SUMMARY

This experimental work was carried out at several sites at the Northwestern Coast (NWC) and the Northeastern Coast (NEC) of the North Coast Region (NCR) during 1989/90, 1990/91 and 1991/92 seasons. As stated previously the objectives of this work could be summarized in the main follwoing points.

I. To set fertilization recommendation for barley grown in the (NC) areas of Egypt.

II. To evaluate the recommended barley cultivars for rainfed areas under the fertilization treatments studied.

Factor under study were :

I Fertilization combination were as follows :

1- Control treatment.

2- Phosphorous alone at the rate of 15 kg /fed. (P_2O_5)

3- Phosphorous alone at the rate of 30 kg /fed. (P_2O_5)

4- Nitrogen alone at the rate of 15 kg /fed. (N)

5- Nitrogen alone at the rate of 30 kg /fed. (N)

6- A combination of N at the rate of 15 kg/fed. (N) and phosphorous at the rate of 15 kg (P_2O_5).

7- A combination of N at the rate of 15 kg/fed. (N) and phosphorous at the rate of 30 kg (P_2O_5).

8- A combination of N at the rate of 30 kg/fed. (N) and phosphorous at the rate of 15 kg (P_2O_5).

9- A combination of N at the rate of 30 kg/fed. (N) and phosphorous at the rate of 30 kg (P_2O_5).

II. Barley varieties : Three barley varieties were used as the bioassay material in this study : These are CC89 - Giza 123- Giza 124.

In this research work a site x year combination was referred to as environment . Therefore, we have eight environments. From the West to the East the environments are as follow :

1- Sidi Barrani	1990/1991	west Matrouh
2- Sidi Barrani	1991/ 92	west Matrouh
3- El-Mthany	1991/ 92	west Matrouh
4- Wady El-Washk	1991/ 92	Marsa Matrouh
5- Atnooh	1991/ 92	east Matrouh
6- El-Dabaa	1989/ 90	east Matrouh
7- Raffah	1989/ 90	north Sinai
8- Raffah	1991/ 92	north Sinai

This representes most of the variations across the Northern Coastal environments and other agroclimatological parameters such as soil type, soil fertility, rainfall and temperatures.

The experiments were arranged in split plot design with three replications at each site. The three cultivars were assigned to the main plots and fertilizations treatments were assigned to the sub plots.

Results in general could be summarized as follows :

1- Phosphorous alone did not have material effect on growth characters, yield contributing characters and yield of barley. Raffah 1991/92 was an exception.

2- There was positive effect to nitrogen alone which was evident in hgiher grain, straw and biological yields and in some-yield related characters.

3- Nitrogen and phosphorous in combination showed enhanced effect on most of the characters studied here. Yields of barley were improved with increasing the rate of N and P. The highest yields were obtained when N and P were at their highest rates (30kg N + 30 kgP_2O_5/fed.).

4- The responses to fertilizer are closely related to amount of rainfall and tend to decrease with decreasing seasonal rainfall

5- The variety CC89 did not do as better as Giza 123 and Giza 124 at any environments. In fact, it was the poorest in most measured characters. Whereas Giza 123 and Giza 124 ranked first at various environments.

6- The highest grain, straw and biological yields and some-yield related characters were obtained for those plants grown in Sidi Barrani 1991/92 and Raffah 1991/92. But the lowest were obtained for those plants grown in El-Dabaa 1989/90 and Sdi Barrani 1990/91. These results could be attributed to differences in the amount of rainfall as well as rainfall distribution.

The major results for each character as affected by the treatments as follows :

I. Vegetative Growth :

1) Plant Height:

Applying P fertilizer at the rate of 15 kg/fed. resulted in significant increase in plant height compared to the control at Sidi Barrani 1990/91 only. Applying N fertilizer at the rate of 15 or 30 kg/fed. resulted in signficiant increase in plant height compared to the control at El-Mthany 1991/92, Sidi Barrani 1991/92, Wady El-Washk 1991/92 and Raffah 1991/92. The tallest plant height was recorded when N and P rates were applied at their highest rates (30kg N + 30 kgP_2O_5 /fed.) at most environments.

The differences in plant height among varieties were not significant at all environments.

The tallest barley plants were those obtained at Raffah 1991/92. On the contrary, the shortest plants were obtained for those plants grown in Sidi Barrani 1990/91.

