

## Fertilizer Production and Import in Pakistan

### Author's Details:

(1) **Muhammad Bilal Tariq**-University of Gujrat, Lahore Pakistan

(2) **Rizwan Fareed**-University of Gujrat, Lahore Pakistan

(3) **Rabia Mian**-Superior University Lahore Pakistan

(4) **Naeem Ud din**-CIMS Lahore Pakistan

(5) **Waqar Hassan**-University of Lahore Pakistan

(6) **Miss Sehrish khan**-University of Gujrat, Lahore Pakistan

### Abstract

*This study is conducted to find out the impact of production and import of fertilizer on agriculture sector of Pakistan. Pakistan is an agricultural economy and majority of people live in the rural areas and associated with the agricultural activities. Some major fertilizer production units are playing an important role in fulfilling the demand of fertilizer. Some major kinds of inorganic fertilizers (DAP, CAN, NP, UREA) are being used in the production of major crops on a large scale. Inorganic fertilizer increases the growth of crops. Secondary data is used for this study. In this study it is found that some major inorganic fertilizers are used to import from international market. Production of inorganic fertilizer has a positive impact on the agriculture sector and import of inorganic fertilizers has an insignificant impact on agriculture sector of Pakistan. Government of Pakistan discourages the import of fertilizer and encourages installing the new production units of fertilizers. A large quantity of inorganic fertilizer is produced in Pakistan.*

**Keywords:** Inorganic Fertilizer, Production, Import, Agricultural.

### Introduction

The article is about the impact of inorganic fertilizer production and import of inorganic fertilizer on agriculture sector of Pakistan. In this study it is observed that how much is the production and import of fertilizers and what the impacts are? The importance of agriculture is well established in the economy of Pakistan. Agriculture plays an important role for the development of economy. In Pakistan, agriculture is mostly dependent on the usage of fertilizers to meet the high demand of the food. In next few decades there will be a shortage of the food. The population of the World has been increasing from the '60's at about 2% per annum while food production is increasing with 1.5% per annum in the world. According to this there will be a pressure on the Pakistan's agriculture in next few years (Butt, 1996). The demand of inorganic fertilizer will also be increased. The production of inorganic fertilizer is increased by 3.8 million tones from 1990-2010.

Fertilizer is a key component for the modern farm technology for achieving the large production of the crop. High yield varieties of fertilizers were introduced in 1966-67 and set the stage for green revolution. Application of commercial fertilizers in Pakistan began in 1952-53 (Quddus, Siddiqi, & Riaz, 2008).

Farming is the very oldest profession in the Pakistan that is being practiced from a very long time. 60% of the population of Pakistan is living in the rural areas and related with the agricultural activity. Involvement of the majority of population in the agriculture activities shows the importance of agriculture in Pakistan. Pakistan is the agricultural country and agriculture sector will remain the back bone of the economy of Pakistan. Farming is very important for the lives of rural population (Ahmad & Muhammad, 1998).

The use of chemical fertilizer provides a best method for improvement of agricultural production and decreasing the deficit between world's food supply and demand. Chemical fertilizers alone are not enough to increase the productivity of land but there are some additional factors that can made the usage of fertilizers most effective. These factors are soil, seed, irrigation, government price support policy and market development policy (Butt, 1996).

According to Butt (1996), "various major crops required Nitrogen (N) in the range of 60-180 lbs. Second element which is necessary for the plant growth is the Phosphorus (P<sub>2</sub>O<sub>5</sub>). At least 50% of soils need additional phosphate treatment of 50-150 lbs. The third major element for the growth of plant is the potassium (K<sub>2</sub>O) that is very necessary for the growth of plant. The total area irrigated by rivers and dams in Pakistan is

nearly about 40 million acres. The water required for the major crops in Pakistan is nearly about 87 million acre feet (Butt, 1996).

Inorganic Fertilizer is a chemical or any natural substantial that is included in the soil to increase the fertility. There are different major types of fertilizer that are Urea, CAN, DAP and NP. Urea is widely used in fertilizers as a convenient source of nitrogen. CAN stands for Calcium Ammonium Nitrate. DAP stands for Di-Ammonium Phosphate and NP stands for Nitrophos.

