RESOURCE DEGRADATION AND ENVIRONMENTAL CONCERNS IN PAKISTANS' AGRICULTURE

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ABSTRACT

The growth and sustainability of agriculture in Pakistan will depend on prudent use of natural resources and careful considerations for the environment. The natural resource base of the Country is under great stress, which will become even greater as the population continues to increase. It is argued that the Sectoral policies, especially policies related to natural resources are outdated and lag behind the socioeconomic changes that have altered the pattern of resource use. Resource degradation in Pakistan has arisen from distorted policies that have lead to divergence in private and social costs. In particular, several modern inputs were subsidized for much of the period, 1966-96. Electricity for tube well operations was priced at relatively lower annual rate, leading to overuse of poor quality tube well water which contributed to soil salinity. Moreover the information base on which farmers make decisions is inadequate with respect to internalizing rapid changes in soil and water quality variables by moving to more sustainable practices such as integrated nutrient and pest management and more diversified crop rotations. Public sector research has undoubtedly been biased towards development of technologies based on packages of modern inputs, and has neglected research on public goods such as integrated crop management and crops that enhance diversification and sustainability of production systems. From a policy perspective, there is a need for public and private initiative on several fronts-increased investment in resource management, research and extension, research to develop diversified and more sustainable cropping patterns and rotations, removal of price distortions on key inputs, especially water, and special incentives to invest in inputs such as gypsum that can counteract the problem of poor quality tube well water. Key factors for developing long-term sustainability of both the agricultural and the agriculture-based sectors are the removal of policy distortions and institutional constraints in the natural resource sector.

Keywords: Agriculture, , Pakistan, Pollution, Sustainable, Yield Loss

INTRODUCTION

The performance of agriculture in Pakistan during the past three decades has indeed proved to be a real success. This is demonstrated by the fact that the country was able to meet the increased demand for food of more than 140 million people overtime despite earlier prediction of major food shortages. This success was, to a large extent, made possible by investments in technology and infrastructure, especially roads and irrigation, extension systems, and institutional reforms that revitalized market incentives. Central to this success was a pack age of technology comprising high yielding crop varieties, fertilizers, chemical oriented crop protection, and good water control. The package was produced for the major food and fibre crops, namely wheat, rice and cotton. Because of the revolutionary nature of the high-input high-output technology package, its extraordinary effect on agricultural production in Pakistan is often referred to as the green revolution (Hamid, 1981; Sims, 1988).

The green-revolution package in Pakistan was based on powerful technology that offered a remarkable increase in the yields of wheat, rice and cotton, which were many times greater than the yield of the more productive traditional varieties of these crops. However, it has experienced second-generation problems. Some symptoms of unsustainability have been detected by scientists in the intensive monocropping aspect of the system. High input use has led to increased pest resistance and health problems. The green revolution technology was designed for production in the more favorable environments only, especially in areas with good access to water. Critics of the green revolution have considered the high input nature of the package not only to be unsustainable but also inequitable (Byerlee, 1992; Pagiola, 1995; Hobbs and Morris, 1996)

The present paper seeks to answer two questions. First, is there phenomenal degradation of resources in Pakistan's Agriculture and if there are some indications of unsustainability, what are the causes? Second, what should be the role of the Government and Private Sector in helping to find a way to sustainable resource development?

CHALLENGES TO AGRICULTURE IN PAKISTAN

The momentum of agricultural growth and the level of adoption of technology in Pakistan have not been sustained. Stagnation in yields is accompanied by increasing costs of cultivation. The cost increase came largely from over mechanization, labour and irrigation costs, and not from modern farm inputs like fertilizers, seeds or pesticides, so far as wheat and paddy crops are concerned (Ali and Flinn, 1989; Byerlee and Siddiq, 1994).

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There is an evidence of declining viability of small holdings. The number of operational holdings in 1990-91 declined as compared to those in 1970-71 due to a phenomenon of 'reverse tenancy' under which small and marginal farmers started leasing out land on cash terms to the medium and large farmers who had sufficient capital and family labour and had made investments in machinery and irrigation structures. As such, farm size in the country has continuously declined over the past three decades, with a decreasing share of that land farmed by the tenants. (Table-I) This trend has caused disparity in the farm income between various categories of farm holdings. Poverty has increased, particularly so in case of tenants and marginal farmers. Nonetheless, human resource investments and infrastructure steadily improved over the period, 1960's through 1990's, while rural literacy remained very low (Byerlee and Siddiq, 1994).

