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Estimating the welfare effect of food price increase on households in Nigeria: Direct and substitution effect approach

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ABSTRACT

Increases in food prices in Nigeria have raised huge concerns on the impact welfare of poor households who have substantial share of their spending on food. This study investigated the welfare effects (including the direct and substitution effects) of food price changes on households in Nigeria. The study employed time series data on food prices from 1991-2013 and household survey data obtained from the National household Survey (wave 2). We group household consumption expenditure on different food and non-food commodities into nine (9) namely; fish, meat, pulses, fruit & vegetable, fat & oil, beverages, wheat, rice, corn, and others. Welfare effect was analyzed by compensating variation. The results showed that a safety net program would net to transfer an amount equivalent to 0.76%, 0.26% and 1.02% of the total national consumption to fully compensate the poorest quintile in rural, urban and at the national level respectively. And also, in the richest losers' quintile about 1.29% of the aggregate national consumption will be required by a safety net program to fully compensate them overall. The study concluded that food price changes related significantly with welfare status of the respondents as tested by CV model. Welfare gain was enjoyed mostly by urban household whose mean compensated variation was as high as 18% compared with 14% for rural household.

Contribution/Originality: Unlike other studies in Nigeria, this study established the variation in both rural and urban sector and what is responsible for the differences. It was evidence that Urban and rural non-farm households are the most likely to be influenced by food crisis.

1. INTRODUCTION

Food inflation in developing world is becoming a serious concern for the stakeholders. This price increase have seriously impact the welfare of the poor household who spend more of their respective income on food. According to Orazio, Di Maro, Lechene, and Phillips (2009) to compute the effect of recent persistence rise in food price might be problematic for a number of reasons. Firstly, when a households is net producers of the items whose price witness increase. This will see some of the households to become better off. Secondly, as prices of different commodities might move in possibly very different ways, one need to assess the substitution possibilities to assess the decrease in welfare.

The food crisis experiences in the world between years 2007-2008 was due to sudden rise in price of food and other commodities. For instance, the price of wheat and rice almost doubled in the International market, maize was 42% increased while the food price index of the Food and Agriculture Organization (FAO) stood at 61%. But the reduction in price of rice and other commodities appeared again in 2008 and 2009 before the price pick up again in the year 2010 to 2011 (FAO, 2011). Rise in food price in developing countries might be heavily influence by the price trends in world markets, although the level of price transmission significantly differs. The purchasing power of most urban households and other net food buyers will reduce as a result of this and they will likely prefer cheaper food or commodities. In the same way, the poor urban households will greatly be affected since they spend more of their income on food (Benson, Minot, Pender, Robles, & von Braun, 2008). Studies has found out that about 70% of the world's poor live in rural, and strongly depend on agriculture. The rise in food prices generates potentials for welfare improvements of their livelihoods and reduces the number of poor people with lesser vulnerable (Sanusi & Fanifosi, 2019). Nevertheless, rural population together with urban areas, the attributes of the social structure may influence welfare reduction outcomes.

The implication of food price changes are not always direct, this has been revealed by different authors (Arndt, Benfica, Maximiano, Nucifora, & Thurlow, 2008; Arndt., Hussain, Salvucci, & Østerdal, 2016; Ivanic & Martin, 2008; Shittu, Obayelu, & Salman, 2015; Swinnen & Squicciarini, 2012). According to Molitor, Braun, and Pritchard (2017) there is need to have knowledge of farm households' adaptive capacity in the area of uncertainties surrounding food price changes. Since household decision in the food market remain crucial in determining improvement in welfare status of the household. The effect of price increase on country will be either the country is net food importers or net food exporters. At the household level, the positive effect will be for net producing household (net seller), meanwhile negative effect will be for net food consuming households (net buyers). Increases in food price have initiate worldwide concern about danger to global food security shaking the complacency created by low commodity prices for many years. Both supply-side and demand-side factors are composite forces among others, behind these price increases. Households who are net buyers of food are witnessing declining welfare and also households who are poorly endowed such as landless or small landholders' households.

Increase in prices of food items amount to covariate shock, especially if it persists in time, its consequences will affect all aspects of the livelihoods. In the short run, the effect of locally transmitted food will negatively impact those households who are net food buyers. Meanwhile, the adverse effect these could pose on the household could be cushioned through substitution of the food items with cheaper ones. For the groups of households who are urban wage labourers, a number of tools are put together to cope with the shock(s), this include; income diversification, utilization of savings or assets, and request for assistance or aid from networks (FAO, 2011; Irini & Dawe, 2009).

We have two prominent effects of increasing food prices on developing countries and their population namely direct and indirect. Direct effect will occur when international prices of food promote local prices, and this will have positive effect on local farmers because it will provide an incentive for them to increase their production stuff but food becomes more affordable to consumer therefore both cases real incomes and welfare of the population, and also the poor are affected. Indirect effect will manifest when witnessing higher cost of imported food leads to trade deficits that lower economic activities in the economy leading to unemployment. This might lead to cut in revenue generated by the government that will be spending on public services (Holmes, Jones, & Wiggins, 2008).

The endemic rising and volatile food prices in Nigeria could be linked to the mid-1980s when the International Monetary Fund - IMF/World Bank's Structural Adjustment Program (SAP) was adopted. SAP strategies in Nigeria include increasing lending rates, a pronounced gap between lending and interest rates on bank deposits; devaluation of Nigerian currency (Naira), and increasing cost of production, all leading to hike in general price levels. For the reason that rural population are the most affected by this shows clearly the need to critical examination welfare of effects (including the direct and substitution effects) of food price changes on Households in Nigeria thereby creating a gap that this study intends to fill.

An important policy is to ascertain who is being affected or benefited by the increase in food prices. Urban and rural non-farm households are the most likely to be influenced by the food crisis. But the question of what is the welfare effect of food price changes i.e. what is the distribution of the welfare gains and losses from higher food price still remain unresolved. In this respect this study considered both direct and substitution effect which some past studies failed to acknowledge. This is an important distinction, as substitution effects are far from negligible, given the size of the observed food price changes. Then the study also examines the impact of rising food prices on households' welfare in both rural and urban households, the variation in this sector and what is responsible for all the differences.

2. THEORETICAL FRAMEWORK: THEORY OF WELFARE

Welfare economics is a branch of economics that uses microeconomic techniques to evaluate well-being (welfare) at the aggregate (economy-wide) level (Deardorff, 2014). A typical methodology begins with the derivation (or assumption) of a social welfare function, which can then be used to rank economically feasible allocations of resources in terms of the social welfare they entail. Such functions typically include measures of economic efficiency and equity, though more recent attempts to quantify social welfare have included a broader range of measures including economic freedom (as in the capability approach). In spite of criticisms, welfare state still regulates and implements social policies today. Exposed to some transformations and to some extent replaced by neoliberal policies as a result of changes caused by the globalization and information age, the welfare state is predicted to continue its existence in new forms and remains as an important power to regulate social policies in future (Esra, 2018).

Two theorems are fundamental in the field of welfare economics. The first theorem states competitive market produce (Pareto) efficient outcomes with some assumption given, while the second theorem anchored on the support of any Pareto efficient outcome as the competitive market equilibrium (Hindriks & Myles, 2013). Attempting to apply the principles of welfare economics gives rise to the field of public economics, the study of how government might intervene to improve social welfare. Welfare economics also provides the theoretical foundations for particular instruments of public economics, including cost-benefit analysis, while the combination of welfare economics and insights from behavioural economics has led to the creation of a new subfield, behavioral welfare economics (Bernheim, 2008).

