconditions on the elasticities must hold,

$$\sum w_j \eta_j = 1 \text{ and } \sum w_j \mu_{ij} = 0 \ldots\ldots\ldots\ldots\ldots (3.4)$$

Where$w_j$is the budget share. These two conditions of equation (3.4) are known as Engel and Cournot aggregation, respectively and are known as the adding-up restriction.

Beside utility maximization problem the consumer also faces the problem of expenditure minimization subject to given utility function. The expenditure minimization condition is given by:

$$\text{Minimize } \sum p_k q_k = x \text{ Subjectto } u = v(q_1, q_2, \ldots, q_k) \ldots\ldots\ldots\ldots\ldots (3.5)$$

Solving the first order condition for expenditure minimization we get Hicksian or compensated demand function:

$$q_i = h_i(u, P) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.6)$$

The Hicksian demand function shows that quantity demand of each good is the function of price and utility.

Moreover, Hicksian demand function is equal to Marshallian demand function at optimal utility level such as:

$$q_i = g_i(x, P) = h_i(u, P) \quad \ldots\ldots\ldots\ldots\ldots (3.7)$$

Price elasticities derived from the Hicksian demand function are called compensated orSlutsky price elasticities and are equal to the uncompensated price elasticity (also called Cournot price elasticities) plus the product of the income elasticity and the budget share such as,

$$\varepsilon_{ij} = \mu_{ij} + \eta_i w_j \quad \ldots\ldots\ldots\ldots\ldots\ldots (3.8)$$

Where $\varepsilon_{ij}$is the Slutsky price elasticity.

3.2.2. Restrictions on Demand Equations

Besides the adding-up restriction there are other three basic restrictions such as, homogeneity, symmetry and negativity on demand equations. These can be expressed in terms of the compensated price elasticities as follows:

Homogeneity: $\sum \varepsilon_{ij} = 0$ …… (3.9)

Symmetry: $\varepsilon_{ij} = \varepsilon_{ji}$ …… (3.10)

Negativity: $\sum\sum x_i w_j \varepsilon_{ij} x_j < 0$, for all x_i and x_j that are not constants…… (3.11)

The homogeneity restriction implies that a proportionate change in income and prices of all goods will leave consumption of any one good unchanged. The symmetry restriction means the increase in the price of ith goodwill cause an increase in the compensated quantity demanded of jth goodequal to the increase in the compensated quantity demanded of ith goodcaused by an increase in the price of jth good. Without this restriction inconsistent choices between products would be made and there would be no substitute or complement products. The negativity restriction comes from the convexity of the utility function, which is due to the fact that the

utility is maximized in the Marshallian demand function or alternatively that costs are minimized in the Hicksian demand function. The adding-up, homogeneity, symmetry and negativity restrictions represent the basic restrictions imposed on all demand functions. Determining income and price elasticities that meet these restrictions is the primary aim of demand analysis. Of course, it is possible to determine income and price elasticities without using demand equations derived from utility maximization or cost minimization. A logarithmic-demand model directly specifies the logarithmic quantity demanded as a function of logarithmic income and prices with income and price elasticities acting as coefficients. Such coefficients can be easily estimated by applying ordinary least squares (OLS) to cross-sectional or time series data. However, in order to maximize utility and satisfy the necessary restrictions this model would require constant budget shares and constant elasticities, which is inconsistent with observations that budget shares change when income changes (Deaton and Muellbauer, 1984).

3.2.3. Choice of Demand Models

Both Marshallian and Hicksian demand equations satisfy the restrictions imposed by demand theory. Anexample of a Marshallian demand equation is the Linear Expenditure System (LES) first estimated byStone (1954) and widely applied using individual country data. Although easy to use the LES assumes additive preferences, severely restricting substitution possibilities and it also rules out inferior goods. Another major weakness of the model is that marginal budget shares obtained from estimation are constant with income changes. This property known as homotheticitycan lead to estimations where the income elasticity for necessities actually increases when income rises (Theil and Clements, 1987).

The Rotterdam model first proposed byBarten (1964) and Theil (1965) uses both Marshallian and Hicksian demand functions. Unlike the LES where restrictions are maintained or imposed algebraically within the model, restrictions must be imposed on the Rotterdam model and can be statistically tested. The Rotterdam model also allows the estimation of substitutes and complements. Moreover, the Rotterdam model allows for the separability of preferences a desirable and useful property in demand analysis. If separability holds total expenditure can be partitioned into groups of goods, making it possible to analyze the preferences in one group independent of the quantities in other groups. However, the Rotterdam model has a strong disadvantage in that it produces like the LES model constant marginal shares leading to counterintuitive results, particularly with cross-country analysis in terms of changes in income (Theil and Clements, 1987).

The problem of constant marginal budget shares is avoided using a popular Hicksian demand functioncalled the Almost Ideal Demand System (AIDS) modeldeveloped by Deaton &Muelbauer (1980). They derived the AIDS model with the help of utility maximization and price-independent generalized logarithmic (PIGLOG) preferences. Themaximization problem faced by the household can be written as:

$$\text{Max } U(q) \text{ s.t } pq \leq x \quad \ldots\ldots\ldots \quad (3.12)$$

Where p is price vector, q is quantity vector and x denotes to income, respectively.

The PIGLOGpreferencesclass was represented the cost or expenditurefunction which defines the minimumexpenditure necessary to attain a specificutility level at given prices. We denote thisfunction c(u,p) for utility u and price vectorp and define the PIGLOG class by,

$$\log c(u, p) = (1-u) \log\{a(p) + u \log \{b(p)\} \quad \ldots\ldots\ldots\ldots \quad (3.13)$$

With some exceptions ulies between 0 (subsistence) and 1 (bliss), sothat the positive linearly homogeneous functionsa(p) and b(p) can be regarded as thecosts of subsistence and bliss, respectively.

Taking specific functional forms forloga(p) and logb(p) as,

$$\log a(p) = \alpha_o + \sum \alpha_k \log p_k + \tfrac{1}{2} \sum\sum \gamma_{ij} \log p_k \log p_j \ldots\ldots\ldots\ldots (3.14)$$

$$\log b(p) = \log a(p) + \beta_o \sum p_k^{\beta k} \ldots\ldots\ldots\ldots (3.15)$$

So that the AIDS cost function is written as,

$$\log c(u, p) = \alpha_o + \sum \alpha_k \log p_k + \tfrac{1}{2} \sum\sum \gamma_{ij} \log p_k \log p_j + u\beta_o \sum p_k^{\beta k} \ldots\ldots\ldots.. (3.16)$$

Whereα_i, β_i and γ_{ij} are parameters. It caneasily be checked that c(u,p) is linearly homogeneous in p (as it must be to be a validrepresentation of preferences) provided that$\sum\alpha_i = 1$, $\sum\gamma_{ij} = \sum\gamma_{ji} = \sum\beta_j$. It is alsostraightforward to check that (3.16) has enoughparameters for it to be a flexible functionalform provided it is borne in mind that, sinceutility is ordinal we can always choose a normalization such that at a point,$d^2\log c/du^2 = 0$. The choice of the functionsa(p) and b(p) in (3.14) and (3.15) is governedpartly by the need for a flexible functionalform. However, the main justification is thatthis particular choice leads to a system ofdemand functions with the desirable propertieswhich we demonstrate below.The demand functions can be derived directlyfrom equation (3.16). It is a fundamentalproperty of the cost function (see RonaldShephard, 1970, or Diewert's 1974survey paper) that its price derivatives arethe quantities demanded: $dc(u,p)/dp_i$, $=q_i$.Multiplying both sides by $p_i/c(u,p)$ we find,

$$d\log c(u, p)/d\log p_i = p_i q_i / c(u, p) = w_i \ldots\ldots\ldots\ldots (3.17)$$

Where wiis the budget share of good i.Hence, logarithmic differentiation of (3.16)gives the budget shares as a function ofprices and utility:

$$wi = \alpha i + \sum \gamma ij \log pj + \beta iu\beta o \sum\sum p_k^{\beta k} \ldots\ldots\ldots\ldots (3.18)$$

Where,

$$\gamma ij = ½ (\gamma ij + \gamma ji) \text{ …….. (3.19)}$$

For a utility-maximizing consumer totalexpenditure x is equal to c(u,p) and thisequality can be inverted to give u as afunction of p and x the indirect utilityfunction. If we do this for (3.16) and substitutethe result into (3.18) we have the budget sharesas a function of p and x these are the AIDSdemand functions in budget share form:

$$w_i = \alpha_i + \sum \gamma_{ij} \log p_j + \beta_i \log(x/P) \text{ ……. (3.20)}$$

Where P is a price index defined by,

$$\log P = \alpha_o + \sum \alpha_k \log p_k + ½ \sum\sum \gamma_{ij} \log p_k \log p_j \text{……. (3.21)}$$

The restrictions on the parameters of (3.16)plus equation (3.19) imply restrictions on theparameters of the AIDS equation (3.20). Wetake these in three sets,

$$\sum \alpha_i = 1 \text{ and } \beta_j = 0 \text{ ……. (3.22)}$$

$$\sum \gamma_{ij} = 0 \text{ (11) …….. (3.23)}$$

$$\gamma_{ij} = \gamma_{ji} \text{…….. (3.24)}$$

Provided (3.22), (3.23)and (3.24) hold equation(3.20) represents a system of demand functions which add up to total expenditure ($\sum w_i = 1$)are homogeneous of degree zero in pricesand total expenditure taken togetherand which satisfy Slutsky symmetry. Giventhese, the AIDS is simply interpreted as: in theabsence of changes in relative prices andreal expenditure (x / P) the budget sharesare constant and this is the natural startingpoint for predictions using the model.Changes in relative prices work through theterms γ_{ij} each γ_{ij} represents l0times theeffect on the ith budget share of a 1 percentincrease in the jth price with (x / P) heldconstant. Changes in real expenditure operatethrough the $\beta_i$coefficients these add tozero and are positive for luxuries and negativefor necessities.

