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Variation in food production and consumption pattern in Pakistan

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The paper is about change in food production and consumption pattern in Pakistan. Food availability per capita per annum in Pakistan increased from 298.1 kg in 1979 to 1980 to 414.8 kg in 2007 to 2008 at a rate slower than Population growth (from 85.09 million to 163.8 million over the same period) (Government of Pakistan, 2010). Food consumption pattern in Pakistan are exception and changing by weight nearly three quarters of the diet is made up of cereals and milk product. In addition over half of the expenditure for major food items is on cereals, and milk products (Walters and Mehmood, 1990). The food production (Cereals, Gram, Pulses, Vegetables, Potatoes, and Fruits, Animal product Poultry Product, Sugar and Veg.Ghee) was increased by 52% in 1990 to 2000 over the 1979 to 1990 and by 34.9% in 2000 to 2010 over the 1990s. The annual rate of growth in overall food production rose to 3.9, 4.2 and 2.8% in the 1980s, 1990s and last recent decade against 3.1, 2.4 and 1.9% growth of population in same time period. Food grain production was increased by 32.8 to 29.5% during last thirty years.

Key words: Food production, food consumption, food consumption statistics, food grains, population growth, Cobb Douglas type production function.

INTRODUCTION

Food consumption and production pattern are the driving forces behind any Economy and play a significant role shaping the sustainability of future economic growth (Chernichovsky and Meesook, 1984; Goliai and Pradhan, 2006). This pattern is changing since 1980s because growth rate of the (GDP) has been averaging 5.6% per annum during the decade beginning from 1980 to 1981 further during the last 20 years the average growth rates of the economy has also remained 4.7%. Since population has increased by at least 2.05% per annum, from 85.09 million to 173.5 million between 1980 and 2010 in Pakistan (Government of Pakistan, 2010). To feed this rising population, food production ought to increase proportionately and pattern of change in the production of different items should have been changed against the changes occurred in food consumption pattern, generally the pattern of agricultural diversification shows a shift from crop production to livestock product namely, milk, meat, eggs etc (Husain, 2005; Khan, 2000).

Objective of the study

The main objective of the study is to assess changes in food consumption and Production pattern by analyzing factors responsible for enhancing in production of such items between time periods 1979 to 2010.

METHODOLOGY

There are number of studies analyzing the growth performance of Pakistan agriculture covering different periods, however, very few studies have actually looked into the sources of growth in food cropped production (Khan, 2006). The author states that he has not come across any such study that decomposed, sub-period wise, the output growth into the area, yield and interactive effect covering the most recent period, especially in the 1980s, 1990s and recent decade of this century when Pakistan agriculture did experience significant changes (Majumdar and Basu, 2005; Khan, 2000). Keeping in view this background, between the time periods of 1979/1980, 1989/1990, 1990/1991, 1999/2000 and 2000/2001 to 2009/2010, the data of the Household Income and Expenditure Survey (1979, 1987 to 1988), Pakistan Integrated Household Survey (1998 to 1999, 2001 to 2002), and the Pakistan Social and Living Standard Measurement (PSLM) Survey (2004 to 2005) were used. Agriculture Statistics and various issues of Pakistan Economic Survey were published during 1979 to 1980 and 2009 to 2010.

Multiple regression analysis is used to estimate the separate effect of various factors effecting food cropped output (fertilizer, improved seed, number of tubwell, number of tractors, credit

Table 1. Change over time in average area and annual growth rate of major crops in Pakistan during 1979-1990, 1990-2000 and 2000-2010.

Crop	Area (000 hecht.)							
	Avg. area 1979-1990	Avg. area 1990-2000	% Change during 197919-90 to1990-2000	Annual growth rate during 1979-1990	Annual growth rate during 1990-2000	Avg. area 2000-2010	% Change during 1990-2000 to2000-2010	Annual growth rate during 2000-2010
Wheat	7372	8183	11.0	1.1	0.6	8427	3.0	1.3
Rice	1996	2216	11.0	0.4	2.1	2502	12.9	3.0
Bajra	526	405	-23.0	0.9	-1.1	451	11.5	2.7
Jowar	395	392	-0.7	0.0	-1	316	-19.4	-4.5
Maize	802	905	12.9	1.8	1.6	979	8.1	1.0
Barley	196	153	-21.9	-4.1	-1.6	102	-33.4	-3.7
Total Food Grains	11287	12255	8.6	0.9	0.8	12778	4.3	1.5
Gram	968	962	-0.7	0.3	-4.7	960	-0.2	4.9
Other Pulses	1376	1501	9.1	1.1	0.6	1452	-3.3	-0.4
Sugar cane	847	979	15.5	0.2	2.3	1021	4.3	0.3
Rap & Mustard	348	311	-10.7	-3.5	1.9	248	-20.3	-3.2
Sesamum	33	79	135.9	-4.4	2.9	85	7.4	-3.0
Cotton	2526	2880	14.0	3.0	1.2	3005	4.3	0.2
Tobacco	43	52	19.9	-2.1	1.0	50	-4.2	0.9
Vegetable	168	220	30.9	5.6	0.6	235	6.6	1.8
Potato	49	83	69.9	5.7	4.6	117	41.4	4.1
Total Other Crops	6358	7066	11.1	1.5	0.8	7171	1.5	0.6
Grand Total	17645	19321	9.5	1.0	0.8	19949	3.3	1.2

dispersed and area irrigated). Further elaboration is given in relevant section.