3. METHODOLOGY

The study was carried out in Nigeria. The country is one of the countries in West Africa along the Atlantic Ocean's Gulf of Guinea between latitudes 4°N and 14°N and longitudes 2°2'E and 14°30'E. It has with six geo-political zones and has a total land area of 923,768 km². Nigeria is shared boundaries to the west by Benin, to the northwest and north by Niger, to the northeast by Chad and to the east by Cameroon, while the Atlantic Ocean forms the southern limits of the Nigerian territory. Secondary data was used for this study. The household consumption data were extracted from the Wave 2 of the Nigerian General Household Survey (GHS) –Panel 2012/13. Information on socio-economic characteristics, food production and consumption and food prices, among others, were collected from the households during the post planting period (August –October) of 2012 and repeated during the post-harvest period (February –April) of 2013, such that we have a two-year panel data on the respondents farm households. However, household consumption expenditure on various food and non-food commodities was aggregated into ten (10) foods namely: corn, fish, pulses, fruits, rice, wheat, meat, beverages, fat & oil, and other food.

The Quadratic Almost Ideal Demand System (QUAIDS).

Defining household's net expenditure as:

$$B(p, w, U) = e(p, w, U) - \pi(p, w)$$

where $e(p, w, U)$is the expenditure function $\pi(p, w)$is the profit function, p is the vector of good prices, w is the vector of factors of production prices, and U denotes the welfare (or utility) level.

Approximating $B(p,w,U)$around initial prices $B(po,wo,U)$ using a second-order Taylor expansion (and after some algebraic manipulation):

$$dB(p,w,U) = [s_h - s_y]' \left[\frac{dp}{p}\right] e + \frac{1}{2}\left[\frac{dp}{p}\right]' [S_h E_{hp}] \left[\frac{dp}{p}\right] e$$

where,$\left[\frac{dp}{p}\right]$: vector of percent changes in prices.

s_h : vector of consumption shares (consumption in a commodity / total consumption expenditure).

s_y : is a vector of production shares (production of a commodity / total consumption expenditure).

E_{hp} : matrix of demand elasticities (own price elasticities in diagonal, cross-price elasticities off the diagonal)

The last expression formally corresponds to the concept of Compensating Variation (CV), or the extra income needed to achieve the original level of welfare after the change in prices. It can be interpreted as the combination of a direct effect and a substitution effect:

Direct effect Substitution effect

$$dB(p,w,U) = [\{S_h\} - \{S_y\}]' \left[\frac{dp}{p}\right] e + \frac{1}{2}\left[\frac{dp}{p}\right]' \{S_h\}\{E_{hp}\} \left[\frac{dp}{p}\right] e$$

Table 1. Full derivation

Food groups	Food items
Fish	Fresh fish, frozen fish, smoked fish, dried fish, sea food (Lobster, crabs, prawns), canned fish/sea food, other fish/sea food.
Meat	Chicken, duck, goat, mutton beef, pork, agricultural eggs, bush meat, other meats.
Pulses	Soya bean, brown bean, white bean, groundnut, other nuts.
Fruit & vegetable	Banana, orange/tangerine, mango, avocado pear, pineapple, fruit (Canned) juice, other fruits, tomato puree canned, onion, garden egg, okra fresh/dried, pepper, leaves, other vegetables.
Fat & oil	Palm oil, margarine and or butter, vegetable oil, other oil & fats.
Beverage	Fresh milk, milk powdered, baby milk, milk tinned, cheese, coffee, chocolate, tea, sugar, yam, honey, other sweet & confectionary, soft drinks, fruit juice.
Wheat	Wheat flour, bread, cake, biscuit, meat pie.
Rice	Local rice (Upland & swamp), imported rice.
Corn	Maize, guinea, millet, and other grains.
Other food	Tubers & tuber products, cassava & cassava products.

3.1. Composition of Food Aggregation

Table 1 presents food items used in the study. The food items were grouped into 10 namely; Fish, Meat, Pulses, Fruits and vegetable, Fat & oil, Beverages, Wheat, Rice, Corn and Other food. The quantity of these food items consumed by each household and the unit price of the commodities were obtained respectively for the estimation.

4. RESULTS AND DISCUSSION

We include household demographic characteristics in the QUAIDS model to ascertain the effect of non-economic variables on household food consumption. These variables include gender, age, year spent in school and household size.

Gender of household plays a role in the consumption behaviour of households. The result presented on (Table 2) revealed that the gender of the household head has a negative influence and significant impact on the consumption of fish, meat, fruit, fat and oil, beverage and corn but the positive effect was shown on pulse, wheat, rice and other food which are all significant. This finding implies that household head tends to invest relatively more to their preferred consumption. In both rural and urban area the result was similar negative impact was felt on fish, meat, beverage,

corn and fruit but positive effect on pulse, fat & oil, wheat and rice for (rural household), urban wheat and other food. Pangaribowo and Tsegai (2011) reported that male headed household negated consumption of vegetable, meat, and fish, dairy product and snacks and dried food.

Also, the age of household head has positive and significant influence on meat, pulse, rice, and other food negative effect on fish, fruit, fat & oil, beverage and wheat which implies that the household will demand more of fish, fruit, and beverage. In rural area the age of the household has negative effect on meat, fish, fruit, fat & oil, beverage and corn. In urban age has negative effect on meat, fruit, fat & oil, wheat and other food. The year spent in school has a positive and significant impact on fish, meat, fat & oil and beverage, which implies that more educated household head has more tendencies to invest relatively on more nutritious foods while household head education affects pulse, fruit, wheat, rice, corn and other food. Rural household has positive influence on fish, meat, beverages and other food but have negative impact on pulse, fruit, fat & oil, wheat, rice, and corn. Urban household has positive impact on fat & oil, wheat, corn and other food while fish, meat, pulse, fruit, beverage and rice have negative influence.

The coefficient of household size was positive and has impact on the food expenditure but negative effect on expenditure share for fish, fruit, beverage and corn. This implies that with any addition to the number of the family; the per capita expenditure on food will experience decline as a result of reallocation of resources. This finding also shows that larger household tends to choose cheaper calorie food source rather than more expensive one such as fish, fruit, beverage and corn.

4.1. Expenditure Elasticity

Expenditure elasticity result is presented in the Table 3. The expenditure elasticity is computed for the foods which are fish, meat, pulses, fruit, fat & oil, beverage, wheat, rice, corn and other food. The estimated expenditure elasticity for all food in Nigeria is almost positive and statistically significant at the 5% level, indicating that all the food items are normal goods.

Expenditure elasticity for beverages (1.467), other food (1.398), wheat (1.363), fat and oil (1.338), fish (1.309), meat (1.327), fruit (1.309), and corn (1.341) are greater than one, which those items can be considered luxury goods. The result reveal that the coefficient of expenditure elasticity of rice & pulses is (-1.161), and (-2.379) respectively that is less than 1 which considered them to be necessity food items. The results found out that 10% increase in the respondent's income lead to 14.67% increase in the demand of beverages, 13.98% of other food, 13.63% of wheat, 13.38% of fat and oil, 13.09% of fish, 13.27% of meat, 13.09% of fruits and 13.41% of corn respectively. From the result it can be deduced that for the people to be able to get the require protein source from meat, fish, households must be encouraged in the consumption of each of these food items (Mittal, 2010; Olorunfemi, 2013).