The AIDS model can be used to generate systemsof demand equations that can be estimated over broadly defined groups of commodities. Since budget sharesare not constant income elasticities change with income changes. However, the AIDS model has several disadvantages such as,parameters in the AIDS model are non-linear and are difficult to estimate, negativity is not satisfiedat all data points and separability is not nested in the general specification. However, Theil, Chung andSeale (1989) overcame these problems by combining the core of the AIDS model, called the Working'smodel with the differential approach and separability attributes of the Rotterdam model.The Working's model (1943) expresses budget shares as a linear function of total real expenditures. In its general form Working's (1943) model states that for n goods, i = 1,…,n,

$$w_i = \alpha_i + \beta_i \log E + \varepsilon_i \quad \text{..... (3.25)}$$

Where$w_i = P_iE_i/E$ equals to the budget share for good i, P_i and E_i represent the price of and the expenditure on ith good respectively. Where $E = \sum E_i$ is total real expenditure, ε_i is a residual term and the α_i and β_i are parameters to be estimated. Since the budget shares across all consumption groups sum to 1, the α's and β's are subject to the adding-up conditions,

$$\sum\alpha_i = 1 \text{ and } \sum\beta_i = 0 \quad \text{…… (3.26)}$$

The marginal budget share $\theta_i$is not constant but varies by affluence and it exceeds the budget shares by β_i,

$$\theta_i = dE_i/dE = \alpha_i + \beta_i (1+ \log E) = w_i + \beta_i \quad \text{……..(3.27)}$$

Accordingly, when income changeswichanges as does the marginal share. The income elasticity is the ratio of the marginal share to the budget share given as follows:

$$\theta_i/w_i = dE_i/E*E/E_i = d(\log E_i)/d(\log E) \quad \text{…… (3.28)}$$

Dividing$\theta_i$in equation 3.14 by w_i we get,

$$\theta_i/w_i = 1 + \beta_i/w_i \ldots\ldots\ldots\ldots\ldots\ldots (3.29)$$

Equation 3.29 shows that $\beta_i$is greater than zero for a luxury good (has an income elasticity greater than 1) while it is less than zero for a necessity (has an income elasticity less than 1). If $\beta_i = 0$, then the good has unitary elasticity. Equation 3.29 also shows that if the good is a luxury or a necessity (whether the βs are less than or greater than zero) the income elasticity of good i will decline as income increases. This is due to the fact that the budget shares (wi) of necessities decline as income increases whereas the budget shares of luxuries increase as income increases. In the case of unitary elasticities income elasticities remain unchanged with income changes. This is because the budget shares do not change for unitary elastic goods as income levels change.

Further developments in the AIDS model are still on-going. Bollino (1987) has proposed a generalized version of AIDS naming it theGeneralized Almost Ideal Demand System(GAIDS).Bollino and Violi (1990) introduced a hybrid model combining the Translog andAIDS models, called the Generalized Version of the Almost Ideal and Translogdemand system (GAITL). Green and Alston (1990) corrected the Stone's Index fora case when prices are exactly (linearly) proportional to the index value. Moschini(1995) modified the Stone's Index for computing a price index in a situation wheredifferent measurement units are used for various commodities. However, thesemodifications are not widely used in the empirical analysis.

In consumption analysis the choice of demand system is of primaryimportance because it has direct relationship with the nature of parameters or elasticities obtained (King, 1979). For the present studyLA/AIDS is preferredbecause of its theoretical superiority, being flexible in allowing but not requiringthe general restrictions of demand theory to hold. In addition, in

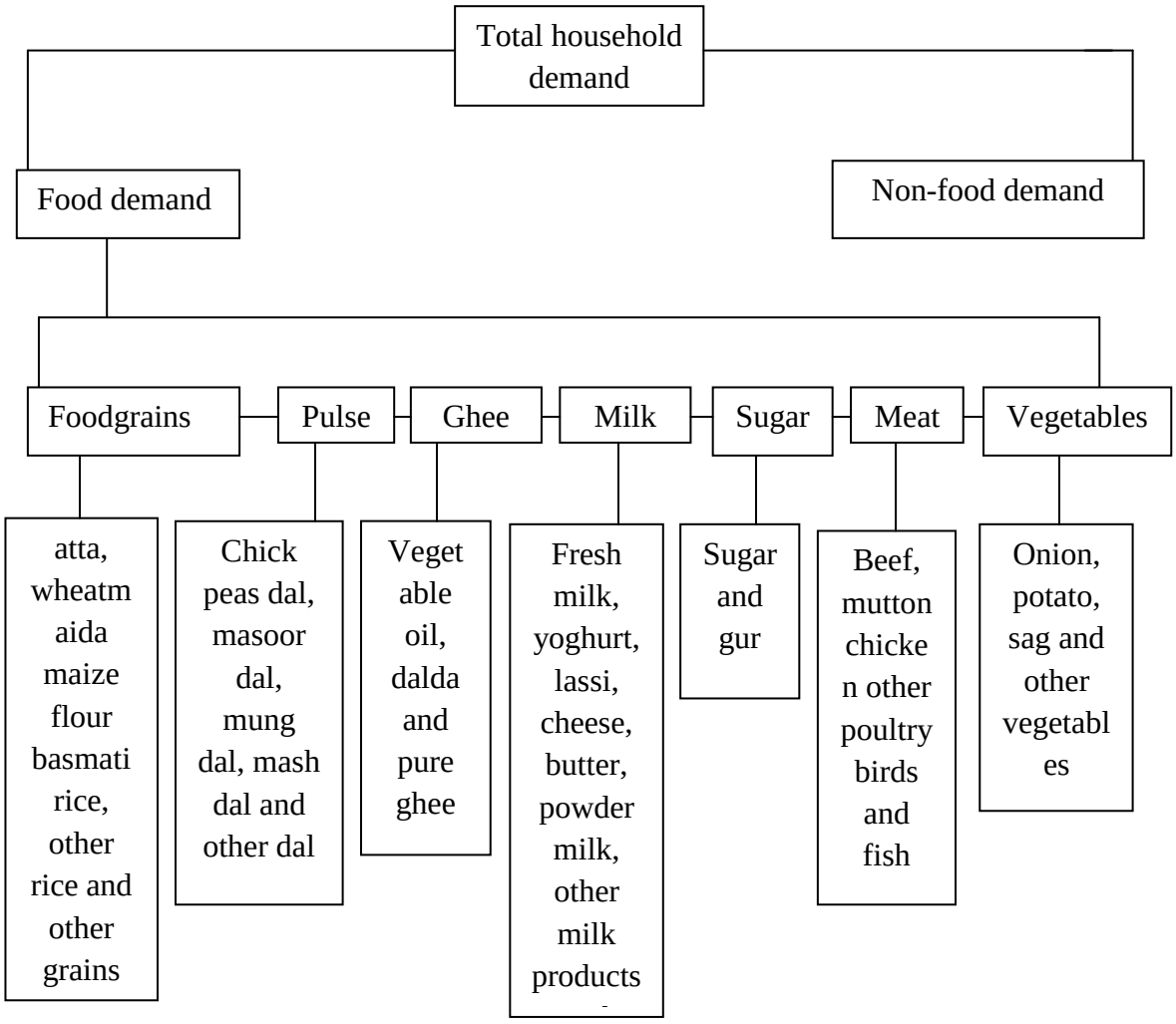
contrast to the LESmodel it permits a full range of commodities (complementary and substitute goods,normal and inferior goods) to be analyzed.

3.2.4. Choice of Demand Projection Models

In developing countries policies regarding to household food demand, supply, production, distribution and food security based on demand forecasts for various commodities therefore, demand prediction are essential for development planning. Demand projection requires reliable estimates of income elasticities, growth of population and growth rate of income. In the case of demand for food in developing countries, the problems of projection are compounded by many factors among which the most notable are rapidly growing population, industrialization and changing preferences etc. In this study, we are concerned with the demand projection for various food commodity groups at the given level of income and population. For projecting the demand for food we use a simple growth model.

3.2.5. Food Commodity Groups Include in the Analysis

The major food commodities groups selected for the study arefoodgrains (atta, wheat, maida, maize flour, basmati rice, other rice and other grains), pulses (chick peas dal, masoor dal, mung dal, mash dal and other dal), ghee (vegetable oil, dalda and pure ghee), milk (fresh milk, yoghurt, lassi, cheese, butter, powder milk, other milk products and baby formula milk), sugar (sugar and gur), meat (beef, mutton, chicken, other poultry birds and fish), vegetables (onion, potato, sag and other vegetables). The details of household food demand are given in the following figure.



