



INFLUENCE OF INTEGRATED NUTRIENT MANAGEMENT ON ECONOMIC RETURN OF WHEAT UNDER UPPER EGYPT CONDITIONS

Essam A. Abd El-Lattief*

Abstract: *The effect of integrated use of chemical fertilizer (NPK), biofertilizer and farm yard manure (FYM) on costs, return and net profit per ha as well as return-cost ratio of wheat was carried out in the Experimental Farm of the Faculty of Agriculture, South Valley University at Qena on a sandy soil. The recommended NPK, biofertilizer and FYM were applied alone and in various combinations among them. A randomized complete block design, with three replications, was used in this study. Treatments affected all economics parameters studied. The highest value of costs per ha was obtained from treatment T₁ (recommended NPK, 190: 70: 120 N, P₂O₅, K₂O kg ha⁻¹). T₆ (half of the recommended NPK + 10 tons FYM + biofertilizer) treatment gave the maximum return and net profit per ha as well as return-cost ratio compared with the other treatments. Therefore, integrated plant nutrient supply system could help in meeting the goals of balanced fertilization and increased profitability per unit area.*

Key words: *wheat, biofertilizer, FYM, return, net profit and return-cost ratio.*

* Department of Agronomy, Faculty of Agriculture, South Valley University, Qena, Egypt



1. INTRODUCCION

Wheat (*Triticum aestivum*, L.) is the world's most important and most widely grown cereal crop through many properties and uses of its grains and straw. In Egypt, it is well known that the expansion of wheat planting in sandy soils is one of the solutions for curtailing the gap between consumption and production of wheat. However, production of wheat in sandy soils is facing many problems like, low organic matter and poor soil fertility.

Now, increased attention is being paid to develop an integrated plant nutrition system that maintains and enhances soil productivity through balanced use of different sources of nutrients, including chemical fertilizers, organic fertilizers and biofertilizers. The basic concept, underlying the integrated plant nutrition system, is the adjustment of soil fertility and plant nutrient supply to an optimum level for sustaining desired crop productivity. This might optimize the benefits of all sources of plant nutrients in an integrated manner [1].

The high cost of chemical fertilizers and the low purchasing power of most of the farmers restrict its use in proper amounts, hampering crop production. Besides, a substantial amount of the nitrogen is lost through different mechanisms including ammonia volatilisation, denitrification and leaching losses, causing environmental pollution problems [2], [3]. The use of expensive chemical fertilizers and pesticides is a limiting factor for the low-income farmers and increases the cost of crop production. Bio-fertilizers are eco-friendly and have been proved to be effective and economical alternate of chemical fertilizers with lesser input of capital and energy [4].

Biofertilizers differ from chemical and organic fertilizers in the sense that they do not directly supply any nutrients to crops and are cultures of special bacteria and fungi. The production technology for biofertilizers is relatively simple and installation cost is very low compared to chemical fertilizer plants. *Azotobacter* act as one of the important biofertilizer for rice and other cereals, it can apply by seed dipping and seedling root dipping methods [5-8]. *Azotobacter* can also be able to enhance the growth in wheat crop [9].

The combination of mineral fertilizers, with organic manures, helped in increasing the grain yield of wheat and implied a saving of 50% cost, compared to a system with only mineral fertilization [10]. Jen-Hshuan [1] stated that microbial inoculants could be used as an economic input to increase crop productivity, lowering fertilizer doses and more nutrients increasing harvested from the soil. Moreover, Hegab and Abou El-Wafa [11] showed that



the integration between chemical, organic and biofertilizers gave higher grain, straw and biological yields of wheat crop, compared with single application of such fertilizers.

The objective of this study was to investigate the effect of seven combinations of chemical, organic and bio fertilizers on income of bread wheat c.v Giza 168.

2. MATERIALS AND METHODS

2.1. Experimental site description

The investigation was carried out at the experimental farm of the Faculty of Agriculture, South Valley University, Qena Governorate, Egypt, during 2013/2014 season. It lies at 26°10' N latitude and 32°43' E longitudes with an altitude of 79 m above mean sea level. The soil of the experimental field was sandy having pH 7.88, electrical conductivity 2.52 ds/m, organic carbon 0.49% and available NPK of 186.3, 8.25 and 183.0 ppm, respectively.

2.2. Experimental treatments and design

The different treatment combination as follows:

T₁- Recommended NPK (190: 70: 120 N, P₂O₅, K₂O kg ha⁻¹).

T₂- FYM (20 tons ha⁻¹) alone.

T₃- Biofertilizer (*Azotobacter chroococcum*) alone.

T₄- Half of the recommended NPK+ 10 tons FYM.

T₅- Half of the recommended NPK + biofertilizer.

T₆- Half of the recommended NPK + 10 tons FYM + biofertilizer.

T₇- Control (without any fertilizers).