The natural resource base of the Country is under great stress. The Sectoral policies, especially policies related to natural resources are outdated and lag behind the socioeconomic changes that have altered the pattern of resource use in agriculture. Resource degradation in Pakistan is arising from distorted policies that may lead to divergence in private and social costs. Electricity for tube well operations is priced at relatively lower annual rate, leading to overuse of poor quality tube well water which is contributing to soil salinity. Moreover the information base on which farmers make decisions is inadequate with respect to internalizing rapid changes in soil and water quality variables by moving to more sustainable practices such as integrated nutrients and pest management and more diversified crop rotations. Public sector research is also biased towards development of technologies based on packages of modern inputs, and neglecting research on public goods such as integrated crop management and crops that can enhance diversification and sustainability of production systems in the Country. It is against this backdrop that we delineate the nature, extent and severity of resource degradation in Pakistan's agriculture sector.

Land

Pakistan comprises 79.61 million hectares of land, of which 59.47 million hectares has been surveyed. Approximately 21.85 million hectares is used for agriculture, while some 4.04 million hectares is under forests and 9 million is culturable waste (GOP; 2004).

Since independence, the area of land under cultivation has increased by approximately 40 percent. Yet today the country is approaching its physical limits. Of the total surveyed land area, less than 20 percent retains the potential for intensive agricultural use, while 62 percent is classified as having low potential for crops, livestock, and forestry production. Overall, land categorized as cultivable represents less than one-quarter of the country's total area. Today, nearly all of this land is already under cultivation. Very little additional land is available for the expansion of agriculture. (Sandhu, 1992; GOP, 1992; GOP, 2000)

Shortage of arable land does not, of course, preclude an increase in agricultural production. Practices such as double-cropping, increases in labor productivity, and better technical inputs can boost agricultural output. But a number of forces have combined to prevent the realization of the country's full agricultural potential. These include poor water management practices, a system of absentee landlords, the fragmentation of landholdings, the reduction in farm size from generation to generation as farming population rise, poor access to agricultural capital, poor technology transfer to farmers, and lack of information concerning the use of agricultural inputs, such as fertilizers and pestidicides. Heavy use of fertilizers, particularly during the 1960's and 1970's, has also left soils deficient in number of nutrients essential to plant growth. (Hassan & Amenah, 1993).

Approximately 40 percent land in the central-western parts of the country was affected by light water and wind erosion. In the southwest and along the southern coastal parts, wind-eroded and salinized soils have predominated. Desert soils, highly salinized soils, and some severely eroded areas are found along the Indo-Pakistan border, and soil in the lowlands of the Indus River valley have suffered from salinization. Meanwhile, lands in and around the north eastern parts of the country have been classified as "stable" under normal conditions. (UNEP; 1990).

The most important causes for reduced land productivity have been water and wind erosion, salinity and sodicity, water logging, flooding, and loss of organic matter. According to one finding, 17 percent of surveyed soils (which include most of the soils usable for agriculture, forestry, or ranching) were affected by water erosion, 7.6 percent by wind erosion, 8.6 percent by salinity and sodicity and 8.6 percent by flooding and ponding; fully 96 percent suffered from less -than -adequate organic matters. These problems often occurred simultaneously and produced synergistic impacts on agricultural productivity. As Such, Soils in Pakistan have suffered from both water and wind erosions, and poor organic matter contents, thereby reducing potential productivity of best soils. (GOP; 1992).

The salination/sodication of soils in Pakistan has been an outcome of low quality water used for irrigation. High temperatures on various parts of the Country have induced evapo-transpiration at rates much higher than the rainfall resulting in accumulation of salts in the surface layer of soils rendering them unproductive.