The data is used for last 20 years to see the production and import of fertilizers in Pakistan. Statistical figures are taken from Federal Bureau Statistics and National Fertilizer Development Centre. On the web site of NFDC there are some publications on yearly basis but I was unable to access these publications because of restrictions. Limited time become a hurdle to search more data on the topic.

### **Problem Statement**

Economy of Pakistan is mostly dependent on the agriculture sector. In 2008 the share of agriculture sector was 20% in the GDP of Pakistan. The contribution of agriculture sector in GDP is going down year by year. In the present era, agriculture production is very much dependent on the use of fertilizers. One reason of reduction in production of agriculture products is the lack of availability of fertilizers to farmers. Pakistan is considered an agricultural country and majority lives in villages and their income is generated from agriculture. Reduction in the agricultural activities is likely to affect a large population of the country. How much production of fertilizers in the country? Is this production fulfilling the demand by farmers? How much is important import of fertilizer by Pakistan and why? What is the impact of import of fertilizer on the agriculture sector of Pakistan? These are some questions to be assumed and under investigator.

### **Objectives of the study**

- To find out is inorganic fertilizer important?
- To find out the inorganic fertilizer production and import in Pakistan?
- To find out the impact of production and import of inorganic fertilizer on agriculture sector of Pakistan?

### **Literature Review**

Literature review consist the researches by different researchers about the importance of the fertilizers and the requirements for the usage of fertilizer. Researchers also discuss about the food problem as population is growing and how the consumption of fertilizer is increasing by every year. According to researchers there is a lack of water for the irrigation.

“According to the census of 1997, the population of Pakistan is 130.579 million. Despite expected slowdown in population growth in future it is estimated that population will reach 164.0 million by 2010. The food consumption has grown faster and per capita food consumption (Ahmad & Muhammad, 1998).”

In Pakistan, the water requirement for the major crops is about 87 million acre feet. The water and power development Authority have projected that ultimate water balance for farm use in Indus plains in an average year is about 82 million acre feet of water. This leaves a deficit of about 5 million acre of water (Butt, 1996).

Application of commercial fertilizers was begin in Pakistan in 1952-53. The off-take was only 1000 nutrient tones of nitrogen. In 1959-60, phosphorus was introduced to the farmers with the initial usage of 100 nutrient tones. The off-take of potash was started in 1966-67 with the usage of 120 nutrient tones. These trends in usage of fertilizer emphasized the usage of fertilizer in the economy of Pakistan (Quddus et al., 2008).

In 1971-72 consumption of fertilizer was about 382 thousand tones and in 1997-98 consumption level reached to 2.6 million tones. “The use of fertilizer is highest in the Sindh province followed by Punjab, KPK, and Balochistan. One third fertilizer all over the country is used in the production of cotton. The crop production regions of Balochistan are the smallest consumer in the country (Ahmad & Muhammad, 1998).”

Since fertilizer is an input, the demand for fertilizer is a derived one. It depends on the use of land and other complementary inputs such as irrigation, modern varieties and the quality of soil. The demand for fertilizer is also affected by the agro climate, such as rainfall (Hossain & Singh, 2000).

### **Theoretical Framework**

The economy of Pakistan is mostly dependent on the agriculture sector. Agriculture sector plays a very important role for the development of the economy. Agriculture always played a vital role in sustaining human life. The introduction of agricultural fertilizers has marked the new agricultural revolution. As fertilizer is any organic and inorganic material of natural that is added to a soil to increase the output of the plant. Fertilizer is used for the growth of plant. An assessment found that 40%-60% inorganic fertilizer is used for the growth of crop. Inorganic fertilizers shall be studied in this article. Urea, CAN, DAP and NP, are the major inorganic fertilizers. There is a large production of fertilizers in Pakistan by different production units to fulfilling the demand. Farming activities are mostly dependent upon the usage of inorganic fertilizers. There is a positive relationship between the usage of fertilizers and the cultivation of the crops. If effective fertilizer is used for the growth of crop then the production will be good of that crop if there are no climate changes. Government use to import some fertilizers to fulfilling the demand of fertilizer in Pakistan. The impact of import on agriculture can be positive or negative. If the prices of import fertilizer will be high than the local market price then the farmer will not purchase the imported fertilizer. If the quality of the fertilizer will be good with the price factor then farmer will prefer to buy that imported fertilizer. It will increase the productivity of crops and will have a good impact on agriculture sector.

