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EFFECT OF PREVIOUS CROP AND N- RATE ON PRODUCTIVITY AND ECONOMIC EVALUATION OF GROWNING BREAD WHEAT USING RAISED BED TECHNIQUE

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ABSTRACT

This study was carried out at different locations (on farmers' fields) in Sharqia Governorate, Egypt, during 2012/2013 season to find out the effect of previous crop (rice, cowpea, cotton and maize), planting methods (traditional and raised bed) and nitrogen fertilizer rate (120 and 180 kg N ha^{-1}) on some wheat (var. Mesr 1) yield components, grain, straw and biological yields and NPK contents in grain and straw as well. Water applied and net return of growing wheat on raised bed, compared to confidential method (flat) were considered. The most important findings could be summarized as follows:

Regardless the previous crop and the assessed N-rate, the yield attributes of spike No m^{-2}, grain No $spike^{-1}$, grain weight $spike^{-1}$ and 1000 grain weight were higher under raised bed planting, comparable with traditional planting. In addition, grain, straw and biological yields exhibited the same trend. The abovementioned variables were higher as cowpea was the preceding crop. Regardless different locations, raised bed planting resulted in higher figures for the abovementioned variables even with lower N-rate e.g.120 kg N ha^{-1}, comparing with traditional planting with supplying N at180 kg ha^{-1}.

Higher N, P and K uptake for grain and straw yields were attained due to raised bed planting, comparable with traditional planting, and the values were greater as cowpea was the previous crop with supplying N at 180 kg ha^{-1} rate.

The applied irrigation water was varied from 3991 to 4513 m^3 ha^{-1} under raised bed planting method at different locations, comparing with 5781 m^3 ha^{-1} recorded with traditional planting.

In general, the highest cost estimated is about 5695 LE with traditional planting method, whereas, the lowest cost estimated i.e. 5295 LE was recorded with raised bed planting receiving the lowest N rates. The highest net return (27961 LE) was achieved due to growing wheat crop, after cowpea crop, on raised bed with supplying N at 180 kg ha^{-1}rate which. On the contrary, the lowest net return (15438 LE) was noticed with traditional planting method.

On conclusion, it is advisable to grow wheat crop, after a legume crop, on raised bed, where higher figures of wheat grain yield and its N, P and K contents were obtained. In addition, saving irrigation water and conserving soil fertility as well as higher net economic return were with planting wheat on raised bed instead of the conventional method.

Keywords: previous crop, N -rate, water applied, wheat crop, raised bed planting, net return

INTRODUCTION

Wheat (Triticum aestivum L.) belongs to family Poaceae tribe Hordeae. It is the most vital winter crop of Egypt. Wheat is primarily used as a staple food as long as more protein than any other cereal crops. It is consumed in many forms like bread, cakes, bakery products, biscuits, and many products of confectionery. Its straw is used as animal feed and manufacturing paper.

The rice - wheat system has threatened environmental safety and promoted degradation and inefficient use of natural resources, particularly soils and water (Gupta and Seth, 2007). It has also resulted in a number of ecological and other problems such as development of hardpan, low input use efficiency, including water, and emergence of insects–pests as well as environmental pollution through greenhouse gases emission (Humphreys et al., 2010). Furthermore, there is a great concern about groundwater depletion in large areas where the rice - wheat system prevails (Ambast et al., 2006; Hira, 2009; and Rodell et al., 2009). Also, Abou Keraisha et al. (2012) found that the growing cereal crops after legume crops produced more grain yield than those grown after none legume crops. They added that the available NPK and organic matter were higher in second cycle than that of zero time and the first cycle of the crop rotation. Chen et. al., (2004) stated that in cereal-legume rotation, the cereal benefits from the nitrogen fixed by the legume and the decomposition of the nutritive-biomass, root and nodules of legume which help the increases of soil organic matters as well as reduce weed population density and biomass production. Crop rotation affects soil fertility; it is increased with the inclusion of legumes in crop rotation. Legumes growing in association or in rotation with cereal crop were found to improve soil fertility according to (Akhtar et al., 2010). Some of the general reasons of crop rotation are: to maintain soil structure, increase soil organic matter, crop nutrient and water use efficiency as well as reduce soil erosion, pest infestation, reliance on agricultural chemicals (Riedell et al., 2009). Anderson (2008) quantified winter wheat response to preceding crop and crop management.