The pollution impacts and contaminant load both in type and quantity have increased in soils due mainly to technological progress and industrial development. The waste effluent from dwelling sites is discharged into sewage system and is ultimately disposed into rivers from where it again reaches the irrigated fields. Whereas farmers consider the use of sewage for irrigation as cost-effective, administrators take it as a viable option for sewage disposal. The use of sewage water for irrigation purposes, on the other hand, has contaminated the soils and crops with heavy metals and high salt contents. (Table II).

Water erosion damages to range/forest/agricultural soils were highest in NWFP and lowest in the Punjab; reverse is true for wind erosion. It was reported that about1.9 and 3.8 million hectares in Punjab were severely affected by water and wind erosions respectively. Loss of fertile soil through water erosion was estimated around one billion tons in Punjab alone (Table III). In areas facing erosion, natural and native vegetation is at risk. Even growing crops have been damaged by wind storms in parts of the Punjab (Mirza and Ahmad, 1998).

Water

Pakistan’s water sources have been limited. The country has experienced critical water shortages, which lead to power break outs and also to inadequate supplies of irrigation water for the main crop-growing seasons. To compensate, a finely balanced system of water management for irrigation, electricity, and industry was developed. The system has been shaped in part by the Indus Water Treaty. Signed in 1960 by India and Pakistan following long-standing water disputes, the treaty gives Pakistan control over the Indus and its western tributaries-the Jhelum and Chenab, while India controls the Ravi, Beas, and Sultej, branches in the east. The treaty allowed Pakistan to construct two large storage and hydroelectric dams: the Tarbela on the Indus and the Mangala on the Jhelum, as well as a system of smaller dams, inter river canals, and irrigation canals. This irrigation system is one of the largest such systems in the world and meets as much as 65 percent of the country’s food and fiber production. (Gulhati, N.D; 1973).

The existing irrigation system is highly inefficient. Of the total inflow of 131 MAF in the indus basin system, water available for irrigation through canals is about 97.5 MAF. This means that some 33.5 MAF is lost in seepage and evaporation from canals and watercourses. This loss is a major cause of waterlogging and salinity of soils in the Indus Basin. Vertical pumping systems used for drainage have proved to be unsustainable: the recycled water contains chemicals that have produced sodicity and reduced life of pumping machines (Pakistan Administrative Staff College; 1994).

No serious effort has been made to develop a drainage system to parallel the irrigation system. In Pakistan there are 531344 tube wells pumping about 49.50 MAF water, out of which some 30-40 percent water is regarded unsuitable for irrigation purposes. As such, tons of salts are pumped up in the process. The salts have decreased crop productivity in the prime lands of Canal Command Areas. The result is lower crop productivity.

It may be noted that canal water supplies in the country did not cope with crop requirements due to droughts, silting of water reservoirs, and competition between agricultural and non-agricultural demands and increased cropping intensity. As a result, pumping of ground water increased tremendously over the years. Due to canal water shortages, partly because of silting of the existing water reservoirs, number of tube wells in the country increased at an alarming rate (See Table IV).

The pumped ground water in most parts of Pakistan was regarded unfit for irrigation. About 70 % tube wells pumped hazardous water owing to high level of chemicals during the period 1995- 2000. Lands irrigated with hazardous water have aggravated soil salination/sodication, deteriorated the produce quality/shelf life, and created environment concerns. In addition, sub-soil drying due to draw-down of water table depth has posed another future concern. More and more pumping of ground water has not only lowered the water table but added to waterlogging. The practice has deteriorated ground water quality in most parts of the country.

The mushroom growth of tube wells in the private sector, during the past decade, have resulted in lowering the water table. Irrigating lands with water regarded unsuitable for crop cultivation have adversely affected crop productivity. 70-80 % of pumped ground water was found hazardous and entirely unsuitable for irrigation (Haq *et al.*, 1997).

The estimated extent of salt-affected soils may further be stemmed from the fact that salt addition through irrigation water was about 55-60 million tons against a removal of only 25-28 million tons out of the Indus Plains in 1997. It was reported that salt addition would further increase due to more application of poor quality tubewell water while removal of salt will be much lower because of decreased volume of drainage effluent volume compared to the above quantities (Mirza and Ahmed, 1998).