Decomposition of change in output of major crops is calculated by using following formula:

$$\Delta o = yb \,\Delta A + Ab\Delta y + \Delta A\Delta y$$

Δo = Change in crop output (between t and b)
Ab = Area of crop in the base year
yb = yield level of crop in the base year
ΔA = Change in cropped area (between time t and b)
Δy = Change in yield level (between time t and b)
b, t = base and terminal year (average of each decade in each case)

Changes in mean area, production and yield of major crops from 1979 to 2010 in Pakistan

The performance of agriculture can be judged from the growth rate of area, production and yield of different crops (Bachman and Paulino, 1979; Chernichovsky and Meesook, 1984; Giri, 2006). Data regarding overtime change and annual growth rate in average

area, production and yield of different crops including total food grains during 1979/1990 to1990/2000 and 1990/2000 to 2000/2010, has been presented in Tables 1, 2 and 3.

Area under different crops

Table 1 shows that while area under wheat, rice, maize increased by 11, 11 and 12.9% in the 1990s, as compared to 1980s, it decreased by varying degree under the remaining food crops (Bajra [23%], Jowar [-0.7%] Barley [-4.1%]). Overtime change in area during 2000 to 2010 remained positive in case of wheat (3%), rice (12.9%), maize (8.1%) and Bajra (11.1%), wheat is the most vantage and pivotal crop of the county. This edible food crop accounts for about 41.7, 42.4 and 42.2% of the cropped area of the county during 1980s, 1990s and recent decade respectively.

Considering the 15 important crops being produced in overall Pakistan, it was found an increased in the area of food, grains, and 8.6% in the 1990s over 1980s and decreased 4.3% in 2000 to 2010 over 1990s. The area under total crops has grown at the rate of 1.5, 0.8 and 0.6% per annum, while area under food grain crops has also grown at the rate of 0.9, 0.8 and 1.5% per annum during 1980s,

Table 2. Change over time in average production and annual growth rate of major crops in Pakistan during 1979-90, 1990-00 and 2000-10.

Crop	Production ('000 tonnes)							
	Avg. production 1979-1990	Avg. production1990-2000	% Change during 1979-1990 to1990-2000	Annual growth rate during 1979-1990	Annual growth rate during 1990-2000	Avg. production 2000-2010	% Change during 1990-2000 to2000-2010	Annual growth rate during 2000-2010
Wheat	12338	16981	37.6	2.7	3.2	21097	24.2	3.0
Rice	3259	3950	21.2	0.0	5.3	5342	35.3	5.4
Bajra	232	179	-22.8	-3.4	0.6	242	35	4.7
Jowar	229	233	1.5	0.0	-0.4	189	-18.9	-4.3
Maize	1041	1393	33.8	2.8	4.4	2672	91.8	10.4
Barley	140	150	7.1	-2.4	-0.7	86	-42.8	-8.3
Total food grains	17239	22886	32.8	2.0	3.5	29628	29.5	4.0
Gram	438	567	29.3	6.0	4.8	562	-0.8	3.0
Other Pulses	673	782	16.1	2.4	4.4	848	8.5	3.3
Sugar cane	32602	44837	37.5	1.0	3.7	48711	8.6	1.9
Rap & Mustard	235	250	6.3	-0.9	4.4	204	-18.4	-2.2
Sesamum	13	35	157.6	-4.9	4.7	35	1	-1.1
Cotton	1071	1657	54.7	8.6	-0.3	2006	21	2.2
Tobacco	74	94	27.3	0.1	2.2	99	5	2.6
Vegetable	2182	2994	37.2	6.4	-0.1	3016	0.7	1.4
Potato	564	1085	92.3	4.6	7.3	2083	92	5.2
Total other crops	37853	52301	38.2	1.6	3.4	57562	10.1	2.0
Grand Total	55092	75187	36.5	1.8	3.5	87190	16	2.4

1990s and 2000 to 2010 respectively. Within food grain, the highest growth in area has been recorded for maize (1.8%) followed by wheat (1.1%) during 1980s while rice (2.1%) followed by maize (1.6%) during 1990s. It was also highest in case of rice (3.0%) but followed by bajra (2.7%) during 2000 to 2010. Favorable weather in Barani area accounted to high growth for bajra. Growth rate of wheat (1.3%) and rice (3.0%) in recent study decade was also high as compared to 1990s.

Production and yield per hectare of different crops

During 1979-1980 to 1990-2000 and 1990-2000 to 2000-2010 the food grain production grown at a compound rate of 2, 3.5 and 4% while yield per hectare increased 1.9, 1.2, 2.5%, respectively (Tables 4 and 5). Although the growth of area contributed to the expansion of production of food grain crops, the growth rate of yields were better than that for growth rate of area.

The production of wheat the major cereal crop of the county, increased at a compound rate of 2.7, 3.2 and 3.0% during 1980s, 1990s and 2000 to 2010. During the 1980s, rate of increased in production of rice is zero, while during 1990s rate of rise in

production of rice (5.3%) is higher as compared to wheat (3.2%) and maize (4.4%).

