



GETTING MORE CROP WITH LESS FERTILIZER A CASE STUDY



BENEFITS

- WATER SAVING BY 50%
- REDUCTION IN FERTILIZER USE UPTO 45%
- REDUCTION IN PRODUCTION COST UPTO 35%
- YIELD INCREASED BY MORE THAN 100%
- EARLY MATURITY OF CROP
- BETTER PRODUCE QUALITY
- CROP DIVERSIFICATION
- HIGHLY SUITABLE FOR UNEVEN TOPOGRAPHY



A CASE STUDY

Maize is 3rd important cereal crop after wheat and rice in Pakistan. It is sown on an area of about one million hectares (2.5 million acres) with production of nearly five million metric tons. Out of which around 60 percent is used in poultry and livestock feeds, 25 percent in industries, and remaining 15 percent is utilized as staple food. It is consumed for production of value added products such as flour, starch, oil, and fodder for livestock. Recently, Maize is playing a vital role in development of livestock sector in Pakistan by way producing huge quantity of highly nutritional fodder/silage. With highest yield of about 20 tons per acre among fodders, hybrid yield is harvested in only 90 days compared to other forages having much longer growth period.

Each year, farmers spend huge capital in terms of application of crop production inputs, especially fertilizer for production of good quality maize and getting higher yields. Usually, two bags of Di-ammonium Phosphate (DAP), three & a half bags of Urea, two bags of Sulphate of Potash (SOP), and one (10 kg) bag of Zinc Sulphate are used for the purpose. Amid all inputs, fertilizer application costs are the highest for maize production.

It is pertinent to mention that plant requires a balanced supply of nutrients throughout its growing period, which are usually low during early growth stages and then increase towards

fruiting where nutrient management becomes the most critical. This principle can, however, not be

followed under present input application methods, which is resulting in wastage of about 50 percent of the applied fertilizer due to volatilization and leaching resulting significant wastage of resources (money and energy).

DRIP IRRIGATION

- 54% Reduction in Fertilizer Use
- 18% Increase in Yield

Contrary to conventional practices, drip irrigation enables fertilizer applications in exact dosages accordingly to crop growth stage. This precise provision of nutrients with irrigation water is called fertigation that results in high fertilizer use efficiency, enables timing of application as per crop demand, increased yields, and improved quality of the produce as well as saving in labour.

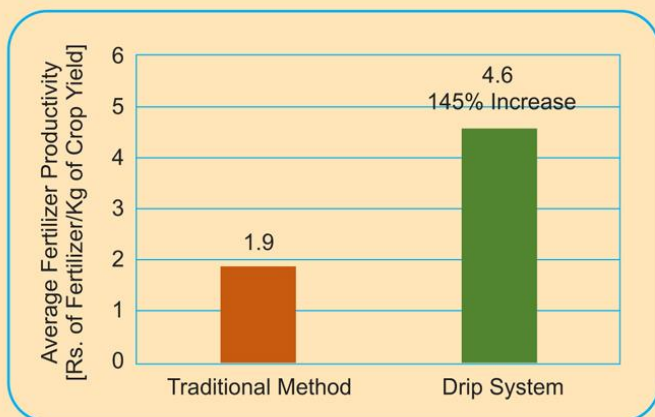
The Government of Punjab has launched “Punjab Irrigated-agriculture Productivity Improvement Project (PIPIP)” that aims at promoting modern irrigation technologies for improvement of irrigated agriculture. Drip irrigation is one of such technologies that has enormous potential for minimizing cost of production by reducing the input use, especially water and fertilizer. Drip systems have been installed on about 10,000 hectares (25,000 acres) all over the province on different crops including Maize. To assess its impacts, seven drip irrigation systems installed at different farms for maize in Okara, Sahiwal, Jhang and Faisalabad districts, have been studied and results have been tabulated as under (Table-1).