4.2. Expenditure Elasticity for Rural Households

Expenditure elasticity result is presented in the Table 4. Expenditure elasticity for beverages (1.460), other food (1.417), wheat (1.354), fat and oil (1.359), fish (1.302), meat (1.333), fruit (1.327), and corn (1.030) are more than one – meaning that they are luxury goods. The expenditure elasticity in the rural area found to be either close or greater that unity for all households, meaning that when their income increases they will spend more on consumption of those foods items / group. This could be that those in rural area are not yet consumed the desired quantities. The result reveal that rice (-1.203), and pulses (-2.450) are considered to be necessity food items in this study area.

4.3. Expenditure Elasticity for Urban Households

The elasticity at mean level is presented in this section. The estimated expenditure elasticities were all positive and statistically significant at the 5% level, indicating that all the food items are normal goods. The coefficient of fish, meat, pulses, fruit, fat and oil, beverage, wheat and other food are greater than 1 – indicating that they are luxury goods. But rice and corn with coefficient which is less than 1 denote that they are necessity goods (Table 5).

4.4. Compensated Elasticity

Behavioural characteristics of the consumer demand system are measured inform of elasticity. Consumer response to price change is categorized in term of own price elasticity and cross-price elasticity. Compensated elasticity of demand was termed as the portion of change quantity demanded, captured by price effect. By using the parameter estimates, both compensated own and cross-price elasticities were calculated.

The result revealed that the food item showed the expected sign (a-priori). From the result, the price elasticity of fat & oil s the most inelastic followed by wheat, fish (-0.089), rice, meat (-0.017), beverages (-0.014), other food (-0.043), corn (-0.002), pulses (-0.0195), fruit (-0.033). The lowest among the own price is meat (-0.017), follow by fruit (-0.033), other food (-0.043), corn (-0.056), beverage (-0.060), fish (-0.089), meat (-0.017) and the highest own price is fat & oil (-0.215) meaning that a marginal increase in the price of fat & oil and its products will lead to a substantial decline in its consumption. This result was in line with the study of Tefera, Demeke, and Rashid (2012) which explained that compensated own price elasticity are negative for all commodities and also close to -1 implying that most of the commodities are own-price unitary elastic (Table 6).

Compensated cross-price elasticity with positive sign indicates substitution relationship among pairs of goods while a negative sign indicates the complementary relationship among goods. Rice is the strong substitute for wheat and complementary good are fish and beverage. Olorunfemi (2013) reported that the own price elasticity is lowest for cereals and pulses and highest for meat, fish and egg.

4.5. Compensated Elasticity for Rural

The own-price elasticity for beverages (-0.069) is the most inelastic, followed by the own price elasticity for corn (-0.0399), rice (-0.120) and other food (-0.024) since the figure are less than unity - implying inelastic relationship. The cross elasticity of compensated showed negative relationship among some sub groups, this showed the power of substitutability features in this group. The cross-price coefficient of fish and meat was -0.025; this implies that 10% increase in the price of meat would result in 0.25% increase in fish demand. Similarly, we found that 10% increase in the price of fat & oil will increase demand for pulses by 0.06%. Also, some sub-groups showed positive relationship which might denote the existence of complementarity within the food sub groups. For instance, a 10% rise in the prices of rice would spur about 3.1% increases in meat demand and vice versa (Table 7). This result is almost consistent with the result of Alem (2011).

4.6. Compensated Elasticity for Urban Households

The compensated own price elasticity for fish is (-0.062), meat (-0.038), pulses (-0.174), fruit (-0.025), fat and oil (-0.212), beverages (-0.024), wheat (-0.255), rice (-0.124), corn (-0.003), and other food (-0.048) indicating inelastic relationship since the coefficient is less than unity. The coefficient of cross-price elasticity showed positive and negative signs, an indication of food types being complementary and or substitutes such as rice and fish as complementary good while other food and corn; as shown on Table 8, the result contrast to the study of Olorunfemi (2013).

Table 2. Demographic characteristics.

Variables/Food groups	Fish	Meat	Pulse	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Pooled										
Gender	-0.0002 (0.00009)**	-0.00009 (0.0001)	-0.0002 (0.0001)**	0.0002 (0.00006)	-0.00002 (0.00009)	-0.0004 (0.0002)**	0.00002 (0.0001)	0.0001 (0.0002)	-0.0004 (0.0002)*	0.0008 (0.0003)***
Age	-1.40 (2.34e)	0.00001 (2.99e)***	8.02e (2.72e)***	-6.34e (1.62e)***	-2.93e (2.24e)	-0.0001 (4.9e)***	-3.93e (3.19e)	0.00001 (4.70e)***	1.40e (20e)	0.00002 (0.39)**
Year spent in school	5.67 (4.97e)	6.49e (6.40e)	-3.49 (5.81e)	-2.59e (3.46)	7.97e (4.75e)*	0.00002 (9.85e)**	-1.06e (6.78e)	-1.98e (0.00001)	-0.00001 (0.00001)	-1.31e (0.00001)
Household size	-0.00003 (0.00001)	3.00e (0.00002)	0.00002 (0.00002)	-4.97e (8.79e)	3.42e (0.00001)	-0.00004 (0.00003)	3.20e (0.00002)	0.00003 (0.00003)	-0.00003 (0.00003)	0.00005 (0.00004)
Rural										
Gender	-0.0003 (0.0001)**	-0.0001 (0.0001)	0.0001 (0.0001)	-0.0002 (0.0001)***	0.0001 (0.0001)	-0.001 (0.0002)**	0.0002 (0.0001)	0.0001 (0.000)	-0.0003 (0.00)	-0.001 (0.0004)***
Age	-0.4.13e-07 (2.9e-06)	-0.00001 (3.54e-06)***	5.64e-06 (3.34e-06)	-7.37e-06 (2.03e-06)***	-3.146e-06 (2.88e-06)	-0.00002 (5.70e-06)***	3.08e-06 (3.37e-06)	0.0002 (5.95e-06)***	-4.54e-06 (6.06e-06)	0.00004 (9.03e-06)**
Year in school	6.65e-06 (6.32e-06)	2.19e-06 (7.56e-06)	-520e (726e)	-2.94 (4.32e-06)	-0.00001 (6.09e-06)*	0.00003 (0.00001)**	-1.58e-06 (7.11e-06)	-0.00001 (0.00001)	-0.00002 (0.00001)*	0.00001 (0.00001)
Household size	-0.0002 (0.00002)	0.00002 (0.00002)	0.00003 (0.00002)**	-0.00002 (0.00001)**	7.85e-06 (0.00002)	-0.0001 (0.00003)	-0.00001 (0.00002)	0.0001 (0.00003)	-0.00003 (0.0001)	0.0001 0.0001
Urban										
Gender	-0.0005 (0.0002)	-0.0001 0.0003)	-0.0002 (0.0002)	-0.0001 (0.0001)	-0.0002 (0.0002)	-0.0001 (0.0004)	0.0004 (0.0002)	0.001 (0.001)	-0.0003 (0.0003)	4.07 (0.01)
Age	5.93e (4.85e)	-2.25e (7.63)	4.20e (4.54e)	-2.96 (3.59)	-0.0001 (4.48)**	3.83 (0.00001)	-0.00002 (9.49e)**	0.00003 (0.00002)*	5.10e (9.69e)	-0.00001 (0.00002)
Year in school	6.11e (0.00001)	6.77 (0.00002)	5.53e (9.66e)	0.00001 (7.70e)*	-2.30e (9.57)	0.00002 (0.00002)	-2.09e (0.00002)	0.00001 (0.00004)	-0.00001 (0.00002)	-0.00004 (0.00004)
Household size	-0.0001 (0.00003)**	0.0001 (0.0001)	0.00004 (0.0003)	0.00002 (0.00002)	0.00003 (0.00003)	-0.0001 (0.0001)*	0.0001 (0.0001)	0.0001 (0.0001)	-1.23e (0.0001)	-0.0001 (0.0001)