During 2000 to 2010 rate of growth in the production of maize (10.4%) was highest followed by rice (5.4%) as compared to other food crops and while yield of wheat (1.7%) rice (2.4%) and maize (9.4%) also increased at a significant rate particular due to the introduction of high yielding varieties of rice and maize (Husain, 2005). Expansion of areas, production and yield of maize was due to its role as a live stock, poultry feed production and edible oil. The production of oil seeds (rap and mustard, sesamum) has declined during last thirty years despite the fact that demand for vegetable ghee has tripled as result of substitution of desi ghee. In fact cotton seed, which has always been the major domestic source of edible oil double its production, consequently, the share of cotton seed oil in domestic production has further increased, while that of rapeseed and mustard and sesamum has declined (Javeed and Yameen, 2003; Khan, 2006) wheat, Gram and barley suffer decline both in area and yield during (2000-2010) these crops are grown mainly in Barani areas. The fluctuation in weather was a major factor behind the instability of these crops. Among non-food grains the most promising crops include sugarcane and cotton. In net terms the total food grains production experienced an increase of 32.8% in

Table 3. Change over time in average yield and annual growth rate of major crops in Pakistan during 1979-1990, 1990-2000 and 2000-2010.

Crop	Avg. yield 1979-90	Avg. yield 1990-00	% Change during 1979-90 to 1990-2000	Annual growth rate during 1979-1990	Annual growth rate during 1990-2000	Avg. yield 2000-2010	% Change during 1990-00 to 2000-2010	Annual growth rate during 2000-2010
Wheat	1.7	2.1	24.0	1.6	2.6	2.5	20.5	1.7
Rice	1.6	1.8	9.2	-0.4	3.2	2.1	17.8	2.4
Bajra	0.4	0.4	0.3	-4.3	1.7	0.5	13.0	1.0
Jowar	0.6	0.6	2.3	0.1	0.5	0.6	1.0	0.1
Maize	1.3	1.5	18.4	1.0	2.8	2.7	75.5	9.4
Barley	0.7	1.0	37.2	1.7	0.8	0.8	-18.6	-4.6
Total food grains	1.5	1.9	21.5	1.2	2.7	2.3	23.2	2.5
Gram	0.5	0.5	10.5	5.6	5.0	0.6	24.1	-1.9
Other Pulses	0.5	0.5	6.4	1.4	3.7	0.6	15.2	3.7
Sugar cane	38.5	45.8	19.0	0.8	1.4	47.7	4.1	1.1
Rap & Mustard	0.7	0.8	19.0	2.6	2.5	0.8	-3.6	1.0
Sesamum	0.4	0.4	9.2	-0.5	1.8	0.4	-9.5	1.9
Cotton	0.4	0.6	35.6	5.6	1.5	0.7	21.7	2.0
Tobacco	1.7	1.8	6.2	1.3	1.3	2.0	10.5	1.7
Vegetable	13.0	13.6	4.9	0.8	-0.8	12.9	-5.2	-0.3
Potato	11.6	13.1	13.2	-1.1	2.7	17.9	36.1	1.1
Total other crops	6.0	7.4	24.3	0.2	2.6	8.0	8.1	1.0
Grand Total	3.1	3.9	24.1	0.7	2.7	4.4	13.1	1.2

1990s over the 1980s and 29.5% in 2000 to 2010 over the 1990s. Although the cropping sector as a whole and some individual crops in the past did experience remarkable growth rates from the 1980 but the rates of increase in yields have either slowed as in case of wheat (important food grain crop) or become constant (Tables 4 and 5).

In so far as average yield was concerned, all food grain recorded net increase of 21.5% in the 1990s over 1980s and 23.2% in 2000 to 2010 over 1990s respectively. Self sufficiency in food can be achieved and sustained only if yield of these crops can be increased beyond past trend. This can be done by bringing more area under certified seed by improved cultural practices, more balanced and timely use of fertilizer and high water use efficiency (Husain, 2005; Hasan, 1997; Javeed and Yameen, 2003; Khan, 2006).

It can be safely inferred that overall performance was nevertheless quite good. The trend of food grains production rose 128.20% between 1979 and 2010. The average annual rate of growth (2.5 %) was equal to developing country. Three fourth of the growth (1.6%) was due to growth in yield and one fourth (0.9%) to the growth in gross area sown. The contribution of yield growth has risen over time, while the contribution of area expansion has

declined (Figures 1 and 2). About 40% area was due to increase double cropping, the remainder being accounted for by the expansion of the net cultivated area (Table 4).

Component of change in mean production

The change in output of major crops in Pakistan can be broken into three components (1) expansion in cropped area at the old yield level (2) increase in yield on the old cropped area, and (3) a cross-product term of increased area and yield. The results of de composition into area, yield and interactive effects are produced in Table 5. The breakdown of change in output measured separately for each decade since the early 1980s.

The data given in Table 5 indicates that among different sources of increase in mean production of total food grains increase in mean yield contributed 68.5 and 81.8% in first and second period that is, 1979-1980 to 1990-2000) and (1990-2000 to 2000-2010) respectively. In first period (1979-1980 to 1990-2000) and second period (1990-2000 to 2000-2010) most of the growth in crop output is explained by increase in yield for all crops except pulses and vegetables. The contribution of yield to the change in output of

Table 4. Area, production yield, cropping intensity of food grain crops.