3.3. Dataandits Sources

This study usedthe data ofPakistan Panel Household Survey (PPHS)-2010, conducted by Pakistan Institute of Development Economics (PIDE) Islamabad, this data set consists of 4076 households and we used all of them for our study.The amount (quantities) consumed and expenditures made by households on various commodity groups such that, foodgrains, pulses, ghee, milk, sugar, meat and vegetables as well as age composition of different households have been taken from this survey.The SPSS package has been used in order to arrange the PPHS-2010 data set. Per capita GDP growth data from the year 2010 to 2030 is taken from Economic

Research Service (ERS) Macro Economic Data set (2005). ERS estimate the projected growth rate of per capita GDP on the basis of the value of 2005 dollar. The data of total population and population growth rate for the year 2000 to 2010 is taken from Asian Development Bank (ADB) Key Indicators for Asia and the Pacific (2010).

3.4. Methodology

3.4.1. EconometricModelling

The estimation of Linear Approximation Almost Ideal Demand System (LA/AIDS) is carried out using a system of equationscomprising household budget shares for various commodity groups. Thecommodity groups included in the analysis were: foodgrains (atta, wheat, maida, maize flour, basmati rice, other rice and other grains), pulses (chick peas dal, masoor dal, mung dal, mash dal and other dal), ghee (vegetable oil, dalda and pure ghee), milk (fresh milk, yoghurt, lassi, cheese, butter, powder milk, other milk products and baby formula milk), sugar (sugar and gur), meat (beef, mutton, chicken, other poultry birds and fish), vegetables (onion, potato, sag and other vegetables). Thus, theestimated system consisted of a set of 7budget share equations, i.e. one budget share equation for each item or commoditygroup. Since all budget shares sum up to unity they form a singular system ofequations that cannot be estimated directly. Hence to make the system non-singular,one of the share equations has to be dropped arbitrarily.

For ith commodity, the budget share equation used for empirical estimationis,

$$w_i = \alpha_i + \Sigma\gamma_{ij}\ln P_j + \beta_i \ln (X/P) + \Sigma\theta_{ih}Z_h \text{ .....(1)}$$

Where

w_i = Budget share for ith commodity group .

X = Per capita expenditure (Rs) on all consumption items included in the model.

P = Stones' index estimated as $\ln P = \Sigma w_j \ln P_j$[1]

Z_h= No. of household members of type h.

h = 1, children (aged < 6 years).

= 2, adolescents (aged 6–15 years).

= 3, adults (aged over 15 years).

p_j = Price/unit (Rs) or aggregate price of consumption items in group j

i,j = 1,2,3,……..N

α_i, γ_{ij}, β_i and θ_{ih} are parameters to be estimated.

Budget share of ith commodity group is computed as:

$$w_i = p_i q_i / \Sigma p_i q_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where,$p_i$is price of ith commodity group and q_i is quantity of ith commodity group, respectively.

$p_i q_i$= expenditure on ith commodity group.

$\Sigma p_i q_i$ = total expenditures (income).

The price of ith commodity group is computed as:

$$p_i = p_i q_i / q_i \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

---

[1]Introduced by Richard Stone in (1953)

Ston;s index along with per capita expenditures is estimated as:

$$\ln(X / P) = \ln X - \ln P \ldots..(4)$$

$$X = \Sigma\, p_i q_i / n \ldots\ldots\ldots\ldots(5)$$

Where

n = Household size

The AIDS model satisfies the adding-up, homogeneity, and symmetry restrictions automatically. The adding-up requires $\Sigma\gamma_{ij} = 0$, $\Sigma\, \beta_i = 0$, homogeneity implies $\Sigma\, \gamma_{ij} = 0$ and symmetry implies

$\gamma_{ij} = \gamma_{ji}$.

Based on equation (1), the following uncompensated own-price (e_{ii}), cross-price (e_{ij}), expenditure ($Є_i$) and household age composition elasticities (φ_i) are estimated from the parameter estimates[2]:

$$Є_i = (\beta_i / w_i) + 1 \text{ ---------- } (6)$$

$$e_{ij} = (\gamma_{ij} - \beta_i w_j) / w_i - \sigma_{ij} \text{ ------- } (7)$$

The values of $\sigma_{ij}$are one and zero in the case of own price and cross price elasticity respectively.

The compensated own and cross price elasticities can be computed by using the Slutsky equation in elasticity form:

$$e^H_{ij} = e_{ij} + w_j Є_i \text{ ----------(8)}$$

Where, e^H_{ij} is the compensated (Hicksian) price elasticity.

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[2]see details in Farooq, *et al*. (1999).

$$\varphi_{ih} = [\theta_{ih} Z_h - \beta_i (Z_h / N)] / w_i \text{ ---(9)}$$

Where, N denotes the total households.

Moreover, the impact of a change in family composition on the household income/total expenditures (i.e. the change in expenditure on ith good as a percent of household income) is estimated using the following equation:

$$\Omega_{ih} = [\ \theta_{ih} - \beta_i \ln (N+1/N)] * 100 \ldots\ldots\ldots\ldots (10)$$

The β_i parameter of the AIDS model determines the effect of a change in real expenditure on the budget share of good i and whether this good is a luxury, a necessity or an inferior good. For a luxury $\beta_i>0$ and the expenditure/income elasticity is greater than one ($Є_i>1$) and w_i increases with rising total expenditure (X). For a necessary good, $\beta_i<0$ and the expenditure elasticity lies between zero and one ($0 <Є_i< 1$), w_i decreases with increasing X. And, for an inferior good $\beta_i< -1$ and the expenditure elasticity is smaller than zero ($Є_i<0$).In addition, it is possible to examine all complementary and substitutive relations between pairs of goods by estimating the compensated price elasticities.

3.4.2. Food Demand Projections Model

The food demand is projected using the following growth formula[3]:

$$D_t = d_0 \times N_t\ (1+y \times e)^t \ldots\ldots\ldots\ldots\ldots\ldots (3.1)$$

Where

D_t = household demand (million metric tonnes) of a commodity group in year t.

d_0 = per capita consumption (kg) of the commodity group in base year i.e. the year 2010.

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[3]this formula has been used by various researchers including Goyal and singh (2004), mittal (2008) and Kumar *et al* (2009).

N_t= the projected population (million) in the year t. ADB data set enable us to project the future level of Pakistan population from the year 2011 to 2030 with the help of simple

compounding formula[4].

y = growth in per capita income (GDP).

e = expenditure / income elasticity of demand for the commodity group.

t = years 1, 2, 3……..n. for base year t =0.

This formula is widely used for projecting food demand because it requires less information and parameters. This model uses several assumptions, such as constant growth in population, no change in taste and preferences, constant prices, and constant technology of production.This study providesthe demand projections for various food commodity groups from the year 2010 to 2030. These projections have been based on constant price, 2 percent growth of population and various per capita income growths. Since the projected population data of Pakistan are not available at any reliable source, therefore we projectedthe population of Pakistan from the year 2011 to 2030 with the help of simple compounding formula, taking 2010 as base year and 2 percent average population growth rate[5].

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[4] $Pop_{Future} = Pop_{present} * (1+i)^n$ Where: Pop_{Future}= Future population. , $Pop_{present}$= Present population.
i = Population growth rate. n = Number of year

[5] The average population growth rate of the past ten year (from 2000 to 2010) estimated as 2% is consider for population projection.

CHAPTER NO 4

RESULTS AND DISCUSSION

4.1. Introduction

In this chapter,analysis of food demand followed by projecting food demand for Pakistan is given. The chapter is divided into three sections. Section one explains descriptive statistics of important variables used in this study. Section two explains the estimated elasticities and their implications. Section three explains the food demand and its projection for the year 2010 to 2030.

4.2. Descriptive statistics

Descriptive statistics about the budget shares of various commodity groups, their aggregate prices, age composition and size of the households are presented in Table 4.1. It is observed that foodgrains is major consumption items group having average budget share of 25.83 percent of household expenditure whereas pulses, ghee, milk, sugar, meat and vegetables having average budget shares of 7.51, 15.39, 12.66, 14.65, 14.65, 14.79 and 9.05 respectively. The coefficients of variations for prices of various commodity groups ranged between 20.61 and 119.40 percent. The largest variation is observed for the aggregated price of milk category. This is attributed to large differences in the price of various milk types and milk items such as powder milk, baby formula milk, lassi, cheese, butter and other milk products. Sugar and meat prices exhibited the least variation. Regarding age composition, on the average every household is composed of 1.038 children, 1.189 adolescents and 4.652 adults and average size of household is 7.509 members.