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

Table 3. Estimated expenditure and price elasticity of demand based on QUAIDS Results (Pooled).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Expenditure	1.282 (0.014)	1.327 (0.009)	-2.379 (0.016)	1.309 (0.130)*	1.338 (0.027)	1.467 (0.009)	1.363 (0.076)	-1.161 (0.180)*	1.341 (0.002)	1.398 (0.015)
Fish	-0.089 (0.003)	-0.042 (0.003)	-0.002 (0.002)***	-0.029 (0.002)	-0.001 (0.002)***	-0.014 (0.004)**	-0.003 (0.001)**	0.016 (0.001)	-0.0002 (0.002)***	0.007 (0.002)**
Meat	-0.023 (0.001)	-0.017 (0.002)*	0.001 (0.001)***	-0.021 (0.001)	-0.024 (0.001)	0.039 (0.003)	-0.004 (0.001)**	0.016 (0.001)	0.0002 (0.001)***	-0.002 (0.001)**
Pulses	0.001 (0.003)***	0.012 (0.004)**	-0.0195 (0.003)*	0.003 (0.003)***	-0.006 (0.003)**	0.035 (0.006)*	0.001 (0.002)***	0.016 (0.001)	0.0002 (0.002)***	-0.002 (0.002)***
Fruit	0.032 (0.002)	-0.041 (0.003)	-0.0004 (0.001)***	-0.033 (0.003)	-0.022 (0.002)	0.058 (0.004)	-0.004 (0.001)**	0.018 (0.001)	-0.002 (0.001)**	-0.007 (0.001)*
Fat & oil	-0.017 (0.004)**	-0.081 (0.005)	-0.007 (0.003)***	-0.038 (0.003)	0.215 -(0.006)	-0.072 (0.008)*	-0.008 (0.002)**	0.017 (0.002)*	-0.006 (0.003)**	-0.003 (0.003)***
Beverage	-0.005 (0.002)**	0.025 (0.002)	0.004 (0.001)**	0.018 (0.001)	-0.014 (0.001)	-0.060 (0.003)	-0.002 (0.001)**	0.021 (0.001)	0.004 (0.001)**	0.009 (0.001)*
Wheat	-0.019 (0.008)**	-0.047 (0.009)**	0.002 (0.005)***	-0.025 (0.005)**	-0.0295 (0.008)**	-0.037 (0.014)**	-0.146 (0.012)	0.037 (0.008)**	-0.022 (0.014)**	-0.006 (0.013)***
Rice	0.017 (0.001)	0.030 (0.001)	-0.051 (0.001)	0.018 (0.001)	0.009 (0.001)*	0.060 (0.002)	0.006 (0.001)**	-0.128 (0.002)	0.022 (0.002)	0.017 (0.002)*
Corn	-0.0003 (0.002)***	0.0004 (0.003)***	0.017 (0.002)*	-0.003 (0.002)**	-0.005 (0.002)**	0.016 (0.004)**	-0.004 (0.003)***	0.026 (0.002)	-0.056 (0.005)	0.009 (0.004)**
Other food	-0.006 (0.001)*	-0.004 (0.002)**	0.014 (0.001)	-0.006 (0.001)*	-0.002 (0.001)**	0.026 (0.003)*	-0.001 (0.002)***	0.015 (0.002)*	0.006 (0.003)**	-0.043 (0.004)

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

Table 4. Estimated expenditure and price elasticity of demand based on QUAIDS Results (Rural).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Expenditure	1.302 (0.016)	1.333 (0.011)	-2.450 (0.0197)	1.327 (0.016)	1.359 (0.033)	1.460 (0.010)	1.354 (0.086)	-1.030 (0.260)**	1.294 (0.026)	1.417 (0.017)
Fish	-0.0999 (0.004)	-0.045 (0.003)	-0.001 (0.002)***	-0.032 (0.002)	-0.009 (0.003)**	-0.012 (0.005)	-0.002 (0.001)**	0.016 (0.001)	-0.004 (0.002)**	-0.011 (0.002)*
Meat	-0.025 (0.002)	-0.0096 (0.003)**	0.002 (0.001)**	-0.020 (0.002)*	-0.026 (0.002)	0.052 (0.003)	-0.003 (0.001)**	0.016 (0.001)	-0.002 (0.001)**	-0.005 (0.001)**
Pulses	0.002 (0.004)***	0.015 (0.005)**	-0.013 (0.004)**	0.008 (0.004)**	-0.005 (0.004)***	0.033 (0.007)	0.001 (0.002)***	-0.132 (0.002)	0.026 (0.003)*	0.037 (0.003)
Fruit	-0.035 (0.002)	-0.0395 (0.003)	0.002 (0.002)***	-0.037 (0.004)*	-0.026 (0.002)	0.063 (0.005)	-0.003 (0.001)**	0.017 (0.001)	-0.006 (0.002)**	-0.009 (0.001)*
Fat & oil	-0.017 (0.006)**	-0.086 (0.006)	-0.006 (0.004)**	-0.044 (0.004)	-0.217 (0.008)	-0.064 (0.0099)	-0.007 (0.003)**	0.017 (0.002)*	-0.004 (0.004)***	-0.004 (0.004)***
Beverage	-0.004 (0.002)**	0.033 (0.002)	0 .003 (0.001)**	0.020 (0.002)*	-0.012 (0.002)***	-0.069 (0.004)	-0.001 (0.001)***	0.0198 (0.001)	0.003 (0.001)**	0.008 (0.001)*
Wheat	-0.141 (0.0099)	-0.033 (0.011)**	0.001 (0.006)***	-0.022 (0.006)**	-0.028 (0.010)**	-0.023 (0.017)	-0.120 (0.013)*	0.036 (0.009)**	0.003 (0.001)**	-0.027 (0.014)**
Rice	0.017 (0.002)*	0.031 (0.002)	-0.051 (0.001)	0.017 (0.001)	0.009 (0.002)**	0.057 (0.003)	0.006 (0.002)**	-0.120 (0.003)	-0.011 (0.015)***	0.013 (0.003)**
Corn	-0.005 (0.003)**	-0.005 (0.003)**	0.015 (0.002)*	-0.007 (0.002)**	-0.003 (0.003)***	0.010 (0.005)	-0.002 (0.003)***	0.026 (0.003)*	-0.022 (0.003)*	0.011 (0.005)**
Other food	-0.0095 (0.002)**	-0.008 (0.002)**	0.013 (0.001)	-0.008 (0.001)*	-0.002 (0.002)***	0.022 (0.003)	-0.003 (0.002)**	0.011 (0.002)*	-0.0399 (0.006)*	-0.024 (0.005)**