A change from sowing crops on flat to raised beds offers more effectual control of irrigation water and drainage, thereby increasing yields (Ram et al., 2013). Dhadli et al. (2009) reported that the 15–30% higher yield of soybean and 16% higher for the following wheat on raised bed compared to conventional tillage mainly due to avoidance of aeration stress compared with excessive wet conditions under flat system. Nitrogen plays a vital role in all living tissues of the plant. No other nutrient has such an influence on promoting vigorous plant growth. Wheat productivity and quality is conditioned by diverse factors of which climate, genetics, and crop management are the most relevant. Nitrogen is one of the main inputs of the winter wheat. Nitrogen efficient management is basic to optimizing its utilization while decreasing pollution risks and operational costs (Campillo et al., 2010). High wheat yields require increases in N application and the excessive addition of this nutrient can contribute to watercourse pollution (Semenov et al., 2007). Among the fertilizer inputs used in wheat crops, N fertilizer normally affects production costs more than other inputs (Fundación Chile, 2005). Production of high wheat yields requires the application of high N rates, and the excess of this nutrient can promote watercourse pollution.

The aim of this investigation is to study the effect of planting method and nitrogen fertilizer rates on yield, its attributes and nutrients uptake of wheat plant as well as water saving and net return under different previous crop conditions.

MATERIALS AND METHODS

A field experiment was carried out on farmers' fields at different sites located in Sharqia Governorate, Egypt e.g. Abu Hammad, Belpis, Qnayat, and Faqous, during 2012/2013 winter season. The aim is to study the effects rice, cowpea, cotton and maize as preceding crops grown at Abu Hammad, Belpis, Qnayat, and Faqous, respectively, combined with both planting methods (raised beds and conventional method, flat) and 120 and 180 kg N ha^{-1} rates on wheat crop performance (Triticum aestivum L.,cultivar Mesr 1). Some relevant soil physical and chemical properties of the experimental sites are listed in Table 1 which were determined according to Ryan et al., (1996)

The adopted treatments were tested in a randomized complete block design with four replicates. With raised bed technique, the wheat was planted on slightly raised bed 1.2 m in width which separated with small furrows (25 cm in depth and 30 cm in width) in order to facilitate irrigation water advance. The adopted treatments were as follows:

1. Farmer practice with previous crop (rice) + 180 kg N ha^{-1} (control).
2. Raised bed with previous crop (rice) + 120 kg N ha^{-1}
3. Raised bed with previous crop (rice) + 180 kg N ha^{-1}
4. Raised bed with previous crop (Cowpea) + 120 kg N ha^{-1}
5. Raised bed with previous crop (Cowpea) + 180 kg N ha^{-1}
6. Raised bed with previous crop (cotton) + 120 kg N ha^{-1}
7. Raised bed with previous crop (cotton) + 180 kg N ha^{-1}
8. Raised bed with previous crop (maize) + 120 kg N ha^{-1}
9. Raised bed with previous crop (maize) + 180 kg N ha^{-1}

Surface irrigation was adopted in different locations. The irrigation water, for all plots, was calibrated using cutthroat flume. A standard rectangular cut-throat flume was installed in the inlet of each plot under free flow conditions. The depth of the water head (ha) was measured and the discharge (Q) was determined using the following equation as follows:

$$Q = C \, ha \, 1.56$$

where

C is a coefficient constant of the flume. Under traditional planting treatment the normal irrigation practice was followed, where the farmer fills the basins frequently without taking into account the crop's requirements, however, irrigation water amounts and timing were recorded.

Grains of wheat were sown at the rate of 120 and 180 kg ha^{-1} for raised bed and flat (farmer practices), respectively. Sowing dates were extended from 15th to 28th November at different locations. The area of the experimental plot was 84 m^2.

Table 1. Some soil physical and chemical properties post preceding crops under different locations.

