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DEMAND MANAGEMENT OF PAKISTAN'S FOOD SYSTEM 1960-1986

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1. INTRODUCTION	1
2. FOOD CONSUMPTION IN THE GREEN REVOLUTION ERA, 1960-70	2
3. INSTABILITY IN THE FOOD SYSTEM, 1971-76	7
4. ECONOMIC RECOVERY AND DIET DIVERSIFICATION, 1977-86	9
5. ACCOMMODATING DEMAND EXPANSION: THE EDIBLE OIL/MILK COMPLEX	12
6. INCOME AND PRICE IMPACTS ON FOOD DEMAND	14
7. THE CHANGING ROLE OF WHEAT IN THE FOOD SYSTEM	18
8. CONCLUSION	20

BIBLIOGRAPHY

TABLES

TABLE 1:	Food Consumption Growth and Self Sufficiency	3
TABLE 2:	Real Food Price Indices (1975/76 = 100)	4
TABLE 3:	Average Annual Growth in Agricultural Production	6
TABLE 4:	Percent Change in Per Capita Calorie Consumption	9
TABLE 5:	Comparison of Pakistan Demand Elasticity Estimates	15
TABLE 6:	Comparison of Actual and Predicted Consumption Changes	17

FIGURES

FIGURE 1:	Retail Food Price Indices (Deflated)	5
FIGURE 2:	Per Capita Sweetener Consumption in Pakistan	11
FIGURE 3:	Per Capita Consumption of Edible Oil	13

EXECUTIVE SUMMARY

During the quarter century, 1960-1986, Pakistan's food system was dramatically transformed. Over that period, per capita calorie consumption improved dramatically, the share of cereal calories provided by domestic production increased, and diets became more diverse. This process was partially promoted by a rapidly growing agricultural sector and important growth and diversification of per capita incomes. Policy makers, in the context of this demand expansion, faced conflicting policy objectives. On the one hand there was a need to promote additional food consumption from the low level that prevailed in the 1960s. On the other hand, additional domestic food production could be used to substitute for imports or expand exports, thus generating scarce foreign exchange and contributing to food self-sufficiency goals, particularly for wheat. The management of food demand, through trade and other pricing policy instruments, resulted in dramatically changing patterns of prices and consumption in the food system. This paper traces the evolution of Pakistan's food system through three distinctly different periods: the Green Revolution thrust toward wheat self-sufficiency and food consumption growth; the economic stagnation of 1970-76 with rapidly rising food prices and the search for new sources of food supplies; and the post 1976 economic recovery and diet diversification. The paper places special emphasis on complex interactions within the food system associated with the diet diversification process, particularly the rapid increase in edible oil and milk consumption and the recent trend toward declining per capita consumption of wheat.

1. INTRODUCTION

This paper is about changing patterns of food consumption in Pakistan and the policy environment which promoted these changes. The analysis here is carried out largely at the national aggregate level. National policies are often implemented in response to a concern about macroeconomic aggregates, such as the price level of politically sensitive commodities and the flows of trade and foreign exchange. These policies, in turn, aim to alter aggregate behavior in the national economy. An analysis of food consumption outcomes within the framework of aggregate response to policy instruments is critical since it throws light on primary stresses influencing policy management.

National food systems are defined by complicated interactions among commodities at the production level, where there is competition for production inputs such as water and land. Furthermore, primary production commodities, such as cotton or milk, often result in more than one consumption commodity. Thus commodity-specific policies can have unintended and important spill-over effects. At the consumption level there are also multi-commodity interactions, where families and individuals shift their consumption patterns as their incomes, employment, place of residence and other aspects of their economic environment change.

Prices are at the interface between these domestic production and consumption patterns, influencing both producers and consumers, usually in opposite directions. But prices themselves are a reflection of trade and fiscal policies. These policies play a major role in managing the food demand system as economic development unfolds. Pakistan's experience with food policy over the past 25 years reflects the complexity of its food system.

Pakistan has achieved impressive agricultural production growth and diversification. But the factors generating this process—Green Revolution technology, irrigation investments, and some price and marketing reform—are often not the primary factors influencing the food consumption process. Despite the importance of the agricultural sector's contribution to on-farm consumption and rural incomes and employment, the changing pattern of food consumption in Pakistan is not at all an analog of the production changes. At the center of the differences is a policy-led process of demand management, reflecting often conflicting objectives and inducing both intended and unintended results in the food system.

The next three sections of this paper are about the changing pattern of food demand in Pakistan, measured at the national level. These sections, which correspond to three distinct periods of food system development, comprise a story told from a demand management perspective. Following this is an analysis of the unusual interactions between edible oil and milk consumption, two of Pakistan's fastest growing food commodities. The next section reports an attempt, not entirely successful, to formally disaggregate the influences of income and price changes on the consumer demand system. The paper concludes with a discussion about issues relating to future development of the food system.

2. FOOD CONSUMPTION IN THE GREEN REVOLUTION ERA, 1960-70

An overview of key indicators of Pakistan's food production, consumption, and international trade is shown in Table 1. The country began the 1960s with a low level of food consumption, about 1700 calories per person per day. Unstable production in the first part of the decade, combined with an interruption of food aid, pushed food issues to the top of the country's policy agenda. By 1970/71, per capita food consumption had increased by 20 percent. An inspection of Table 1 shows that this consumption expansion was led by a dramatic increase in both wheat and rice (the dominant "other cereal") production, resulting from widespread adoption of imported high-yielding seed varieties and large private sector investments in tubewell irrigation technology. This huge production increase allowed policy managers to induce, not only a dramatic increase in consumption, but also large generation of foreign exchange through wheat import substitution. The share of wheat consumption supplied from domestic sources increased ten percentage points in the last half of the 1960s, from 84 to 94 percent. Despite the growth in both production and consumption, domestic wheat prices during this period (producer level) were held almost 30 percent above the world market equivalent. An implication here is that consumption gains could have been even greater, through greater imports and lower prices, had policy managers not been contending with the conflicting foreign exchange objective, an important feature of Pakistan's demand management system.

