SUMMARY

Effect of Two- and Three-year Cotton Rotations on the Growth and Yield of the Associated Rotation Crops: Wheat, Clover and Maize:

Two field experiments were carried out during 1977/78 and 1978/79 seasons at the Agricultural Research and Experiment Station of the Faculty of Agricultural Science, Moshtohor. The aim of the experiments was to study the effect of different cotton rotations as well as the residual effect of cotton fertilization treatments on the growth and yield of three associated crops, namely, clover, wheat and maize.

The experimental treatments for clover included 10 treatments which were the combination of two rotation systems (2- and 3-year cotton rotations) and five cotton fertilization treatments.

For wheat, also 10 treatments were tested which were the combination of two rotation systems (2- and 3-year cotton rotations) and five cotton fertilization treatments.

The design of the experiments for clover and wheat was a split-plot design with four replications. Cotton fertilization treatments were arranged at random in the main plots and the sub-plots were assigned for crop rotation treatments.

For maize, each experiment included the above-mentioned 20 treatments which were the combination of two rotation systems (2- and 3-year cotton rotations), five cotton fertilization treatments and two preceding winter crops (clover and wheat). The design is considered as a split-split-plot design with four replications. The main plots were for fertilization treatments, the sub-plots for rotations and the sub-sub-plots for the preceding crops.

Cotton fertilization treatments were:

1. Zero kg N/fad. as a control.
2. 30 kg N/fad.
3. 60 kg N/fad.
4. F.Y.M. at a rate of 20 t/fad.
5. G.M. by means of growing clover as a catch crop before cotton planting and turning under clover residues.

Clover, wheat and maize were given their normal cultural treatments.

Data on growth, yield components, yield and the spread of weeds and nematodes in clover, wheat and maize were recorded.

Results of the experiments are summarized as follows:

First Part: Effect of Crop Rotation and Cotton Fertilization Residues on the Growth, Yield and Spread of Weeds and Nematodes in Clover:

A. Effect of Crop Rotation:

1. Plant height of clover grown in 2-year rotation was higher than that in 3-year rotation. That was particularly clear at the second cut in both seasons.
2. Number of branches/plant of clover in 2-year rotation was higher than that in 3-year rotation. That was clear at the second and third cuts.
3. Growing clover in 2-year rotation increased the dry weight of leaves and stems/plant compared with clover in 3-year rotation.
4. Crop rotation did not significantly affect the fresh and dry forage yields of clover at all cuts as well as in both experimental seasons. Slight increases were recorded in fresh and dry forage yields in 2-year rotation, but differences between 2- and 3-year rotations were not significant.
5. Growing clover in 2-year rotation significantly reduced weed density compared with clover grown in 3-year rotation.
6. The nematode population in the rhizosphere of clover plants in 3-year rotation was 17.5% lower than that in 2-year rotation. Such difference was beyond the level of significance.

B. Residual Effect of Cotton Fertilization:

1. F.Y.M. and G.M. residues significantly increased plant height of clover compared with N fertilizer.
2. Clover plants grown after cotton given F.Y.M. or preceded by G.M. produced higher number of branches/ plant than those grown after cotton treated with N fertilizer.
3. The dry weight of leaves/plant was not significantly affected by different fertilization residues in both seasons.

   On the other hand, the dry weight of stems/plant was favourably affected by F.Y.M. and G.M. residues, particularly at the second cut.
4. G.M. as well as F.Y.M. residues were significantly superior to N fertilizer in their effect on the fresh and dry forage yields of clover in both seasons. Significant increases in fresh and dry yields of clover grown in G.M. & F.Y. manured cotton rotations at different cuts in both seasons were recorded.
5. Growing clover in rotation in which cotton was G. manured significantly reduced weed density as well as weed population. On the contrary, F.Y.M. applied to cotton significantly increased weed growth in succeeding clover.

6. In general, higher N level applied to cotton was more effective in reducing weed growth in clover compared with unfertilized cotton.
7. Growing cotton after clover as a catch crop significantly increased nematode population in succeeding clover. Lowest nematode population in clover was where cotton was supplied with 60 kg N/fad.

C. Effect of the Interaction between Crop Rotation and Cotton Fertilization:

All effects of the interaction between crop rotation and cotton fertilization treatments on growth characters, forage yield and spread of weeds and nematodes in clover were not significant in both seasons.

Second Part: Effect of Crop Rotation and Cotton Fertilization Residues on the Growth, Yield and Spread of Weeds and Nematodes in Wheat:

A. Effect of Crop Rotation:

1. Neither plant height nor number of tillers/m^2 of wheat were significantly affected by crop rotation in both seasons.
2. Crop rotation had no significant effect on number of fertile tillers/m^2, spike length, spike weight, spike grain weight, and 1000-grain weight of wheat in both seasons.

Growing wheat in 3-year rotation system insignificantly increased most of yield components studied compared with wheat in 2-year rotation.

3. Grain and straw yields of wheat were not significantly affected by crop rotation in both seasons.
4. Straw yield of wheat in 3-year rotation exceeded that in 2-year rotation by about 16% in 1978/79 season. Such increase was, however, beyond the level of significance.
5. Growing wheat in 3-year rotation significantly reduced weed density compared with 2-year rotation.
6. The 3-year rotation was significantly superior to the 2-year rotation in depressing the nematode population in the rhizosphere of wheat plants.