Parameter		previous crop and location			
		Rice (Abu Hammad)	**Cowpea (Belpis)**	**Cotton (Qnayat)**	**Maize (Faqous)**
pH, soil: water susp., 1:2.5		8.14	8.09	8.38	8.17
EC, dS m^{-1}, soil paste		3.43	4.14	3.38	1.65
OM	%	1.42	1.55	1.51	1.48
$CaCO_3$	%	3.78	3.24	2.89	2.88
Sand	%	27.53	25.31	16.33	18.33
Silt	%	36.64	34.72	36.77	36.28
Clay	%	35.83	39.97	46.90	45.39
Soil texture		Silty clay	Silty clay	Clay	Clay
Cations and anions					
Ca^{++}	Me L^{-1}	15.99	18.58	14.89	8.09
Mg^{++}	Me L^{-1}	11.59	11.39	9.99	6.59
Na^{+}	Me L^{-1}	6.53	10.94	8.49	1.60
K^{+}	Me L^{-1}	0.16	0.46	0.16	0.16
CO_3^{--}	Me L^{-1}	0.00	0.00	0.00	0.00
HCO_3^{-}	Me L^{-1}	14.65	13.59	8.99	5.29
Cl^{-}	Me L^{-1}	10.59	16.39	18.38	3.00
SO_4^{--}	Me L^{-1}	9.03	11.39	6.16	8.15
Available macronutrients					
N	Ppm	15.42	45.22	35.12	36.45
P	Ppm	7.93	14.97	13.26	6.63
K	Ppm	350	385	320	366

Phosphoric fertilizer, as calcium superphosphate (15.5% P_2O_5), and potash fertilizer, as potassium sulphate (48% K_2O), were supplied during seed- bed preparation at 36 kg P_2O_5 ha^{-1} and 58 kg K_2O ha^{-1} rates, respectively. Nitrogen fertilizer, as ammonium nitrate (33.5 % N), was applied at two times, 2/3 of the assessed N dose before life (Mohayah) irrigation and the remainder at the next irrigation. All cultural practices were carried out according to normal methods being adopted for wheat production.

Plants of each plot were harvested and biological, grain and straw yields and harvest index as well were determined. Data concerning yield components e.g. spike number m^{-2}, grain number $spike^{-1}$, grain weight $spike^{-1}$, and 1000 grain weight were considered. Samples of grain and straw were wet – digested according to Nkonge, and Ballance (1982) and nitrogen was determined as described by Parkinson and Allen (1975). Phosphorous was determined colourimetrically using ammonium molybdate and ammonium metavanadate as outlined by Ryan et al.,(1996), whereas potassium was determined using flame spectrophotometry method (Black, 1982). The uptake N, P and K of grain, straw and biological yields were calculated based on element% multiplied by dry weight of each yield (kg ha^{-1}).

The results were statistically analyzed using M-stat computer package to calculate F ratio according to Snedecor and Cochran (1990). Least significant difference (L.S.D) was used to differentiate means at the 0.05 level (Waller and Duncan, 1969).

RESULTS AND DISCUSSION

Some yield components of bread wheat crop

Data in Table 2 show that all of the yield components under investigation were significantly affected due to the adopted treatments. The highest values of spike No m-2 (433.3) and grain weight spike^{-1} (4.31 g) were recorded with wheat grown, after maize crop, on raised bed and supplied with N at 180 kg ha^{-1} rate. Grain No spike^{-1} and 1000 grain weight traits exhibited different trends, where the highest value of grain No spike^{-1}(87.0) was obtained with wheat grown after cotton crop on raised bed and received 180 kg N ha^{-1}. Whereas, the highest1000-Grain weight value (57.87g) was attained due to growing wheat on raised bed after maize crop and received 120 kg N ha^{-1}. Regardless the previous crops and the assessed N-rates, Spike No m^{-2}, Grain No spike^{-1}, Grain weight spike^{-1} and 1000 Grain weight yield attributes were higher by 3.15, 5.18, 22.18 and 5.15%, respectively, under raised bed planting, comparable with traditional planting. The longer wheat yield components in raised bed were probably due to wider spacing, which provided better light conditions in the canopy for photosynthesis than with wheat on flat layout. Such results agree with Ram et al. (2013) who concluded that the spike length and number of grains per spike were greater in raised beds than with flat layout. Moreover, in rice - wheat systems, Ram et al. (2012) found that the mono-cropping systems in most occasions recorded yield depression which could be due to the apparent increases of pathogenic micro-organisms population, decrease population of beneficial micro-organisms in crop rhizosphere and increase production of phytoxic allelopathic chemicals and impair physical and chemical soil conditions. Data in Table 2 indicate that the investigated yield attributes were improved under raised bed technique even with lower N-rate e.g 120 kg N ha^{-1}, regardless different locations, where spike No m^{-2}, grain No spike^{-1}, grain weight spike^{-1} and 1000 grain weight exhibited higher figures amounted to 2.93, 3.58, 20.47 and 4.46%, respectively, higher than that recorded with traditional planting and receiving N at180 kg ha^{-1}.