During the same period, per capita consumption of rice increased even more rapidly than wheat, as its share of total food calories grew from 10 to 13 percent. Policy managers, using the national rice export monopoly, allowed the production/consumption ratio to fall from 1.16 to 1.14, in order to promote lower real rice prices domestically and to accommodate aggregate national diet diversification. The share of non-cereals, led by a large decline in the production and consumption of pulses, fell by 3 percentage points or 7.5 percent.

Some further insight into this process is provided by the way the forces of demand and supply played out in the country's price system. A record of real (deflated) consumer food prices shown in index form for various years over the period 1960/61 - 1984/85 is shown in Table 2. Some of these prices are portrayed in Figure 1. (It is important to note that the lines in Figure 1 simply connect the points for the 5 years shown and do not represent prices in the interim years. While this masks some price variability, it also provides a clearer view of real relative price trends.) This price graph, which will be referred to at various points in the paper, provides a useful portrayal of the dramatically changing real relative prices in Pakistan's food economy and suggests a richer pattern of diet diversification than that summarized in the "calorie share" column in Table 1.

What was going on in the food economy during the 1960s other than strategic events in the rice and wheat sectors? The prices shown in Figure 1 are the result of real supply and demand forces in the Pakistan economy. Prices fall when the growth in demand, largely a function of demographic and income factors, is outstripped by the growth in available supply

from domestic and imported sources. This is clearly shown for the case of wheat and rice between 1960/61 and 1970/71, when real prices fell by 9 and 15 percent, respectively.

TABLE 1: Food Consumption Growth and Self Sufficiency

	CALORIES PER CAPITA	CALORIES INDEX	CALORIE SHARE	PRODUCTION/ CONSUMPTION RATIO
<i>Total Food</i>				
1961/63	1685	100	100	.96
1970/71	2013	120	100	.99
1974/76	2084	124	100	.97
1977/80	2143	127	100	.99
1984/86	2193	130	100	.99
<i>Wheat</i>				
1961/63	688	100	41	.84
1971/71	860	125	43	.94
1974/76	995	145	48	.84
1977/80	1003	147	45	.90
1984/86	994	144	45	.97
<i>Other Cereals</i>				
1961/63	313	100	19	1.16
1970/71	415	133	21	1.14
1974/76	366	117	18	1.26
1977/80	355	113	17	1.39
1984/86	329	105	15	1.29
<i>Non Cereals</i>				
1961/63	668	100	40	.99
1970/71	738	110	37	.99
1974/76	722	108	35	.98
1977/80	778	117	36	.96
1984/86	871	130	40	.94

Source: FAO Food Balance Sheets (revised for *Agriculture in the Year 2000* study).

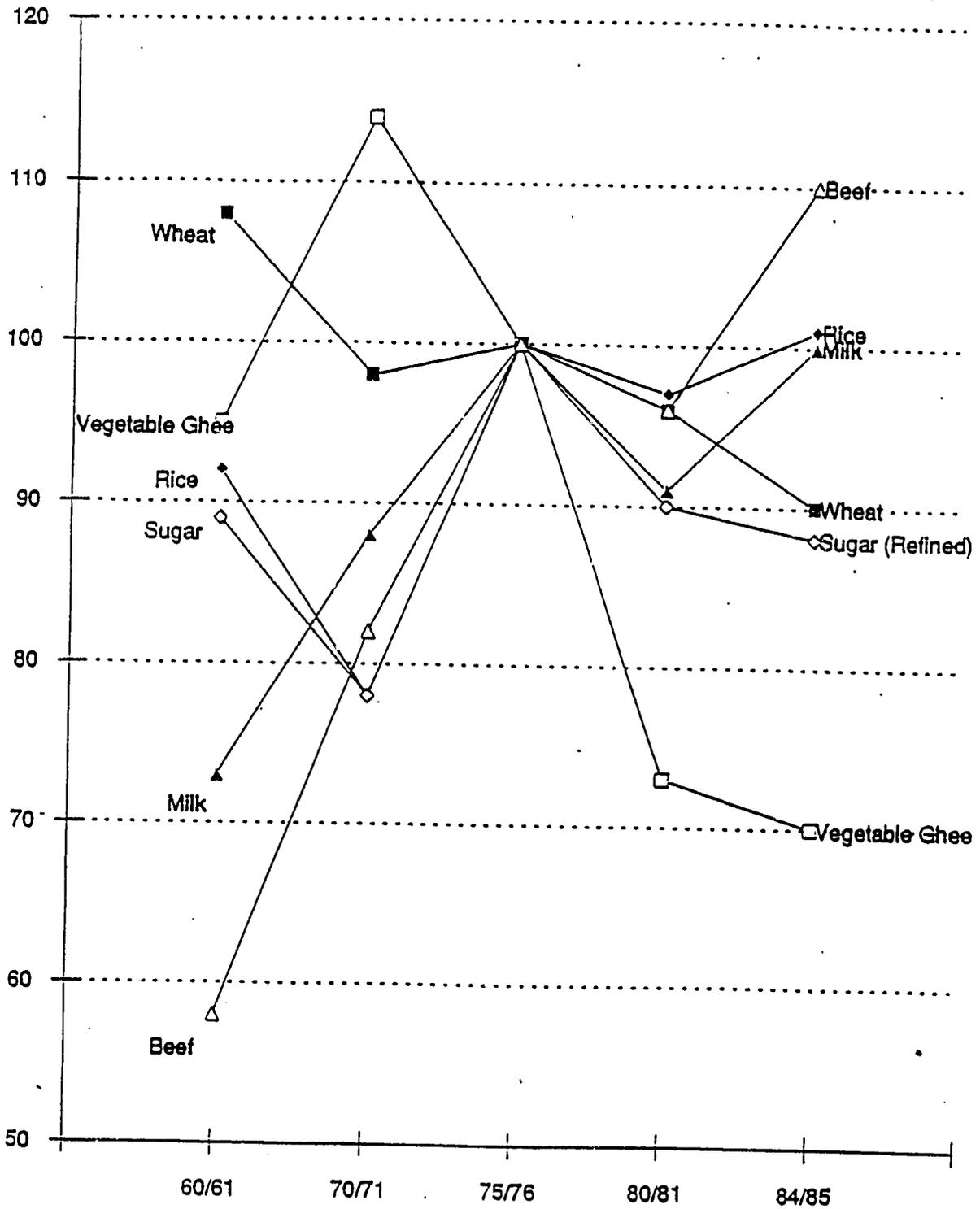
TABLE 2: Real Food Price Indices (1975/76 = 100)