2) Spike length :

Applying P fertilizer alone at the rate of 15 or 30 kg/fed. resulted in significant increase in spike length compared to the control at Sidi Barrani 1990/91 only. While applying N fertilizer at the rate of 15 or 30 kg/fed. resulted in significant increase in spike length compared to the control at the six environments of Sidi Barrani 1990/91, Sidi Barrani 1991/92, El-Mthany 1991/92, Wady El-Washk 1991/92, Atnooh 1991/92 and Raffah 1991/92. When N and P fertilizers were added together the increases in spike length were significant compared to the control at the same six environments mentioned before.

There was significant differences in spike length among varieties at all environments except for those plants grown at Raffah 1989/90. The two cultivars Giza 123 and Giza 124 gave longer spikes than those of CC89 cultivar.

The highest three spike lengths were obtained for those plants grown at El-Dabba 1989/90, El-Mthany 1991/92 and Raffah 1991/92. On the contrary, the shortest spikes were obtained for those plants grown at Sidi Barrani 1990/91 and Raffah 1989/90.

3)Leaf area:

No significant difference in leaf area at all environments when P was added alone was detected. Applying N fertilizer at the rate of 15 kg/fed.

significantly increased leaf area compared to the control at Atnooh 1991/92, Wady El-Washk 1991/92, Sidi Barrani 1991/92 and Raffah 1991/92. While applying N fertilizer at the rate of 30 kg /fed. significantly increased leaf area compared to the control at the six environments of Sidi Barrani 1990/91, Sidi Barrani 1991/92, El-Mthany 1991/92, Wady El-Washk 1991/92, Atnooh 1991/92 and Raffah 1991/92. The highest leaf areas at most environments were recorded when N and P were used at their highest rates (30 kg N + 30 kg P_2O_5/fed.).

The differences in leaf area among cultivars were not significant at all environments.

The highest two leaf areas were those obtained for plants grown at Sidi Barrani 1991/92 and Raffa 1991/92. On the contrary, plants grown at Sidi Barrani 1990/91 and Raffah 1989/90 gave the lowest leaf areas.

4) Straw yield:

No significant difference in straw yield occurred at all environments when P was added alone except at Raffah 1991/92 whereas when P was added at the rate of 15 kg /fed. significant increase in straw yield occurred compared to the control. applying N at the rate of 15 kg/fed. resulted in significant increase in straw yield compared to the control at Wady El-Washk 1991/92, Sidi Barrani 1991/92 and Raffah 1991/92. But applying N fertilizer at the rate of 30 kg/fed. significantly increased straw yield at the six environments of Sidi Barrani 1991/92, Wady El-Washk 1991/92,

Atnooh 1991/92, El-Mthany 1991/92, Sidi Barrani 1991/91 and Raffah 1991/92.

When N and P ferttilizers were added in the combination the increases in straw yield were significant compared to the control. The highest straw yields at Sidi Barrani 1990/91, Atnooh 1991/92, El-Mthany 1991/92 and Raffah 1991/92 were achieved with treatment (30 kg N + 30 kg P_2O_5/fed.). Straw yield of the barley plants that received (30 kg N + 30 kg P_2O_5/fed.). outyielded those plants of the control with 81%, 222%, 71% and 197% at the four environments mentioned above respectively. On the other side, the highest straw yields of barley plants grown at Wady El-Washk 1991/92 and Sidi Barrani 1991/92 were achieved by adding (30 kg N + 15 kg P_2O_5/fed.). The increase in percentages due to the last treatment over the control were 132% and 121% respectively.

The differences in straw yields among varieites were significant at Atnooh 1991/92 and Wady El-Washk. The two varieties Giza 123 and Giza 124 produced high straw yields compared to CC89 variety. The same trend was observed at most environments eventhough the differences were not significant.

The highest straw yields were obtained for those plants grown in Sidi Barrani 1991/92 and Raffah 1991/92. On the contrary, the lowest straw yields were obtained for those plants grown in Sidi Barrani 1990/91 and El-Dabaa 1989/90.

The effect of the interaction between fertilization x variety on straw yield was significant at Raffah 1991/92 only.