### **Seasonal Variation**

#### ▪ “Rabi: Consumption & Production

Rabi refers to the crops for which seeds are sown in September-October. Urea is needed in the middle of these crops, therefore, in the months that fall between sowing and harvesting urea off take increases. DAP fertilizer is mainly used at the time of sowing the seeds.

#### ▪ Kharif: Consumption & Production

As far as the production of fertilizer in Kharif and Rabi is concerned it is more or less independent. In terms of consumption Rabi needs a lot of fertilizer as major crops of Pakistan (Rice, Wheat, and Sugarcane) grow in rabi season and the weather conditions are more suitable to use fertilizer due to minimum rainfall. In the Kharif season only cotton is grown and does not require much fertilizer as compared to other crops (Qasim, 2007)”.

### **Fertilizer Consumption in Pakistan**

The consumption of fertilizer is increasing from the last 20 years as compare to the consumption of 1960's and 1970's. In 1993 the consumption of fertilizer was 97 kg/ha. There was a continuous increase in the consumption of fertilizer to the year 2005. After 2005, there was a little decrease in the consumption that was 159 from 169 kg/ha (National Fertilizer Development Centre).

### **Fertilizer usage by major crops**

In cultivation of wheat there is a high usage of fertilizer that is 2180 ('000 nutrient tones). Wheat is the major crop of Pakistan. After wheat, there is a high usage of fertilizer in cultivation of cotton that is 1090 ('000 nutrient tones). After wheat and cotton, fertilizer is used in a large quantity in the cultivation of rice, maize and sugarcane (National Fertilizer Development Centre).

The main factors contributing to this remarkable growth are:

- Introducing high yielding crops.
- Concentrated efforts made by the Government agencies
- Concentrated efforts made by the fertilizer companies to promote the usage of fertilizers.
- Establishment of a network of sales depots for fertilizers in most of the agricultural areas of Pakistan

### **Production of Fertilizer in Pakistan**

Fertilizer requirements in the country are met from both domestic production and imports. Currently, there are 14 production units. The annual production in 2010 is as follows: Urea 5.15 million tones, DAP 626 thousand tones, CAN 346 thousand tones, NP 304 thousand tones (National Fertilizer Development Centre).

### **Import of Fertilizer**

Fertilizer demand in Pakistan increased dramatically during the last twenty years. The consumption of urea increased from 541(000 tones) in 1990-91 to 1525 (000 tones) in 2009-10. The demand of DAP fertilizer increased from 499 (000 tones) in 1990-91 to 1080 (000 tones). The import of NP in 1990-91 was 83 (000

tones) but in 2009-10 there is no import of NP. The demand of NP is fulfilling by production units of Pakistan. There is an increase 0.98 million tones in the import of urea from 1990 to 2010. There is also increase in import of DAP fertilizer that is 0.581 million tones from 1990 to 2010. Import figure of urea shows that there is a shortage in production of urea in Pakistan that is used to import. And the import of DAP is less because DAP is produced on a large scale in Pakistan. In 2010 there is no import of NP and CAN fertilizers (National Fertilizer Development Centre).

### **Impact of production and import of fertilizers on Agriculture**

Fertilizer has a great impact in the production of crops. Fertilizers are used on a large scale in the production of major crops. The total production of fertilizers increased from 2.6 million tones to 6.4 million tones from 1990 to 2010. There is an increase of 3.8 million tones in the production of fertilizers. The total import of fertilizers increased from 1.1 million tones to 2.6 million tones from 1990 to 2010. The increase in import of fertilizers is 1.5 million from last twenty years. As compare to production of fertilizers and import of fertilizers, there is a large increase in the production of fertilizers. A big amount of fertilizers is produced in Pakistan.