	WHEAT	RICE	MILK	BEEF	PULSES
1960/61	108	92	73	58	88
1970/71	98	78	88	82	107
1975/76	100	100	100	100	100
1980/81	96	97	90	96	144
1984/85	90	101	101	11	159

	REFINED SUGAR	VEGETABLE GHEE	EGGS	REAL WPI FOOD	NOMINAL WPI FOOD
1960/61	89	95	n/a	89	33
1970/71	78	114	112	92	44
1975/76	100	100	100	100	100
1980/81	90	73	90	100	155
1984/85	88	70	78	98	205

Source: Calculated from Government of Pakistan Economic Survey Statistical Supplement 1988/89.

FIGURE 1: Retail Food Price Indices (Deflated)



Source: Government of Pakistan

Sugar is the other outstanding example. The share of non-cereal calories in the Pakistani diet would have fallen further were it not for substantial increases in sugar production induced by protected producer prices, public investment, and a price subsidized ration program in urban areas. Policy managers could have achieved an even greater decrease in the real sugar price and, hence, more consumption had they not been concerned with the direct foreign exchange costs and food security implications of existing policies. During the period, the large domestic production increment was utilized not only to facilitate an increase in per capita consumption, but also to increase self-sufficiency (from about .8 to .95) and domestic stocks (by about 15 fold) to cushion the impact of the unstable domestic production and world price environment. This policy of high protection from world markets, while appearing to save foreign exchange through the self-sufficiency gain, actually worsened Pakistan's foreign exchange earning capacity by drawing scarce production inputs away from crops with better net foreign exchange earning prospects (Gotsch, 1975).

The decrease in real prices in the latter half of the 1960s for wheat, rice, and sugar should be compared with the price performance of other important elements in the diet, as this is helpful to understanding the important changes in the food system in the 1970s. Meat, milk, and ghee (a cooking oil) each play an important role in the Pakistani diet, with demand being strongly responsive to changes in income. In contrast to the major grain crops, livestock production experienced a slow, two percent annual growth during the 1960s. These relationships are shown in Table 3. With population growing at almost three percent and real per capita income growing in excess of four percent, great pressure was placed on livestock product prices, as confirmed in Figure 1 and Table 2. The ghee price shown is for the vegetable oil based product (as distinct from the butterfat product, *desi ghee*) which grew to a place of major importance in the food economy in the latter half of the 1970s. During the 1960s the price of the predominant butterfat ghee increased even faster than the *dalda* price shown in Figure 1. Despite these food price increases, the strategic role of wheat and rice in the diet resulted in only a 3.3 percent increase in the real food price index during the 1960s.

**TABLE 3: Average Annual Growth in Agricultural Production
(At constant factor cost)**

	<u>1960/65</u>	<u>1965/70</u>	<u>1970/77</u>	<u>1977/85</u>
Agriculture	3.8	6.3	1.7	3.7
Major Crops	4.7	9.1	0.9	3.5
Minor Crops	4.8	3.8	4.6	2.8
Livestock	1.9	2.0	2.4	4.4

Source: Report of the National Commission on Agriculture

3. INSTABILITY IN THE FOOD SYSTEM, 1971-76

The optimism induced by the Green Revolution's impact on the food economy in the late 1960s was short-lived. Between 1970 and 1975, actual market prices for food increased by an average of 127 percent. International price shocks and general excess demand in the macro-economy played an important part here, but imbalance between supply and demand in the food economy pushed food prices up even faster than the general inflation rate, so that, in contrast to the 1960s, real food prices increased by almost 10 percent in the first half of the seventies. The dilemma facing food policy makers was acute during this period, as they struggled to keep prices under control and to generate foreign exchange in the face of excessive government spending and an increasingly over valued exchange rate.

Unfortunately, the agricultural sector itself was a major source of the problem. During the first half of the 1970's growth in the major crop sector, as shown in Table 3, slowed dramatically. This was led by successive years of falling cotton and sugar production. But growth in the grains sector slowed, as well. By 1970, almost 60 percent of Pakistan's wheat land was planted in high-yielding varieties. With such a large proportion of the land already growing HYV's, the production growth rate inevitably slowed. The rice growth rate also slowed, due in part to the Government's desire to maintain a large share of rice land in low yielding but high valued (on export markets) aromatic rice varieties.

On the demand side there was some respite. Growth in real per capita income was small during the early 1970s. On the other hand, the 3.1 percent annual population growth rate was almost 7 percent higher than that of the previous decade.