Table 4.1

Descriptive Statistics about Budget Shares of Various Commodity Groups, Their Respective Aggregated Prices and Age Composition of Households

Commodity Group	Mean	Standard deviation	Coefficient of variation
Budget shares			
Foodgrains	25.83	18.44	71.38
Pulses	7.51	6.93	92.30
Ghee	15.39	8.96	58.21
Milk	12.66	15.13	119.51
Sugar	14.65	10.31	70.40
Meat	14.79	15.07	101.89
Vegetables	9.05	6.79	75.13
Price/Unit			
Foodgrains (Rs/1Kg)	36.26	21.34	58.85
Pulses(Rs/1Kg)	100.88	33.80	33.51
Ghee(Rs/1Kg)	124.09	25.83	20.82
Milk (Rs/1Liter)	25.34	30.25	119.40
Sugar(Rs/1Kg)	73.58	15.17	20.61
Meat(Rs/1Kg)	198.43	91.12	45.92
Vegetables(Rs/1Kg)	28.35	11.13	39.25
Households			
Composition by age			
Children (age ≤ 6)	1.038	1.283	123.61
Adolescent (age 6-15)	1.819	1.727	94.96
Adult (age > 15)	4.652	2.617	56.27
Household Size	7.509	3.932	52.37

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

4.3. Parameters Estimates of LA/AIDS Model

The estimated parameter of the preferred LA/AIDS model are presented in Table 4.2 and its corresponding adjusted R^2 and F values in Table 4.3 respectively. Out of eighty four parameters of seven equations, seventy two parameters are highly significant, meanstheir corresponding variables such as prices, per capita real income and household agecompositionaffect (either positively or negatively) theircorrespondingbudget shares, while twelve parameters are insignificant[6], means their corresponding variables do not affect theircorresponding budget shares well. The adjusted R^2 of the model ranged between 22.8 and 74.1 percent. The highest adjusted R^2 is observed for foodgrains means that, the number of regressors, explains 74.1 percent variation in foodgarins budget share. The lowest adjusted R^2 of pulses and vegetables means that the number of regressors shows least variation in their budget shares. It is observed that except of foodgrainsother food groups have uncommonly low adjusted R^2, it is because we use cross sectional data set with a large number of observations. From table 4.3 we observed highly significant F value for all commodity groups.

[6] The insignificant parameters are $\alpha_7, \gamma_{25}, \gamma_{35}, \gamma_{45}, \gamma_{52}, \gamma_{53}, \gamma_{57}, \theta_{31}, \theta_{32}, \theta_{42}, \theta_{71}, \theta_{73}$ respectively.

Table 4.2

Parameter Estimates of the Preferred LA/AIDS Model for Various Food Commodity Groups

Parameters	Estimates	T	Significance	Parameters	Estimates	T	Significance
α_1	-0.580	-36.963	0.000	γ_{45}	0.003	1.229	0.219
β_1	-0.140	-95.434	0.000	γ_{46}	0.002	3.191	0.001
γ_{11}	0.010	7.093	0.000	γ_{47}	-0.012	-6.964	0.000
γ_{12}	0.006	4.935	0.000	θ_{41}	0.003	3.240	0.001
γ_{13}	-0.009	-4.703	0.000	θ_{42}	0.001	1.493	0.135
γ_{14}	-0.019	-22.020	0.000	θ_{43}	0.003	5.022	0.000
γ_{15}	0.016	6.226	0.000	α_5	-0.125	-7.870	0.000
γ_{16}	-0.013	-15.097	0.000	β_5	-0.056	28.482	0.000
γ_{17}	-0.007	-3.345	0.001	γ_{51}	-0.019	-17.237	0.000
θ_{11}	0.007	6.039	0.000	γ_{52}	0.002	1.617	0.106
θ_{12}	0.010	11.794	0.000	γ_{53}	-0.001	-0.828	0.408
θ_{13}	0.004	6.820	0.000	γ_{54}	-0.025	-35.095	0.000
α_2	-0.039	-3.285	0.001	γ_{55}	0.022	9.869	0.000
β_2	-0.031	-20.747	0.000	γ_{56}	-0.005	-6.177	0.000
γ_{21}	-0.014	-17.549	0.000	γ_{57}	-0.008	-4.229	0.000
γ_{22}	0.012	14.924	0.000	θ_{51}	0.004	3.903	0.000
γ_{23}	-0.003	-2.596	0.009	θ_{52}	0.001	1.714	0.087
γ_{24}	-0.012	-22.284	0.000	θ_{53}	0.002	4.677	0.000
γ_{25}	-0.003	-1.584	0.113	α_6	-0.492	-32.525	0.000
γ_{26}	-0.002	-3.204	0.001	β_6	0.106	68.324	0.000
γ_{27}	-0.003	-2.372	0.018	γ_{61}	-0.010	-7.953	0.000
θ_{21}	0.002	3.038	0.002	γ_{62}	0.004	3.370	0.001
θ_{22}	0.001	1.718	0.086	γ_{63}	-0.004	-2.357	0.018
θ_{23}	0.001	3.333	0.001	γ_{64}	-0.025	-32.012	0.000
α_3	-0.096	-6.084	0.000	γ_{65}	0.016	6.454	0.000
β_3	-0.038	-17.980	0.000	γ_{66}	0.013	14.680	0.000
γ_{31}	-0.012	-10.924	0.000	γ_{67}	-0.021	-10.423	0.000
γ_{32}	0.004	3.624	0.000	θ_{61}	0.003	2.178	0.029
γ_{33}	0.026	15.200	0.000	θ_{62}	0.005	6.178	0.000
γ_{34}	-0.015	-20.931	0.000	θ_{63}	0.006	11.103	0.000
γ_{35}	-0.002	-1.096	0.273	α_7	-0.010	-0.868	0.385
γ_{36}	-0.004	-5.788	0.000	β_7	-0.025	-16.499	0.000
γ_{37}	-0.006	-3.653	0.000	γ_{71}	-0.012	-14.126	0.000
θ_{31}	-0.001	-1.463	0.143	γ_{72}	-0.002	-2.134	0.033
θ_{32}	0.000	.488	0.626	γ_{73}	-0.006	-4.762	0.000
θ_{33}	0.003	5.139	0.000	γ_{74}	-0.008	-14.315	0.000
α_4	-0.317	-22.040	0.000	γ_{75}	-4.59	-0.028	0.978
β_4	0.076	45.944	0.000	γ_{76}	-0.006	-9.963	0.000
γ_{41}	-0.011	-10.137	0.000	γ_{77}	0.025	17.885	0.000
γ_{42}	0.005	4.291	0.000	θ_{71}	0.001	1.567	0.117
γ_{43}	-0.006	-3.567	0.000	θ_{72}	0.002	2.684	0.007
γ_{44}	0.031	32.638	0.000	θ_{73}	0.000	1.165	0.244

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

Table 4.3

Adjusted R^2 and F values of Preferred LA/AIDS Model for Various Food Commodity Groups

Model number	Commodity group	Adjusted R^2	F
1	Foodgrains	0.741	1060.005
			(0.000)*
2	Pulses	0.240	117.504
			(0.000)
3	Ghee	0.228	110.063
			(0.000)
4	Milk	0.719	945.354
			(0.000)
5	Sugar	0.368	216.636
			(0.000)
6	Meat	0.648	680.519
			(0.000)
7	Vegetables	0.229	110.969
			(0.000)

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

* Probabilities of F-Statistics are in parentheses.

4.4. The Estimated Elasticities and their Implications

The estimated income/expenditure, uncompensated/Marshallian own, cross-price and household age composition elasticities are presented in table 4.4 whilecompensated/Hicksian own, cross-price elasticities and impacts of change in age composition of the family on household expenditure on various commodity groups are presentedin tables 4.5 and 4.6 respectively. All estimated income elasticities are positive. All uncompensated and compensated own-price

elasticity estimates have correct(negative) signs, clarifiesthe factthat price of a commodity itself have negative impact on its quantity demand.Farroq*et al* (1999) and Zahoor *et al* (2012) also reported similar findings for Pakistani Punjab. Out of thefortytwo uncompensated cross-price elasticities, thirteen elasticitiesare positive signifying grosssubstitutes, and the othertwenty nine elasticitiesare negative indicating complementaryconsumer goods.Onthe other hand, out offortytwo compensated cross-price elasticities, six elasticitiesare negative signifying gross complements and the otherthirty six elasticitiesare positive indicating gross substitute. Comparing to the findings of Zahoor *et al* (2012) who reported that out of fifty six uncompensated cross-price elasticities, sixteen are positive indicating gross substitutes and forty are negative indicating gross complements while out of fifty six compensated cross-price elasticities, forty are positive indicating gross substitutes while sixteen are negative indicating gross compliments. Estimated income elasticities of foodgrain, pulses, ghee, sugar and vegetables are less than one ($Є_i < 1$) implies that these items are necessities while, estimated income elasticities of milk and meat are greater than one ($Є_i > 1$) implies that these items are luxuries. Comparing to Farooq*et al* (1999) who reported that pulses are necessities and meat and milk are luxuries while Zahoor *et al* (2012) reported that vegetables and cooking oil are necessities and meat and milk are luxuries food items. Milk and meat are more income elastic than other food items implies that when income rises then their demands also rise and it couldbe justified that due to low purchasing power (poverty)in the country the people were responding moretowards the consumption of these items as their income changes (Khalil *et al*, 2012). Except of meat, other six food commodity groups have inelastic own-price (both uncompensated and compensated) elasticities implies that they are integral items of household diet.Farooq*et al* (1999) and Zahoor *et al* (2012) reported inelastic own-priceelasticities for all food commodity

groups include in their analysis. We are estimated both the uncompensated and compensated cross-price elasticites. But the uncompensated/Marshallian cross-price elasticity estimatesprovide the most accurate picture of cross-price compliments and substitutes. Therefore, we discussed only the cross-price effects of uncompensated elasticity estimates. The own-price elasticity(both uncompensated and compensated) of pulses is higher than the own-price elasticity of vegetables. The negative value of their uncompensated cross-price elasticitiiesimplies that they are grosscompliments[7]. Regarding the consumption of protein goods, the own-price elasticity of meat is much higher than ghee implying that households are relatively moreresponsive to change in the price of meat compared to ghee. Whereas, their uncompensated cross-price elasticities are negative indicating that they are the gross complimentsin consumption. Zahoor *et al* (2012) also reported similar findings. The own-price elasticity of sugar is higher than the own-price elasticity of milk. Thenegative value of their uncompensated cross-price elasticities implies that they are gross compliments in consumption. The uncompensated cross-price elasticities of foodgrains indicate substitutive relationship with pulses, meat and vegetables, respectively. Most of the household age composition elasticities have positive signs, but for milk and meat it has negative signs.Farooq*et al* (1999) also reported similar findings.