Table 2. Effect of previous crop and nitrogen rates on some yield components of wheat grown in different locations.

Previous crop and location	Treatment	Spike N° m^{-2}	Grain N° spike^{-1}	Grain weight spike(g)$^{-1}$	1000 Grain weight (g)
Rice (Abu Hammad)	Farmer practice + 180 kg N ha^{-1} (control)	391.3	74.00	3.07	48.22
	Raised Bed + 120 kg N ha^{-1}	405.7	76.00	3.86	50.75
	Raised Bed + 180 kg N ha^{-1}	415.7	74.33	3.74	50.37
Cowpea (Belpis)	Raised Bed + 120 kg N ha^{-1}	391.7	81.00	3.63	44.80
	Raised Bed + 180 kg N ha^{-1}	360.0	80.00	3.90	48.72
Maize (Qnayat)	Raised Bed + 120 kg N ha^{-1}	386.7	71.00	4.11	57.87
	Raised Bed + 180 kg N ha^{-1}	433.3	76.00	4.31	56.67
Cotton (Faqous)	Raised Bed +120 kg N ha^{-1}	428.3	79.00	3.83	48.45
	Raised Bed + 180 kg N ha^{-1}	411.0	87.00	4.17	47.98
LSD,0.05		26.17	10.28	0.522	1.945

Grain, straw, biological yields and harvest index

The results in Table 3 reveal that grain, straw, biological yields and harvest index were significantly influenced due to the assessed treatments. Higher values of grain, straw and biological yields were recorded with raised bed planting method, comparing with traditional planting and the values were superior as cowpea was the preceding crop. Such finding proved that inclusion of a legume crop in the cropping system can play an increasingly important role to maintain soil fertility and sustain crop productivity. In connection, Pandiaraj et al., (2015) found that the wheat crop was responded strongly to the previous legume crop (green gram) and grain yield was increased by a factor of 1.89 and straw yield by 2.05, compared to the control (after maize). In addition, Dogan and Bilgili 2010; Kamel et al 2010; El-Masry et al. 2010 and Abou Keraisha et al. 2012 demonstrated that planting cereal crops after legume produced more grain yield than those grown after non-legume crops. In general, data reveal that raised bed planting surpassed traditional planting, where wheat grain, straw and biological yields were increased by 31.23, 35.75 and 36.02%, respectively, higher than that under traditional planting method. There are indications that yields of wheat on raised bed can be further increased through nitrogen applications because of the reduced loss of lodging on raised bed. Such findings are in parallel with those of Alam, (2012) stated that wheat grain yield was higher with raised bed planting method than conventional planting one due to improving yield components.

Table 3. Effect of previous crop and nitrogen rates on grain, straw and biological yields of wheat grown in different locations.