For as biofertilizer treatments, the seeds were inoculated by liquid culture of locally isolated strains of *Azotobacter chroococcum* ($\approx 10^9$ CFU/ml) which obtained from Biofertilizers Production Unit of Faculty of Agriculture, South Valley University. 1% of carboxy methyl cellulose (CMC) was added to the culture to increase its viscosity to gel form to act as adhesive biostabilizer, the addition of CMC was made just before using. The experiment was carried out in a randomized complete block design (RCBD) with three replications. Experimental unit measured 3.0 m in width and 4 m in length.

2.3. Cultural practices

Bread wheat (Giza 168 cv.) was sown on the 15th of November. Whole of phosphorus and potassium were applied basally before sowing in all treatments. Nitrogen fertilizer was applied in three equal doses; the first, during soil preparation, and the second and third



after 21 and 63 days from sowing, respectively. The other cultural practices were carried out as recommended for the crop.

2.4. Measured traits

At harvest time, grain and straw yields were estimated at plot basis. Cost of land rent, land preparation, bed preparation and repairing, fertilizers, labor, irrigation and harvesting as well as price of the products and byproducts were recorded. Simple economic analysis such as total cost, return, net benefit and benefit-cost ratio were done for different treatments.

3. RESULTS AND DISCUSSION

Data in Table 1 indicated that the minimum cost (8145 L.E ha⁻¹) was recorded in T₇ (control, without any fertilizers), followed by T₃ (biofertilizer alone) of 8345 L.E ha⁻¹ than other treatments. Application of mineral NPK alone (T₁) gave the highest value of cost (10110 L.E ha⁻¹) followed by T₆ (half of the recommended NPK + 10 tons FYM + biofertilizer) of 10028 L.E ha⁻¹.

It is evident from the results in Table 1 that the maximum return per ha of 22701 L.E., was obtained from treatment T₆ (half of the recommended NPK + 10 tons FYM + biofertilizer), followed by T₁ (recommended NPK, 190: 70: 120 N, P₂O₅, K₂O kg ha⁻¹) of 20052 L.E. The return per ha was minimum (12455 L.E. /ha) in the T₇.

Like return per ha, T₆ gave the maximum net profit per ha (12673 L.E). The net profit per ha was minimum (4310 L.E) in the T₇ (Table 1). The highest return and net profit values observed in the T₆ treatment can be attributed to the increases in grain yield (5610 tons ha⁻¹) and straw yield (8605 tons ha⁻¹) produced per unit area under T₆. The lowest return and net profit values observed in the T₇ treatment can be attributed to the decreases in grain yield (3024 tons ha⁻¹) and straw yield (4881 tons ha⁻¹) produced per unit area under this treatment (Figure 1).

Also, the highest value of return-cost ratio (2.26) was obtained by the application of T₆, while, the lowest (1.53) was obtained from T₇. These results are in agreement with those reported by Shah and Ahmad [12] who found that integrated use of urea and FYM at 75:25 or 50:50 ratios (N basis) had produced maximum yields and was, then, recommended for profitable wheat grain yield. While, Jen-Hshuan [1] reported that microbial inoculants could be used as an economic input to increase crop productivity and fertilizer doses might be lowered.



Table 1. Effect of integrated nutrient management on economic traits of wheat.

Treatments	Total cost (L.E*/ha)	Return (L.E/ha)			Net profit (L.E/ha)	Return-cost ratio
		Grain	Straw	Total		
T ₁	10110	13013	7039	20052	9942	1.98
T ₂	9545	10544	6240	16784	7239	1.76
T ₃	8345	9560	5336	14896	6551	1.79
T ₄	9828	12842	6900	19742	9914	2.01
T ₅	9328	12727	6765	19492	10164	2.09
T ₆	10028	14956	7745	22701	12673	2.26
T ₇	8145	8062	4393	12455	4310	1.53

T₁- Recommended NPK (190: 70: 120 N, P₂O₅, K₂O kg ha⁻¹), T₂- FYM (20 tons ha⁻¹) alone T₃- Biofertilizer (*Azotobacter chroococcum*) alone, T₄- Half of the recommended NPK+ 10 tons FYM ha⁻¹, T₅- Half of the recommended NPK + biofertilizer, T₆- Half of the recommended NPK + 10 tons FYM ha⁻¹ + biofertilizer, T₇- Control (without any fertilizers). *L.E (Egyptian pound) = US \$ 0.126.