In addition, introduction of surface irrigation canals during the last century, resulted in raising water table which reached within the range of 5 feet in 1960's in an area of 0.9 million hectares and hampered crop productivity. Although many cost-intensive drainage projects were initiated in various parts of the country for checking the malaise, those projects witnessed mixed success (FAO, 1988; Haq *et al.* 1997).

It was estimated that area underlain in Punjab with 5 feet water table depth will almost finish while that with 10 feet will decrease to half that of 1980's by the year 2015, assuming the given agro-climatic conditions of 2001-2002. Water table at 10 feet depth is generally considered safe for health, production and sustainability of soils and crops. As such, additional drainage facilities may be needed (Table V-VII). However, maintenance of existing infra-structure remains an unfinished task for sustaining irrigated agriculture (Haq *et al.,* 1997).

In short, soil and water quality has deteriorated over time. Average soil organic matter, which was lower than 1% during early 1970s, deteriorated at an average annual
rate of 2.3%, (or a decline of over 33%) during 1980's and early 1990s. Similarly, there has been an alarming increase in the quality of tubewell water, reflected in significant increase in residual carbonates and electro-conductivity. Residual carbonates have almost doubled over years, reflecting a common observation that farmers in Pakistan are increasingly tapping poorer quality groundwater (Byerlee and Siddiq, 1994; Faruqee, 1995).

Forests

Over the past 75 years, forests have decreased from 14.2 percent to 5.2 percent (4.57 million hectares) of Pakistan's total land area, with less than 3 percent currently under tree cover. (PASC, 1994; Hassan A & Amenah A, 1992, GOP; 2004; SDF; 1995)

The negative consequences of uncontrolled forest exploitation were obvious. They have included serious soil erosion and sedimentation, desertification of once-productive upland areas, the silting up of waterways in the plains (making them more prone to flooding), and marked scarcities of fuel wood. The decline in tree cover has resulted in large reduction in watershed and reservoirs efficiency. These processes have major implications for the availability of water for irrigation and power generation. Indeed, large deficits of water and electricity have been predicted in future, with considerable impact on agriculture and the economy. (WAPDA 1994, SDF; 1995).

FARM INPUTS AND THEIR IMPACT ON ENVIRONMENT

PESTICIDES

The use of pesticides in Pakistan increased significantly over the past two decades (Table VIII), Pesticides are considered an important farm input for controlling harmful insects, weeds and diseases. Indiscriminate use of pesticides has created serious problems such as resistance in certain insect pests, resurgence, outbreaks of secondary pests in addition to serious hazardous effects on human/animal health, beneficial and marine fauna etc.

Excessive and indiscriminate use of pesticides has also created serious problems in human beings. Direct intake of pesticides through freshly sprayed vegetables and fruits without considering their residual period and the type of pesticide to be used, have created serious health hazards. Suffocation and vomiting are some of the common problems, faced by passengers passing through cotton growing areas of Pakistan during spray period. According to 1998 United Nations report, as many as 500,000 Pakistanis suffered annually from poisoning due to agro-chemicals, of those, at least 10,000 eventually died. (Sohail, 2003).

CHEMICAL FERTILIZER

The use of chemical fertilizers in Pakistan has increased enormously (Table VIII); It is however argued that fertilizer leave negative impact upon human health and environment. Nitrates are considered to be the cause of diseases in infants and also hypertension. Heavy metals are linked with developmental retardation, kidney damage and death in some instances.

The use of rock phosphate, containing high cadmium concentration for the manufacturing of phosphatic fertilizers may add cadmium to soil beyond permissible limits and consequently accumulate in food and cause hypertension. However, strict control by the industry on cadmium concentration in rock phosphate may preclude the possibility of its presence in fertilizers. Despite spectacular increase in the use of chemical fertilizers the environmental concerns attributed to chemical fertilizers are unfounded under Pakistani conditions. (Framing Outlook, 2004).

HERBICIDES

Weeds cause huge losses to crop yields in Pakistan. It is reported that Rs. 115-200 billion per annum are wasted due to damage to crops by weeds. (See Table IX). Weeds deplete soil, its resources and harbor insects, pests and diseased pathogens. The extent of damage caused by weeds vary according to their type and density. Depending upon extent of weed infestation losses range from minor to complete crop failure. In wheat, weeds cause some 18-30% loss in yield; 10-35 per cent reduction in yield has been reported in sugar cane (Atta, 2002).