Moreover, for all commodity groups included, a consistent positive association between the magnitude of the elasticity estimates and various age groups can be observed. In other words, most of the magnitudes of elasticity estimates for children are smaller as compared with the adolescents and adults. This implies that a change in age composition of the family causes significant quantitative effect in the food demand of the households.

When considering the impact of change in age composition on household food demand,

[7]Two goods are said to be gross compliments if ($\delta Xi/\delta Pi$) < 0 and vice versa.

particular attention focuses on the sign of the coefficient of the respective age group variable. If, for example, a child is added to the household, holding all other variables (including income) constant, the child will place a specific, additional demand on the household's consumption of food items (a hungry mouths effect) but since the household in a monetary sense is now worse off, the child will reduce the household's demand for (normal) food products (a real income effect)[8].

What is measured here is the combined impact of these responses. Thus, it is found that the demand for all commodities except milk and meat increases with the addition of a household member in each category (the hungry mouths effect outweighs the real income effect). The negative sign of milk and meat for household composition implies that the household reduce the expenditure on these items with the addition of members of various age groups. Moreover, adding a child ceteris paribus (holding all other variables constant)reduces expenditure on milk and meat by 0.65 and 1.02 percentrespectively of household income (i.e. the real income effect is outweighing the hungry mouths effect) while increase expenses on foodgrains, pulses, ghee, sugar and vegetables. The addition of an adolescent and adults reduces expenditures on milk and meat by 0.85, 0.82, 0.65 and 0.72 percentrespectively while increasing expenditures on other commodity groups.In short words we can said that, when the household size increases by any age category then expenditures on necessary food items groups increases while on luxury food items groups itdecreases. This indicates tothe existence of poverty because increase in the household size reducedthe household purchasing power results in an increase in the percentage

[8]see details in Farooq, *et al*. (1999).
Hungry Mouths effect: When the household size increases by one additional member, holding all other variables (including income and prices) constant than household expenditure on necessary food items increases.
Real Income Effect: When the household size increases by one additional member, holding all other variables (including income and prices) constant than household expenditure on luxury food items decreases.

spending on necessary food items while reduce expanses on luxury food items. Farooq*et al* (1999) also reported similar findings.

In summary, the pattern of food demand that has emerged from this empirical analysis suggests that changes in the prices of milk and meat will bring major changes in the diet of the households. On the other hand, a significant increase in the demand of milk and meats can be expected following an increase in the household income. An increase in household size ceteris paribus reduces the consumption of milk and meat but increases the demand for other food items. A change in the household age composition brings significant changes in the quantities of various commodities consumed.

Table 4.4

Matrix of the Estimated Income and Uncompensated Own and Cross Price Elasticities of Demand for Various Food Commodity groups

Commodity Group		**With Respect to the Price of**							**Household Composition**		
	Income	Foodgrains	Pulses	Ghee	Milk	Sugar	Meat	Vegetables	Children	Adolescents	Adults
Foodgrains	0.4580	**-0.8213**	0.0639	0.0486	-0.0049	0.1413	0.0298	0.0219	0.1031	0.2017	0.4078
Pulses	0.5872	-0.0798	**-0.8092**	0.0236	-0.1075	0.0205	0.0344	-0.0026	0.0848	0.1242	0.3177
Ghee	0.7531	-0.1418	0.0074	**-0.8691**	-0.1287	-0.0492	-0.0625	0.0613	0.2734	0.0598	0.2437
Milk	1.6003	-0.2419	-0.0056	-0.1398	**-0.8311**	-0.0642	-0.0729	-0.1491	-0.0584	-0.1311	-0.2617
Sugar	0.6177	-0.0309	0.0424	0.0520	-0.1223	**-0.7938**	0.0224	-0.0200	0.0817	0.1050	0.3003
Meat	1.7167	-0.2527	-0.0268	-0.1373	-0.2598	0.0032	**-1.0181**	-0.2068	-0.0780	-0.1121	-0.2553
Vegetables	0.7238	-0.0612	-0.0014	-0.0238	-0.0534	-5.6780	-0.0254	**-0.6987**	0.0497	0.1071	0.1711

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

Table 4.5

Matrix of the Estimated Compensated Own-price and Cross-Price Elasticities of Demand for Various Food Commodity Groups

Commodity Group	With Respect to the Price of						
	Foodgrains	Pulses	Ghee	Milk	Sugar	Meat	Vegetables
Foodgrains	**-0.7029**	0.0983	0.1191	0.0530	0.2084	0.0976	0.0634
Pulses	0.0719	**-0.7651**	0.1139	-0.0332	0.1066	0.1213	0.0505
Ghee	0.5028	0.0640	**-0.7532**	-0.0334	0.0612	0.0489	0.0068
Milk	0.1714	0.1146	0.1065	**-0.6285**	0.1702	0.1637	-0.0043
Sugar	0.1286	0.0887	0.1471	-0.0440	**-0.7033**	0.1138	0.0359
Meat	0.1907	0.1021	0.1269	-0.0424	0.2547	**-0.7642**	-0.0515
Vegetables	0.1257	0.0530	0.0876	0.0382	-5.5720	0.0816	**-0.6333**

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

Table 4.6

Percent Change in Household Income Spent on Various Food Commodity Groups Due to Change in Family Composition

Commodity Group	HH Composition		
	Children	Adolescent	Adults
	……impact as percent	of HH income……	
Foodgrains	2.45	2.75	2.15
Pulses	0.58	0.48	0.48
Ghee	0.37	0.47	0.77
Milk	-0.65	-0.85	-0.65
Sugar	1.10	0.80	0.90
Meat	-1.02	-0.82	-0.72
Vegetables	0.41	0.51	0.31

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

4.5. Food Demand Projections in Pakistan

In this study food demand is projected for Pakistan from the year 2010to 2030.Per capita household demand for various commodities is given in table 4.7; Population projections used for demand projections are given in table 4.8;Percapita income growth rate is given in table 4.9 and Expenditure elasticities used for demand projections are given in table 4.10 respectively. Projections are made for various commodity groups such as foodgrains, pulses, ghee, milk, sugar, meat and vegetables in Pakistan.

4.5.1. Per Capita Demand of Food Commodities in Base Year 2010

The per capita consumption of food in Pakistan for the year 2010 has been depicted in Table 4.7. Per capita consumption of food (as food demand) inthe year 2010is used as baseline food demand forprojecting the future per capita food demand. It can be observed that foodgrains, vegetables and pulses are major consumption items having per capita consumption of 107 kg/year,125 kg/year and 96.1 kg/year respectively. Moreover, ghee, sugar, milk and meat having per capita demand of 27.5 kg/year, 55.5 kg/year, 85.7 kg/year and 22.2 kg/year respectively. The total per capita food demand isobserved as 519 kg/year.

4.5.2. Population Projections

According to the Asian Development Bank (ADB)Key Indicators for Asia and the Pacific 2010, the total population of the Pakistan was 173.6 million inthe year 2010 and will be expected to rise on average rate of 2 percent per year (because from 2000 to 2010 the average population growth rate was 2 percent). On the basis of this information we projected the population of the country from the year 2011 to 2030. The details of base year and projected population are given in table 4.8. Thetotal population of thecountry is expected to increase from 173.6 million in 2010

to 191.3 million in 2015, 211.2 million in 2020, 233.2 million in 2025 and further to 257.5 million in 2030.

4.5.3. Income Growth

Base year and projected growth rate of per capita income/GDP is given in table 4.9. The projected growth rate of income inthe year 2010 was 2.69 percent and is expected to be 2.97 percent in 2015, 2.52 percent in 2020, 2.98 percent in 2025 and 3.05 percent in 2030.

4.5.4. Expenditures/Income Elasticities for Various Commodities Groups

Expenditure elasticities of various commodity groups derived from this study are given in table 4.10. Expenditure elasticities of foodgrains, pulses, ghee, sugar and vegetables are less than one, means they are necessities food items groups while it is greater than one for milk and meat indicate that they are luxury food itemsgroups.

Table 4.7

Per Capita Consumption/Demand of Various Food CommodityGroups in 2010

Commodity Group	Demand (Kg/year)
Foodgrains	107
Pulses	96.1
Ghee	27.5
Milk	55.5*
Sugar	85.7
Meat	22.2
Vegetables	125
Total	519

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

*In food demand analysis we assume 1kg = 1liter (Khalil and Yousaf, 2012).

Table 4.8

Base Year and Projected Population for the Year 2010 to 2030(Million)

Year	Population	Year	Population
2010	173.6	2021	215.5
2011	176.7	2022	219.8
2012	180.3	2023	224.2
2013	183.9	2024	228.6
2014	187.6	2025	233.2
2015	191.3	2026	237.9
2016	195.1	2027	242.6
2017	199.0	2028	247.5
2018	203.0	2029	252.4
2019	207.1	2030	257.5
2020	211.2		

Source: Computed by authors based on Asian Development Bank (ADB) data set for the year2010.