Previous crop and location	Treatment	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Biological yield (t ha^{-1})	Harvest index (%)
Rice (Abu Hammad)	Farmer practice Rice + 180 kg N ha^{-1}(control)	6.540	7.053	13.59	48.11
	Raised Bed + 120 kg N ha^{-1}	8.237	10.87	19.11	43.11
	Raised Bed + 180 kg N ha^{-1}	9.190	11.29	20.48	44.87
Cowpea (Belpis)	Raised Bed + 120 kg N ha^{-1}	10.120	12.66	22.78	44.42
	Raised Bed + 180 kg N ha^{-1}	10.200	11.99	22.19	46.00
Maize (Qnayat)	Raised Bed + 120 kg N ha^{-1}	9.540	11.62	21.16	45.08
	Raised Bed + 180 kg N ha^{-1}	9.643	12.30	21.94	43.94
Cotton (Faqous)	Raised Bed + 120 kg N ha^{-1}	9.553	11.39	20.94	45.64
	Raised Bed + 180 kg N ha^{-1}	9.603	11.75	21.35	44.96
LSD,0.05		0.413	0.677	0.9465	1.323

Data in Table 3 prove that raised bed technique is still improving grain, straw, biological yields even with lower N-rate, regardless different locations, where grain, straw, biological yields values reached to 30.13, 39.41 and 35.25 %, respectively, higher than that obtained with traditional planting and receiving N at180 kg ha^{-1} .

N, P and K uptake of grain bread wheat

Data in Table 4 demonstrate that values of N, P and K uptake in wheat grains were significantly influenced due to the assessed treatments. The highest grains N, P and K uptake figures were recorded as wheat was grown after cowpea crop using raised bed technique and received N at 180 kg ha^{-1}

rate. In connection, Pandiaraj et al., (2015) pointed out that the N application and inclusion of a legume (green gram) in the cropping system significantly increased the N uptake by wheat crop. Furthermore, Giller (2001) observed that legumes can fix substantial amounts of atmospheric N_2, which allows them to be grown in N-impoverished soils without fertilizer or N inputs. Data also indicate that increasing N rate to180 kg ha^{-1} under raised bed planting resulted in higher values of N, P and K uptake in wheat grains, compared with120 kg N ha^{-1}. Such findings may be due to that nitrogen caused an increase in meristematic activity and the amount of metabolites synthesizing by the plant and nitrogen is an essential nutrient controlling the new growth and improved plant photosynthetic capability. The present data demonstrate that, regardless N rates and preceding crops, raised bed technique induced N, P and K uptake values for wheat grains amounted to 36.40, 57.04 and 38.33%, respectively, higher than that under traditional planting. In addition, raised bed technique resulted in higher N, P and K uptake values for wheat grains even with lower N-rate, regardless different locations, where N, P and K uptake reached to 31.98, 52.99 and 34.67%, respectively, higher than that obtained with traditional planting and receiving N at180 kg ha^{-1}.

Table 4. Effect of previous crop and nitrogen rates on grain wheat N, P and K uptake in different locations.

Previous crop and location	Treatment	Macronutrients uptake of wheat grain (kg ha^{-1})		
		N	P	K
Rice (Abu Hammad)	Farmer practice + 180 kg N ha^{-1} (control)	147.0	16.21	30.60
	R B + 120 kg N ha^{-1}	192.7	30.65	42.14
	R B +180 kg N ha^{-1}	236.3	38.58	50.00
Cowpea (Belpis)	R B + 120 kg N ha^{-1}	239.1	38.03	52.30
	R B+ 180 kg N ha^{-1}	265.1	43.28	56.08
Maize (Qnayat)	R B+ 120 kg N ha^{-1}	214.3	34.06	46.87
	R B+ 180 kg N ha^{-1}	238.1	38.88	50.35
Cotton (Faqous)	R B+ 120 kg N ha^{-1}	218.3	35.19	46.05
	R B + 180 kg N ha^{-1}	251.0	41.46	53.14
LSD,0.05		8.639	2.673	4.307