Year	Cultivated area (million)	Cropped area (million)	Food cropped area (000 hec.)	Production ('000 tonnes)	Yield (Kgs)	Cropping intensity
1979-1980	20.23	19.22	10803	15232	1410	95
1980-1981	20.30	19.33	10709	16188	1512	95
1981-1982	20.42	19.71	11141	16319	1465	97
1982-1983	20.31	20.06	11255	17491	1554	99
1983-1984	20.33	19.99	11264	15854	1407	98
1984-1985	20.61	19.92	11258	16692	1483	97
1985-1986	20.17	20.28	10392	18462	1777	101
1986-1987	20.92	20.60	11678	17216	1474	98
1987-1988	20.66	19.52	11183	17471	1562	94
1988-1989	21.02	21.82	11738	19395	1652	104
1989-1990	21.07	21.89	11922	19312	1620	104
1990-1991	20.96	21.82	11934	19588	1641	104
1991-1992	21.06	21.72	11668	20634	1768	103
1992-1993	21.40	22.44	12191	21056	1727	105
1993-1994	21.51	21.87	11919	20917	1755	102
1994-1995	21.55	22.14	12297	22422	1823	103
1995-1996	21.68	22.59	12473	22968	1841	104
1996-1997	21.98	22.73	12113	22962	1896	103
1997-1998	21.96	23.04	12618	25160	1994	105
1998-1999	21.93	22.86	12599	24775	1966	104
1999-2000	21.96	22.74	12734	28381	2229	104
2000-2001	22.13	22.04	12359	25986	2103	100
2001-2002	22.23	22.12	12000	24310	2026	100
2002-2003	22.21	21.85	11989	25890	2159	98
2003-2004	22.12	22.94	12657	26955	2130	104
2004-2005	22.13	22.78	12654	29905	2363	103
2005-2006	22.65	23.13	12896	30396	2357	102
2006-2007	21.88	23.56	13066	32332	2475	108
2007-2008	21.23	23.85	13020	29789	2288	112
2008-2009	21.18	23.80	13980	35061	2508	112
2009-2010	21.21	23.80	13679	34759	2541	112
Growth rate	0.1	0.8	0.9	2.5	1.6	0.7

wheat rice, total grain, cotton and vegetables continued to be strong in the (1990-2000 to 2000-2010) but negative so far vegetables. In second period (1990-2000 to 2000-2010) growth in vegetable is strongly explained by expansion of area and modestly as regard sugarcane output. The area expansion effect on output growth of wheat, rice, total grain, and cotton is very week in both period (1979-1980 to 1990-2000 to 2000-2010) vegetables are integral part of the household and for regional economies in Pakistan. Their growth has been important in providing nutrition, employment and, forwarding linkages to processing industries. Since the 1980s the share of crop area used for vegetables has increased significantly because its increasing demand of the domestic and Middle East market, but the impact of yield on output was negative. This is because production of certified vegetable seed is inadequate rather negligible as compared to the requirement (Ashiq et al., 2007). However, to meet the yield gap Government in 2005-2006, launched fruit and vegetable development project for dissemination of improved production technologies, certification and registration of fruit plants and vegetable seed and improving marketing and post-

harvest technology of fruit and vegetable. The analysis given in Table 4 indicates that most of the increase in output of wheat, rice, total food grains, sugarcane, cotton and pulses has occurred due to productivity gains.

Δo	=	$yb \Delta A + Ab\Delta y + \Delta A\Delta y$
Δo	=	Change in crop output (between t and b)
Ab	=	Area of crop in the base year
yb	=	yield level of crop in the base year
ΔA	=	Change in cropped area (between time t and b)
Δy	=	Change in yield level (between time t and b)
b, t	=	base and terminal year (average of each decade in each case)

Food production pattern including non cropped

The estimates for the 1979-1980 to 2009-2010 position with regard

Table 5. Decomposition of change in output of major crops.

Period	Area effect (ybΔA)	Yield effect (AbΔy)	Interactive effect (ΔAΔy)
1979-1980 to 1990-2000			
Wheat	29.6	63.4	7.0
Rice	51.4	43.7	4.8
Total food grains	25.7	68.5	5.8
Sugarcane	41.5	50.6	7.9
Cotton	24.7	66.0	9.3
Pulses	58.3	38.2	3.5
Vegetables	83.0	13.0	4.0
1990-2000 to 2000-2010			
Wheat	12.4	85.0	2.5
Rice	37.0	55.8	7.2
Total food grains	14.7	81.8	3.5
Sugarcane	49.8	48.1	2.1
Cotton	21.7	75.0	3.3
Pulses	-40.3	145.1	- 4.8
Vegetables	735.1	-594.6	-40.5
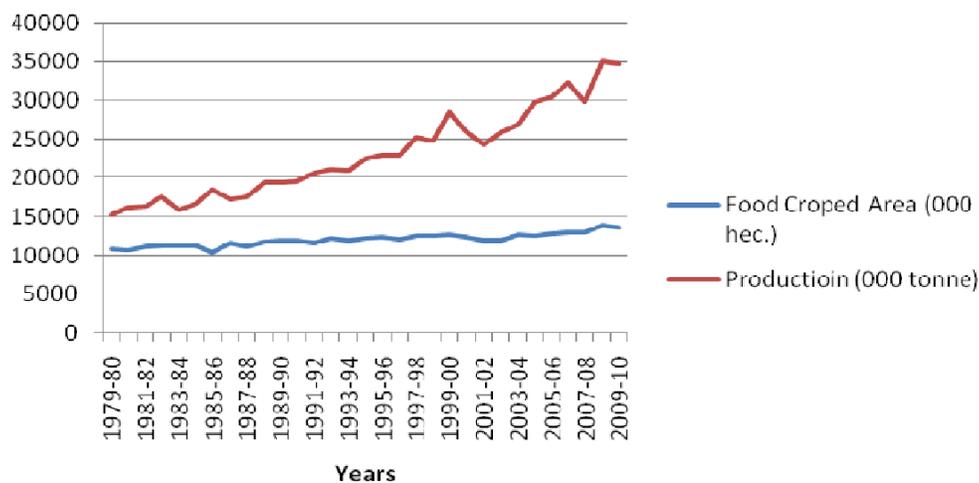
Figure 1. Area and production of food grains.