The record of real prices shown in Figure 1 and the data in Table 1 provide evidence of the food policy drama during this period. Keeping in mind that actual market prices were exploding, real prices were also rising for virtually all major food commodities. Policy managers were losing control of the supply-demand balances. In the face of a slow-growing livestock production sector, with no new technology available, and no real options for international trade, there was little policy managers could do to prevent the continuing escalation of livestock-based food prices.

The grains sector, however, offered options to food policy managers, and dilemmas, as they struggled with conflicting policy objectives. Insight is gained by contrasting the policy response to demand pressure in domestic wheat and rice markets. At the beginning of the 1970s Pakistan had made great progress toward its goal of national self-sufficiency in wheat consumption, a remarkable achievement given that it coincided with a 25 percent increase in per capita consumption. The record in Table 1 shows that all of this gain was lost by 1975. In addition, real prices reversed their trend of the earlier period, increasing modestly. By turning once again to imported wheat, policy managers accommodated not only the impact of rapid population growth but also facilitated a 16 percent increase in per capita wheat consumption.

This increase is a bit puzzling given the negligible growth in real per capita income during the period. It is possible, despite the 25 percent increase in wheat consumption in the earlier period, that consumers were prepared to purchase more wheat than was available at official prices, making consumption in this period dependent upon administratively controlled supplies. An estimated 50-60 percent of urban consumers still relied on the official ration shop distribution system in the early 1970s. Under this condition, an import generated increase in available supply could be absorbed by consumers even with moderately increasing real prices. An alternative explanation is that as Green Revolution wheat technology continued to spread, it was adopted increasingly by poorer farmers in more problematic agri-ecological environments. These farm families, with their relatively high income elasticities of demand, would tend to use the increase in production to accommodate an increase in household wheat consumption. Finally, near the end of the period, Pakistan began to experience large inflows of remittance funds from formerly rural Pakistanis working in oil exporting countries. These remittances were received by households with lower than average per capita incomes and higher than average demand elasticities for wheat. It is likely that all three of these processes combined to explain the increase in per capita wheat consumption in the face of rising real prices and low growth in national aggregate per capita income.

The domestic rice market was managed differently from that of wheat. Rice is a important commodity in the Pakistani diet. In this earlier period, rice constituted somewhat less than half the calorie consumption share of wheat and a stronger income elasticity of demand. It does not have the symbolic importance in the political economy, however. In addition, it is an export crop and a principal generator of foreign exchange. In the early 1970s, with rice production continuing to expand, policy managers faced the choice of using the production increment to dampen the domestic food price level and facilitate a further expansion of consumption or to increase exports and generate badly needed foreign exchange. The results of their choice is revealed in Table 1 and Figure 1. Rice exports were stepped up to the extent that domestic per capita rice consumption fell by 12 percent. The domestic self-sufficiency ratio increased from 1.14 to 1.26, reflecting the move toward exports. The domestic food economy gave up this rice grudgingly as real rice prices increased 28 percent.

In effect, the government sacrificed its wheat self-sufficiency objective but did it as cheaply as possible in terms of foreign exchange cost. It exported expensive rice calories, driving up the domestic price of rice, and used part of the proceeds to import considerably more and cheaper wheat calories, thus keeping the politically sensitive domestic wheat flour market marginally under control. Overall, by 1975/76 nominal food prices rose 127 percent over the previous five years, while real food prices increased by 8.8 percent. Per capita calorie consumption, which had made such large gains during the previous period, increased by only 3 percent.

4. ECONOMIC RECOVERY AND DIET DIVERSIFICATION, 1977-86

In the 1977-86 period, Pakistan has experienced economic expansion (see Table 3) stimulated by a recovering agricultural sector, increases in foreign assistance, and large remittances from workers in the Middle East (see Amjad, 1986), with real per capita income growing by 4.4 percent annually. Population has continued to expand at a 3 percent rate. However, a glance at Figure 1 shows that in the post 1976 period, the rise in food prices was halted and in some cases reversed. With demand generating factors expanding at such a rapid rate, faster than the 1970 - 76 period, how have real food prices been contained?

The agricultural recovery facilitated an easing of supply conditions. This effect was reinforced by the beginning of an apparent slowdown in the demand expansion for wheat. The period also witnessed a remarkable diversification in consumption patterns. This diversification is revealed in broad outline in Table 1 but is shown more completely in Table 4, below.

TABLE 4: Percent Change in Per Capita Calorie Consumption

	TOTAL CALORIES	WHEAT	RICE	REFINED SUGAR	PULSES
1960-70	20.0	25.0	59.0	135.0	-36.0
1970-75	3.3	1.6	-10.0	-2.0	1.4
1975-80	2.4	1.4	-1.0	21.0	-15.1
1980-85	1.0	-2.0	-1.3	44.0	-16.1
	BEEF	FLUID MILK	POULTRY	EDIBLE OIL	
1960-70	-	-	17	-	
1970-75	-	-	43	22	
1975-80	0	21	35	41	
1980-85	2	19	135	29	

Note: Beef and fluid milk figures are for 1970-80 and 1980-84.

Source: FAO supply utilization accounts with the following exceptions: Refined sugar from Lodhi (1988). Beef and Fluid milk from Pakistan household income and expenditure surveys.