Table-1: Impact of Drip Irrigation on Fertilizer Cost and Yield Increase

S#	DISTRICT	Farm	Fertilizer Cost (Rs.)				Yield Increase (Mounds)			
			Traditional Practices	Drip Irrigation	Saving	% Decrease	Traditional Practices	Drip Irrigation	Difference	% Increase
1	OKARA	Ch. Asif Ali	14,000	7,000	7,000	50	80	97	17	21
2		Ch. Tariq Aziz	13,500	6,500	7,000	52	77	87	10	13
3		Haji Muhammad Yousaf	10,500	6,500	4,000	38	48	55	7	15
4	SAHIWAL	Qazi Noor Muhammad	14,000	6,000	8,000	57	75	90	15	20
5		Ch. Muhammad Latif	10,500	5,900	4,600	44	65	82	17	26
6	JHANG	Haji Pervez Hussain	n/a	4,500	n/a	n/a	0	55	n/a	0
7	FAISALABAD	Liaqat Ali	11,500	2,500	9,000	78	65	75	10	15
Average			12,333	5,557	6,600	54	68	77	13	18
n/a = not applicable			one mound = 40 kg							

DRIP IRRIGATION SUCCESS STORY

It may be noted from **Table-1** that on an average, 53 percent of fertilizer costs were reduced by drip fertigation as compared to traditional application methods with maximum of about 80 percent reduction (Rs. 8,000/acre) at Liaqat Ali farm in Faisalabad. Likewise, all growers have reported average increase in yield by about 18 percent with maximum of 26 percent by Ch. Muhammad Latif of Sahiwal. Another way to look at this aspect is fertilizer productivity (Rs. of fertilizer spent /kg of crop yield), which is about 145 percent higher in case of drip irrigation as compared to conventional means. (**Fig-1**)



Additional benefits obtained by the growers by using drip system vis-à-vis conventional irrigation practices for maize are about Rs. 20,000/acre. The incremental returns are more than two times for potato crop. For this purpose, farms of Raja Shabbir Haider, Mr.Asim-ud-Din Haider in district Pakpattan and Mian Muhammad Jamil in district Chiniot were visited and it was found that on an average, the additional income of Rs. 53,000 per acre was obtained by growing potatoes on drip. It can, therefore, be concluded that in a maize-potato cropping system, farmer can additionally earn profits valuing Rs. 73,000/acre per annum (**Table-2**).

Table-2: Incremental Returns per Acre in a Maize-Potato Cropping System

Crop	Rupees				Incremental Return
	Input Cost		Income		
	Conventional	Drip	Conventional	Drip	
Maize	42,000	30,000	52,000	60,000	20,000
Potato	38,000	25,000	120,000	160,000	53,000
Total					73,000
One US\$ = 100 Rupees					

Currently about 188 billion cubic feet of natural gas (15% of total country's natural gas consumption) is consumed each year by fertilizer industry. Involving massive amount of energy consumption and capital costs. For instance, fertilizer requirements for about one million hectares (2.5 million acres) of maize crop are estimated at about five million bags of DAP, nine million bags of Urea, five million bags of SOP, and one million bags of Zinc Sulphate for which farmers spent about Rs. 45 billion annually.

Overall, all farmers showed satisfaction on performance of drip irrigation systems and reported that drip irrigation provided them a great opportunity to reduce the production costs and increase in yields by applying optimal amounts of fertilizers and water.

Use of drip irrigation technology resulted in reduction of fertilizer costs to about 60 percent as compared to conventional practices. It is noted that huge amount of energy and capital resources can be saved each year by using drip irrigation system. For example, installation of drip irrigation systems on 10 percent of area (125,000 acres), presently under Maize, may result in saving of about Rs. 800 million per year on account of fertilizer cost reduction in addition to numerous benefits in terms of water saving, yield increase, better produce quality, irrigated area increase as well as substantial social and environmental benefits. Reduction in energy use by the fertilizer industry for production of fertilizer is another aspect to be looked into.

It may be concluded that drip irrigation is a multiple solution technology that has the potential of not only curtailing farmers' production costs by optimal use of most critical/precious crop production inputs i.e. water and fertilizers but also enhanced outputs/yields. Drip irrigation technology may also contribute in averting current energy crises by lowering the energy consumption in agriculture sector.

