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APPENDIX 2

INDEX NUMBER OF TOTAL FOODGRAINS PRODUCTION

(Base : Average of 1950-51 to 1952-53=100)

Year	Group of 13 districts	Rest of the State
1950-51	98.43	102.63
1951-52	97.22	92.85
1952-53	104.35	104.52
1953-54	106.66	109.17
1954-55	122.16	112.42
1955-56	110.61	101.61
1956-57	114.68	106.96
1957-58	94.13	99.04
1958-59	124.77	108.30
1959-60	124.52	113.48
1960-61	141.12	120.37
1961-62	138.22	117.57
1962-63	128.42	113.46
1963-64	113.01	99.35
1964-65	137.18	132.25
1965-66	113.67	118.13
1966-67	77.43	111.93
1967-68	143.13	146.36
1968-69	123.65	143.57
1969-70	144.05	153.49
1970-71	149.89	176.05

A NOTE ON THE NATURE OF DEMAND ELASTICITIES OF POULTRY, POTATO AND BRINJAL : USING PANEL DATA IN MYMENSINGH TOWN, BANGLADESH*

Introduction

Price, cross-price, and income elasticities of demand for a commodity are termed as demand elasticities. Demand elasticities define the nature of the products from the standpoint of consumer preferences : whether the products are more or less important in consumers' 'market basket,' whether the products are complements or substitutes, superior or inferior, necessary or luxurious. An understanding of such nature of demand for commodities is essential as guide for decision-making and programme operations by producers, traders, and other public or private agencies.

Time-series and family budget data are generally used for estimating demand equations and demand elasticities. Budget data, however, are inadequate for estimating price and cross-price elasticities; while detailed time-series data are not often available and accurately maintained particularly in the less developed countries. In fact, due to the dearth and inadequacy of necessary data, the computation of price and cross-price elasticities of demand, especially for agricultural commodities has been a long standing problem in these countries.

* This study is a part of the Bangladesh Agricultural University Research Project: Panel Survey on Consumer Demand in a Selected Urban Centre and a Rural Area in Bangladesh.

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Panel data, obtained from a group of consuming units over a period of time, on the other hand, are considered more adequate and convenient for making reliable estimation of all the different demand elasticities (Purcell and Raunikar, 1971). With the exception of a gross estimate of price elasticity of potato made by Sharp-Cravens Research, Inc. in 1969, there has been no scientific study made on demand elasticities, particularly, price and cross-price elasticities of demand for poultry, potato and brinjal in Bangladesh. Poultry is a costly meat component, and potato and brinjal are the important vegetable components of the urban diets in the country. In this paper an attempt has been made to estimate the nature of various demand elasticities of these farm products using panel data. The equations were run in computer at the Atomic Energy Centre, Dacca.

Methodology

In this study data obtained from selected 30 cross-sectional families in Mymensingh town and Agricultural University campus, during January 8 to March 15, 1973, have been used. Daily detailed data on family consumption and expenditure—quantity of each significant item bought and consumed, the number of consumers in the family, number of guests entertained, the prices paid per unit of product, etc.—were reported or recorded by the panel family. Field investigators were engaged for visiting each family on every alternate date in the afternoon or evening at the option of the family for recording and collecting the data for the past consecutive two days (for that day and the day before) in prescribed form. House rent was used as proxy for estimating the family income where family income could not be obtained with reasonable reliability. The families were stratified income-wise into 6 groups for estimating various income-consumption functions. The lower three groups and the upper three groups have been classified as low and high income groups respectively to be used, where necessary, in estimating price-quantity functions. But no income-consumption functions were estimated for the high and low income groups separately.

Per capita figures have been computed based on per adult units. In constructing a 'per adult equivalent' scale it is not only necessary to consider the age, sex, marital status, and occupation of the members of the family but also the type of commodity/commodities in question. In this study adult units have been calculated taking each child below 5 years of age as 0.5, each female person as 0.9, and each male person as 1.0 adult unit.

The calculation of elasticity depends on the type of function fitted. In many cases the difference between the highest and the lowest estimates of elasticities is quite large. So the choice of the mathematical form for estimating the relation between the variables must be made carefully. In consumer demand analyses any of the following six forms of equations is

likely to fit the data (N. Islam, 1965) : Linear, Double-log, Semi-log, Log inverse, Inverse, and Quadratic. These equations were employed in analysing the data. But only the statistically more reliable and/or logically consistent equations have been reported in this paper. Income-consumption functions have been developed under the structure : quantity/expenditure as a function of income/aggregate expenditure, prices and other things held constant. Price-consumption functions have been developed under the structure : quantity as a function of prices, income held constant.

Results and Discussions

Income Elasticities

From Table I it is seen that the estimates of coefficients of elasticities made from various consumption functions for poultry vary from 0.71 to 2.35. In most cases, however, the estimated values are greater than 1 supporting the hypothesis that poultry meat is a luxurious food item of the urban consumers. In the case of potato and brinjal the estimated values are less than 1 indicating that these are necessary food items.