Export priorities continued to dominate the rice sector, particularly in the face of faltering rice production, thus pushing up real prices and reinforcing the trend toward modestly falling per capita rice consumption. Per capita wheat consumption also fell slightly, despite falling real prices, a feature confirmed both by food balance sheet data and comparison of national

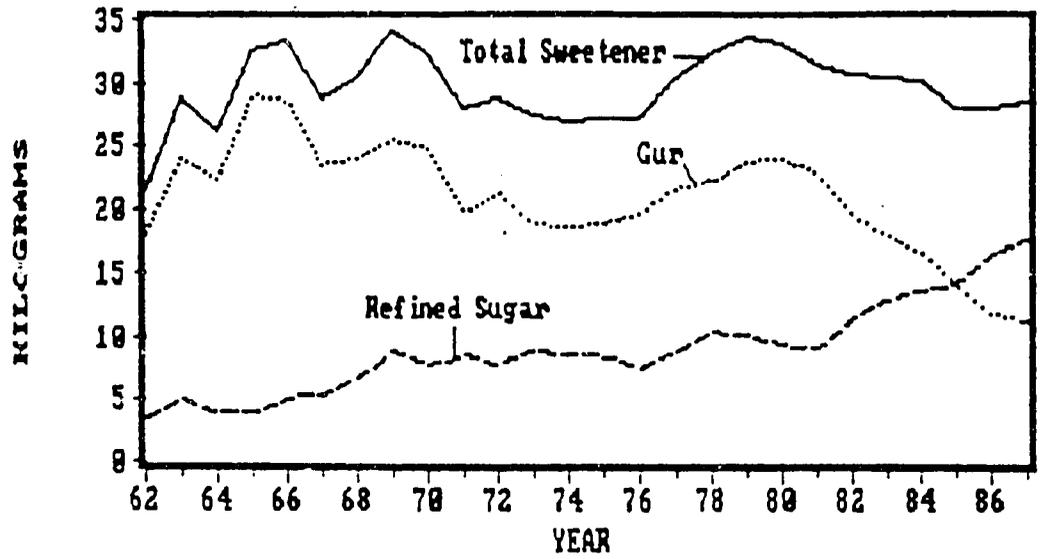
household sample surveys. Given the substantial increase in real per capita income over the period, this evidence suggests a very low, and perhaps negative, income elasticity for wheat. This possibility will be discussed in more detail below. Per capita consumption of grams and other pulses also continued falling, as real prices increased, apparently the result of crop system shifts induced by spreading Green Revolution technology in wheat and rice. In contrast, consumers increased their consumption of refined sugar, vegetable oil, milk and other dairy products, eggs, and poultry meat as prices fell sharply.

The dramatic increases in livestock product prices in the earlier period reflected by those for milk and beef in Figure 1, stimulated two additional responses in the food economy. First, private parties and some government sponsored joint-ventures began to make investments in modern poultry raising techniques. The impact of this can be seen in the astonishing fall in real egg prices. Eggs and poultry meat, which played a negligible role in the food economy prior to this investment, have dominated the expansion of animal protein consumption since 1975. While per capita protein consumption grew at a slow .25 percent annually, protein consumption from poultry and eggs grew, from a low base, at almost 18 percent per year, thus increasing the animal share of total protein from 6.6 to 9.3 percent.

The second response came from food policy managers. With the price of *desi ghee*, the butterfat based cooking oil, skyrocketing, the government decided to begin imports of large amounts of soybean and palm oil. Although government administered the domestic price of these imports through import duties and release prices, the landed price of imported vegetable oil was low enough to cause the step to fall in the domestic price level shown in Figure 1 (Goldman and Hall). The response of consumers was overwhelming, putting per capita consumption of vegetable oil on an upward trajectory after 1974, when the large imports began. Initially, this imported oil was provided through concession PL-480 sales. As demand expanded, however, the share of commercial imports increased and was supplemented by domestic supplies of cottonseed oil from the recovering cotton crop following 1978. The result of this supply expansion, even in the face of robust demand forces, drove down prices in dramatic fashion. Between 1974 and 1984 edible oil consumption accounted for 123 percent of change in per capita calorie consumption in Pakistan (see Goldman and Hall, 1990 for further details).

The consumption of refined sugar also increased. In this case, however, the demand was accommodated from neither imports nor domestic supply expansion. Rather, Government supported investors in capital intensive centrifugal sugar mills, by establishing production zones around those mills in order to guarantee throughput in the mills and augment the supply of refined sugar in urban areas, where it was sold to consumers through a subsidized ration program. This was necessary to curtail the supply of cane sugar to the village sugar processing industry which produced a coarse brown sweetener called *gur*, a product preferred by rural consumers. As shown in Figure 2, over time this policy was successful. Refined sugar consumption increased, mostly an urban phenomenon, while *gur* consumption decreased in rural areas. At the end of the period per capita sugar consumption, refined and unrefined combined, remained virtually unchanged.