B. Residual Effect of Cotton Fertilization:

1. Neither plant height nor number of tillers/m^2 of wheat were significantly affected by cotton fertilization treatments in both seasons.
2. Yield components of wheat after cotton treated with G.M., F.Y.M. and 60 kg N/fad. were higher than of those of wheat after unfertilized cotton. Differences in yield components were not great enough to reach the level of significance.
3. Cotton fertilization treatments had no significant residual effect on grain and straw yields of wheat in both seasons.

Grain and straw yields of wheat were higher after cotton treated with G.M., F.Y.M. and 60 kg N/fad. than after unfertilized cotton, but differences were not significant.

4. Cotton fertilization treatments significantly effected weed density in succeeding wheat in both seasons. Supplying cotton with F.Y.M. significantly increased weed growth in succeeding wheat, whereas G.M. reduced weed density. Treating cotton with a higher N level showed good effect in depressing weed density in succeeding wheat.
5. Cotton fertilization treatments showed significant residual effect on nematode population in succeeding wheat. The highest nematode population was in wheat after untreated cotton, and the lowest population was after F.Y. manured cotton.

C. Effect of the Interaction between Crop Rotation and Cotton Fertilization:

1. The interaction between crop rotation and cotton fertilization treatments had a significant effect on nematode population in 1978/79 season.
2. Growth characters, yield components, grain and straw yields and weed density in wheat were not significantly affected by crop rotation x cotton fertilization interaction in both seasons.

Third Part: Effect of Crop Rotation, Cotton Fertilization Residues and Preceding Crop on the Growth, Yield and Spread of Weeds and Nematodes in Maize:

A. Effect of Crop Rotation:

1. Tasseling and silking dates were significantly affected by crop rotation. Maize plants grown in 2-year rotation reached tasseling and silking stages earlier than 3-year rotation plants.
2. Plant height, number of leaves/plant, stem diameter and leaf area of maize plants were not significantly influenced by crop rotation in both seasons.
3. Yield components, namely, percentage of barren stalks, number of ears/plant, ear length, ear diameter, ear weight, weight of grain/plant, 100-kernel weight, and shelling percentage were not significantly affected by crop rotation in both seasons.
4. Crop rotation had no significant effect on maize grain yield in both seasons. Grain yield in 2-year rotation exceeded that in 3-year rotation by 10.2 and 1.2% in 1978 and 1979 seasons, respectively. Such increases were not significant.
5. Growing maize in three year cotton rotation significantly depressed weed growth in maize compared with 2-year cotton rotation.
6. Crop rotation had no significant effect on nematode population in maize.

B. Residual Effect of Cotton Fertilization:

1. Maize plants grown in F.Y. manured cotton rotations reached tasseling and silking stages significantly earlier than those grown in rotations in which cotton was treated with G.M. or N fertilizer.
2. Plant height, number of leaves/plant, and leaf area in maize were not significantly affected by the residual effect of cotton fertilizztion in both seasons.
3. Stem diameter of maize plants grown in rotations where cotton was supplied with F.Y.M. or G.M. was significantly higher than that of plants grown in N fertilized cotton rotations.
4. In 1979 season, treating cotton with G.M. or F.Y.M. significantly reduced the percentage of barren stalks of maize compared with N fertilizer treatments.
5. In 1978 season, weight of 100 kernels in maize was significantly affected by cotton fertilization treatments. Treating cotton with G.M. F.Y.M. or 60 kg N/fad. favourably affected 100-kernel weight of succeeding maize.
6. In both seasons, grain yield of maize was significantly affected by cotton fertilization residues. Higher grain yields were obtained in rotations in which cotton was supplied with F.Y.M., G.M. and 60 kg N/fad.

7. Weed density in maize was increased when cotton was supplied with F.Y.M. and G.M. and lowest weed density was in unfertilized cotton rotations.
8. Cotton fertilization treatments showed no significant effect on the nematode population density in the rhizosphere of maize plants.

C. Effect of Preceding Crop:

1. Maize plants grown after clover reached tasseling and silking stages earlier than those grown after wheat in both seasons.
2. Plant height, stem diameter, and leaf area in maize preceded by clover significantly surpassed those in maize preceded by wheat in both seasons.
3. In both seasons, ear length, ear weight, weight of grain/plant and 100-kernel weight in maize after clover were significantly higher than after wheat.
4. Number of ears/plant and ear diameter were significantly affected by preceding crop in 1978 season, and percentage of barren stalks was significantly decreased after clover in 1979 season.
5. Shelling percentage was not significantly affected by preceding crop in both seasons.
6. Maize grain yield after clover significantly exceeded that after wheat by 18.6 and 19.6% in 1978 and 1979 seasons, respectively.

7. Growing maize after clover significantly reduced weed growth compared with maize grown after wheat.
8. Preceding crop had no significant effect on the total nematode population in the rhizosphere of succeeding maize plants.

D. Interaction Effects:

1. Growth characters, yield components, grain yield, weed density and nematode population in maize were not significantly influenced by crop rotation x cotton fertilization interaction, in both seasons.
2. Leaf area (in 1979 season), yield of grain/plant (in 1978 season), yield of grain/fad. (in both seasons) and nematode population (in 1979 season) were significantly influenced by crop rotation x preceding crop interaction.
3. Ear weight (in 1978 season), yield of grain/plant (in 1978 season), grain yield/fad. (in 1978 season) and nematode population (in 1979 season) were significantly affected by cotton fertilization x preceding crop interaction.
4. Total nematode population in maize plots was significantly affected by crop rotation x cotton fertilization x preceding crop interaction, in 1979 season. Other characters studied were not significantly affected.