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

Table 5. Estimated expenditure and price elasticity of demand based on QUAIDS results (Urban).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Expenditure	1.344 (0.019)	1.372 (0.013)	1.4195 (0.042)	-1.342 (0.013)	1.344 (0.037)	1.386 (0.012)	1.715 (0.197)	-1.227 (0.0199)	0.985 (0.276)**	1.516 (0.037)
Fish	-0.062 (0.005)	-0.0295 (0.004)*	-0.014 (0.003)**	-0.017 (0.003)*	-0.006 (0.004)**	-0.002 (0.007)***	-0.006 (0.002)**	0.019 (0.002)*	-0.002 (0.003)***	-0.005 (0.002)**
Meat	-0.016 (0.002)*	-0.038 (0.004)*	-0.014 (0.002)*	-0.184 (0.002)	-0.0197 (0.002)*	0.023 (0.005)**	-0.007 (0.001)*	0.017 (0.001)	-0.003 (0.002)**	-0.0004 -0.0004)***
Pulses	-0.029 (0.006)**	-0.055 (0.007)*	-0.174 (0.008)	-0.028 (0.004)*	-0.011 (0.007)**	-0.063 (0.011)*	-0.006 (0.004)**	0.032 (0.003)	-0.009 (0.006)**	-0.004 (0.005)***
Fruit	-0.019 (0.003)*	-0.038 (0.004)*	-0.014 (0.002)*	-0.025 (0.005)**	-0.015 (0.003)**	0.053 (0.006)*	-0.005 (0.001)**	0.022 (0.001)	-0.004 (0.002)**	-0.005 (0.005)***
Fat & oil	-0.011 (0.007)**	-0.067 (0.008)*	-0.0096 (0.006)**	-0.025 (0.005)**	-0.212 (0.009)	-0.087 (0.013)*	-0.005 (0.003)**	0.008 (0.003)**	0.003 (0.005)***	0.0099 (0.004)**
Beverage	-0.001 (0.002)***	0.015 (0.003)**	-0.010 (0.002)**	0.017 (0.002)*	-0.016 (0.002)*	-0.024 (0.006)**	-0.005 (0.001)**	0.018 (0.001)	0.003 (0.002)**	0.0099 (0.002)**
Wheat	-0.043 (0.013)**	-0.091 (0.018)**	-0.021 (0.014)**	-0.036 (0.009)**	-0.020 (0.014)***	-0.109 (0.025)**	-0.255 (0.003)	0.042 (0.019)**	-0.006 (0.019)***	-0.019 (0.029)***
Rice	0.0198 (0.002)*	0.033 (0.003)	0.016 (0.002)*	0.021 (0.001)	0.0096 (0.002)**	0.053 (0.003)	0.055 (0.003)	-0.124 (0.004)	-0.054 (0.003)	0.020 (0.004)**
Corn	-0.003 (0.002)**	-0.002 (0.004)***	-0.004 (0.003)***	-0.002 (0.002)***	-0.011 (0.004)**	-0.003 (0.006)***	0.001 (0.004)***	-0.088 (0.003)	-0.093 (0.006)	0.016 (0.004)**
Other food	-0.005 (0.002)**	-0.001 (0.003)***	-0.002 (0.002)***	-0.005 (0.002)**	-0.005 (0.002)**	0.031 (0.005)*	-0.003 (0.004)***	0.022 (0.004)*	0.010 (0.004)**	-0.048 (0.009)**

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

Table 6. Price elasticity of the Quaids food demand system compensated (Pooled).

Food groups	Fish	Meat	Pulses	Fruits	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Fish	-0.089 (0.003)	-0.042 (0.003)	-0.002 (0.002)***	-0.029 (0.002)	-0.001 (0.002)***	-0.014 (0.004)**	-0.003 (0.001)**	0.016 (0.001)	-0.0002 (0.002)***	-0.007 (0.002)**
Meat	-0.023 (0.001)	-0.017 (0.002)*	0.001 (0.001)***	-0.021 (0.001)	-0.024 (0.001)	0.039 (0.003)	-0.004 (0.001)**	0.016 (0.001)	0.0002 (0.001)**	-0.002 (0.001)**
Pulses	0.001 (0.003)***	0.012 (0.004)**	-0.0195 (0.003)*	0.003 (0.003)***	-0.006 (0.003)**	0.035 (0.006)**	0.001 (0.002)***	0.016 (0.001)	0.0002 (0.002)***	-0.002 (0.002)***
Fruit	-0.032 (0.002)	-0.041 (0.003)	-0.004 (0.001)**	-0.033 (0.003)	-0.022 (0.002)	0.058 (0.004)	-0.004 (0.001)**	0.018 (0.001)	-0.002 (0.001)**	-0.007 (0.001)*
Fat & oil	-0.017 (0.004)**	-0.081 (0.005)	-0.007 (0.003)**	-0.038 (0.003)	-0.215 (0.006)	-0.072 (0.008)*	-0.008 (0.002)**	-0.017 (0.002)*	-0.006 (0.003)**	-0.003 (0.003)***
Beverage	-0.005 (0.002)**	0.025 (0.002)	0.004 (0.001)**	0.018 (0.001)	-0.014 (0.001)	-0.060 (0.003)	-0.002 (0.001)**	0.021 (0.001)	0.004 (0.001)**	0.009 (0.001)*
Wheat	-0.019 (0.008)**	-0.047 (0.009)**	0.002 (0.005)***	-0.025 (0.005)**	-0.0295 (0.008)**	-0.037 (0.014)**	-0.146 (0.0123)	0.037 (0.008)**	-0.022 (0.014)**	-0.006 (0.013)***
Rice	0.017 (0.001)	0.030 (0.001)	-0.051 (0.001)	0.018 (0.001)	0.009 (0.001)*	0.060 (0.002)	0.006 (0.001)*	-0.128 (0.002)	0.022 (0.002)	0.017 (0.002)*
Corn	-0.0003 (0.002)***	0.0004 (0.003)***	0.017 (0.002)*	-0.003 (0.002)**	-0.005 (0.002)**	0.016 (0.004)**	-0.004 (0.003)***	0.026 (0.002)	-0.056 (0.005)	0.009 (0.004)**
Other food	-0.006 (0.001)*	-0.004 (0.002)**	0.014 (0.001)	-0.006 (0.001)*	-0.002 (0.001)**	0.026 (0.003)*	-0.001 (0.002)***	0.015 (0.002)*	0.006 (0.003)**	-0.043 (0.004)