5) Biological yield:

Adding P fertilizer alone at the rate of 15 kg/fed. significantly increased biological yield compared to the control at Raffah 1991/92 only. Applying N fertilizer at the rate of 15 kg/fed. resulted in significant increase in biological yield compared to the control at Sidi Barrani 1991/92, Wady El-Washk 1991/92, and Raffah 1991/92. But with 30 kg N/fed. significant increase in biological yields compared to the control were observed at the six environments of Sidi Barrani 1990/91, Sidi Barrani 1991/92, El-Mthany 1991/92, Wady El-Washk 1991/92, Atnooh 1991/92 and Raffah 1991/92. The highest biological yields at Sidi Barrani 1990/91, Atnooh 1991/92, Wady El-Wask 1991/92, El-Mthany 1991/92 and Raffah 1991/92 were achieved by adding treatment (30 kg N + 30 kgP_2O_5/fed.). Biological yield of the barley plants receiving the treatment (30 kg N + 30 kg P_2O_5/fed.) outyielded those plants of the control with 90%, 202%, 143%, 69% and 187% at the five environments mentioned above, respectively. On the other side, the highest biological yields of barley at Sidi Barrani 1991/92 were achieved by adding (30 kg N + 15 kg P_2O_5/ fed.). Percentage increase due to last treatment compared to the control were 122%.

The differences in biological yields among varieties were significant at Atnooh 1991/92, Wady El-Washk 1991/92 only. Variety CC89 produced less biological yield than the two varieties Giza 123 and Giza 124. The same trend was observed at most environments eventhough the differences were not significant.

The highest biological yeilds were obtained for plants grown in Sidi Barrani 1991/92 and Raffah 1991/92. On the contrary, the lowest biological yield were obtained for plants grown in Sidi Barrani 1990/91 and El-Dabaa 1989/90.

The effect of the interaction between fertilization x variety on biological yield was significant at Raffah 1991/92 only.

II. Yield and Yield Components :

1) Number of spikes /m^2:

Applying P fertilizer at the rate of 15 or 30 kg/fed. showed less effect on number of spikes/m^2 at all environments. Adding N fertilizer at the rate of 15 kg /fed. significantly increased the number of spikes/m^2 compared to the control at Wady El-Washk 1991/92 and Sidi Barrani 1991/92. Also applying 30 kg N/fed. resulted in significant increase in number of spikes/m^2 at Wady El-Washk 1991/92, Atnooh 1991/92 and Sidi Barrani 1991/92. When N and P fertilizer were added together the increases in number of spikes/m^2 were significant compared to the control at Sidi

Barrani 1990/91, Atnooh 1991/91, Wady El-Washk 1991/92, El-Mthany 1991/92 and Sidi Barrani 1991/92. The highest number of spikes/m^2 were achieved by adding treatment (30 kg N + 30 kg P_2O_5/fed.) at most environments.

The differences in number of spikes/m^2 among varieties were significant at Atnooh 1991/92 only. Variety Giza 123 produced the highest number of spikes/m^2 followed by Giza 124 variety and the lowest Cc89 variety. The same trend was observed at most environments eventhough the differences were not significant.

The highest number of spikes/m^2 were obtained for plants grown in El-Mthany 1991/92 and Sidi Barrani 1991/92. On the contary the lowest number of spikes/m^2 were obtained for plants grown in El-Dabaa 1989/90 and Sidi Barrani 1990/91.

The effect of the interaction between fertilization x variety on number of spikes/m^2 was significant at Atnooh 1991/92 and Sidi Barrani 1991/92.

2) Number of grains/spike:

Applying P fertilizer alone at the rate of 15 or 30 kg/fed. resulted in significant increase in number of grains/spike compared to the control at Sidi Barrani 1990/91 only. Applying N fertilizer alone at the rate of 15 or

30 kg/fed. resulted in significant increase in number of grain/spike compared to the control at the six environments of Sidi Barrani 1990/91, Sidi Barrani 1991/92, El-Mthany 1991/92, Wady El-Washk 1991/92, Atnooh 1991/92 and Raffah 1991/92. When N and P fertilizer were added together the increase in number of grains/spike was significant compared to the control at the same six environments.

The differences in number of grains/spike among varieties were significant at all environments except Sidi Barrani 1990/91, El-Dabaa 1989/90 and Raffah 1989/90. Variety Giza 124 produced the highest number of grains/spike compared with Giza 123 and CC89 varieties.

The highest three means number of grains/spike were obtained for paltns grown at El-Dabaa 1989/90, El-Mthany 1991/92 and Sidi Barrani 1991/92 and fewest grains / spike were obtained for plants grown at Sidi Barrani 199091 and Raffah 1989/90.

