SEQUENTIAL AND INTERCROPPING SYSTEMS OF PLANTING COTTON WITH SOME WINTER CROPS

By

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ABSTRACT

A Two-year study was conducted at Kafr EL-Hamam Agricultural Research Station, ARC, Sharkia Governorate, Egypt during 2009/2010 and 2010/2011 seasons to investigate the effect of new cropping systems of growing cotton by planting it in relay intercropping with faba bean and wheat compared to solid plantings after these winter crops. The treatments were laid out in a split plot design with three replications. Two cotton cultivars (Giza 86 and Giza 90) were grown in the main plots meanwhile cropping systems were devoted in sub plots as followed: cotton after Egyptian clover (E.c) at 20th March, 20thApril and 20th May. Relay intercropping cotton with faba bean and wheat at 20th March. Cotton seeds were grown after faba bean and wheat at 20th April and 20th May, respectively, however faba bean seeds were grown on one side(low density) or both sides of the ridge(high density), as well as, wheat grains were grown at two rows (low density) or three rows per ridge(high density). The obtained results could be summarized as follows:

Cotton cultivars had insignificant effects on preceding crops of wheat and faba bean while cropping systems had significant effects on grain yield /fad. and its components. Wheat (solid) planting in two rows/ridge (S10) had higher values in each of grain weight/spike, grain yield / m^2, grain yield / fad., Faba bean planting in two sides (solid) per ridge had the highest value in grain yield/ fad

Cotton cultivar Giza 86 had higher values of each of plant height, number of total open bolls per plant, seed cotton yields per plant and per fad. , as well as, fiber technology traits than those of another cotton cultivar. Plant height, numbers of total and open bolls per plant, boll weight, seed cotton yields per plant and per fad. , as well as, fiber technology traits were affected significantly by cropping systems. Growing cotton plants as followed by E.c or intercropping with faba bean at 20th March or solid planting after faba bean at 20 April had the same results. Also, there were no significant differences between planting cotton after faba been at 20 April and intercropping with wheat at 20 March. Late planting date of cotton (20th May) as followed after Egyptian clover or wheat caused significant reductions in all cotton traits. Growing cotton after/with legumes had positive effects on cotton traits in a comparison with those of wheat. Yield of relay intercropping cotton with wheat at 20th March was increased significantly than those of solid cultures at 20th May. Low plant population densities of faba bean and wheat under intercropping cotton caused significant increaments in cotton traits. Cotton cultivar Giza 86 had significant increase in cotton characters than Giza 90, meanwhile, Giza 90 was more tolerant to late planting than Giza 86. The results indicated that there were significant differences between cultivars, cropping systems and their interactions on relative yields of cotton and land equivalent ratios as compared with traditional planting or double cropping systems of winter crops. Also, intercropping systems gave an advantage in (LER) as compared with sequential cropping systems. The results revealed that cotton cultivar Giza 86 had higher total and net returns than the other cultivar (Giza 90). In regard to cropping systems, total and net returns of cotton after faba bean at 20th April gave the highest total and net returns, while planting cotton after wheat at 20th May was the lowest one

Key words: Cotton , wheat, faba bean , relay intercropping , total return

DEDICATION

I dedicate this work to whom my heart felt thanks; to my parents and my sons and my wife as well as to my brothers, sister and my friends for all the support they lovely offered along the period of my post graduation.

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INTRODUCTION

Wheat is one of the main cereal crops in the world and Egypt. It is considered as strategic crop and the main food for Egyptians, sometime it is used widely in blending with maize flour to make bread. Wheat provides almost 20 % of the total calories to the people in the world and 37% in Egypt. The straw is a source of fodder for animals .The total cultivated area of wheat in Egypt was about 3,181,510 fad. and the total production of wheat was 8852551(Ton) with an average of 18.55 ardab/fad in 2011/2012. The total consumption was about 16 million tons of grains and flour. **(**Bulletin of Statistical Cost Production and Net Return, 2013 Part (1)).

Faba bean (*Vicia faba* L.) is one of the main legumes in the world and the first legume in Egypt. The total cultivated area of faba bean in Egypt was about 107963 fad and the total production of faba bean seed was 945755 ardab (146592 ton) with an average of 8.76 ardab /fad in 2011/2012**(**Bulletin of Statistical Cost Production and Net Return, 2013 Part (1)). Faba bean contains nearly 24- 28% of protein and 58% of carbohydrate. The straw is a source of fodder for some animals. Faba bean plays an important role in Nitrogen fixation in the soil by nodulation.

Egyptian clover (E.c) is the main forage crops in the Egypt; it plays an important role in Nitrogen fixation in the soil by nodulation. The total cultivated area of E.c was about 1,777,355 fad.

Cotton is the most important fiber crop in the world and Egypt and it is considered an industrial commodity of world wide importance

because of importance in national and international economy. The lint is used to make processed cotton which is woven into fabrics, either alone or combined with other fibers. Also, it is produced vegetable oil (18% of seed weight). Unfortunately, there was a reduction in the cultivated area of cotton in Egypt where it decreased from 1,064,678 fad. in 1982 to 333,360 fad. at 2012 (Bulletin of Statistical Cost Production and Net Return, 2013 Part (2)) . This is a result of decreasing the net return as compared with other summer crops, *i.e.* maize and rice. So, many growers find it more remunerative to grow cotton at May after winter crops such as Egyptian clover (E.c) or faba bean (*Vicia faba* L.) and wheat (*Triticum aestivum* L.).

It is clear that Egyptian cotton as the strategic crop subjected to stress. The farming sector needs to make certain changes and adjustments in the Egyptian production systems. One of the key strategies in the agricultural production systems is the intercropping. Relay intercropping allows farmers to grow two crops in the same field and season where the growing season is not long enough to accommodate two crops (Guldan *et al*., 1999). Intercropping of wheat and cotton is practiced on large scale in China **(**Zhang *et al*., 2008b) but it is considered a new farming system in Egypt (Sultan *et al*., 2012).

Concerning for cropping system, crop species and planting date lead to a renewed interest in sequential and intercropping systems. Crop species in intercropping pattern must be carefully chosen to minimize competition and enhance the efficient use of water, light and nutrients **(**Sayed Galal *et al*., 1983). There was several studies reported

success of relay intercropping cotton with some field crops in Egypt such as faba bean (Hussein,Samira, and Haikel, 2000 and Zohry, 2005), wheat (Hussein, Samira, 2006 and El-Hawary, 2009) and corn (Noaman, 2014; Metwally *et al*., 2009 and Metwally *et al*., 2012).

In preview, cotton cultivars and cropping systems may have impact of seed cotton yield and yield components and fiber quality so the objective of this work is to search new cropping systems of planting cotton in Egypt by growing cotton in relay intercropping with some winter crops, as well as, growing it through sequential cropping systems .