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

Table 7. Price Elasticity of the QUAIDS food demand system compensated or Hicksian elasticity (Rural).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Fish	-0.0999 (0.004)	-0.045 (0.003)	-0.001 (0.002)***	-0.032 (0.002)	-0.009 (0.003)**	-0.012 (0.005)**	-0.002 (0.001)**	0.016 (0.001)	-0.004 (0.002)**	-0.011 (0.002)**
Meat	-0.025 (0.002)	-0.0096 (0.003)**	0.002 (0.001)**	-0.020 (0.002)	-0.026 (0.002)	0.052 (0.003)	-0.003 (0.001)**	0.016 (0.001)	-0.002 (0.001)**	-0.005 (0.001)**
Pulses	0.002 (0.004)***	0.015 (0.005)**	-0.013 (0.004)**	0.008 (0.004)**	-0.005 (0.004)**	0.033 (0.007)**	0.001 (0.002)***	-0.132 (0.002)	0.026 (0.003)*	0.037 (0.003)
Fruit	-0.035 (0.002)	-0.0395 (0.003)	0.002 (0.002)***	-0.037 (0.004)*	-0.026 (0.002)	0.063 (0.005)	-0.003 (0.001)**	0.017 (0.001)	-0.006 (0.002)**	-0.009 (0.001)*
Fat & oil	-0.017 (0.006)**	-0.086 (0.006)	-0.006 (0.004)**	-0.044 (0.004)	-0.217 (0.008)	-0.064 (0.0099)*	0.007 (0.003)**	0.017 (0.002)	-0.004 (0.004)***	-0.004 (0.004)***
Beverage	-0.004 (0.002)**	0.033 (0.001)	0.003 (0.002)**	0.020 (0.002)*	-0.012 (0.004)**	-0.069 (0.001)	-0.001 (0.001)***	0.0198 (0.001)	0.003 (0.001)**	0.008 (0.001)*
Wheat	-0.041 (0.0099)**	-0.033 (0.011)**	0.001 (0.006)***	-0.022 (0.006)**	-0.028 (0.010)**	-0.023 (0.017)***	-0.120 (0.013)*	0.036 (0.009)**	0.011 (0.015)***	-0.027 (0.014)**
Rice	0.017 (0.002)*	0.031 (0.002)	-0.051 (0.001)	0.017 (0.001)	0.009 (0.002)**	0.057 (0.003)	0.006 (0.002)**	-0.120 (0.003)	0.022 (0.003)*	0.013 (0.003)**
Corn	-0.005 (0.003)**	-0.005 (0.003)**	0.015 (0.002)*	-0.007 (0.002)**	-0.003 (0.003)**	0.010 (0.005)**	-0.002 (0.003)***	0.026 (0.003)*	-0.0399 (0.006)*	0.011 (0.005)**
Other food	-0.0095 (0.002)**	-0.008 (0.002)**	0.013 (0.001)	-0.008 (0.001)*	-0.002 (0.002)***	0.022 (0.003)*	-0.003 (0.002)**	0.011 (0.002)*	0.007 (0.003)**	-0.024 (0.005)**

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

Table 8. Price elasticity of the quaids food demand system compensated or hicksian elasticity (Urban).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Fish	-0.062 (0.005)	-0.0295 (0.004)*	-0.014 (0.003)**	-0.017 (0.003)*	-0.006 (0.004)**	-0.002 (0.007)***	-0.006 (0.002)**	0.019 (0.002)*	-0.002 (0.003)***	-0.005 (0.002)**
Meat	-0.016 (0.002)*	-0.038 (0.004)*	-0.014 (0.002)*	-0.184 (0.002)	-0.0197 (0.002)*	0.023 (0.005)**	-0.007 (0.001)*	0.017 (0.001)	-0.003 (0.002)**	-0.0004 (0.002)***
Pulses	-0.029 (0.006)**	-0.055 (0.007)*	-0.174 (0.008)	-0.028 (0.004)*	-0.011 (0.007)**	-0.063 (0.011)*	-0.006 (0.004)**	0.032 (0.003)	-0.009 (0.005)**	-0.004 (0.005)***
Fruit	-0.019 (0.003)*	-0.038 (0.004)*	-0.014 (0.002)*	-0.025 (0.005)**	-0.015 (0.003)**	0.053 (0.006)*	-0.005 (0.001)**	0.022 (0.001)	-0.004 (0.002)**	-0.005 (0.002)**
Fat & oil	-0.011 (0.007)**	-0.067 (0.008)*	-0.0096 (0.006)**	-0.025 (0.005)**	-0.212 (0.009)	-0.087 (0.013)*	-0.005 (0.003)**	0.017 (0.003)*	-0.017 (0.005)**	-0.008 (0.004)**
Beverage	-0.001 (0.002)***	0.015 (0.003)**	-0.010 (0.002)**	0.017 (0.002)***	-0.016 (0.002)*	-0.024 (0.006)**	-0.005 (0.001)**	0.018 (0.001)	0.003 (0.002)**	0.0099 (0.002)**
Wheat	-0.043 (0.013)**	-0.091 (0.018)**	-0.021 (0.014)**	-0.036 (0.009)**	-0.020 (0.014)***	-0.109 (0.025)**	-0.255 (0.300)***	0.042 (0.019)**	0.006 (0.019)***	0.019 0.029)***
Rice	0.0198 (0.002)*	0.033 (0.003)	0.016 (0.002)*	0.021 (0.001)	0.0096 (0.002)**	0.053 (0.003)	0.005 (0.003)**	-0.124 (0.004)	-0.054 (0.003)	0.020 (0.004)**
Corn	-0.0003 (0.002)***	-0.002 (0.004)***	-0.004 (0.003)***	-0.002 (0.002)***	-0.011 (0.004)**	-0.003 (0.006)***	0.001 (0.004)***	-0.088 (0.003)	-0.092 (0.007)	0.016 (0.004)**
Other food	-0.005 (0.002)**	-0.001 (0.003)***	-0.002 (0.002)***	-0.005 (0.002)**	-0.005 (0.002)**	0.031 (0.005)*	0.003 (0.004)***	0.022 (0.004)*	0.010 (0.004)**	-0.048 (0.001)

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

4.7. Uncompensated Elasticity

Table 9 - 11 presents uncompensated elasticity result for all the food items for pooled, rural and urban households respectively. The result showed that the uncompensated elasticity result for all the food items were price inelastic as expected. Pulses showed strong substitution effect with price of fish (0.230) and fruit for pulses (0.123) (Table 9). The rural household as shown on (Table 10), the uncompensated own price elasticities of fish (-0.025), meat (-0.223), pulses (0.123), fruit (-0.080), fat and oil (0.147), beverages (-0.468), wheat (0.103), rice (-0.025), corn (-0.133), and other food (-0.173) are all significant. For urban household (Table 11), the uncompensated own price elasticity possess the expected negative. The uncompensated own price elasticity of fish (-0.068), meat (-0.2096), pulses (-0.109), fruit (-0.094), fat and oil (-0.140), beverages (-0.4095), wheat (-0.232), rice (-0.021), corn (-0.164) and other food (-0.183). Cross price elasticities in the rural area, the relationship between fish and meat shows the largest substitution effects. All cross-price elasticities are found to be inelastic. On the other hand, complimentary good are pulses and rice. For urban, few of the foods that are compliments are beverage and other food. There is strong substitution between wheat (0.209) and rice (0.138). The study is against the study of Olorunfemi (2013) which reported that beverages show the strongest substitution for price of fruit followed by meat for plantain.