3) Grain weight per spike:

Applying P fertilizer alone at the rate of 15 or 30 kg/fed. significantly increased grain weight per spike compared to the control at Sidi Barrani 1990/91 only. Adding N fertilizer alone at the rate of 15 kg/ fed. resulted in significant increase in grain weight per spike compared to the control at Atnooh 1991/92 Sidi Barrani 1991/92 adn Raffah 1991/92. However, applying N fertilizer at the rate of 30 kg/fed. resulted in significant increase in grain weight per spike compared to the control at

Atnooh 1991/92, Wady El-Washk 1991/92, Sidi Barrani 1991/92 and Raffah 1991/92. When N and P fertilizer were added together the increase in grain weight per spike was significant compared to the control at Sidi Barrani 1990/91, Sidi Barrani 1991/92, El-Mthany 1991/92, Wady El-Washk 1991/92, Atnooh 1991/92 and Raffah 1991/92.

The differences in grain wieght per spike among varieites were significant at Atnooh 1991/92 and El-Mthany 1991/92. The two varieties Giza 124 and CC89 gave heavier grains /spike than Giza 123 variety. The same trend was observed at the other environments eventhough the differences among varieties were not significant.

The heaviest wights of grains/spike were obtained for plants grown at Sidi Barrani 1991/92 and Raffah 1991/92. On the contrary, lowest weight of grains/ spike were obtained for plants grown at Sidi Barrani 1990/91.

4) 1000-grain weight :

There were significant differences in 1000-grain weight due to fertilization at the two environments of Atnooh 1991/92 and El-Mthany 1991/92. When P was added alone at the rate of 15 kg/fed. resulted in significant decrease in 1000-grain weight compared to the control while, applying N fertilizer at the rate of 15 kg N/fed. resulted in significant decrease in 1000-grain weight compared to the control, also when added N and P together the decrease in 1000-grain weight was significant

compared to the control at Atnooth 1991/92. But El-Methany 1991/92, adding N or P alone at any used rate gave no significant differences in 1000-grain weight. Applying the combination treatment (15 kg N + 30 kg P_2O_5/fed.) only resulted in significant increase in 1000-grain weight compared to the control.

CC89 variety produced heavier grains than Giza 123 and Giza 124 at Atnooh 1991/92, Sidi Barrani 1991/92, Raffah 1991/92 and El-Dabaa 1989/90. The same trend was observed at the other environments eventhough the differences among varieties were not significant.

The heaviest 1000-grain weight were obtained for plants grown in Sidi Barrani 1991/92 and Raffah 1991/92. On the contrary, the lowest 1000-grain weights were obtained for plants grown in El-Mthany 1991/92, Sidi Barrani 1990/91 and El-Dabaa 1989/90.

5) Grain yield :

Applying P fertilizer alone at the rate of 15 kg/fed. significantly increased grain yield compared to the control at Raffah 1991/92 only. Applying N fertilizer at the rate of 15 kg/fed. resulted in significant increase in grain yield compared to the control at Wady El-Washk 1991/92, Sidi Barrani 1991/92, Raffah 1991/92, but applying 30 kg N/fed. resulted in significant increase in grain yield compared to the control at Wady El-Washk 1991/92, Atnooh 1991/92, Sidi Barrani 1991/92 and Raffah 1991/92. The highest grain yields at Sidi Barrani 1990/91, Atnooh

1991/92, Wady El-Washk 1991/92, El-Mthany 1991/92 and Raffah 1991/92 were achieved when N and P fertilizer were applied at their highest rates (30 kg N + 30 kg P_2O_5/fed.).

Grain yield of the barley plants receiving (30 kg N + 30 kg P_2O_5/fed.) outyielded those plants of the control with 122%, 169%, 244%, 65% and 152% at the five environments mentioned above respectively. On the other side, the highest grain yield of barley plants grown at Sidi Barrani 1991/92 were achieved by adding (30 kg N + 15 kg P_2O_5/fed.). Percentage increase due to last treatment compared to the control was 126%.

Variety CC89 produced less grain yield than the two varieties Giza 123 and Giza 124 at Atnooh 1991/92 and Raffah 1991/92 only. The same trend was observed at most environments eventhough the differences were not significant.

The highest grain yields were obtained for plants grown in Sidi Barrani 1991/92 and Raffah 1991/92. On the contrary, the lowest grain yields were obtained for plants grown in El-Dabaa 1989/90 and Sidi Barrani 1990/91.

The effect of the interaction between fertilization x variety on grain yield was significant at Atnooh 1991/92, Wady El-Washk 1991/92 and raffah 1991/92.