to important food items, such as food grain (wheat, rice, maize, jowar and Barley), Pulses, sugar, edible oils, livestock product (milk, mutton, beef, poultry meat) vegetables, potatoes, fruits, fish and eggs are given in Table 5. Livestock product contributed by cattle, sheep, goat and poultry. Among the crops used as food, partly consumed by the farm household and partly sold in the market, food grain (wheat, rice, maize, jowar and Barley), constitute the most important group (44.4 %) followed by fruits (7.3%) vegetable (5.6 %) pulses (1.7 %), Potato (1.1 %) and Gram (1.1 %) during the 1980s and 1990s 38.8, 6.8, 5.1, 1.3, 1.8 and 1.0% for same items respectively. Similar pattern was observed during 2000 to 2010 however, during all three study decades the product range share of each food items has stayed within a broad percentage of 44.4 to 0.7. The food production pattern during last thirty years with protein has gone up by a significant margin especially milk, beef, poultry

and sugar. The most striking increase has been in milk. These changes usually portray the outcome of an interaction of major physical and technological and institution factors. Favorable changes in public policy and increased private investment since the early 1980s have shifted the emphasis from small scale (fragmented) production to the development of large scale cattle farms (Khan, 2006; Khan, 2000; Hasan, 1997; Husain, 2005). The dairy and meat industries are apparently now responding to the rapid growth of demand for these products. A well organized and efficient poultry industry has already emerged in the urban areas of the country since the late 1970s (Husain, 2005; Khan, 2000; Walters, 1990). The average annual rates of change in the production of different food items in the last three decades are given in Table 5. The food production was increased by 52% in1990 to 2000 over the 1979 to 1990 and by 34.9% in 2000-2010
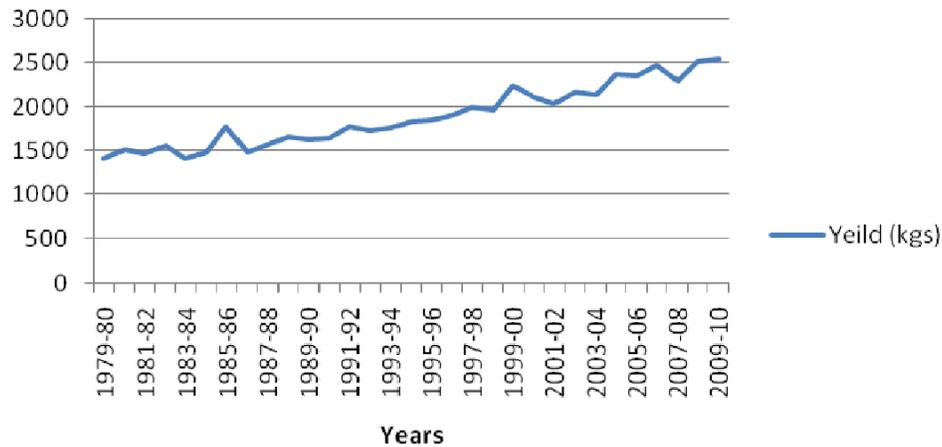
Figure 2. Yield of food grains (Kgs).

over the 1990s. The annual rate of growth in overall food production rose to 3.9, 4.2 and 2.8% in the 1980s, 1990s and last recent decade against 3.1, 2.4 and 1.9% growth of population in same time period. Food grain production was increased by 32.8 to 29.5% during last 30 years. The population growth rate of Pakistan which was running at 3.1% in 1980-1990 and declined from 2.4% in the 1990-2000 to 1.9% in 2000-2010 is projected to reach over 351 million by 2050, which is the challenge that have to face by the agriculture sector to feed an ever increasing population. To feed this population Pakistan may begin the strategies to fulfill the potential yield, gap, of food obtained by cropped and livestock output. Pakistan planning commission in January 2011 obtained from (Iqbal and Ahmed, 2003) and identified unachieved potential of yields regarding different crops which is 67 to 84% and of which the difference between best practice and average yield is 31 to 75% and the difference between research potential yields and the best practice yields is 25 to 75% regarding wheat (43.5%), Maize (58.5%), rice (45.6%), sugarcane (72.8%) and cotton (30.08%). The reasons narrated for such a huge productivity gap include: traditional farming practices, inefficient irrigation methods, high input costs, lack of bio safety regulations and insufficient institutional credit for poor farmers (Husain, 2005). Although livestock is showing improvement over past few years in dairy sector, yet there is a great room for improvement of productivity. In dairy sector there is 78% yield gap if compared with minimum standard required to compete globally. Moreover, a striking issue of 30 to 40% livestock is underfed and only 10% of livestock is vaccinated.