According to the observation it is found that there is a positive relationship between fertilizers and agriculture production. If other factors remain constant, the usage of fertilizers in big amount increases the production of crops. In 1995, the production of major crops was 7, 0907,000 tones with the use of 40, 79,648 tones inorganic fertilizers. In 2008, the production of major crops was 105,702,000 tones with the use of 72, 46,132 tones inorganic fertilizers. These figures show the positive relationship between use of fertilizer and production of major crops. Pakistan discourages to the import of fertilizer but due to the increase in demand of fertilizers, government use to import the fertilizers. When demand of fertilizer increases the price of local fertilizers also increases that creates the shortage of supply of fertilizers to the farmers. Then the demand is fulfilled by the imported fertilizers. There is not so much import of fertilizer in Pakistan but it has negative impact on agriculture sector of Pakistan. By increasing the use of fertilizer in Pakistan, Government of Pakistan felt that there should be more investment in the fertilizer production to increase the production of crops and government is trying to provide fertilizers to farmers on low prices. So production and import of fertilizers has an impact on agriculture sector of Pakistan.

### **Research Design**

Secondary data is used to study in this article. This article contains the study of last twenty years 1990-2010. Data is collected from the different articles. There is a population of 14 major production units of inorganic fertilizer. Production and imports are taken of seven major production units as a sample size. Sample is taken randomly. Simple Regression method is used on the data.

This study is about the production and import of fertilizers and their impact on agriculture sector of Pakistan. In agriculture sector the production of crops is studied. The sample is:

- National Fertilizer Corporation of Pakistan (Pvt.) Ltd.
- Pak Arab Fertilizers (Pvt.) Ltd.
- Fatima Fertilizers Company Ltd.
- Fauji Fertilizer Company Ltd.
- Fauji Fertilizer Bin Qasim Ltd.
- Engro Chemical Pakistan Ltd.
- Dawood Hercules Chemicals Ltd.

Major types of inorganic fertilizers are used to study in this article that are:

- Urea (Nitrogen Fertilizer)
- DAP (Di-Ammonium Phosphate)
- CAN (Calcium Ammonium Nitrate)
- NP (Nitrophos)

Major crops are used to study that are:

Maize, Cotton, Rice, Sugarcane, Wheat.

Variables that are used to study in this article are:

Fertilizer Production	→	Independent Variable
Import	→	Independent Variable
Agriculture	→	Dependent Variable

### **Fertilizer**

A chemical or natural substance added to soil to increase its fertility

### **Types of Fertilizers**

- Organic Fertilizers
- Inorganic Fertilizers
- Inorganic Fertilizers are used to study in this article.

### **Import**

Import is used to bring in the goods and services into the port of a country.

### **Agriculture**

Agriculture is the cultivation of animals, plants and other life forms for food, fiber, and other products used to sustain life. In this study, agriculture production is taken into account.

### **Hypothesis**

H<sub>0</sub>: There is no significant impact of production of inorganic fertilizer and import on agriculture sector of Pakistan.

H<sub>1</sub>: There is a significant impact of production of inorganic fertilizer and import on agriculture sector of Pakistan.

### **Findings**

The followings are the major statistical findings of this study:

R<sup>2</sup> = 0.718

Independent variables taken in the model that are Fertilizer production and Import explain the 71% change in the dependent variable that is Agriculture.

F-test = 21.68, Sig. 0

F- Test shows that overall model is statistically significant.

T- Test = 0

T statistics indicates that out of two independent variables only one variable is significant that is production of inorganic fertilizers.

DW = 1.63

The DW value is 1.63 shows that there is problem of heteroscedasticity.

VIF = 1.14 VIF values of independent variables that are fertilizer production and import indicate that multi-collinearity does not exist between the two variables.

### **Model**

Model of my study is:

$$Y = \beta^0 + \beta_1 X_1 + \beta_2 X_2$$

$$\text{Agriculture} = 5.59 - .213 \text{ Import} + 6.25 \text{ Production}$$

$\beta^0$  Defines that in the absence of Import and Production of inorganic fertilizer then Agriculture production will be 5.59.

$\beta_1 X_1$  Defines that considering all other factors remain constant, 1 unit change in import of inorganic fertilizer will bring -.213 units decrease in the agriculture production.