N, P and K uptake of straw bread wheat

Data in Table 5 show that values of N, P and K uptake in wheat straw were significantly affected due to the investigated treatments. Higher N, P and K uptake for wheat straw were attained due to raised bed planting, compared with traditional planting, and the value was superior as cowpea was the previous crop and supplying N at 180 kg ha^{-1} rate. Such results could be justified based on the role of the decayed residues of cowpea in improving soil structure, thereby improving aeration, moisture movement and retention. In addition, chemical function is manifested by organic matter ability to interact with metals, metal oxides, hydroxides and clay mineral to form metal organic complexes and act as ion exchange and store house of macro and micronutrients. Moreover, biological function which provides carbon as energy source to N-fixing bacteria enhances plant growth root initiation facilitating nutrient uptake, improving chlorophyll synthesis and seed germination (Prochazkova et al., 2003 and Ingle et al., 2004). As for the favorite impacts of raised bed technique and regardless N rates and preceding crops, higher N, P and K uptake in wheat straw were obtained and reached to 41.64, 46.59 and 43.33%, respectively, higher than that under traditional planting. In addition, increasing N rate resulted in higher N, P and K uptake in wheat straw, except those under rice as previous crop, where the uptake value did not greatly alter due to the assessed N rates. Furthermore, raised bed technique induced higher N, P and K uptake values for wheat straw yield even with lower N-rate, regardless different locations, where N, P and K uptake values reached to 36.62, 43.69 and 39.88%, respectively, higher than that attained with traditional planting and receiving N at180 kg ha^{-1}.

Table 5. Effect of previous crop and nitrogen rates on N, P and K uptake of straw wheat grown in different locations.

Previous crop and location	Treatment	Macronutrients uptake of wheat grain (kg ha^{-1})		
		N	P	K
Rice (Abu Hammad)	Farmer practice + 180 kg N ha^{-1} (control)	34.69	14.95	134.3
	R B + 120 kg N ha^{-1}	60.72	29.38	243.6
	R B +180 kg N ha^{-1}	63.66	28.49	244.0
Cowpea (Belpis)	R B + 120 kg N ha^{-1}	52.68	25.48	211.3
	R B+ 180 kg N ha^{-1}	68.27	30.49	262.2
Maize (Qnayat)	R B+ 120 kg N ha^{-1}	53.56	25.87	214.6
	R B+ 180 kg N ha^{-1}	66.62	29.73	255.7
Cotton (Faqous)	R B+ 120 kg N ha^{-1}	51.96	25.47	224.0
	R B + 180 kg N ha^{-1}	58.01	28.98	240.5
LSD,0.05		4.050	3.123	20.17

Applied water m^3 ha^{-1}

Respecting the rate of savings in irrigation water, data in Table 6 illustrate that the raised bed, regardless the assessed N –rates, resulted in higher savings in irrigation water more than the farmer practice. The applied irrigation water was varied from 4513 to 3991 m^3 ha^{-1} for planting wheat on raised bed, compared with 5781 m^3 ha^{-1} for traditional planting (flat treatment). The applied water for wheat sowing on raised bed after cowpea was lower than flat treatment by 1790 m^3 ha^{-1} with savings in irrigation water by 30.96 %. This might be due to the reduction of soil surface evaporation and deep percolation losses with raised bed technique, compared to the flat one. Abd El-Halim and Abd El-Razek, (2014) concluded that applying water through the raised bed method saved about 42% of the water applied, comparable with the flat one. Furthermore, Aggarwal and Goswami (2003) and Ram et al., (2005) have also showed similar or higher yields of wheat on raised beds compared with flat with 30–50% reduction in irrigation water. The hypothesis of raised bed technology is to exploit irrigation water by reduce water losses by decreasing evaporation, deep percolation, surface run-off and seepage. These advantages come from the fact that irrigation water advances is faster in raised bed than in flat treatment and less water percolation losses were attained with raised bed technique. These findings are in agreement with those obtained by Ram, et al., (2013) who stated that the wheat grown on raised beds received 18.8% lower applied water than flat method.

Table 6. Effect of previous crop and agricultural methods on applied water ($m^3 ha^{-1}$) of wheat grown in different locations.