Table 4.9

Projected Growth Rates in per capita Income (% per annum)

Year	Per capita Income Growth	Year	Per capita Income Growth
2010	2.69	2021	2.82
2011	1.42	2022	2.87
2012	2.06	2023	2.92
2013	2.02	2024	2.95
2014	2.54	2025	2.98
2015	2.97	2026	3.00
2016	2.90	2027	3.02
2017	2.82	2028	3.04
2018	2.68	2029	3.02
2019	2.60	2030	3.05
2020	2.52		

Source: Economic Research Service (ERS) Macro Economic Data set (2005).

Table 4.10

Income/Expenditure Elasticities for Various Food Commodity Groups

Commodity Group	Expenditure/Income Elasticity
Foodgrains	0.4580
Pulses	0.5872
Ghee	0.7531
Milk	1.6003
Sugar	0.6177
Meat	1.7167
Vegetables	0.7238

Source: Computed by authors based on PPHS data of Pakistan for the year 2010

4.5.5. Future Demand forFoodin Pakistan

The total and per capita household demand of various food commodities from the year 2010 to 2030 at 2 percent population growth rate is given in table 4.11 and 4.12 respectively. It is observed that, the total household demand for various food items increaseswith the passage of time.The highest total demand is observed for food grains, pulses and vegetables. Household demand of foodgrains increases from 18.6 million metric tonnes inthe year2010 to 21.9 million metric tonnes inthe year 2015, 25.3 million metric tonnes inthe 2020, 30.6 million metric tonnes inthe year2025 and further to 36.4 million metric tonnes inthe year 2030. Household demand for pulses and vegetables rises from 16.7, 21.7 million metric tonnes from the year 2010 to 35.3, 49.8 million metric tonnes in the year 2030 respectively. Similarlytotal demand for ghee, milk, sugar and meat rises from 4.8, 9.6, 14.9 and 3.9 million metric tonnes inthe year 2010 to 11.2, 37, 32 and 15.8 million metric tonnes inthe year 2030. When we divided total household demand by population then we get per capita household demand. From table 4.12 we observed rising trends in per capita household food demand from the year 2010 to 2030. Per capita household

demand for foodgrains, pulses, ghee, milk, sugar, meat and vegetables rises from 107, 96.11, 27.6, 55.49, 85.7, 22.2 and 125 kg/per year in 2010 to 141.2, 137.1, 43.4, 144, 124.5, 61.6 and 193.3 kg/year in 2030 respectively.

In summary, the food demand that has emerged from this empirical analysis suggests that keeping prices constant when the population grow by 2 percent per annum then per capita and total household food demand increase for the next two decades. It is concluded that household food demand has been primarily driven by growth in population and income.

Table 4.11

Total Demand for Various Food Commodity Groups from 2010 to 2030

(Million MetricTonnes/year)

Year	*Commodity groups*						
	Foodgrains	*Pulses*	*Ghee*	*Milk*	*Sugar*	*Meat*	*Vegetables*
2010	18.6	16.7	4.8	9.6	14.9	3.9	21.7
2011	19	17.1	5	10	15.3	4	22.3
2012	19.7	17.7	5.1	10.7	15.8	4.3	23.2
2013	20.2	18.3	5.3	11.2	16.4	4.5	24
2014	21	19.1	5.6	12.2	17.1	5	25.2
2015	21.9	20	6	13.4	18	5.4	26.6
2016	22.6	20.8	6.1	14.2	18.6	5.8	27.6
2017	23.3	21.5	6.4	15	19.3	6.1	28.6
2018	24	22.1	6.6	15.8	19.8	6.5	29.6
2019	24.6	22.8	6.8	16.6	20.5	6.8	30.6
2020	25.3	23.5	7	17.4	21.1	7.2	31.6
2021	26.5	24.8	7.5	19.4	22.3	8	33.6
2022	27.5	25.8	7.8	20.9	23.3	8.7	35.1
2023	28.5	26.9	8.2	22.5	24.2	9.4	36.8
2024	29.5	28	8.6	24.2	25.2	10.1	38.4
2025	30.6	29	9	26	26.3	11	40.1
2026	31.7	30.2	9.4	28	27.4	11.8	42
2027	32.8	31.4	9.8	30	28.5	12.7	43.8
2028	34	32.7	10.3	32.3	29.7	13.7	45.7
2029	35	33.9	10.7	34.3	30.7	14.6	47.6
2030	36.4	35.3	11.2	37	32	15.8	49.8

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

Table 4.12

Per Capita Demand of VariousFood Commodity Groups 2010 to 2030

(Kg/year)

Year	*Commodity groups*						
	Foodgrains	*Pulses*	*Ghee*	*Milk*	*Sugar*	*Meat*	*Vegetables*
2010	107	96.1	27.6	55.5	85.7	22.2	125
2011	107.7	97	27.9	56.8	86.5	22.7	126.2
2012	109	98.5	28.4	59.2	88	23.8	128.7
2013	110	99.6	28.8	61.1	89	24.6	130.5
2014	112.1	102	29.7	65.1	91.2	26.3	134.4
2015	114.5	104.8	30.8	70	93.9	28.4	139
2016	115.8	106.4	31.4	72.9	95.4	29.7	141.5
2017	117	107.8	32	75.6	96.7	30.9	144
2018	118	109	32.3	77.7	97.8	31.8	145.7
2019	119	110.2	32.8	80.1	99	32.9	147.8
2020	120	111.3	33.3	82.4	100.1	33.9	149.7
2021	123.2	115.1	34.7	90.2	103.7	37.3	156
2022	125.1	117.5	35.6	95.1	105.9	39.5	159.9
2023	127.1	119.9	36.6	100.5	108.1	41.9	164
2024	129	122.2	37.5	105.9	110.4	44.3	168
2025	131.1	124.7	38.5	111.6	112.7	46.9	172
2026	133.1	127.1	39.4	117.5	115	49.5	176.2
2027	135.1	129.6	40.4	123.8	117.4	52.4	180.4
2028	137.2	132.2	41.4	130.5	119.8	55.4	184.8
2029	138.9	134.2	42.3	136.1	121.8	58	188.4
2030	141.2	137.1	43.4	144	124.5	61.6	193.3

Source: Computed by authors based on PPHS data of Pakistan for the year 2010.

CHAPTER NO 5

CONCLUSION AND RECOMMENDATIONS

5.1. Introduction

This chapter consistsof five sections. First section discussed major findings of the study, second section deals with conclusion, in third section policy implications are given, fourth section provide the recommendations for further research and the last fifth section discussed the limitations of the study.

5.2. Major Findings of the Study

Major finding of the study are as follows:

1. All estimated income elasticities are positive.
2. All uncompensated and compensated own-price elasticity estimates have correct(negative) signs.
3. Estimated income elasticities of foodgrains, pulses, ghee, sugar and vegetables are less than one ($Є_i$< 1) implies that these items are necessities while estimated income elasticities of milk and meat are greater than one ($Є_i$> 1) implies that these items are luxuries.
4. Except of meat other six food commodities groups have inelastic own-price (both uncompensated and compensated) elasticities implies that they are integral items of household diet.
5. The negative value of uncompensated cross-price elasticitiies of pulses and vegetables implies that they are gross compliments.

6. The uncompensated cross-price elasticities of meat and ghee are negative indicating that they are the gross compliments.
7. The negative value of the uncompensated cross-price elasticities of milk and sugar implies that they are gross compliments in consumption.
8. The uncompensated cross-price elasticities of foodgrains indicate substitutive relationship with pulses, meat and vegetables, respectively.
9. Most of the household age composition elasticities have positive signs, but for milk and meat it has negative signs.
10. When the household size increases by any age category then expenditures on necessary food items groups increases while on luxury food items groups it decreases. This indicates the existence of poverty.
11. The food demand that has emerged from this empirical analysis suggests that keeping prices constant when the population grow by 2 percent per annum then per capita and total household food demand increase for the next two decades. It is concluded that household food demand has been primarily driven by growth in population and income.

5.3. Conclusion

This study attempts to analyze andproject food demand in Pakistan. The study is based on Pakistan Panel Household Survey (PPHS) for the year 2010. The important contribution of this study is that it uses PPHS data for the first time for food demand analysis and alsoprojects the future level of food demand for Pakistan.The SPSS package has been used in order to arrange the data.The Linear Approximation Almost Ideal Demand System (LA/AIDS) model is used particularly for elastisities estimation, while a simple growth model is used for food demand projection.

The empirical analysis of household food demand patterns reported here has provided broadly satisfactory results both in terms of economic theory and statistical fit. On the basis of income elasticity foodgrains, pulses, ghee, sugar and vegetables are found to be necessities, while milk and meat are identified as luxuries. All food items except meat included in the analysisare integral items of the household diet. Uncompensated cross-price elasicities shows that most of the commodities are gross complements, while compensated cross-price elasticities shows that most of them are gross substitute. Pulses and vegetables, ghee and meat, milk and sugarare identifies as gross compliments on the basis of uncompensated cross-price elasticities.The uncompensated cross-price elasticities of foodgrains indicate substitutive relationship with pulses, meat and vegetables, respectively. An increase in the household income will induce substantial expansion in household demand for milk and meat products but consumption of these foods will decline if household size grew ceteris paribus.On the Other hand, the food demand projections shows that per capita and total household food demands would beapproximately double for the next two decades.

