INVESTIGATION ENERGY AND ECONOMICS ANALYSIS OF MAIZE PRODUCATION

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ABSTRACT:- This study was conducted at the experimental site in Islamabad, Pakistan, in spring season 2013 (March – July). A randomized complete block design with three treatments and replicated thrice were used in this study, fertilizers were evaluated on the basis of yield, input/output energy of maize crop. NPK had the maximum output energy gain as compared to cow manure and control treatment gave the lowest output energy. Cow manure used high energy as compared to NPK and control. The results further revealed that other NPK fertilizer treatments were affected by the high input costs thus maximum benefits were achieved. It is interesting to note that the NPK treatment appeared to be the best for all farmyard manure and control plots.

Key Words: Maize, Inputs/outputs energy, Economics Analysis, Production

INTRODUCTION

In developing countries, corn is the main source of income for many far-mers (Tagne et al., 2008). In Pakistan, maize ranks third after wheat and rice and 98% of the crop is grown in KP and Punjab. Pakistan grows maize on about 1.11 million hectares with an annual production of 4.04 million ton of grain and aver-age yield 3.62 t ha^{-1} (GOP, 2009). The soils of Pakistan are normally low in organic matter, firstly because of the arid climate leads to rapid decom-position of organic matter and seco-ndly because (there is very little organic matter in the soil). On average there is less than 1% organic matter most of the soils of Pakistan. Farming can enhance soil fertility through the use of minerals as well as organic materials (Azad and Yousaf, 1982).

Plants grow better by Nitrogen fertilizer. Sufficient Nitrogen makes dynamic growth and dark green color (Malival, 2001). Organic fertilizers including farmyard manure, sheep manure and poultry manure a used for crop production as a substitute of chemical fertilizers. Interest is globally-increasing for organic farming because of soil fertility depletion (Elfstrand et al., 2007). Agricultural sector has to pro-vide more food for increasing population and is energy dependant required that the population increase like other sectors depend on energy sources such as electricity and fossil fuels (Hatirli et al., 2005). Energy is an important input of agriculture from subsistence agriculture age. It is an established fact in the world that agricultural production is positively correlated with energy input (Singh, 1997). Agriculture acts as both an energy consumer and a producer. It

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uses large quantities of non-commercial energy available locally, such as seed, manure and energy animate as well as commercial energy, directly and indirectly in the form of diesel, fertilizers, plant protection, irrigation water chemical, machinery. Efficient use of energy helps to achieve increased production and productivity and contributes to the profitability and competitiveness of agricultural sustain-ability always in the countryside (Singh, 2005).

MATERIALS AND METHOD

This study was conducted at the ex-perimental site in Islamabad, Pakistan, in spring season 2013 (March – July). The cultivator implement was operated by a diesel powered tractor MF-375; two fertilizer treatments (inorganic and organic) were tested. The soil at the site was classified as medium textured loam. The experiment was laid out in randomized complete block design (factorial) with three replications. Plot was divided into sub plots measuring equally to 20 m × 10 m plots were 9 experimental units (re-phrase the sentence). The recommended dose of @140-70-70 NPK kg ha^{-1}, (Saleem et al., 2006) cow manure @ 7000 kg ha^{-1} and control was applied in this study. The maize variety locally known as Akbar was sown @ seed 25 kg ha^{-1}. [Energy input fuel, seeds, fer-tilizer, manure, labor requirements were determined for cultivation of maize production based on the energy equivalent on the inputs and output (Table 1), output-input energy ratio, energy productivity net energy gain were calculated (Hatirli et al., 2005., Mohammadi et al, 2008). All data were subject to analysis of variance (ANOVA) using the analysis of variance procedure (Steel and Torri, 1980). The treatment mean separated using least significant difference (LSD) at 0.05 level of probability. The equation was used in the calculation of fuel consumption per hectares for each field operation. (Moerschner and Gerowitt, 2000).

Table 1. Energy equivalents of different input and output used in field crop production

Input	Energy Equivalent (MJ)	Reference
Human Labor (h)	2.3	Yaldiz *et al,* 1990
Diesel (L)	47.8	Safa *et al*, 2002
Chemical Fertilizer (Kg)		
Nitrogen	60.6	Singh *et al*, 2003
Phosphorous	11.1	Ozkan *et al*, 2003
Potassium	6.7	Pimental. 1979
Cow Manure (Kg)	3.8	Green, 1987
Seed (Kg)	14.7	Panesar B.S, 2002
Output		
Seed	14.7	Panesar B.S, 2002

RESULTS AND DISCUSSION

Yield

The field experiment was performed in order to evaluate the productivity of each tillage method and to relate it to the input energy consumption. The mean yield results are shown in Fig. 1, the result revealed that significant increase in yield (5115 kg ha^{-1}) highest in NPK as compared to (3712 kg ha^{-1}) in cow manure, while the low-est yield in (2331 kg ha^{-1}) control plots. These results are in agreement with earlier studies by other researchers (Sial *et al.*, 2007; Adeniyan and Ojeniyi, 2005) who reported that application of chemical and organic manure better maize grain yield (poorly written, re-phrase it).