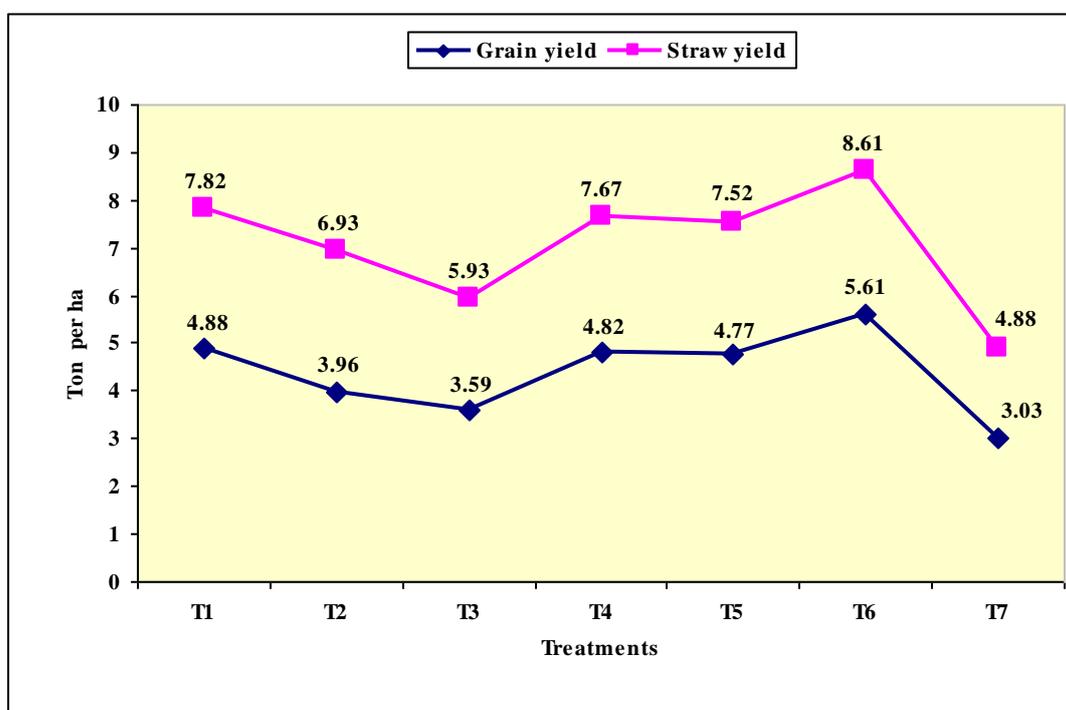


Figure 1: Effect of integrated nutrient management on grain and straw yields of wheat

4. CONCLUSION

Generally, it can be concluded that application of half of the recommended NPK + 10 tons FYM + biofertilizer with *Azotobacter* on wheat gave the highest values of return and net profit per ha as well as return-cost ratio. The minimum values of previous were obtained from control treatment (without any fertilizers).



REFERENCES

- [1] Jen-Hshuan, C. 2006. The combined use of chemical and organic fertilizers and/or biofertilizer for crop growth and soil fertility. Int. Workshop on Management of the Soil -Rhizosphere System for Efficient Crop Production and Fertilizer Use, Land Development Department, Bangkok 10900, Thailand.
- [2] De Datta, S.K. and Buresh, R.J. 1989. Integrated nitrogen management in irrigated rice. *Advances in Soil Science* 10, 143–169.
- [3] Choudhury, A.T.M.A. and Kennedy, I.R. 2005. Nitrogen fertiliser losses from rice soils and control of environmental pollution problems. *Communications in Soil Science and Plant Analysis* 36, 1625–1639.
- [4] Hafeez, F.Y., Hameed, S., Zaidi, A.H. and Malik, K.A. 2002. Bio-fertilizers for Sustainable Agriculture. In: Azam, F., M.M. Iqbal, C. Inayatullah and K.A. Malik (eds.), *Techniques for Sustainable Agriculture*, Pp: 67–73. Nuclear Institute of Agriculture and Biology, Faisalabad, Pakistan.
- [5] Kannaiyan, S., Govindarajan, K., Lewin, H.D. 1980. Effect of foliar spray of *Azotobacter chroococcum* on rice crop. *Plant Soil.*, 56: 487 – 490.
- [6] Kannaiyan, S. 1999. Biological fertilizers for rice production. In: Kannaiyan, S (Ed) *Bioresources technology for sustainable agriculture*. Associate Publishing Company, New Delhi, pp.1– 29.
- [7] Rüttimann J.C., Rubio, L.M., Dean, D.R. and Ludden, P.W. 2003. VnfY is required for full activity of the vanadium-containing dinitrogenase in *Azotobacter vinelandii*. *J. Bacteriol.*, 185:2383–2386.
- [8] Singh, M.S., Devi, R.K.T. and Singh, N.I. 1999. Evaluation of methods for *Azotobacter* application on the yield of rice. *Ind. J. Hill Farm.*, 12 : 22–24.
- [9] Kader, M.A., Miar, M.H. and Hoque, M.S. 2002. Effects of *Azotobacter* inoculants on the yield and Nitrogen uptake by Wheat. *J. of Biol. Sciences.*, 2(4): 259-261.
- [10] Kiani, M.J., Abbasi, M.K. and Rahim, N. 2005. Use of organic manure with mineral N fertilizer increases wheat yield at Rawalakot Azad Jammu and Kashmir. *Archives of Agronomy and Soil Science* 51(3):299-309.
- [11] Hegab, S.A.M. and Abou El-Wafa, A.M. 2005. Relative efficiency of some nitrogen sources for maize and wheat crops. *Egypt J. Appl. Sci.* 20 (5a):109-127.
- [12] Shah, Z. and Ahmad, M.I. 2006. Effect of integrated use of farm yard manure and urea on yield and nitrogen uptake of wheat. *J. Agric. and Bio. Sci.* 1(1): 60-65.