Previous crop and location	Parameters		
	Applied water ($m^3 ha^{-1}$)	Rate of savings in irrigation water ($m^3 ha^{-1}$)	Rate of savings in irrigation water %
Farmer practices (Rice, Abu Hammad)	5781	0.00	0.00
Raised Bed (Rice, Abu Hammad)	4084	1697	29.35
Raised Bed (Cowpea, Belpis)	3991	1790	30.96
Raised Bed (Maize, Qnayat)	4032	1749	30.25
Raised Bed (Cotton, Faqous)	4513	1268	21.93

Economic Evaluation of wheat under different adopted treatments:

Total Cost:

Data in Table 7a show that the highest total cost e.g. 5695 LE was attained with traditional planting method, whereas, the lowest cost estimated 5295 LE with growing wheat on raised bed and received the lowest N rates, under all circumstances of the previous crops. The increase in total cost, under traditional planting, is attributable to higher costs of seeds, fertilizers and irrigation management which is estimated 400 LE higher than those with raised bed planting method and representing 7.02 % of the total variable costs under traditional planting method.

Table 7a. Total cost (LE ha^{-1}) for wheat grown in different locations as affected by previous crop and both planting methods and N rates.

	Treatment	Variable cost							Field Rent	Total Cost
		plowing	Seeds	Planting	Irrigation	Fertilizer	Weeds	Harvesting		
Rice (Abu Hammad)	Farmer practice + 180 kg N ha^{-1} (control)	200	300	80	500	515	200	900	3000	5695
	Raised bed + 120 kg N ha^{-1}	200	200	80	300	415	200	900	3000	5295
	Raised bed + 180 kg N ha^{-1}	200	200	80	300	515	200	900	3000	5395
Cowpea (Belpis)	Raised bed + 120 kg N ha^{-1}	200	200	80	300	415	200	900	3000	5295
	Raised bed + 180 kg N ha^{-1}	200	200	80	300	515	200	900	3000	5395
Maize (Qnayat)	Raised bed + 120 kg N ha^{-1}	200	200	80	300	415	200	900	3000	5295
	Raised bed + 180 kg N ha^{-1}	200	200	80	300	515	200	900	3000	5395
Cotton (Faqous)	Raised bed + 120 kg N ha^{-1}	200	200	80	300	415	200	900	3000	5295
	Raised bed + 180 kg N ha^{-1}	200	200	80	300	515	200	900	3000	5395

Source: Collected and calculated from data of experimental field.

Net return [1]:

Based on the price of wheat outputs e.g. 2800 and 400 LE/ton of grain and straw yields, respectively, it is clear from Table 7b that the highest net return (27961 LE) was achieved due to growing wheat, after cowpea crop, on raised bed and supplied with the highest N rate. Applying traditional planting method (control) resulted in the lowest net return (15438 LE). Regardless previous crops and N-rates, growing wheat crop on raised beds was most profitable, where the net return was higher by 40.57% than that with traditional planting method. Higher net return due to planting wheat on raised beds is attributed to saving in the costs of seeds, watering and energy. These results are in agreement with the findings of Ladha et al., (2009) and Jat et al., (2009) who reported that the raised bed method saves in irrigation and production costs and resulted in higher net economic returns in compared with conventional systems. In connection, Aggarwal and Goswami (2003) and Ram et al. (2005) have also reported similar or higher yields of wheat on raised beds and 30–50% reduction in irrigation water use on raised bed planting method, compared with flat planting one. In addition, higher net returns obtained from soybean and wheat grown under raised bed treatments were due to higher yields and lower variable costs compared with other treatments.

Table 7 b. Net return of wheat grown in different location as affected by agricultural methods in both seasons.

Previous crop and Location	Treatment	Total return	Total cost	Net return
Rice (Abu Hammad)	Farmer practice + 180 kg N ha^{-1} (control)	21133	5695	15438
	Raised Bed + 120 kg N ha^{-1}	28128	5295	22833
	Raised Bed + 180 kg N ha^{-1}	30248	5395	24853
Cowpea (Belpis)	Raised Bed + 120 kg N ha^{-1}	32684	5295	27389
	Raised Bed + 180 kg N ha^{-1}	33356	5395	27961
Maize (Qnayat)	Raised Bed + 120 kg N ha^{-1}	31360	5295	26065
	Raised Bed + 180 kg N ha^{-1}	31920	5395	26525
Cotton (Faqous)	Raised Bed + 120 kg N ha^{-1}	31304	5295	26009
	Raised Bed + 180 kg N ha^{-1}	31588	5395	26193

Source*:* collected and calculated from data of experimental field.