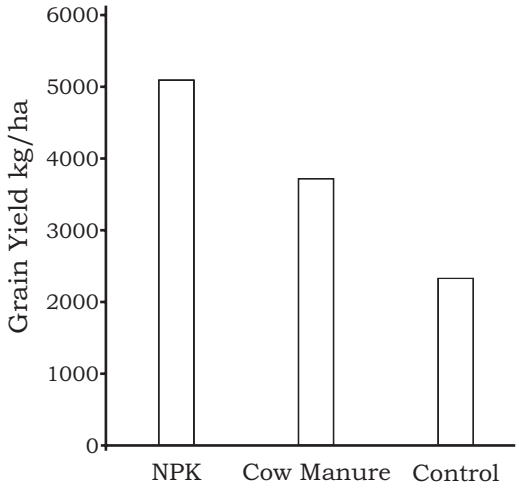

Figure 1. Effect of inorganic and organic fertilizers on grain yield (kg ha-1)

Table 2. Energy inputs/outputs for spring maize

Input energy (MJ ha^{-1})	NPK	Cow Manure	Control
Human labour (MJ ha^{-1})			
- Sowing	184	184	184
- Harvesting	368	368	368
Diesel (MJ ha^{-1})	505.1	505.1	505.1
Fertilizer (kg ha^{-1})			
- NPK	20909		---
- Cow manure	---	26600	---
Seed (MJ ha^{-1})	367.5	367.5	367.5
Total input energy (MJ ha^{-1})	22333.6	28024.6	1424.6
Output energy (MJ ha^{-1})	75190	54566	34265
Net energy (MJ ha^{-1})	52856.4	26541.4	32840.4

Input-output energy

The input and output energy values used in maize production are shown in Table 2, the total input energy was observed maximum under cow manure (28024.6 MJ ha^{-1}) followed by NPK (22333.6 MJ ha^{-1}) and lowest input energy was found in control plot (1424.6 MJ ha^{-1}). The result indicated that higher output energy was obtained in NPK (75190 MJ ha^{-1}), followed by cow manure (54566 MJ ha^{-1}) and minimum output energy found in control (34265 MJ ha^{-1}). The net energy was found highest in NPK (52856.4MJ ha^{-1}), followed by cow manure (26541.4 MJ ha^{-1}) and the lowest net energy observed in control (32840.4 MJ ha^{-1}).Re-write as poorly written.

Table 3. Economics analysis of various tillage methods for autumn sown maize

Cost (PKR)	NPK	Cow Manure	Control
Fuel consumption @ Rs. 102/lit	689.0	689.0	689.0
Lubricant at 15% of diesel cost (Rs.)	104.0	104.0	104.0
Tractor hired @ Rs. 1800/ha	1800.0	1800.0	1800.0
Labour cost			
- Skilled 10 labour @ Rs. 0 per day for sowing	8000.0	8000.0	8000.0
- Skilled 20 labour @ Rs. 0 per day for harvesting	16000.0	16000.0	16000.0
Inputs			
- Seed 25 kg ha^{-1} @ Rs. 45/kg	1125.0	1125.0	1125.0
- Urea/bag @ Rs. 1800/-	10944.0	----	
- DAP/bag @ Rs. 3900/	11856.0	----	
- MOP/bag @ Rs. 4000/	9280.0	----	
- Cow Manure 7 tons @ Rs. 10500/-		10500.0	
Total cost of production (a) Rs	59798.0	38218.0	27718.0
Gross income (b) sell @ Rs. 50/kg	255750.0	135650.0	116550.0
Net income (b -a) Rs.	195952.0	97432.0	88832.0

Economic analysis of spring sown maize

Economic analysis was performed and the results are shown in Table 3. The treatment with 140-70-70 NPK kg ha^{-1} gave the highest net benefits (Rs. 19,5952'). It was followed by (Rs. 97432) under cow manure while the lowest benefits (Rs. 88832) was achieved under control. The results further revealed that other

NPK fertilizer treatments were affected by the high input costs thus maximum benefits were achieved. It is interesting to note that the NPK treatment appeared to be the best for all farmyard manure and control plots.

CONCLUSION

It was concluded that fertilizers were evaluated on the basis of yield, input/ output energy of maize crop. NPK had the maximum output energy gain as compared to cow manure and control treatment gave the lowest output energy. Cow manure used high energy as compared to NPK and control. Further studies are also recommended for the researchers to carry out such similar studies in maize crop.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

S.No	Author Name	Contribution to the paper
1.	Mr. Shafique Qadir Memon	Conceived the idea, Wrote Abstract, Overall management of the article
2.	Mr. Nadeem Amjad	Technical input at every step
3.	Mr. Riaz Ahmed	Data collection, Data entry in SPSS and analysis, Result and Discussion

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