5.4. Recommendations/PolicyImplications

The results derived from this research have much policy relevance. The estimated elasticities of food items with respect to expenditure (income) and household size are particularly relevant for producers and policy-makers to make investment and incentive decisions.The major share of the households budget are devoted to goods like foodgrains, ghee, milk, sugar and meat, while smaller shares are deposited to other food items like pulses and vegetables.The expenditure elasticities of food items also suggest that the nutritional requirements will get improved with the easy availability of food items. It may be generated through the food support programs like food program of World Food Program (WFP), Benazeer Income Support Program, Zakat and usher

etc. There exists a direct relationship between household size and food consumption items.Because household size is one of the most important determinants that significantly affect the household food demand, according to our findings therefore, various population control measures may improve the standard of living of Pakistani households.The government can also consider the results of cross price elasticities of food items in its key decision regarding households. For instant, our results show that if a tax is imposed on meat, households will substitute for meat into something that they consider a good substitute. The policy makers can get further assistance from the study findings while targeting household's decisions.

The projections for important food items on various assumptions give the evidence of great responsibility placed on the agriculture sector to produce food for domestic consumption. Because of high total and per capita demand for foods like foodgrains, pulses, ghee, milk, sugar, meat and vegetables, the projected future demand for these food items is quite big. The production in agriculture and dairy farming must be directed towards increasing the supply of these foods items. Food policy is one of the major government policies because it proves national independency, sustainable economy and society its main goal is to get self-sufficiency in food. Our estimated results about food demand projection would be helpful in this regard.

5.5. Limitations of the Study and Future Research

The projection of demand is based on some assumptions, such as constant growth in population, no change in taste and preferences, constant prices, and constant technology of production. Any change in these parameters can change the projections for food demand. For example, an increase in the price of milk may result in milk–sugarcomplementation that may reduce the demand for sugar. Similarly, adecrease in the demand for pulses may decrease the vegetables

demand, which will fall the total demand for vegetables. An increase in the price of foodgrains and an improved technology may have different effects on the household foodgrains demand. Moreover we consider direct (human) demand of foods and ignore the indirect (animal) demand which occupy a major share of total food demand. There is a need for further research to examine the direction of change and its welfare implications.

However, the results of the study are satisfactory but further analysis may be merited.Our data setprovides informationabout major food commodities only and limited information about socioeconomic factorstherefore, our analysis focused only on the demand of major commodity groups and we are including one demographic factor age in our analysis.Other possibility would be to investigate other commodity groupings or to incorporate additional socioeconomic factors such as education, occupation, region, household size etc in the model.

Nevertheless, it is expected that results and general arguments advanced here would be quite robust and despite the limitations of the present study, it should positively contribute to the discussions on issues concerning food demand analyses projections and food security in Pakistan.

REFERENCES

Adulavidhaya, K., Kuroda, Y., Lau, L, J. and Yotopoulos, P, A. (1984). The Comparative Statics of the Behavior of Agricultural Household in Thailand.*TheSingapore Economic Review,* 29 (1), 67-96.

Ahmad, E. and Arshad, M.(2007).Household Budget Analysis for Pakistan under Varying the Parameter Approach.*PIDE Working Paper*, 41, 1-19.

Ahmad, M. and Farooq, U. (2010). The State of Food Security in Pakistan:Future Challenges and Coping Strategies. *Paper Submitted for presentation at the "26th AGM and Conference of PSDE in Islamabad, Pakistan*, 1-27.

Ahmed, U, A. and Shams.(1994).Demand Elasticities in Rural Bangladesh: An Application of the AIDS Model. *The Bangladesh Development Studies*, XXII (1), 125-135.

Andersen, P, P., and Watson II, D, D. (2011). Food Policy for Developing Countries: The Role of Government in Global, National and Local Food Systems. *Cornell University Press.*

Bansil, P, C. (2011). Demand for Foodgrains-2020-21.*Article Techno Economic Research Institute J-7, Saket, New Delhi,110017*, 1-24.

Barigozzi, M., Alessi, L., Capasso, M. and Fagiolo, G. (2009).The Distribution of Household Consumption-Expenditure Budget Share.*Working Paper Series*, 1061, 3-52.

Barten, A, P. (1964).Consumer Demand Functions under Conditions of Almost Additive Preferences.*Econometrica*, 32, 1-38.

Bashir, M, K. Schilizzi, S. and Pandit, R. (2012). The Determinants of Rural Household Food Security in the Punjab, Pakistan: An Econometric Analysis.*Working Paper School of Agricultural and Resource Economics, 1203*,1-30.

Bollino, C, A. (1987). GAIDS: A Generalised Version of the Almost Ideal Demand System. *Economic Letters,* 23 (2), 199–203.

Bollino, C, A. and Violi, R. (1990). GAITL: A Generalised Version of the Almost Ideal and Translog Demand Systems. *Economic Letters,* 34 (2), 127–129.

Burki, A, A. (1997).Estimating Consumer Preferences for Food, Using Time Series Data of Pakistan.*The Pakistan Development Review*, 36(2), 131-153.

Burney, N, A. and Akhtar, N. (1990).Fuel Demand Elasticities in Pakistan: An Analysis of Household's Expenditure on Fuel using Micro Data.*The Pakistan Development Review,* 29 (2), 155-174.

Burney, N, A. and Khan, A, H. (1991). Household Consumption Patterns in Pakistan: An Urban-Rural Comparision Using Micro Data. *The Pakistan Development Review*, 30 (2), 145-171.

Caglayan, E. and Aster, M. (2012).A Microeconometric Analysis of Household Consumption Expenditure Determinants for both Rural and Urban Areas in Turkey.*American International Journal of Contemporary Research,* 2 (2), 27-34.

Chechye, L., Rock, B, D. and Vermeulen, F. (2008). An Afriat Theorem for the Collective Model of Household Consumption, 1-29.

Claudio, M. (2000).New-Zealand Consumption Equivalence Scales from Quasi-Unit Record Data.*Aust.N.Z.J*, 42(2), 127-144.

Deaton, A. andMuellbauer, J. (1980).An Almost Ideal Demand System.*The American Economic Review,* 70 (3), 312-326.

Deaton, A. and Muellbauer, J.(1984).Economics and Consumer Behavior.*Cambridge University Press*.

Diewert, W, E. (1974).Applications of Duality Theory.*Frontiers of Quantitative Economics*, 2(3).

Dunne P. and Edkins, B. (2005).The Demand for Food in South Africa.*Paper presented to Economics Society South Africa Conference, Durban*, 1-28.

Farooq, U., Young, T. and Iqbal, M.(1999).In Investigation into the Firm Households Consumption Patterns in Punjab Pakistan.*The Pakistan Development Review,* 38 (3), 293-305.

Frechet, G.,Lanctot, P., Morin, A. and Savard, F.(sep.2010).Equivalence Scales: An Empirical Validation. *Working Paper. Centre Detudesur la PauvreteetTexclusin,* 1-23.

Fu, S., Wojciech, J., Florkowski,Nambiar, P, M., Anna V, A.,Resurreccion andChinnan, M, S. (2013). Household Consumption Characteristics of Cookies: The Case of Uganda.*Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Orlando, Florida,* February 2-5, 1-19.

Gong, X., Soest, A, V. and Zhang, P. (2000).Sexual Bias and Household Consumption:A Semiparametric Analysis of Engel Curves in Rural China. *IZA Discussion Paper,* 212, 2-31.

Govindasamy, R., Purduri, V., Kelley, K. and Simon, J, E. (2012). Influence of Consumer Demographics on the Demand for LocallyGrown Ethnic Greens and Herbs Because of Food

Miles Concerns: A Logit Model Analysis. *Journal of Food Distribution Research,* 3 (1), 116-134.

Govt. of Pakistan (2009-10). Pakistan Economic Survey various issues Economic Advisor's Wing. *Fin. Div. Islamabad.*

Goyal, S, K. and Singh, J, P. (2004). Demand Versus Supply of Foodgrains in India: Implications to Food Security. *Paper presented at the 13th International IFMA Congress of Farm Management on "Feed theWorld- please the Consumer-Maintain the Environment" to be held at Wageningen,* The Netherlands,July 8-13, 2001, 2-20.

Green, R. and Alston, J, M. (1990).Elasticities in Aids Models.*American Journal of Agricultural Economic*, 72(2), 442–445.

Gronau, R. (1988). Consumption Technology and the Interfamily Distribution of Resources: Adult Equivalence Scales Reexamined. *Journal of Political Economy,* 96 (6), 1183- 1205.

Haller, A.Chhetri, V. Mulder, F, S.Jagirdar, S, A, H.Balbi, L. andKiyani, S. (2008).High Food Prices in PakistanImpactAssessment and the Way Forward.*FAO, UNDP, UNICEF, UNESCO, WFP, WHO*.

Haq, R. and Arshid, N. (2009).Inequality and Welfare by Food Expenditure Components.*The Pakistan Development Review,*48 (4), Part II, 755–768.