FIGURE 2: Per Capita Sweetener Consumption in Pakistan



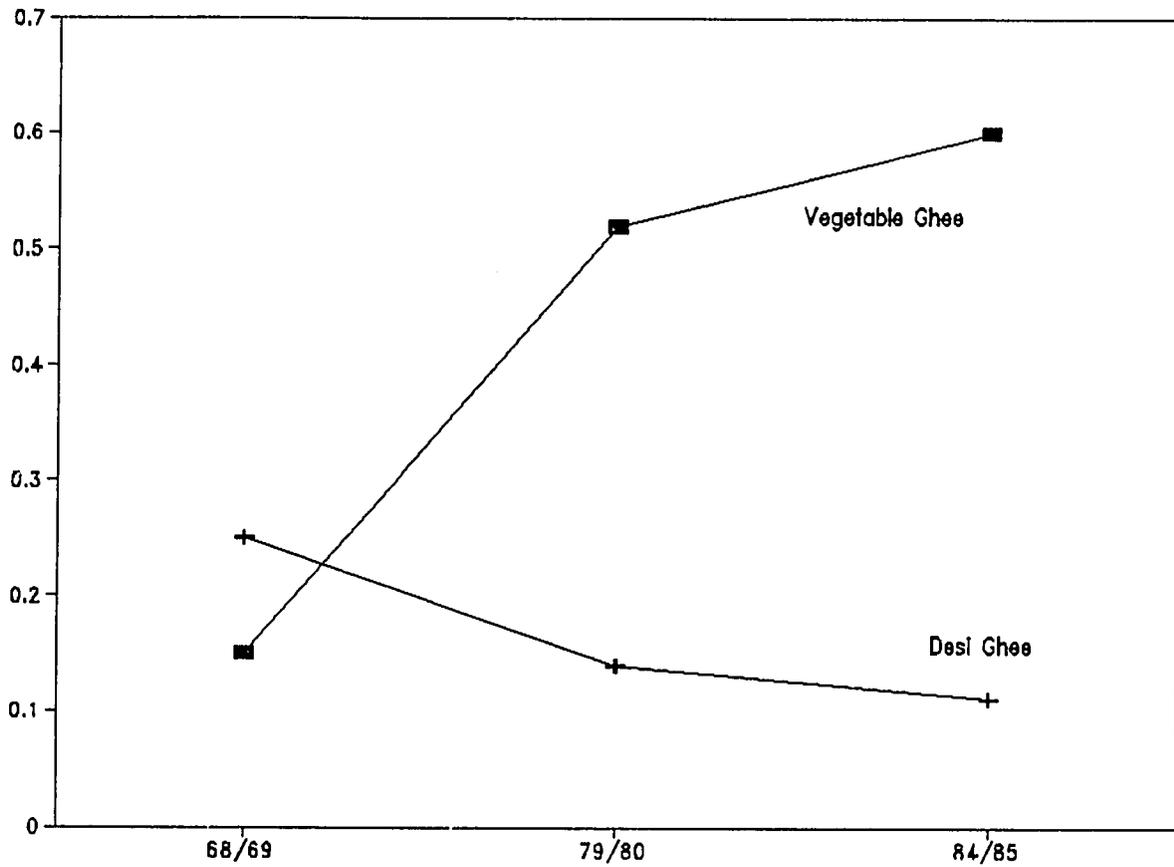
5. ACCOMMODATING DEMAND EXPANSION: THE EDIBLE OIL/MILK COMPLEX

One of the most intriguing elements in the diet diversification process involves milk consumption. As with beef production, the overall supply of milk in Pakistan over the entire period grew at a rate equal to or marginally less than population. Evidence suggests that the income elasticity of demand for both commodities is strong, so that demand was expanding at a rate faster than domestic supply. The result for beef is easy to see in Figure 1 and Table 4, where the real price increases sharply and per capita consumption stagnates. There is a slackening of this process between 1975 and 1980, when real prices fall slightly. This is probably in response to the unusually high rate of bullock and buffalo slaughter, as tractors spread rapidly over the Pakistani countryside.

The price and consumption pattern for fluid milk is different, however. Real prices fell sharply after 1975 then rose, but at a slower rate than beef prices. Surprisingly, however, comparison of household expenditure surveys show a very substantial increase in per capita consumption of fluid milk. Although powdered milk imports increased sharply from a negligible base during this period, the level of imports represented a very small fraction of total milk consumption in the country. With per capita milk production virtually constant over the period, where did the additional milk come from?

In a roundabout way the increased milk consumption came from the vegetable oil imports. Attracted by the rapidly falling real prices and the easy availability of vegetable ghee, consumers shifted out of the butterfat based *desi ghee*. This substitution is confirmed by the comparison of household expenditure survey consumption data shown in Figure 3. Buffalo milk, which predominates over cow milk in Pakistan, contains about 5-6 percent butterfat. *Desi ghee* contains almost 100 percent butterfat. As consumers shifted out of *desi ghee* and into *dalda*, it facilitated a 20 to 1 potential supply expansion in fluid milk. Of course, some of this butterfat was diverted into confectionery consumption. But the evidence in the expenditure surveys reveals that a tremendous increment of fluid milk was released directly into consumer markets. This unplanned result of the decision to expand vegetable oil imports has been a strategic feature of the Pakistan food economy over the past decade.

FIGURE 3: Per Capita Consumption of Edible Oil (per month)



Source: Pakistan Household Income and Expenditure Surveys

6. INCOME AND PRICE IMPACTS ON FOOD DEMAND

Throughout the period examined here, food policy makers have had to contend with vigorous expansion in the demand for food. Although there are many factors which contribute to this demand, three are generally considered to be primary: population growth, changes in real per capita income, and changes in real and relative food prices. A simple equation model showing the impact of these factors on the change in expenditure on food (both market purchases and "purchases" from own-farm production) is

$$\text{Expend}' = \text{Pop}' + Y' (E_y) + P' (E_p),$$

where Expend', Pop', Y', and P' represent growth rates over time in real food expenditures, population, real per capita total expenditure, and real food prices; E_y and E_p represent expenditure and price elasticities of demand, the proportionate relationships between the change in total expenditure (used in applied studies as a proxy for income, which is more difficult to measure) and a change in price, respectively, and the change in consumption. These relationships also apply to changes in calorie consumption, holding the market quality of the food group in question constant, an exercise which is carried out below. Population growth exerts a general pressure on aggregate demand for food, while changes in incomes and prices influence per capita consumption levels. When domestic availability of food, from either domestic production, stocks, or imported sources, cannot accommodate the change in demand induced by population growth and change in income, then real prices rise. When availability grows faster than these changes then real prices fall.

Population growth in Pakistan has been among the highest in Asia, at about 3 percent per annum, and accounts for the largest portion of change in aggregate consumption over the past 25 years. But over that period, there has been important increases in per capita consumption of total calories, as well, with some foods playing a greater role than others in that growth. Food policy management has played a central role in that process.

The narrative thus far has been constructed around inspection of real price changes shown in Figure 1 and the data on per capita consumption shown in Tables 1 and 4. Is it possible to obtain a stronger quantitative estimate of the relative importance of income changes versus price changes as factors shaping the actual changing pattern of consumption in Pakistan?