According to the data given in Table 6, food production increased at the growth rate of 3.9, 4.2 and 2.8% during1980s, 1990s and recent decade at a rate slightly faster than population growth (which averaged 3.1, 2.4 and 1.9% per annum during the same time period). Unfortunately, the country has not been able to achieve self-sufficiency in producing the main staple crop (wheat) and has to import, on average 10 to 12% of the country total consumption. However, 25% of rice is exported (Husain, 2005).

Food consumption pattern

Food consumption pattern in Pakistan are exception and changing. By weight nearly three quarters of the diet is constituted by cereals and milk products. However, this pattern is changing as majority of the population shifts to more animal product and poultry (Walters and Mehmood, 1990). It is generally thought that there is positive correlation between income and consumption of animal and poultry

product. The following Table 7 shows estimates of per capita monthly consumption of food item in Pakistan in 1979-1980 to1987-1988, 1998-1999, 2001-2002 and 2004-2005. The estimates are based on data obtained from PIHS, Household income and expenditure survey and PSLM survey of these years. Data given in the Table 7 shows consumption of cereals has declined since the 1979s. Per capita consumption of cereal (including wheat, rice) fell from 12.45 kg in 1979-1980 to 9.29 kg in 2004-2005. The decline in cereal consumption (32.7%) could be explained because it has been replaced in Pakistani diet by increased in animal product (35.9%) poultry product (1.3%) vegetables (14.7%) sugar (4.6%) in 2004 to 2005 against consumption of 1979 to 1980 that was 44.6, 25.9, 0.5, 11.4 and 2.6% in case of cereals, milk product, poultry product, vegetables and sugar respectively (Table 6). Several factors may have contributed to the rapid expansion in the consumption of animal product, poultry product, vegetables and sugar in Pakistan first real per capita GNP increased at an annual rate of 4.9% per annum between 1979-1980 to 2009-2010 second Pakistan is the most urbanized nation in south Asia with city dwellers making up 36% of its population (2008) while the urbanization rate is 3% (2005-2010) (Government of Pakistan, 2010).

Input factors affecting total cropped food production

Multiple regression techniques can be used to estimate the separate effects of various factors affecting food cropped output (Fertilizer, improved seed, number of tubewell, number of Tractors, Credit disbursed and Area irrigated) whenever, there is sufficient independent variation among the determining factors (Sanderson and Roy, 1979). However, area irrigated was found to be highly inter-correlated with number of tube wells, and credit disbursed was found with all other inputs. A high degree of inter-correlation impairs the stability of the regression coefficient and, thus their dependability as indicators of the separate influence of each of these factors on output. For the purpose of this analysis, dropped the area irrigated and credit disbursed variable.

A regression equation was estimated using Cobb Douglas type production function. It estimates real contribution of each and every factor affecting output. Important factors affecting cropped food output that is the number of tubewell, number of tractors; improved seed distributed (000 tones) fertilizer off-take (000 N/T) area cultivated million hectares during 1979-1980 to 2009-2010. Many factors were left out to keep study within manageable limits.

Cobb Douglas type production function was fitted which is

Table 6. Average food production (000 tonne), % Share of each food items, change over time and annual growth rate of food items.

Food items	Avg. production 1979-1990	%	Avg. production 1990-2000	%	% Change during 1979-90 to 1990-2000	Annual growth rate during 1979-1990	Annual growth rate during 1990-2000	Avg. production 2000-2010	%	% Change during 1990-00 to 2000-2010	Annual growth rate during 2000-2010
Total food grains	17239	44.4	22886	38.8	32.8	2.0	3.5	29628	37.2	29.5	4.0
Gram	438	1.1	567	1.0	29.3	6	4.8	562	0.7	-0.8	3.0
All pulses	673	1.7	782	1.3	16.1	2.4	4.4	848	1.1	8.4	3.3
Vegetable	2182	5.6	2994	5.1	37.2	6.4	-0.1	3016	3.8	0.7	1.4
Potato	564	1.5	1085	1.8	92.3	4.6	7.3	2083	2.6	92.0	5.2
Total Fruits	2817	7.3	4025	6.8	42.9	4.8	2.6	4903	6.2	21.8	3.8
Mutton	468	1.2	692	1.2	47.9	5.6	-2.1	639	0.8	-7.7	-2.3
Beef	552	1.4	894	1.5	62.0	6.0	2.5	1306	1.6	46.1	6.4
Milk	11364	29.3	20706	35.1	82.2	5.3	6.2	30967	38.9	49.6	3.8
Fish	386	1.0	577	1.0	49.3	5.5	2.0	696	0.9	20.6	5.2
Poultry meat	153	0.4	285	0.5	86.1	8.5	7.5	485	0.6	70.4	8.9
Sugar	1414	3.6	2780	4.7	96.6	7.2	2.4	3475	4.4	28.6	1.1
Veg.ghee	572	1.5	722	1.2	26.1	5.4	1.7	961	1.2	33.2	0.7
Grand total	38822	100.0	58994	100.0	52.0	3.9	4.2	79567	100.0	34.9	2.8
Eggs million nos.	3487		5933		70.1	7.4	53.0	9339		57.4	5.5
Population (million)	-				-	3.1	2.4	-		-	1.9

Table 7. Per capita monthly consumption of major food items in Pakistan.