The use of herbicides in Pakistan has increased from 4% to 11 per cent but it is still much lower (almost 50 percent) when compared with its usage in the advanced countries. There is a need to increase the application of to both major and minor crops herbicides. However, problems and risks are involved in the indiscriminate use of herbicides. The use of herbicides is desirable, but should only be pursued if farmers are educated in their proper usage. Mistakes in the application of herbicides can ruin the crops, and create immunities in the weeds making them harder to kill.

LESSONS AND OPTIONS

Pakistan was at the forefront of Green Revolution in the late 1960s and early 1970s, in which farm machinery, pesticides and fertilizers, irrigation and the replacement of traditional crops with high-yielding varieties dramatically increased productivity. The land in the country is now increasingly unable to support burden of intensive agriculture. Crop yields – and water resources are declining alarmingly, and some parts are close to becoming barren. Many farmers are heavily in debt from their investments in new equipment and reliance on chemicals, and rural unemployment is increasing. Other intensive farming practices, particularly with wheat and rice, have virtually mined nutrients from the soil. For instance, heavy use of fertilizers has disastrous effect: excess nitrates have leached into groundwater and contamination of groundwater with nitrates has increased dramatically. As such, the cultivable lands have become sick through over-application of chemicals.

Environmental degradation related to agriculture in Pakistan has been the product of technological and policy failures. High-input technology has created onsite second-generation effects that can only be corrected by improved research, development and extension (RD&E). In less developed areas, lack of appropriate technology has been a major source of environmental degradation. Lacks of appropriate policy and institutions, as well as Tax law enforcement, are main sources of external costs and the wasteful use of resources.

The sustainability of agriculture in Pakistan will depend on the prudent use of natural resources and careful considerations for the environment. The natural resource base of the Country is under great stress, which will become even greater as the population continue to increase. Investment in environmentally sensitive technology is needed to ensure sustainability. The current constraints related to natural resources are not the result of limits on supply but rather of managerial and institutional problems. The solutions to the current problems in sustaining agriculture and arresting environmental degradation no longer simply lie in technology, but also in institutional reform.

Sectoral policies, especially those related to natural resources in agriculture are outdated and lag behind the socioeconomic changes that have altered the patterns of resource use. Water resource management has been fragmented and project-based. Both surface and groundwater are mostly under open-access regimes that encourage wasteful usage. This in turn has lead to waterlogging and salinity problems. Although, water pricing has been adopted but mainly for the purpose of paying for the operation and maintenance costs of irrigation, rather than as a basis for allocation purposes. Key factors for developing long-term sustainability of both the agricultural and the agriculture-based sectors are removal of policy distortions and institutional constraints in the natural resource sector, and at the same time promotion of participatory management.

Combined with the stagnation of output in recent years, reflected in large- scale imports of food and food products, underline growing concerns about degradation in most valuable asset-irrigated land base in the Country. Resource degradation in itself is not a reason for policy intervention if it is internalized into producer decision-making. However, in this case, there are several reasons to believe that this is not the case. First, some of the problems have arisen from distorted policies that have lead to divergence in private and social costs. In particular, several modern farm inputs were subsidized for much of the period, 1966-96. Even electricity for tubewell operation was priced at relatively lower annual rate, leading to overuse of poor quality tubewell water which is a major contributor to soil salinity. Second, the information base on which farmers make decisions is inadequate with respect to internalizing rapid changes in soil and water quality variables by moving to more sustainable practices such as integrated nutrient and pest management, more diversified crop rotations, and incorporation of legumes into the system. Third, public sector research has undoubtedly been biased towards development of technologies based on packages of modern inputs, and has neglected research on public goods such as integrated crop management and crops that enhance diversification and sustainability of production systems. Indeed, until recently, very little research addressed efficient use of inputs, and the balancing of external inputs use and internal sources of nutrients.