There is a record of household expenditure survey data for Pakistan, beginning in the early 1970's and including various years through the mid-1980's. The early surveys form a weak statistical base and are not necessarily comparable with those which follow, but the 1979 and 1984-85 surveys are stronger. These surveys provide rich understanding of many dimensions of Pakistan's food system.

The results of two sophisticated attempts to use this survey data to determine income and price elasticities are reported in Alderman (1987) and Ahmad, et al. (1987). A summary and comparison of their estimates of national aggregate elasticities is shown in Table 5. Each of these studies confirm that income and price are important determinants of demand. Unfortunately, they differ substantially regarding the order of magnitude of the parameters. Alderman's estimate of the income elasticity for wheat, for example, is .36 contrasted with Ahmad, et al's estimate of .12. There are important differences between the two studies, with respect to estimates of both price and income elasticities for all major commodities.

TABLE 5: Comparison of Pakistan Demand Elasticity Estimates

Expenditure Elasticity (E_y):				
	<u>Alderman</u>	<u>Ahmad</u>	ELASTICITY RELATIONSHIPS	
			<u>Alderman</u>	<u>Ahmad</u>
Wheat	0.36	0.12	0.29	0.26
Rice	0.91	0.44	0.72	0.96
Pulses	0.49	0.26	0.39	0.57
Dairy	1.26	0.46	1.00	1.00
Own Uncompensated Price Elasticity (E_p):				
	<u>Alderman</u>	<u>Ahmad</u>	ELASTICITY RELATIONSHIPS	
			<u>Alderman</u>	<u>Ahmad</u>
Wheat	-0.71	-0.17	0.75	0.35
Rices	-1.51	-0.37	1.59	0.77
Pulses	-0.44	-0.26	0.46	0.54
Dairy	-0.95	-0.48	1.00	1.00
Ratio of Income and Price Elasticities (E_y/E_p):				
	<u>Alderman</u>	<u>Ahmad</u>		
Wheat	-0.51	-0.71		
Rice	-0.60	-1.19		
Pulses	-1.11	-1.00		
Dairy	-1.33	-0.96		

- Notes: 1. The aggregate national Elasticities reported by both studies are the weighted average of estimated urban and rural elasticities.
 2. In both cases, these estimates are from the 1979 Household and Income Expenditure Survey data. Alderman's estimates are from a Almost Ideal Demand System (using independent market prices) approach; Ahmad et al employ a modified Linear Expenditure System approach.

Sources: Alderman (September, 1987); Ahmad et al (1987).

Some common structural relationships are revealed, however. Inspection of the proportionate relationship among expenditure elasticities within each study shows an almost similar hierarchy (see the "elasticity relationships" columns). Milk has the highest income elasticity in both studies and wheat the lowest; the ratio between the two elasticities is almost identical, as well. The relative relationships between wheat, rice and milk are similar in both studies, but the expenditure elasticities for pulses are in different place orders. Unfortunately, there is not a similar degree of consistency between the own price elasticity estimates, other than milk being the highest in both studies. There are also large discrepancies between the expenditure/price elasticity ratios in the two studies.

Although both studies are carefully and expertly done, Alderman's estimates may be preferred since his methodology is less constraining. Applying Alderman's elasticity estimates to the demand equation shown above and using the actual price and real per capita income changes for past periods should result in estimates of per capita consumption changes which approximate those actually observed. The results of this exercise applied to wheat, rice, and milk, shown in Table 6, are mixed. These elasticity estimates work best with fluid milk (and other dairy product) consumption, where the expenditure and own-price elasticities over-predict by 27 percent the actual 21 percent increase in per capita consumption in the 1970-80 period, and under predict by 28 percent the observed 19 percent increase in consumption between 1979 and 1984. Including the effect of the wheat and rice cross-price elasticities (not shown in the table) reduces the under prediction in the latter case to 18 percent. The elasticities also work reasonably well for wheat and rice during the period 1970-80, where the own price and expenditure elasticities explain almost 100 percent of the observed 9.2 percent change in per capita wheat consumption and over-predict the actual 11 percent decline in rice consumption by 35 percent (26 percent error when the wheat and pulse cross-price elasticities are included). The parameters also predict well the 1960-70 period. Unfortunately, for wheat and rice they do not explain at all well the 1975-84 period, nor do they explain well the successive five-year periods after 1970 (only 1980-85 is shown in Table 6).

It is possible, based on Table 6, to make some judgments about the relative importance of per capita income and price changes on the national consumption pattern between 1960-70 and 1970-80. Per capita income is about 2.3 times more important than price on wheat consumption in the earlier period and is almost the exclusive influence in the 1970-80 period. Income and price effects are somewhat more balanced in the case of rice in the 1960-70 period, with the income effect on consumption about 75 percent greater than the price impact. This is reversed in the 1970-80 period, where the impact of price is about 70 percent greater than that of income, as the aggressive export thrust drove up domestic rice prices. For milk we have no consumption change data for the earlier period. During 1970-80, however, the income effect dominates the price effect. During 1980-85, where the elasticity estimates seem to work reasonable well for milk consumption, the role of price increases, accounting for a bit less than half the impact of income.

TABLE 6: Comparison of Actual and Predicted Consumption Changes

	ACTUAL CONSUMPTION CHANGE (%)	PREDICTED CONSUMPTION CHANGE		ACTUAL/PREDICTED RATIO
		<i>Income Effect</i>	<i>Own Price Effect</i>	
<i>1969-70</i>				
Wheat	25.0	15.5	6.6	1.13
Rice	59.0	40.2	23.0	0.93
Milk	n/a	n/a	n/a	n/a
<i>1970-80</i>				
Wheat	9.2	8.0	1.4	0.98
Rice	-11.3	20.7	-36.0	0.74
Milk	21.0	28.7	-2.1	1.27
<i>1980-85</i>				
Wheat	-2.0	7.0	4.8	-.17
Rice	-1.5	18.2	-6.2	-.13
Milk	18.8	25.2	-11.6	0.72

Note: These estimates are from coefficients estimated by Alderman (1987). See text and Table 5.