CONCLUSION

Based on the present results, it is advisable to grow wheat crop, after a legume crop, on raised bed which exhibited higher figures of wheat grain yield and its N, P and K contents. In addition, saving irrigation water and conserving soil fertility as well as higher net economic return do important issues prefer planting wheat on raised bed instead of the conventional method.

([1]) Net return=(productivity*price)-total cost

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تاثير المحصول السابق ومعدلات من السماد النيتروجينى على الانتاجية والتقييم الاقتصادى لقمح الخبز المنزرع باستخدام تكنولوجيا المصاطب

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أجريت هذه الدراسة في مواقع مختلفة في حقول المزارعين بمحافظة الشرقية مصر خلال الموسم الزراعي 2013/2012.لمعرفة تاثير المحصول السابق (ارز- لوبيا – قطن –ذرة شامية) و طرق الزراعة(احواض مسطحة ومصاطب) ومعدلات مختلفة من النيتروجين (120 و 180 كجم نيتروجين للهكتار) على محصول قمح ومكوناته والمحتوى الغذائي وكذلك كمية المياه المضافة وصافى الربح لقمح الخبز صنف مصر 1 النامى على مصاطب مقارنة بزراعته بالطريقة العادية.

وكانت اهم النتائج كما يلى:

بغض النظر عن المحصول السابق ومعدلات التسميد النيتروجينى فان مكونات محصول القمح(عدد السنابل للمتر المربع وعدد حبوب السنبلة ووزن حبوب السنبلة ووزن الالف حبة) قد زادت معنويا بزراعة القمح على مصاطب مقارنة بالطريقة العادية(مسطح) ، هذا بالإضافة الى ان محصول الحبوب والقش والبيولوجى قد اعطى نفس الاتجاه. وان القياسات السابقة قد زادت معنويا عند زراعة القمح عقب محصول اللوبيا.

وبغض النظر عن اختلاف المواقع فان الزراعة على مصاطب قد أعطت اعلى القيم معنويا لتلك الصفات السابقة مع المعدل المنخفض من النيتروجين 120 كجم ن/ هكتار مقارنة بزراعة القمح في احواض(الطريقة العادية) مع إضافة 180 كجم ن/ هكتار.

ان الممتص من النيتروجين والفوسفور والبوتاسيوم في الحبوب والقش قد زاد معنويا بزراعة القمح على مصاطب مقارنة بالطريقة العادية(مسطح) وان تلك القيم قد زادت معنويا عند زراعة القمح عقب محصول اللوبيا واضافة 180 كجم ن/ هكتار.

تراوحت قيم مياه الرى المضافة من 3991 الى 4513 متر مكعب للهكتار عند الزراعة على مصاطب باختلاف المواقع مقارنة بـ 5781 متر مكعب للهكتار عند زراعة القمح بالطريقة العادية(مسطح).

على وجه العموم، جاءت اعلى قيم للتكلفة الاقتصادية وقدرت ب 5695 جنيه مصري للهكتار وذلك عند استخدام الطريقة العادية في الزراعة. بينما سجلت اقل القيم وقد وقدرت ب 5295 جنيه مصري للهكتار وذلك بزراعة القمح على مصاطب باستخدام المعدل الأقل من النيتروجين (120 كجم نيتروجين للهكتار). في حين سجل اعلى صافى ربح بزراعة القمح على مصاطب عقب محصول اللوبيا مع استخدام 180 كجم نيتروجين للهكتار وقد قدر ب 27961 جنيه مصري للهكتار وباستخدام طريقة الزراعه العادية (احواض مسطحة) أعطت اقل صافى ربح وقد قدر ب 15438 جنيه مصري للهكتار. وفى الختام، فمن المستحسن ان يزرع القمح عقب اللوبيا كمحصول بقولى على مصاطب، لكى يتم الحصول على اعلى قيم لمحصول الحبوب والممتص من النيتروجين والفوسفور والبوتاسيوم بالإضافة الى الحفاظ على مياه الرى وللمحافظة على خصوبة التربة فضلا عن ارتفاع صافى الربح الاقتصادى من زراعة القمح على مصاطب بدلا من الطريقة التقليدية.