Food Items	2004-2005	%	2001-2002	%	1998-1999	%	1987-1988	%	1979	%
Wheat & wheat floor	8.2	28.9	8.94	35.0	9.27	35.7	10.045	37.0	11.2	40.1
Rice & rice floor	1.03	3.6	1.17	4.6	1.05	4.0	1.175	4.3	1.24	4.4
Bakery product	0.06	0.2	0.05	0.2	0.04	0.2	0.02	0.1	0.01	0.0
Total cereals	9.29	32.7	10.16	39.8	10.36	39.9	11.25	41.5	12.45	44.6
Gram	0.2	0.7	0.16	0.6	0.18	0.7	0.235	0.9	0.28	1.0
Mash	0.06	0.2	0.04	0.2	0.05	0.2	0.095	0.4	0.1	0.4
Moong	0.09	0.3	0.07	0.3	0.08	0.3	0.1	0.4	0.15	0.5
Masoor	0.06	0.2	0.05	0.2	0.06	0.2	0.08	0.3	0.09	0.3
Other pulses	0.03	0.1	0.03	0.1	0.03	0.1	0.02	0.1	0.02	0.1
Total pulses	0.44	1.5	0.35	1.4	0.40	1.5	0.53	2.0	0.64	2.3
Milk (Fresh & Boiled)	6.67	23.5	5.8	22.7	5.93	22.9	6.49	23.9	5.18	18.6

Table 7. Cont'd.

Milk packed	2.18	7.7	0.06	0.2	0.03	0.1	0.01	0.0	0	0.0
Milk Dry/ Condensed	0.09	0.3	0.07	0.3	0.03	0.1	0.02	0.1	0.01	0.0
Butter	0.0446	0.2	0.0459	0.2	0.0526	0.2	0.0590	0.2	0.75	2.7
Desi Ghee	0.03	0.1	0.04	0.2	0.04	0.2	0.075	0.3	0.12	0.4
Yogurt	0.49	1.7	0.55	2.2	0.48	1.9	0.3	1.1	0.61	2.2
Mutton	0.07	0.2	0.1	0.4	0.11	0.4	0.13	0.5	0.16	0.6
Beef	0.63	2.2	0.61	2.4	0.59	2.3	0.44	1.6	0.41	1.5
Total animal product	10.20	35.9	7.28	28.5	7.26	28.0	7.53	27.7	7.24	25.9
Vegetable Ghee	0.67	2.4	0.64	2.5	0.65	2.5	0.575	2.1	0.51	1.8
Cooking Oil	0.12	0.4	0.09	0.4	0.08	0.3	0.045	0.2	0.03	0.1
Total	0.79	2.8	0.73	2.9	0.73	2.8	0.62	2.3	0.54	1.9
Fish	0.06	0.2	0.05	0.2	0.07	0.3	0.065	0.2	0.06	0.2
Chicken meat	0.23	0.8	0.14	0.5	0.13	0.5	0.065	0.2	0.06	0.2
Eggs	0.08	0.3	0.07	0.3	0.06	0.2	0.04	0.1	0.03	0.1
Total poultry & fish	0.37	1.3	0.26	1.0	0.26	1.0	0.18	0.6	0.15	0.5
Banana	0.31	1.1	0.12	0.5	0.18	0.7	0.18	0.6	0.14	0.5
Citrus fruits	0.19	0.7	0.21	0.8	0.16	0.6	1.925	7.1	1.87	6.7
Apples	0.24	0.8	0.11	0.4	0.16	0.6	0.075	0.3	0.02	0.1
Dry fruits	0.020	0.1	0.008	0.0	0.016	0.1	0.018	0.1	0.016	0.1
Other fruits	0.41	1.4	0.58	2.3	0.65	2.5	0.135	0.5	0.13	0.5
Total fruits	1.17	4.1	1.03	4.0	1.17	4.5	2.33	8.6	2.18	7.8
Potatoes	1.18	4.2	1.05	4.1	1.05	4.0	0.68	2.5	0.73	2.6
Tomatoes	0.36	1.3	0.34	1.3	0.33	1.3	0.29	1.1	0.27	1.0
Onion	0.94	3.3	0.98	3.8	0.89	3.4	0.695	2.6	0.62	2.2
Other vegetables	1.71	6.0	1.51	5.9	1.53	5.9	1.605	5.9	1.57	5.6
Total vegetables	4.19	14.7	3.88	15.2	3.8	14.6	3.27	12.1	3.19	11.4
Salt	0.33	1.2	0.3	1.2	0.31	1.2	0.235	0.9	0.24	0.9
Chills	0.08479	0.3	0.08049	0.3	0.08643	0.3	0.00007	0.0	0.00008	0.0
Sugar (Dasi or Milled)	1.31	4.6	1.26	4.9	1.32	5.1	0.94	3.5	0.72	2.6
Gur/ Shaker	0.17	0.6	0.15	0.6	0.19	0.7	0.245	0.9	0.49	1.8
Tea (Black & Green)	0.0723	0.3	0.0563	0.2	0.0634	0.2	0.0001	0.0	0.08	0.3
Total condiments	1.97	6.9	1.85	7.2	1.97	7.6	1.42	5.2	1.53	5.5
Grand total	28.42	100.0	25.53	100.0	25.95	100.0	27.12	100.0	27.92	100.0

Table 8. Model summary.