The higher value of expenditure elasticity than the quantity elasticity from the same form of equation in the case of poultry indicates that poultry has reasonable quality variations at retail level. In the case of potato, the lower value of expenditure elasticity than the quantity elasticity is in contradiction to the logic. This gives rise to doubt on the reliability of the quantity or expenditure or both kinds of data. However, equation No. 4 is likely to be more reliable than equation No. 8. Because, from the analyses of price and cross-price elasticities it is observed that potato consumption is mostly responsive to its own price, income held constant, and not on the prices of its close substitutes (hence, with little or no significant cross-elasticity). This is most probably due to the fact that the consumers prefer to consume varieties of vegetables when available. The price elasticity of potato is estimated to be around 1 (Table II). The quantity elasticity estimated from equation No. 4 is close to the price elasticity, which is reasonable under homogeneity condition. Based on the same principle equation No. 14 for brinjal seems to be more reliable than equation Nos. 11-13, as it provides the coefficient of quantity elasticity which is relatively closer to the coefficient of its price elasticity (with little or no cross-elasticity).

Price and Cross-Price Elasticities

From Table II it is seen that among the high income families the purchase (consumption) of poultry is highly responsive to its price changes; and its purchase is relatively more responsive to the price changes of beef compared to those of other substitutes like mutton and fish.

TABLE I—ESTIMATED CONSUMPTION FUNCTIONS OF POULTRY, POTATO AND BRINJAL AND THEIR PROPERTIES

	R^2	F	Elasticity†
A. Income-Quantity Relations			
Poultry			
1. $\log Y = -7.949 + 1.286 \log X$ (.362)	.76	12.62*	1.286
2. $Y = -.3906 + .1237 \log X$ (.032)	.79	14.93*	0.71
3. $Y = .0033 + 0014\ X$ (.0002)	.90	36.83**	0.95
Potato			
4. $Y = .4.594 + \cdot 0565\ X - .00022\ X^2$ (.022) (.00008)	.63	6.99	0.88
B. Income-Expenditure Relations			
Poultry			
5. $\log Y = -6.163 + 1.259 \log X$ (.256)	.86	24.24*	1.26
6. $Y = -2.333 + .710 \log X$ (.18)	.80	15.66*	0.83
7. $Y = -.090 + .0084\ X$ (.001)	.95	71.18**	0.90
Potato			
8. $Y = 4.423 + .036\ X - .00015\ X^2$ (.016) (.00006)	.62	6.61	0.36
C. Aggregate Expenditure-Quantity Relations			
Poultry			
9. $Y = -.693 + .016\ X - .00007\ X^2$ (.0087) (.00004)	.58	5.51	1.60
10. $Y = \cdot 385 - 18.932 \frac{1}{X}$ (11.85)	.39	2.55	1.12
Brinjal			
11. $\log Y = -.6985 + .385 \log X$ (.268)	.34	2.05	0.385
12. $Y = 2.057 + 1.095 \log X$ (.667)	.40	2.68	0.38
13. $Y = 1.843 + .0108\ X$ (.006)	.40	2.62	0.33
14. $Y = .986 + .0286\ X - .00008\ X^2$ (.524) (.328)	.41	2.80	0.94
D. Aggregate Expenditure-Expenditure Relations			
Poultry			
15. $\log Y = -9.386 + 1.97 \log X$ (1.25)	.38	2.48	1.97
16. $Y = 2.233 - 118.63 \frac{1}{X}$ (63.11)	.47	3.53	1.45
17. $Y = 1.426 + .0954\ X - .00039\ X^2$ (.045) (.0002)	.66	7.71	2.35

* Indicates significant at 5 per cent level.
** Indicates significant at 1 per cent level.
Y=Per capita monthly expenditure/quantity consumed.
X=Per capita monthly income/aggregate expenditures.
Figures in the parentheses are standard errors of estimates.
† For equations other than double-log, elasticities have been estimated at mean values of the relevant data as stated in the Appendix. Elasticities have been computed from different equations as follows :

For Model (1) $Y = A + BX$; elasticity of Y with respect to $X = B\frac{X}{Y}$.

For Model (2) $\log Y = A + B \log X$; elasticity of Y with respect to X=B.

For Model (3) $Y = A + B \log X$; elasticity of Y with respect to $X = \frac{B}{Y}$.

For Model (4) $Y = A + \frac{B}{X}$; elasticity of Y with respect to $X = \frac{-B}{XY}$

For Model (5) $Y = A + BX + CX^2$; elasticity of Y with respect to $X = (B + 2CX)\frac{X}{Y}$.