Haq, U, Z., Nazli, H., Meilke, K., Ishaq, M., Khattak, A., Arhad, H., Hashmi and Fasih, U, R. (2011).Food Demand Patterns in Pakistani Punjab.*Sarhad Journal ofAgriculture*, 27 (2), 305-311.

Horioka, C, Y. (2004). The Stagnation of Household Consumption in Japan.*Venice Summer Institute (VSI) Workshop,* July 25-26, in Venice, Italy, 1-30.

Hovhannisyan, V. and Gould, W, B. (2012).Structural Changes in Chinese Food Preferences.*Selected Paper prepared for presentation at the Agricultural & Applied Economics Association's 2012 AAEA Annual Meeting, Seattle, Washington*, 1-23.

Huang, J., Rozelle, S. and Rosegrant, M, W. (1999). China's Food Economy to the Twenty-first Century: Supply, Demand, and Trade. *Economic Development and Cultural Change*, 47 (4), 737-766.

Huang, K, S. (2006). Testing Structural Change in Demand for Foods.*Selected Paper prepared for presentation at the American Agricultural Economics Association Annual Meeting, Long Beach, California,* July 23-26, 1-14.

Iqbal, R.and Jamal, H. (1992). Regional Differences in Consumption Behavior in Pakistan.*The Pakistan Economic & Social Review*, XXX (2), 95-108.

Jamal, H. andIqbal, R. (1992).Regional Differences in Consumption Behavior in Pakistan.*Pakistan Economic & Social Review*, XXX, 95- 108.

Khan, M ,I. (1975). Demand for Food in Pakistan in 1975.*Pakistan Development Review*, 310-333.

Khalil S. andYousaf, H.(2012).Analysis of Consumption and Demand Elasticites for Food Products in Balochistan. *International Journal of Asian Social Science,* 2 (7), 1103-1122.

Kim, J., Engelhardt, H., Engelhardt H. and Aassve, A. (2009). Does Fertility Decrease Household Consumption? An Analysis of Poverty Dynamics and Fertility inIndonesia.*Demographic Research*, 20 (26), 623-656.

King, R, A. (1979). Choice and Consequences.*American Journal of Agricultural Economics*,61 (5), 839–848.

Kumar, P., Joshi P, K. and Birthal, P, S. (2009).Demand Projections for Foodgrains in India. *Agricultural Economics Research Review*, 22, 237-243.

Kumar, P., Kumar, A., Parappurathu, S. and Raju S,S. (2011). Estimation of Demand Elasticity for Food Commodities in India.*Agricultural Economics Research Review*,24, 1-14.

Kurosaki, T. (2004).Consumption Vulnerability to Risk in Rural Pakistan.*Revised from June and January version*, 1-28.

LaFrance, J. (2008). The Structure of US FoodDemand. *The Journal of Econometrics*, 1-21.

Lia, X., Petersonb, H, H. and Xiac, T. (2012).U.S. Consumer Demand for Organic Fluid Milk by FatContent.*The Journal of Food Distribution Research,* 43 (1), 50-58.

Malik, S, J., Mushtaq, M. and Ghani, E. (1988). Consumption Patterns of Major Food Items in Pakistan: Provincial, Sectoral and Intertemporal Differences 1979 to 1984-85. *The Pakistan Development Review*, XXVII, 4 (II), 751-761.

Malik, S, J. and Sarwar, N. (1993). Some Tests for Differences in Consumption Patterns: The Impact of Remittances using Household Integrated Economic Survey Data of Pakistan 1987-88. *The Pakistan Development Review*, 32 (4), 699-711.

Maitra, P. and Ray, R. (2003).The Effect of Transfers on Household Expenditure Patterns and Poverty in South Africa.*Journal of Development Economics*, 71, 23– 49.

Mejia, M. and Peel, D, S. (2012).Modeling Household Preferences for Cereals and Meats in Mexico.*The Journal of Food Distribution Research*, 43 (1), 59-64.

Mekonnen, D, K., Huang, C, L. and Fonsah E, G. (2012)**.**Analysis of Fruit Consumption in the U.S. with a Quadratic AIDS Model.*Selected Paper prepared for presentation at the Southern Agricultural Economics Association Annual Meeting, Birmingham, AL*, February 4-7, 2-11.

Meng, T., Florkowski, W, J., Sarpong, D., Resurreccion, A, V, A. andChinnan, M. (2013). The Determinants of Food Expenditures in the Urban Households of Ghana: AQuantile Regression. *Selected Paper prepared for presentation at the Southern Agricultural Economics Association (SAEA) Annual Meeting*, Orlando, Florida, 3--5 February, 1-17.

Mittal, S. (2008).Demand-Supply Trends and Projections of Food in India.*Indian Council for Research on International Economic Relations,Working Paper No*.209, 1-20.

Mittal, S. (2010).Application of the QUAIDS Model to the Food Sector in India.*Journal of Quantitative Economics*, 8 (1), 42-54.

Moschini, G. (1995). Units of Measurement and the Stone Index in Demand System Estimation.*American Journal of Agricultural Economics*, 77 (1), 63–68.

Mudassar, K., Aziz, B. and Anwar, A. (2012).Estimating Consumer Demand of Major Food Items in Pakistan: A Micro Data Analysis.*PakistanJournal of Life and Social Sciences*, 10 (1), 53-58.

Nazli, H., Haider, S, H. and Triq, A. (2012).Supply and Demand for Cereals in Pakistan, 2010–2030. *IFPRI Discussion Paper,* 01222, 1-22.

Ndeffo, L, N., Ngwen, N., Tegoum, P, J. N., Kamdem, C, B. and Makoudem, M. (Feb.2007). Impact of Equivalence Scales on the Spatial Distribution of Poverty in Cameroon: A Dynamic Approach. *PMMA Working Paper*, 04, 1-36.

Nisar, A., Chima, A, R. and Saleem A. (2012). Food Consumption Analysis in Pakistan: Expenditure Elasticities Approach using HIES Data. *Interdisciplinary Journal of Contemporary Research in Business,* 4, 466-475.

Regorsek, D. andErjavec, E. (2007).Food Demand in Slovenia.*Paper prepared for presentation at the I Mediterranean Conference of Agro-Food Social Scientists. 103rd EAAE Seminar 'Adding Value to the Agro-Food Supply Chainin the Future Euromediterranean Space'. Barcelona, Spain,* April 23rd - 25th, 1-13.

Samuel F. (2009). Inequality in the Distribution of Household Expenditure in Cameroon.*Proceedings of the German Development Economics Conference, Frankfurt a.M,* 43, 1-27.

Sania, B. and Cliff, A. (1998).Intra-household Resource Allocation in Rural Pakistan: A Semiparametric Analysis. *Journal of Applied Econometrics,* 13, 463-480.

Seale, J, Jr., Regmi, A. and Bernstein, J. (2003).International Evidence on Food Consumption Patterns.*Economic Research Service/USDA,* 1-50.

Sekhar, C, S, C. (2008). Cereals Sector in India:Recent Trends and Projections. *Commodity Vision,*2(2), 60-67.

Shephard, R, W. (1970).Theory of Cost and Production Functions.

Sher, F., Ahmad, N. andSafdar, S. (2012). Income and Economies of Scale Effect on Household Food Demand Pattern in Pakistan.*Acadmic Research International*, ISSN-L: 2223-9553, issn, 2223-9944, 3 (1), 50-56.

Siddiqui, R. (1982). An Analysis of Consumption Pattern in Pakistan.*The Pakistan Development Review*, 21(4), 232-296.

Smith, M. (2007).Microeconomic Analysis of Household Expenditures and their Relationship with House Prices.*Reserve Bank of New Zealand Bulletin,* 70 (4), 39-45.

Stone, J,R,N. (1953).The Measurement of Consumers Expenditure and Behavior in theUnited Kingdom, 1920-1938.*Cambridge*,1.

Stone, J, R, N. (1954). Linear Expenditure System and Demand Analysis: An Application to the Patterns of British Demand. *Economic Journal*, 64, 511–527.

Suleri, A, Q. and Haq, S. (2009).Food Insecurity in Pakistan.*Sponsored by (SDPI)., (SDC)., (WFP), Pakistan.*

Theil, H. (1965). The Information Approach to Demand Analysis.*Econometrica*, 33, 67-87.

Theil, H. and Clements, K, W. (1987). Applied Demand Analysis: Results from System-WideApproaches. *Ballinger Publishing Company, Cambridge, MA.*

Theil H., Chung, C, F. and Seale, J, L. (1989).International Evidence on Consumption Patterns.*JAI Press, Inc, Greenwich, CT*.

Tian, X. and Yu, X. (2012). The Demand for Nutrients in China: A Direct Approach. *Selected Poster prepared for presentation at the International Association of Agricultural Economists (IAAE) Triennial Conference, Foz do Iguacu, Brazil,* 18-24 August, 1-7.

Ulubasoglu, M., Mallick, D., Wadud, M., Hone, P. and Haszler, H. (2010). Food Demand Elasticities in Australia.*The working papers are The School or IBISWorld Pty Ltd,* 2-35.

Working, H. (1943).Statistical Laws of Family Expenditure.*Journal of the American Statistical Association*,38, 43-56.

Yousaf, H. andKhalil S. (2011). Household Milk Demand Function of Karachi City: An Econometrics View. *Pakistan Journal of Applied Social Sciences,* 1(1), 12-23.