The rural household, the uncompensated own price elasticities of fish (-0.025), meat (-0.223), pulses (0.123), fruit (-0.080), fat and oil (0.147), beverages (-0.468) showed significant coefficient. Additionally, for the urban households, it showed the expected signs which are statistically significant at 5% level of confidence. That is, meat (-0.2096), pulses (-0.109), fruit (-0.094), fat and oil (-0.140), beverages (-0.4095), wheat (-0.232), rice (-0.021), corn (-0.164) and other food (-0.183) (Table 12).

4.8. Impact of Price Changes Application

In order to gain more understanding about food price changes, this study considered the application of two scenarios. Firstly, a 10% increase in the real food prices and secondly, a condition of full price transmission from international market prices to the domestic prices. Table 12 showed quintile of the compensation variation as percentage of national consumption expenditure (this depict how much resources would be required by a safety net program to fully compensate the losses of different groups), proportion of losers by expenditure quintile (loss as a fraction of households expenditure) and the mean compensated variation as percentage of household expenditure for both rural, urban and the national.

4.9. Scenario A (10% Price Changes)

From Table 12, a safety net program would net to transfer an amount equivalent to 0.76%, 0.26% and 1.02% of the total national consumption to fully compensate the poorest quintile in rural, urban and at the national level respectively. And also, in the richest losers' quintile about 1.29% of the aggregate national consumption will be required by a safety net program to fully compensate them overall. The Table also showed the proportion of the losses by expenditure. From the table, it was observed that urban households are the big losers (i.e. urban households were affected more than rural households in all simulation). For instance, at the poorest quintile about 0.66% rural households' were losers while it's about 0.74% in urban households. The result equally showed that 0.682%, 0.724% and 0.777% were worse off for rural, urban and national respectively. De Janvry and Sadoulet (2009) and Tefera et al. (2012) indicated in their respective research that poor households negatively affected by the rise in prices is rural, both farmers and non-farmers.

Table 9. Price elasticity of the QUAIDS food demand system uncompensated (Pooled).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Fish	-0.034 (0.004)*	-0.268 (0.004)	-0.0595 (0.002)	-1.142 (0.002)	-0.076 (0.003)	-0.366 (0.006)	0.0197 (0.001)	-0.088 (0.001)	-0.093 (0.002)	-0.136 (0.002)
Meat	-0.151 (0.002)	-0.217 (0.003)	-0.059 (0.001)	-0.138 (0.002)	-0.093 (0.002)	-0.326 (0.004)	-0.021 (0.001)	-0.092 (0.001)	-0.095 (0.001)	-0.136 (0.001)
Pulses	0.230 (0.004)	0.431 (0.005)	-0.127 (0.003)	0.213 (0.003)	0.118 (0.003)	0.689 (0.007)	0.033 (0.002)	0.060 (0.002)	0.202 (0.003)	0.277 (0.003)
Fruit	-0.158 (0.002)	-0.272 (0.004)	-0.055 (0.001)	-0.0083 (0.004)**	-0.090 (0.002)	-0.302 (0.005)	-0.021 (0.001)	-0.088 (0.001)	-0.096 (0.002)	-0.138 (0.002)
Fat & oil	-0.145 (0.005)	-0.316 (0.007)	-0.068 (0.003)	-0.156 (0.004)	-0.145 (0.007)	-0.4398 (0.010)	-0.025 (0.002)	-0.092 (0.003)	-0.103 (0.004)	-0.138 (0.004)
Beverage	-0.146 (0.002)	-0.287 (0.002)	-0.063 (0.001)	-0.111 (0.002)	-0.090 (0.002)	-0.464 (0.004)	-0.021 (0.002)	-0.098 (0.002)	-0.102 (0.002)	-0.138 (0.002)
Wheat	-0.1499 (0.011)	-0.287 (0.016)	-0.059 (0.005)	-0.145 (0.008)	-0.101 (0.009)	-0.411 (0.025)	-0.127 (0.012)	-0.074 (0.011)*	-0.1197 (0.015)*	-0.143 (0.016)*
Rice	0.129 (0.001)	0.236 (0.002)	0.002 (0.001)**	0.120 (0.001)	0.0698 (0.001)	0.379 (0.003)	0.021 (0.001)	-0.0034 (0.003)**	0.105 (0.002)	0.133 (0.003)
Corn	-0.1295 (0.003)	-0.236 (0.005)	-0.044 (0.002)	-0.121 (0.002)	-0.075 (0.003)	-0.353 (0.007)	-0.022 (0.003)*	-0.083 (0.003)	-0.153 (0.006)	-0.126 (0.005)
Other food	-0.141 (0.002)	-0.2499 (0.003)	-0.049 (0.001)	-0.129 (0.002)	-0.075 (0.002)	-0.358 (0.005)	-0.019 (0.002)*	-0.098 (0.002)	-0.094 (0.003)	-0.184 (0.005)**

Note: ** indicates significant 5% and * indicates significant 10%.

Table 10. Elasticity of the QUAIDS food demand system uncompensated or Marshallian (Rural households).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Fish	-0.025 (0.004)*	-0.272 (0.004)	-0.595 (0.002)	-0.147 (0.003)	-0.077 (0.003)	-0.368 (0.007)	-0.0195 (0.001)	-0.088 (0.002)	-0.098 (0.003)	-0.148 (0.003)
Meat	-0.153 (0.002)	-0.223 (0.004)	-0.578 (0.001)	-0.138 (0.002)	-0.095 (0.002)	-0.312 (0.004)	-0.021 (0.001)	-0.091 (0.001)	-0.098 (0.002)	-0.146 0.002)
Pulses	0.238 (0.005)	0.443 (0.006)	-0.123 (0.004)	0.225 (0.004)	0.121 (0.004)	0.703 (0.009)	0.034 (0.002)	0.064 (0.002)	0.203 (0.003)	0.296 (0.004)
Fruit	-0.163 (0.003)	-0.271 (0.004)	-0.058 (0.002)	-0.080 (0.004)	-0.095 (0.003)	-0.300 (0.006)	-0.021 (0.001)	-0.089 (0.001)	-0.101 (0.002)	-0.149 (0.002)
Fat & oil	-0.148 (0.006)	-0.324 (0.009)	-0.068 (0.004)	-0.164 (0.005)	-0.147 (0.008)	-0.435 (0.013)	-0.026 (0.003)	-0.092 (0.003)	-0.102 (0.006)	-0.148 (0.005)
Beverage	-0.145 (0.003)	-0.222 (0.001)	-0.062 (0.002)	-0.109 (0.002)	-0.088 (0.005)	-0.468 (0.001)	-0.021 (0.001)	-0.097 (0.002)	-0.103 (0.002)	-0.146 (0.002)
Wheat	-0.144 (0.013)	-0.269 (0.018)	-0.0599 (0.006)*	-0.141 (0.097)**	-0.098 (0.011)*	-0.393 (0.029)	-0.103 (0.013)*	-0.072 (0.012)	-0.109 (0.016)*	-0.170 (0.017)***
Rice	0.133 (0.002)	0.240 (0.002)	0.003 (0.001)**	0.123 (0.001)	0.072 (0.002)	0.386 (0.004)	0.022 (0.002)	-0.025 (0.003)*	0.109 (0.003)	0.140 (0.003)
Corn	-0.1295 (0.004)	-0.230 (0.006)	-0.043 (0.002)	-0.121 (0.003)	-0.0696 (0.003)	-0.344 (0.009)	-0.019 (0.003)*	-0.077 (0.004)	-0.133 (0.007)	-0.126 (0.006)
Other food	-0.146 (0.002)	-0.255 (0.004)	-0.051 (0.001)	-0.133 (0.002)	-0.076 (0.002)	-0.366 (0.006)	-0.023 (0.002)	-0.101 (0.003)	-0.095 (0.003)	-0.173 (0.006)

Note: *** indicates significant 1%, ** indicates significant 5% and * indicates significant 10%.