TABLE II—ESTIMATED PRICE-CONSUMPTION FUNCTIONS OF POULTRY, POTATO AND BRINJAL AND THEIR PROPERTIES

Price-Quantity Relations	R^2	F	Elasticities with respect to†			
			Own price	Beef price	Mutton price	Expenditure on fish
Poultry (high income group)			X	X_1	X_2	X_3
18. $\log Y = -1.20 - \underset{(3.16)}{3.205} \log X + \underset{(1.594)}{1.462} \log X_1 + \underset{(3.282)}{0.46} \log X_2 + \underset{(.60)}{0.67} \log X_3$	.52	1.09	—3.205	1.462	0.46	0.67
19. $Y = .082 - \underset{(.031)}{.031X} + \underset{(.015)}{.0086} X_1 + \underset{(.018)}{.0025X_2} + \underset{(.044)}{064} X_3$	.59	1.43	— 3.20	0.947	0.447	1.423
Potato (All groups)						
20. $\log Y = .388 - \underset{(.325)}{1.076} \log X$	.61	10.92**	—1.08			
21. $Y = 1.508 - \underset{(.488)}{1.66} \log X$	.62	11.59**	—1.00			
22. $Y = 3.184 - \underset{(.508)}{1.654} X$	.60	10.60*	—0.94			
Brinjal (All groups)						
23. $\log Y = 1.251 - \underset{(.226)}{.833} \log X$	.58	9.80*	—0.83			
24. $Y = 1.212 - \underset{(.431)}{1.312} X$	.57	9.22*	—0.87			

Figures in parentheses are standard errors of estimates.

Y=Per capita weekly quantity consumed.

X=Weekly price of the commodity. X_1=Weekly price of beef. X_2=Weekly price of mutton. X_3=Per capita weekly expenditure on fish.

† As is stated in the case of elasticity in Table I.

A similar analysis for low income families produced erratic and perverse results with unexpected signs of the price and cross-price elasticity coefficients. One of the reasons for this erratic results may be that most purchases of poultry meat or any meat by the low income families are based on obligatory consumption need for entertaining special guests or eating better food on religious or ceremonial occasions (Kabir, 1974). As a result, its consumption is least responsive to price changes.

It is found from Table II that potato, having unitary price elasticity, is relatively more price elastic than brinjal. Analyses for estimating cross-price elasticities for potato and brinjal with their major substitutes produced erratic results with unexpected signs of the cross-price elasticity coefficients. This may indicate that consumers prefer to consume varieties of vegetables when available within the price range in the study at least during the winter vegetable production season (Hossain, 1974, Sarker, 1974). The other implication of such a situation, where the signs of the estimated coefficients are not consistent with the logic of the model, may be that there is the possibility of the existence of high multicollinearity between several independent variables in the equation (Tomek and Rabinson, 1972). But, in Bangladesh, in the case of vegetables during winter when new crops appear in the market in most cases one after another in the market such possibility of inter-correlation between their prices is not very strong.

Conclusions

Many of the equations have not been found statistically highly reliable, but still these have been reported in the paper so that the variations in the estimate are revealed and the readers may make their choice and judgment on their own. The results are only tentative and indicative of the nature of urban consumer demand for the products. It is assumed that these tentative results in this paper, pending the final and conclusive results of the detailed study, will be in many ways helpful to researchers and various users.

A narrow and insufficient range in data (variations in data), a short period covering only 9 weeks, and a smaller number of consuming households, and possible errors in reporting information by the households are, however, the major limitations of this study.

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APPENDIX

Basic Characteristics of the Data

(*Figures in brackets are mean values*)

	All groups	Low group	High group
Per capita monthly income (Tk.) ..	27-235 (113)	27-120 (63)	110-235 (163)
Per capita monthly aggregate expenditure (Tk.)	60-153 (95)	60-81 (70)	89-153 (120)
Per capita weekly expenditure on fish (Tk.)		.42-1.1(.8)	.38-1·3(1.1)

All groups	Potato	Poultry	Brinjal
Per capita monthly consumption (seer)	5.45-9.20 (7.15)	·02-·36 (.15)	1.91-3.47 (2.88)
Per capita monthly expenditure (Tk.)	4.68-7.57 (5.86)	.08-2.02 (.86)	

Weekly prices and per capita consumption

	Prices (Taka/seer)	Quantity consumed (seer)		
		All groups	Low group	High group
Potato	.77-1.20 (.97)	1.3-2.1 (1.7)	1.2-2.1 (1.6)	1.1-2.3 (1.7)
Poultry	4.50-6.14(5.21)	.02-.08 (.04)	.01-.06 (.03)	.02-.09 (.05)
Brinjal	.25-.62 (.43)	.38-1.11 (.065)	.29-.77 (.54)	.33-1.43 (.73)
Cauliflower and cabbage	.30-1.20 (.63)			
Beans	.25-1.00 (.50)			
Beef	4.25-6.33 (5.41)			
Mutton	8.00-10.0 (8.72)			

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