From a policy perspective, there is a need for public and private initiative on several fronts- increased investment in resource management, research and extension, research to develop diversified and more sustainable cropping patterns and rotations, removal of price distortions on key inputs, especially water, and special incentives to invest in inputs such as gypsum that can counteract the problem of poor quality tube well water. Such policy interventions may be rewarding if they can reverse the trend in resource degradation. However costs of such interventions have to be considered against potential benefits, before making definite policy prescriptions.

Table-I: ***Number and area of farms by size of farm in Pakistan***

Pakistan	**Farms**		**Farm area**		**Average size of farm area (hectares)**
Size of farm (Hectares)	**Number**	**%**	**Hectares**	**%**	
All Farms	6620224	*	20437554	*	*
Government Farms	170	*	30772	*	*
Private Farms	6620054	100	20406782	100	3.1
Under 0.5	1290098	19	362544	2	0.3
0.5 to Under 1.0	1099330	17	821245	4	1.0
1.0 to Under 2.0	1425370	22	1981277	10	2.5
2.0 to Under 3.0	966411	15	2256772	11	5.0
3.0 to Under 5.0	890755	13	3442507	17	7.5
5.0 to Under 10.0	580200	9	3891228	19	12.5
10.0 to Under 20.0	260791	4	3324310	16	25.0
20.0 to Under 40.0	77773	1	1955330	10	50.0
40.0 to Under 60.0	15277	*	689070	3	100.0
60.0 to And above	14054	*	1682491	8	150.0

Source: G ovt of Pakistan (2004) Agricultural census, Agricultural Statistics of Pakistan,
*Negligible

Table-II: ***Pollution Load From Towns/Cities In The Punjab***

Constituent	**Value***	**2000****	**2015**
BOD, 5 days Av.	4 tons/day/10^5 persons	3071 tons/day	3200 tons/day
TSS	3 tons/day/10^5 persons	2304 tons/day	2400 tons/day
N	900 kg/day/10^5 person	691 tons/day	720 tons/day
P	200 t/day/10^5 person	153600 tons/day	$16x10^4$ tons/day

*Source: * Mirza and Ahmad (1998)*
***Computed for respective year on the basis of Punjab population)*

Table-III: ***Eroded lands in Pakistan (Percent)***

Kind/degree of erosion	Punjab	Sindh	NWFP	Balochis-tan	Pakistan (000 ha)
a) Water Erosion Slight (sheet and rill)	18.7	*	81.3	*	328.0
Mod. (sheet and rill)	24.7	*	24.2	51.1	3,635.0
Severe (rill/gully)	10.4	1.0	40.2	48.3	5,640.7
Very severe (")	10.4	*	89.6	*	3,446.5
Total	14.6	*	49.8	35.1	13,050.2
b) Wind Erosion Slight	86.7	11.4	0.5	1.4	2,595.5
Moderate	56.2	14.1	0.8	28.9	496.7
Severe to very severe	41.3	54.7	0.6	3.3	3,081.3
Total	61.6	33.2	0.6	4.5	6,173.5

NWFP includes FATA, PATA and Northern Areas.
** Negligible extent.*
Source: Mirza and Ahmad (1998).

Table-IV: ***Increase in Number of Tube wells and pumpage in Pakistan***

Year	Tubewells in Province Punjab				Tubewells in Pakistan	
	Public (No.)	Private (No.)	Total (No.)	Pumpage (MAF)	Tubewells (Total No.)	Pumpage (MAF)
1980-81	10205	161867	172072	31.24	199673	36.25
1990-91	10425	285522	295947	38.30	339840	43.98
2000-01	8234	465433	473667	44.55	531344	49.98

Source: *Govt. of Pakistan (2004)*

Table-V: ***Storage Decline in the Water Reservoirs – Pakistan***

Reservoir	Completion year	Storage capacity (MAF)					
		Initial	1995	2000	2010	2020	Loss (MAF)
Mangla	1967	5.3	4.6	4.5	4.2	4.0	1.3
Chashma	1971	0.7	0.4	0.3	0.2	0.1	0.6
Tarbela	1975	9.3	8.3	8.0	7.3	6.6	2.7
Total	-	15.3	13.3	12.8	11.7	10.7	4.6
Loss (MAF)			2.0	2.5	3.6	4.6	-