Table 11. Price elasticity of the QUAIDS food demand system uncompensated or Marshallian elasticity (Urban).

Food groups	Fish	Meat	Pulses	Fruit	Fat & oil	Beverage	Wheat	Rice	Corn	Other food
Fish	-0.068 (0.005)	-0.272 (0.005)	-0.075 (0.003)	-0.136 (0.003)	-0.078 (0.004)	-0375 (0.009)	-0.023 (0.002)	-0.094 (0.002)	-0.099 (0.003)	-0.124 (0.003)
Meat	-0.148 (0.003)	-0.2096 (0.005)	-0.076 (0.002)	-0.139 (0.002)	-0.093 (0.003)	-0.359 (0.006)	-0.024 (0.001)	-0.098 (0.002)	-0.102 (0.002)	-0.122 0.002)
Pulses	-0.166 (0.007)	-0.311 (0.011)	-0.109 (0.008)	-0.153 (0.005)	-0.087 (0.007)	-0.458 (0.016)	-0.024 (0.004)*	-0.088 (0.005)	-0.111 (0.007)	-0.130 (0.006)
Fruit	-0.148 (0.003)	-0.2798 (0.004)	-0.075 (0.002)	-0.094 (0.005)	-0.087 (0.003)	-0.320 (0.007)	-0.023 (0.001)	-0.091 (0.002)	-0.100 (0.002)	-0.125 (0.002)
Fat & oil	0.141 (0.007)	-0.309 (0.010)	-0.071 (0.006)	-0.144 (0.006)	-0.140 (0.0097)	-0.460 (0.016	-0.023 (0.003)*	-0.096 (0.004)	-0.144 (0.006)	-0.127 (0.005)
Beverage	0.135 (0.003)	-0.235 (0.004)	-0.073 (0.002)	-0.105 (0.005)	-0.090 (0.003)	-0.4095 (0.007)	-0.023 (0.001)	-0.099 (0.002)	-0.103 (0.002)	-0.113 (0.002)
Wheat	0.209 (0.023)	-0.401 (0.0399)*	-0.099 (0.016)	-0.188 (0.019)	-0.112 (0.017)	-0.581 (0.060)	-0.232 (0.030)*	-0.103 (0.025)	-0.117 (0.023)**	-0.134 (0.034)**
Rice	0.138 (0.003)	0.254 (0.004)	0.072 (0.002)	0.1295 (0.002)	0.7497 (0.002)	0.395 (0.006)	0.021 (0.002)	-0.021 (0.005)	0.034 (0.003)	0.129 (0.005)
Corn	-0.095 (0.004)	0.176 (0.007)	0.041 (0.004)*	0.085 (0.003)	0.041 (0.004)*	0.271 (0.010)	0.014 (0.004)**	-0.005 (0.004)	-0.164 (0.006)	0.104 (0.006)
Other food	0.152 (0.004)	-0.275 (0.008)	-0.071 (0.003)	-0.139 (0.004)	-0.085 (0.003)	-0.391 (0.011)	-0.017 (0.004)**	-0.105 (0.005)	-0.099 (0.004)	-0.183 (0.0097)

Note: ** indicates significant 5% and * indicates significant 10%.

Table 12. Scenario A (10% Price changes).

Quintile	Pooled			Rural			Urban		
	CV as % of nat.con.exp.	Prop. of losses by exp	Mean CV (%of hhexp)	CV as % of nat.con.exp.	Prop. of losses by exp	Mean CV (% of hhexp)	CV as % of nat.con.exp.	Prop. of losses by exp	Mean CV (% dofhh exp)
1	1.02	0.81	0.19	0.76	0.66	0.19	0.26	0.74	0.18
2	1.12	0.75	0.16	0.84	0.64	0.17	0.31	0.68	0.15
3	1.14	0.72	0.11	0.87	0.69	0.13	0.30	0.72	0.16
4	1.21	0.78	0.10	0.92	0.71	0.12	0.32	0.76	0.19
5	1.29	0.81	0.06	0.94	0.70	0.09	0.35	0.72	0.20
Total	5.78	0.78	0.12	4.34	0.68	0.14	1.54	0.72	0.18

Note: CV as % nat. con. exp. - compensating variation as percentage of national consumption expenditure.
Proportion of losses by exp. –Proportion of losses by expenditure quintile.
Mean CV (% of household expenditure – Mean compensating variation as percentage of household expenditure for rural, urban and national.

Table 13. Scenario B (With international price transmission).

Quintile	Pooled			Rural			Urban		
	CV as % of nat.con.exp.	Prop. of losses by exp	Mean CV (% of hhexp)	CV as % of nat.con.exp.	Prop. of losses by exp	Mean CV (% of hhexp)	CV as % of nat.con.exp.	Prop. of losses by exp	Mean CV (%0f hhexp)
1	1.26	0.92	0.20	0.76	0.83	0.10	0.42	0.72	0.18
2	1.11	0.96	0.25	0.64	0.81	0.12	0.35	0.65	0.15
3	0.92	0.88	0.21	0.73	0.78	0.11	0.38	0.78	0.16
4	0.97	0.86	0.20	0.73	0.81	0.09	0.33	0.71	0.19
5	1.16	0.89	0.11	0.67	0.86	0.06	0.46	0.75	0.20
Total	5.44	0.90	0.19	3.54	0.82	0.09	1.95	0.72	0.18

Note: CV as % nat. con. exp. - compensating variation as percentage of national consumption expenditure.
Prop. Of losses by exp. –Proportion of losses by expenditure quintile.
Mean CV (% of hh exp. – Mean compensating variation as percentage of household expenditure for rural, urban and national.

4.10. Scenario B (With International Price)

From Table 13, a safety net program would net to transfer an amount equivalent to 0.76%, 0.43% and 1.27% of the total national consumption to fully compensate the poorest quintile in rural, urban and at the national level respectively. And also, in the richest losers' quintile about 1.16% of the aggregate national consumption will be required by a safety net program to fully compensate them overall. The table also showed the proportion of the losses by expenditure. From the Table, it was observed that rural households are the big losers (i.e. rural households were affected more than urban households in all simulation). For instance, at the poorest quintile about 0.83% rural households' were losers while it's about 0.72% in urban households. The result equally showed that 0.82%, 0.72% and 0.90% were worse off for rural, urban and national respectively.

5. CONCLUSION

The study concluded there is significant relationship between food price changes and welfare status of the respondents as tested by CV model. Welfare gain were enjoyed mostly by urban household whose mean compensated variation was as high as 18% compared with 14% for rural household in scenario A. There is therefore, the need for government to support small-scale and sustainable production, not through incomprehension of "small" or ancestral forms of production, but because it will allow us to regenerate soils, save fuel, reduce global warming and achieve food sovereignty.

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