$\beta_2 X_2$  Defines that considering import zero, 1 unit change in production will bring 6.25 units change in agriculture production.

### **Conclusions**

- Fertilizer is important for the growth of crops. Fertilizer increases the fertility of the soil. Fertilizers are considered very important in agriculture. About 60% fertilizer is used for the production of major crops.
- Production of major inorganic fertilizers is increased by 3.8 million tones from 1990 to 2010 and the import of major inorganic fertilizers is increased by 1.5 million tones from 1990 to 2010.

- There is a positive effect of production of inorganic fertilizers on the agriculture sector of Pakistan. Import of inorganic fertilizers has no significant impact on agriculture sector. Import of inorganic fertilizers shows the negative effect on the agriculture sector of Pakistan. Inorganic fertilizer is produced on a large scale in Pakistan. There is a less import of inorganic fertilizer compare with the production of fertilizers. Government discourages to the imports and trying to install new production units of inorganic fertilizers.

References

Ahmad, N., & Muhammad, T. (1998). Fertilizer, Plant Nutrient Management, and Self-reliance in Agricultural. *The Pakistan Development Review* , 37 (4), 217-233.

Butt, W. M. (1996). Supply and Demand of Chemical Fertilizers. *The Pakistan Development Review* , 113, 39-57.

Coady, D. P. (1995). An Empirical Analysis of Fertilizer Use in Pakistan. *Economica* , 213-34.

Hossain, M., & Singh, V. (2000). Fertilizer use in Asian agriculture: implications for sustaining food security and the environment. *Nutrient Cycling in Agroecosystems* , 57, 155-169.

Khan, H. G., Ahmad, A., & Siraj, D. A. (2010). Impact of Rising Prices of Fertilizers on Crops Production in Pakistan. *Global Journal of Management and Business Research* , 10 (9), 54-61.

Lewandrowski, J., Tobey, J., & Cook, Z. (Aug., 1997). The interface between agricultural assistance and the environment: Chemical Fertilizer consumption and area expansion. *Land Economics* , 73 (3), 404-427.

Qasim, F. F. (2007). *Pakistan Fertilizer Sector Review*. Karachi: IGI Finix Securities Ltd.

Quddus, M. A., Siddiqi, M. W., & Riaz, M. M. (2008). The Demand for Nitrogen, Phosphorus and Potash Fertilizer Nutrients in Pakistan. *Pakistan Economic and Social Review* , 64 (2), 101-116.

Table 2

*Fertilizer consumption in Pakistan*

Years	(Kg/ha)
1993-94	97
1994-95	103
1999-00	117
2000-01	138
2001-02	133
2002-03	137
2003-04	148
2204-05	161
2005-06	169
2006-07	159
2007-08	157
2008-09	157

Source: National Fertilizer Development Centre

Table 3

*Fertilizer use by Major crops*

('000 nutrient tones)					
	<b>Wheat</b>	<b>Rice</b>	<b>Maize</b>	<b>Cotton</b>	<b>Sugarcane</b>
1990-91	889.71	189.3	75.72	378	208.23
1991-92	885.48	188.4	75.36	376.8	207.24
1992-93	1009.38	214.76	85.9	429.52	236.24
1993-94	1009.09	214.2	85.88	429.4	236.17
1994-95	1026.05	218.31	87.32	436.62	240.14
1995-96	1182	251.5	100.6	503	276.7
1996-97	1076	253	104	500	196
1997-98	1186	279	114	551	215
1998-99	1171.65	138.97	57.87	596.67	274.06
1999-00	1285.05	152.42	63.47	654.42	300.58
2000-01	1344.02	159.41	66.37	684.45	314.37
2001-02	1328.59	157.58	64.61	676.6	340.77
2002-03	1369.87	162.48	67.65	697.62	320.42
2003-04	1461.5	173.34	72.17	744.28	341.85
2004-05	1847	221.64	55.41	923.5	295.52
2005-06	1902.1	228.25	57.06	951.05	304.43
2006-07	1835.8	220.29	55.07	917.9	293.72
2007-08	1790.5	214.86	53.72	895.25	286.48
2008-09	1855.5	222.66	55.67	927.75	296.88
2009-10	2180	261.6	65.4	1090	348.8