7. THE CHANGING ROLE OF WHEAT IN THE FOOD SYSTEM

Throughout the period under investigation here, wheat has played a strategic role in the food economy. It is by far the largest calorie source and accounts for a large portion of the impressive gains in per capita calorie consumption. The Government of Pakistan used domestic procurement and pricing policy as well as donor assisted imports to ensure stable and modestly declining real consumer prices throughout the period following the mid-1960s (see Figure 1). Earlier in the period the domestic price level was about 30 percent above the equivalent world price (measured at the official exchange rate). Later this situation reversed with domestic prices below the world market by about 35 percent in the 1970's and 19 percent from 1983-87 (Dorosh and Valdés). Failure of domestic wheat prices to fully reflect rupee devaluations accounts for a large share of this reversal.

Although large amount of public resources were expended to support a program of consumer "wheat subsidies" during this period, at one point accounting for 13 percent of current budgetary expenditure, this program had little influence on aggregate flour demand or the price performance described above. Despite the huge amount of resources required to support a program of subsidized ration shops, recent analysis has shown that relatively little of this expenditure was actually transferred to consumers generally and poor consumers specifically. Alderman (1988) concludes that the self-targeting nature of the ration-shop flour notwithstanding, a very small portion of Pakistan's consumers actually benefitted. This was due to the large urban bias in the distribution of ration shops actually selling subsidized flour in a country where more than two-thirds of the population is rural and to massive fiscal and physical leakages from the wheat subsidy program. In 1975 the budgetary cost per kilo of released flour was three times greater than the price differential between rationed and open-market flour (Hamid, Nabi, and Nasim). Similarly, a 1985/86 study suggests that "approximately 69% of the subsidized wheat released by the government is not drawn by consumers from ration shops or subsidized bakeries" (Alderman, Chaudhry and Garcia, 1988). In 1987 the ration-shop program was terminated and replaced by a general subsidy offsetting a portion of processing and marketing costs of wheat flour.

Evidence suggests that Pakistan has entered a new phase in the evolution of its wheat economy. Despite rising per capita income and falling market prices, per capita wheat consumption declined during the 1980's. This decline is revealed in a comparison of the 1979 and 1984 household expenditure surveys and is confirmed in the food balance sheets for the two periods (see Ender, et al). The evidence is consistent with a negative income elasticity of demand, in contrast to the positive elasticities estimated by both Alderman and Ahmad, et al from the 1979 survey. Bouis and Haddad make a strong case of upward bias in calorie-income elasticities estimated by standard econometric techniques. If the evidence supporting a low or negative wheat income elasticity is correct, then it has strategic implications for Pakistan in the post-Green Revolution period. With growth in wheat production slowing and a continued rapid population growth, Pakistan is likely to face renewed pressure on wheat supplies and an increasing need for supplemental wheat imports. In contrast to earlier periods, however, the

impact of rising incomes will probably not be an important factor in Pakistan's wheat economy. In addition, increasing urbanization is likely to dampen further the consumer demand for wheat.

8. CONCLUSION

Pakistan's food economy has gone through three distinct phases since the 1960s. During the Green Revolution expansion government utilized the additional wheat supplies to reduce domestic shortages and simultaneously promote both consumption expansion and national self-sufficiency. Despite rapid increases in prices for key commodities such as meat, milk, and edible oil, the overall real food price index remained stable reflecting the influence of wheat and rice policy. The first half of the 1970s witnessed a reversal of some of these gains. The expansion of wheat and rice production slowed markedly. The general absence of new technology for other crops, combined with poor weather and politically motivated interventions in agricultural markets, led to economic stagnation in the face of rapid population growth. As prices for most food commodities increased, government maintained stable wheat prices through imports. Near the end of the period massive imports of vegetable oil were commenced.

A period of extended economic recovery began in 1977. Demand forces were accommodated by further government promotion of vegetable oil imports, thus driving down the real and relative price of cooking oil. Increased consumption of cooking oil accounted for more than 100 percent of increase in per capita calorie intake during this period. Despite renewed growth of wheat production, particularly in rain-fed areas and in areas with new irrigation water, per capita consumption of wheat declined modestly, apparently due to already high levels of flour consumption and low income elasticities of demand. Finally, diet diversification during this period was promoted further by rapidly increasing poultry production with falling real consumer prices and by increasing supplies of fluid milk which accommodated the robust demand at stable prices. The expanded fluid milk supply resulted from consumer substitution of cheap imported vegetable oil for the traditional butterfat based cooking oil.

Pakistan's food economy is entering a new Post-Green Revolution phase. Continued pressure on domestic wheat supplies will come from rapid population growth, but further rises in per capita income will generate only a small and possibly even a negative demand response. Increasing urbanization of the Pakistan population may further dampen wheat demand expansion (Goldman, 1992). Per capita demand for edible oil, particularly vegetable oil, will also grow less rapidly in the 1990s, since the *desi ghee* substitution phase is virtually complete (see Goldman and Hall, 1990). Although demand for milk is likely to continue expanding, the supply generating interaction with vegetable ghee imports has largely run its course. Nevertheless, it is likely that demand may continue to be accommodated by domestic supply. Hall has shown that during the 1980s an important change in Pakistan's bovine herd structure occurred, resulting in a larger share of milk producing females.

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