Model	R	R^2 Square	Adjusted R^2	Std. error of the estimate
1	0.893[a]	0.798	0.758	0.12110

a. Predictors: (Constant), LNCultAr, LNTrac, LNImpse, LNFert, LNTube.

Table 9. ANOVA[b].

Model	Sum of squares	df	Mean square	F	Sig.
Regression	1.451	5	0.290	19.781	0.000[a]
Residual	0.367	25	0.015		
Total	1.817	30			

a. Predictors: (Constant), LNCultAr, LNTrac, LNImpse, LNFert, LNTube
b. Dependent Variable: LNTFood

Table 10. Regression coefficients[a].

Model	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
Constant	3.622	4.128		0.878	0.389
LNTube	0.076	0.257	0.174	0.295	0.770
LNTrac	0.005	0.081	0.010	0.059	0.954
LNImpse	0.064	0.104	0.138	0.613	0.545
LNFert	0.283	0.304	0.472	0.931	0.361
LNCultAr	1.044	1.593	0.143	0.656	0.518

a. Dependent Variable: LNTFood.

described as follows:

LN OUTPUT	=	bo+b1LNTube + b2LNTrace + b3LNimpse+b4LNfert+b5LNCULAr+U
LN OUTPUT	=	Natural logarithm of cropped output (in 000 tones) from 1979 to 2010
bo	=	Constant
LN Tube	=	Natural Logarithm of Number of tubewell
LN TRac	=	Natural Logarithm of Number of tractors.
LNfert	=	Fertilizer off-take (000 N/T)
LNcultAr	=	Area cultivated million hectars.
U	=	Random error term independently and identically distributed with Zero mean and constant variance.
b1 to b5	=	Co-efficient

Results are given in Tables 8, 9 and 10.

RESULTS AND DISCUSSION

The effects of all factors studied were investigated through multiple regression analysis. The Cobb Douglas production function was estimated using the ordinary least square (OLS) method. The R^2 0.758 represents the proportion of the variation in Y explained by the regression, since implies that about 75% variation in output explained by independent variables included in the study. The influence of independent variables in food cropped output is discussed as under:

Number of tubewells and tractors

The most popular form of mechanization in Pakistan agriculture have been tubewell, tractor. The value of coefficient found as 0.076 indicate that 1% increase in installation of tube well increased the output by 0.07% and the value of coefficient of tractor (0.005) indicates that 1% increase in Number of Tractor enhance output by 0.005%. There is subsidy system prevailed regarding tubewell and tractor in Pakistan a subsidy which does not discriminate between electricity and diesel, appears to be

necessary to continue expansion of tubewell produce irrigation. The credit policy of the donor and government can play role in promoting the use of tractor and enhancing productivity regarding crop production (Walters, 1990).

Improved seed distributed, fertilizer use and area cultivated

The coefficient improved seed 0.064, fertilizer use 0.283 and area irrigated 1.04 was positive. It shows that 1% increase with use in the improved seed, fertilizer; area irrigated increased the output of 0.064, 0.283 and 1.04%, respectively.

This analysis has shown that these factors of growth are likely to play a much smaller role in future only increased cultivated area expansion is significant. It is concluded that output of food crops can be increased by bringing more culturable waste area under plough and controlling urbanization. As regard the co-efficient of fertilizer it indicates that fertilizer dosage will increase, but the marginal pay-off is now relatively low under current production practice. Crop seed are a strategically important input that can enhance or constraint production. The basic genetic capability transmitted through seed allows the productive use of water, fertilizer and cultural practices (Hassan et al., 2010; Javeed and Yameen, 2003).

Conclusion

This paper was carried out with the broad objectives of assessing the trends in food consumption and production in Pakistan since 1979 to 1980.

As per the data area under food grain crops has grown at the rate of 0.9, 0.8 and 1.5% per annum during the 1980s, 1990s and 2000-2010 respectively while food production increased at the rate of 3.9, 4.2 and 2.8% slightly faster than population growth (which averaged 3.1, 2.4 and 1.9% per annum during the same time period).

There has been a switch in preference towards non-cereal items, such as milk, poultry meat, eggs and beef. In this paper it was ascertained factors effecting cropped output. Most of the factors were found positive contributing toward higher food cropped output. However, effect, of area cultivated was highly significant. It is suggested besides motivating the people to exercise over population the endeavors be made in an integrated fashion that is more area should be brought under plough for food production. Government imposes restrictions to prevent encroachment of productive agriculture land and manage canal water supplies for enhancing food outputs further, concentration on food production factors that is improved seed, availability of fertilizer, tractor, tube well and more area under plough be realized.

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