Source: Haq et al. (1997)

Table-VI: ***Salt-Affected Area in the Punjab***

Year	Area surveyed (mha)	Salt-affected			
		Uncultivated (mha)	Cultivated (mha)	Total (mha)	%
1945-46	4.84	0.42	0.49	0.91	18.80
1955-56	5.96	0.54	0.69	1.23	20.64
1965-66	6.88	0.44	0.68	1.12	16.28
1975-76	7.34	0.37	0.61	0.98	13.35
1985-86	7.57	0.30	0.58	0.88	11.62
2000-01	7.92	1.16	1.51	2.67	33.71

Source: Ahmad and Chaudhry (1997)

Table-VII. ***Area underlain by different water table depth in the Punjab (000 ha.)***

Year	June		October	
	0-5'	0-10'	0-5'	0-10'
1980	891	3853	1276	4815
1990	711	3094	-	-
1995	475	2821	901	3566
2015*	Nil	1789	526	2317

Source: Govt. of Pakistan (1998)
** projected*

Table-VIII: ***Province-wise NPK Fertilizers Consumption in Pakistan ('000' Nutrient ton)***

Year		Punjab	Sindh	NWFP	Balochistan	Pakistan	N:P in Pakistan	N:P in Punjab
1979-80:	N	552.0	197.0	53.0	4.0	806.0	3.55:1	3.47:1
	P_2O_5	159.0	54.0	13.0	1.0	227.0		
	K_2O	5.0	3.0	1.0	-	9.0		
1989-90:	N	1046.0	322.0	85.0	14.0	1467.0	3.83:1	3.67:1
	P_2O_5	285.0	77.0	18.0	3.0	383.0		
	K_2O	29.0	9.0	2.0	0.2	40.0		
1999-2000:	N	1500.0	518.0	144.0	55.0	2217.0	3.73:1	3.60:1
	P_2O_5	416.0	132.0	33.0	15.0	596.0		
	K_2O	11.2	6.7	0.6	0.0	18.5		
*2014-15:	N	2184.0	812.0	232.5	116.5	3345.0	3.65:1	3.57:1
	P_2O_5	612.5	214.5	55.5	33.0	915.5		
	K_2O	2.3	2.9	0.0	0.0	5.2		

Source: 1. Govt. of Pakistan (1988, 1998, 2001)
** Projected*

Table-IX: ***Losses in crop Yields Due to Weeds in Pakistan***

Crop	Production '000' tonnes	% Loss in yield	Loss (Million tones)	Value of Loss (Billion Rs.)	Rs/ Kg
Wheat	21078.6	18-30	3.79-6.32	28.4-47.4	7.50
Rice	5155.6	17-39	0.87-2.01	6.7-1.5	7.50
Barley	117.5	18-30	0.21-0.04	0.1-0.2	7.87
Cotton	1911.81	13-41	0.25-0.78	10.7-33.4	42.88
Sugarcane	46332.6	10-35	4.63-16.22	4.8-17.0	1.05
Maize	1662.0	24-27	0.396-0.78	2.4-4.8	6.25
Sorghum	220.4	20-45	0.44-0.0	0.2-0.5	5.50
Pearl millet	155.6	20-45	0.031-0.08	0.2-0.4	7.13
Oil seeds	585.856	21-45	0.123-0.27	2.4-5.1	19.63
Pulses	802.4	25-55	0.20-0.44	5.7-12.6	28.73
Vegetables	4890.8	39-89	1.9-4.35	9.5-21.7	5.00
Fruits	5846.3	5	2.92	43.8	15.00
Total	---	---	15-34	115.3-202.5	

Source: GOP (2001) Agricultural statistics in Pakistan.

Table-X: ***Consumption Of Pesticides In Pakistan (1982 To 2003)***

Year	Consumption	Value (Million Rs.)
1982	5000	320
1987	14848	3259
1992	23439	6554
1997	38004	9904
2000	61299	4971
2001	47592	7741
2002	69897	6790
2003	78132	8138

Government of Pakistan (2004) Economic Survey of Pakistan

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