Table 4

*Production of Fertilizer by products*

(tones)					
	<b>Urea</b>	<b>DAP</b>	<b>CAN</b>	<b>NP</b>	<b>Total Production</b>
1990-91	2,050,278	0	318,800	320,961	2,690,039
1991-92	1,902,296	0	300,029	309,756	2,512,081
1992-93	2,306,110	0	302,198	297,337	2,905,645
1993-94	3,103,854	0	242,724	251,371	3,597,949
1994-95	3,000,313	0	313,907	285,428	3,599,648
1995-96	3,258,046	0	383,492	336,544	3,978,082
1996-97	3,258,135	0	330,196	350,259	3,938,590
1997-98	3,284,168	0	316,324	293,280	3,893,772
1998-99	3,550,457	46,241	338,750	285,035	4,220,483
1999-00	3,968,151	298,287	386,480	261,312	4,914,230
2000-01	3,983,257	324,759	374,400	284,500	4,966,916
2001-02	4,259,829	66,556	329,374	305,691	4,961,450
2002-03	4,407,462	0	335,317	304,856	5,047,635
2003-04	4,434,834	267,919	350,395	363,489	5,416,637
2004-05	4,610,672	408,381	329,864	338,902	5,687,819
2005-06	4,803,870	433,138	327,240	399,405	5,963,653
2005-07	4,731,732	397,747	333,541	368,851	5,831,871
2007-08	4,925,132	356,000	346,000	366,000	5,993,132
2008-09	4,921,726	533,734	344,333	33,2271	6,132,064
2009-10	5,154,883	625,889	345,546	345,393	6,471,711

Source: National Fertilizer Development Centre

Table 5

*Import of Fertilizers*

(000 tones)					
	Urea	DAP	NP	CAN	Total Import
1990-91	541	499	83	0	1123
1991-92	570	554	30	0	1154
1992-93	525	755	117	0	1397
1993-94	206	1162	28	0	1396
1994-95	0	480	0	0	480
1995-96	389	598	0	0	987
1996-97	704	828	0	0	1532
1997-98	264	904	0	0	1168
1998-99	574	774	100	0	1448
1999-00	114	819	122	0	1055
2000-01	86	773	47	0	906
2001-02	0	919	26	0	945
2002-03	0	1124	30	0	1154
2003-04	0	1046	31	0	1077
2004-05	307	811	36	0	1154
2005-06	825	1171	0	0	1996
2006-07	281	935	1	0	1217
2007-08	181	1072	0	0	1253
2008-09	904.6	206.7	0	0	1111.3
2009-10	1525	1080	0	0	2605

Source: National Fertilizer Development Centre

Table 6

*Production of major crops*

(000 ha, 000 tones , kg/ha)						
Years	Wheat	Rice	Cotton	Sugarcane	Maize	Total Agricultural production
Avg 90-95	15,724	3,412	9,648	40,902	1,221	70,907
1995-96	16,907	3,967	10,595	45,230	1,283	77,982
1996-97	16,651	4,305	9,374	41,998	1,259	73,587
1997-98	18,694	4,333	9,184	53,104	1,517	86,832
1998-99	17,858	4,674	8,790	55,191	1,665	88,178
1999-00	21,079	5,156	11,240	46,333	1,652	85,460
2000-01	19,024	4,803	10,732	43,606	1,643	79,808
2001-02	18,227	3,882	10,613	48,042	1,664	82,428
2002-03	19,183	4479	10211	52056	1737	87,666
2003-04	19,500	4848	10048	53419	1897	89,712
2004-05	21,611	5025	14265	47246	2797	90,944
2005-06	21,277	5547	13019	44666	3110	87,619
2006-07	23,295	5439	12856	45,742	3,088	90,420
2007-08	20959	5563	11655	63920	3605	105,702
2008-09	24033	6952	11819	50045	3593	96,442
2009-10	23311	6883	12913	49372	3262	95,741

Source: National Fertilizer Development Centre